AOCNR 2023
THE ASIAN-OCEANIAN CONGRESS OF NEURORADIOLOGY

SGCR WIRES SINGAPORE 2023

Radiology: Driving Innovations, Enhancing Healthspan
18 - 20 August 2023 | Shangri-La, Singapore

e-Proceedings Booklet

Content

Welcome Message

Dear Friends & Colleagues,

On behalf of the Organising Committee, it is my great honour and privilege to invite you to the 14th Asian Oceanian Congress of Neuroradiology (AOCNR), which will be held in conjunction with the SGCR-WIRES 2023 (31st Annual Scientific Meeting Singapore Congress of Radiology and the 13th Workshops in Interventional Radiology Education Singapore), with this year's theme focused on neuroradiology.

As we emerge from the COVID-19 pandemic, there will be a renewed emphasis on reconnecting in person, rebuilding relationships and refocusing on health and well-being. Hence, the theme for 2023, held in Singapore, is "Radiology: Driving Innovations, Enhancing Healthspan". We hope that AOCNR SGCR-WIRES 2023 will be an opportunity to champion the idea of enhancing the life span of good health through innovating and reimagining diagnostic and interventional radiology, and its vital role in faster, safer and better access to appropriate care. We strive to gather the greatest minds in the field of radiology to promote and inspire change through dialogue.

Participants can look forward to an excellent lineup of educational, scientific content, hands-on workshops and networking sessions with renowned international speakers from North America, Europe, Asia and Oceania alongside our local Singaporean experts.

We sincerely urge all members of the various radiology societies to participate and support us to make AOCNR SGCR-WIRES 2023 an outstanding success. We look forward to seeing you in person in Singapore for an enriching meeting of the minds: come for the content, stay for the connection.

Please join our mailing list to indicate your interest and be among the first to receive updates. With your active support and participation, we can look forward to a dynamic and successful congress. We look forward to seeing you in Singapore in 2023!

Professor Tchoyoson Lim (MBBS, FRCR, MMed)
Organising Chair, AOCNR SGCR-WIRES 2023,
President, Neuroradiology Section, Singapore Radiological Society

AOCNR SGCR-WIRES 2023

Organising Committee

Prof Tchoyoson LIM	Organising Chair, AOCNR SGCR-WIRES 2023
Prof CHAN Ling Ling	Program Chair, AOCNR 2023 & SGCR 2023
A/Prof Anil GOPINATHAN	Program Chair, WIRES 2023, & Treasurer AOCNR SGCR-WIRES 2023
Associate Prof TANG Phua Hwee	Pediatric Neuro Lead
Asst Prof LIM Kheng Choon	Glioma Lead
Asst Prof Charlene LIEW	Artificial Intelligence Lead
Asst Prof Sumeet KUMAR	Hydrocephalus & Neurofluids, and Brain Tumour & Molecular therapeutics Lead
Asst Prof YAN Yet Yen	AOCNR Competitions Track Lead
Dr Emma LEE	AOCNR Competition Abstract
Dr HOU Wenlu	AOCNR Competition Abstract
Dr Dinesh SINGH	Francis Hui Quiz
Associate Prof Winston LIM	AOCNR WIRES
Asst Prof CHIA Ghim Song	AOCNR WIRES
Asst Prof Lawrence QUEK	AOCNR WIRES
Asst Prof Luke TOH	AOCNR WIRES
Asst Prof Saravana Kumar SWAMINATHAN	AOCNR WIRES
Asst Prof ZHUANG Kun Da	AOCNR WIRES
Dr Wickly LEE	AOCNR WIRES
Dr Joanna Pearly TI	AOCNR WIRES
Dr YANG Cunli	AOCNR WIRES
Dr Julian GOH	Head & Neck Track Lead
Dr Geoiphy George PULICKAL	Head & Neck Subcommittee
Asst Prof Melissa LEE	Orbital Co-Lead, and Hospitality Lead
Dr GOH Lin Wah	Post Treatment Neck Track Lead
Dr KEI Pin Lin	Otology Lead
Dr KHOO Hau Wei	Parathyroid Lead
Dr Amit KARANDIKAR	Salivary Gland Lead
Dr Alvin SOON	Otology Lead
Asst Prof Robert CHEN	Spine Track Lead
Asst Prof Maaz Mohammad SALAH	Spine Track Co-Lead
Associate Prof Kelvin LOKE	Molecular Imaging & Therapeutics Lead
Asst Prof Elizabeth CHEONG	Hepatobiliary Track Lead
Asst Prof CHONG Le Roy	Osteoporosis Track Lead
Asst Prof LEE Yien Sien	Women's Imaging Track Lead
Asst Prof Gideon OOI	Lung Cancer Screening Lead
Dr Rebekah LEE	Abdomen GI Track Lead
Mr TAY Yi Xiang	Radiography Track Lead
Mr Abdul Syafiq Bin ABDUL RAHMAN	Radiography Track Co-Lead
Ms CHAN Wai Yee	Nursing Track Lead
Asst Prof YU Wai Yung	Neuroradiology Resident Case Review
Ms Azizah MOHAMED AFIF	MSK US Hands-On Workshop Co-Lead
Ms Denise CHOONG	MSK US Hands-On Workshop Co-Lead
Dr Niketa CHOTAI	Breast Workshop Lead
Dr Leonard YEO	Ischaemic Stroke Workshop - Course Director
Dr May LIM	Support
Dr LOW Ying Liang	Social Lead
Dr Samuel NG	Breakfast Course
Dr OOI Shin Yin	Speaker Management
Dr Steve WONG	Publicity lead & AOCNR WIRES
Associate Prof TOO Chow Wei	Advisor & AOCNR WIRES
Asst Prof TEOH Wey Chyi	Advisor

International Advisory Board

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Professor LUO Chao-Bao	

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	Associate Professor Britt CHRISTENSEN		Associate Professor Puneet BELANI
	Associate Professor Laetitia DE VILLIERS		Associate Professor Linda CHU
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Hong Kong, China SAR	Professor Allen CHAN		
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India	Dr Gaurav GOEL		
Indonesia	Dr Sri Andreani UTOMO		
Italy	Dr Nivedita AGARWAL		
	Professor Fabrizio FANELLI		
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	Professor Minako AZUMA		
	Professor Yuichi MURAYAMA		
	Professor Shinji NAGANAWA		
	Professor Michihiro TANAKA		
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	Professor Kei YAMADA		
	Associate Professor Shigeo ICHIHASHI		
	Associate Professor Daiju UEDA		
	Dr Noriyuki FUJIMA		
	Dr Yuji OKUNO		
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	Professor TAN Chong Tin		
	Associate Professor Khairul Azmi ABD. KADIR		
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	Professor LIU Ya Ou		
	Professor LOU Xin		
	Professor TAO Xiao Feng		
	Professor XIAN Jun Fang		
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	Professor CHEN Cheng-Yu		
	Professor GUO Wan Yuo		
	Professor LUO Chao-Bao		
	Professor WONG Ho Fai		
	Associate Professor LEE Chung Wei		
	Dr Rennie CHEN		
	Dr CHEN Yu Pin		
Republic of Korea	Professor BAEK Jung Hwan		
	Professor KIM Dong Joon		
	Professor KIM Eung Yeop		
	Professor KIM Ji-Hoon		
	Professor KIM Man Deuk		
	Professor LEE Jongho		
	Professor LEE Jeong Hyun		
	Professor LEE Seung Koo		
	Professor SHIN Yong-Sam		
	Professor SOHN Chul-Ho		
	Associate Professor AHN Sung Jun		
Sweden	Professor Staffan HOLMIN		
Sri Lanka	Dr Nirmala WIJESINHA		
Switzerland	Professor Zsolt KULCSÁR		
Thailand	Professor Anchalee CHUROJANA		
	Professor Sirintara (Pongpech) SINGHARA NA AYUDHAYA		
	Associate Professor Chai KOBKITSUKSAKUL		
	Associate Professor Tanyaluck THIENTUNYAKIT		
	Asst Professor Arunnit BOONROD		
Türkiye	Professor Can Zafer KARAMAN		
United Arab Emirates	Dr Salman QURESHI		
United Kingdom	Professor Tufail PATANKAR		
	Dr Daniel BIRCHALL		
United States of America	Professor Muneeb AHMED		
	Professor Bulent ARSLAN		
	Professor Christopher FILIPPI		
	Professor Christine GLASTONBURY		
	Professor Francis LEE		
	Professor Manish PATEL		

Invited Faculty

Singapore

Professor Tchoyoson LIM
Professor CHAN Ling Ling
Associate Professor Anil GOPINATHAN

Professor Bernard CHERN
Professor TAN Eng King
Professor Louis TAN
Associate Professor ANG Beng Ti
Associate Professor Brenda ANG
Associate Professor Lester CHAN
Associate Professor CHAN Mei Yoke
Associate Professor CHANG Hui Meng
Associate Professor Kenneth CHANG
Associate Professor Melvin CHUA
Associate Professor Deidre Anne DE SILVA
Associate Professor Joyce KOH
Associate Professor Mark KOH
Associate Professor LIM Chwee Ming
Associate Professor Winston LIM
Associate Professor LIN Xuling
Associate Professor Kelvin LOKE
Associate Professor David LOW
Associate Professor Adeline NG
Associate Professor ONG Chiou Li
Associate Professor PUA Uei
Associate Professor Vijay SHARMA
Associate Professor SITOH Yih Yian
Associate Professor TANG Phua Hwee
Associate Professor TOO Chow Wei
Associate Professor Gervais WANSAICHEONG
Asst Professor Robert CHEN
Asst Professorf Elizabeth CHEONG
Asst Professor CHIA Ghim Song
Asst Professor CHONG Le Roy
Asst Professor James HALLINAN
Asst Professor Septian HARTONO
Asst Professor Nicole KEONG
Asst Professor Sumeet KUMAR
Asst Professor Gillianne LAI
Asst Professor Winnie LAM
Asst Professor Melissa LEE
Asst Professor LEE Yien Sien
Asst Professor Charlene LIEW
Asst Professor LIM Kheng Choon
Asst Professor Gideon OOI
Asst Professor Lawrence QUEK
Asst Professor Maaz Mohammad SALAH
Asst Professor Saravana Kumar SWAMINATHAN
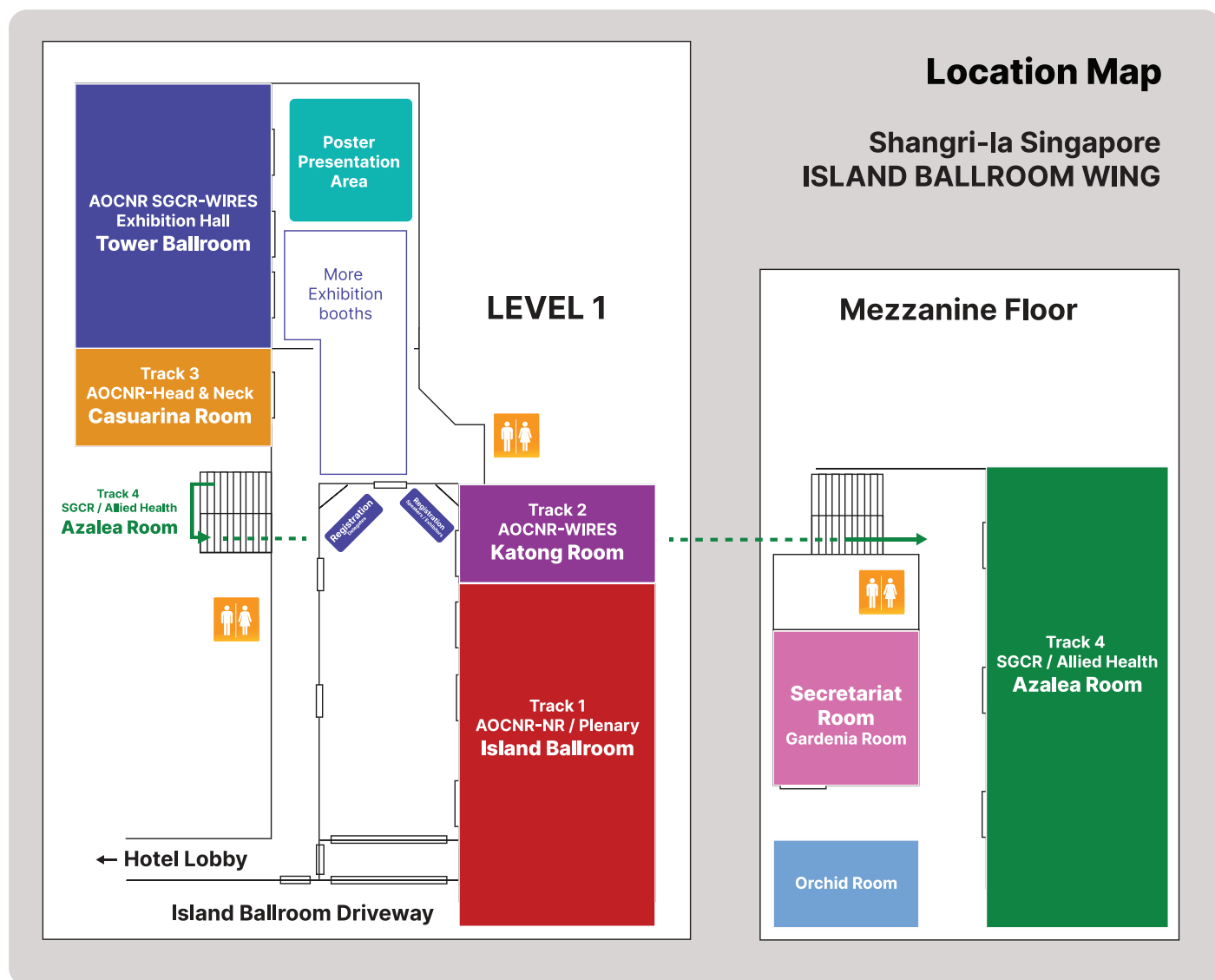Asst Professor TAN Ai Peng
Asst Professor TEO Sze Yiun

Asst Professor TEOH Wey Chyi
Asst Professor Thida WIN
Asst Professor Jocelyn WONG Yen Ling
Asst Professor XIE Wanying
Asst Professor ZHANG Jingjing
Asst Professor ZHUANG Kun Da
Dr Manish BUNDELE
Dr CHEW Chee Kian
Dr Valerie CHEW
Dr Timothy CHEO
Dr CHOI Yoon Seong
Dr Peter CHOO
Dr Linsey Utami GANI
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Dr GOH Lin Wah
Dr HO Chi Long
Dr Amit KARANDIKAR
Dr Bengt KARLSSON
Dr KHOO Hau Wei
Dr Steven KUM
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Dr Wickly LEE
Dr LIM Ming Yann
Dr Andrew MAKMUR
Dr Samuel NG
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Dr Ravi Bickram SHRESTHA
Dr Dinesh SINGH
Dr Alvin SOON
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Dr TAN Min On
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Dr THANG Sue Ping
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Dr Keefe LAI
Dr LOW Hsien Min
Dr YAN Yet Yen
Ms Michelle D. CANO
Ms CHAN Wai Yee
Ms CHONG Pau Khee
Ms Natalie FEGURO
Mr Michael Maximo LADERA
Ms LEE Weiling
Mr LIANG Chong Ri
Ms Rozana Binte OTHMAN

Oral Competition & E-poster Presentation Judges

Australia	Dr Constantine PHATOUROS
Hong Kong, China SAR	Professor Ann D KING
India	Professor Shailesh GAIKWAD
Japan	Professor Michihiro TANAKA
Republic of China	Professor Chen Cheng-Yu
Republic of Korea	Professor KIM Ji-Hoon
Singapore	Professor KHONG Pek Lan
	Professor PUA Uei
	Associate Professor CHONG Bee Kiang
	Associate Professor SITOH Yih Yian
	Dr CHAN Lai Peng
	Dr Peter GOH Yu-Tang
	Dr KEI Pin Lin
	Dr Wickly LEE
	Dr WONG Kang Min

Program / Congress Information

Location Map

Shangri-la Singapore
ISLAND BALLROOM WING

LEVEL 1

- AOCNR SGCR-WIRES Exhibition Hall
  Tower Ballroom
- Poster Presentation Area
- More Exhibition booths
- Track 3
  AOCNR-Head & Neck
  Casuarina Room
- Track 4
  SGCR / Allied Health
  Azalea Room
- Registration Delegates
- Registration Speakers / Faculty
- Track 2
  AOCNR-WIRES
  Katong Room
- Track 1
  AOCNR-NR / Plenary
  Island Ballroom
- ← Hotel Lobby
- **Island Ballroom Driveway**

Mezzanine Floor

- Track 4
  SGCR / Allied Health
  Azalea Room
- Secretariat Room
  Gardenia Room
- Orchid Room

Our Sponsors

Exhibition Hall

Track 3
AOCNR-Head & Neck
Casuarina Room

Island Ballroom Foyer

Booth	Exhibitor Name	Booth	Exhibitor Name	Booth	Exhibitor Name
1	Medtronic	13	RapidAi	25	Johnson & Johnson
2	Balt Group	14	Siemens Healthineers	26	Sirtex
3	Shukun Technology	15	Lunit	27	DeepRad.Ai / TMU
4	Heuron Co., Ltd.	16	BD	A	QST
5	Boston Scientific	17	Bayer	B	ECO
6	Guerbet	18	Neurophet	C	Amazon Web Services
7	Eye-2-Eye	19	GE Healthcare	D	Argon Medical Devices
8	Asahi Intecc	20	DKSH	E	Annalise.Ai
9	Microvention	21	StarMed	F	QT Instruments
10	EIZO	22	Canon Medical	G	Merit Medical
11	Penumbra	23	Kaneka	⊙	Türkiye
12	Carpl.Ai	24	Cordis		

DAY 1

	TRACK 1 AOCNR-Neuroradiology Level 1 - Island Ballroom	TRACK 2 AOCNR-WIRES Level 1 - Katong Room	TRACK 3 AOCNR-Head & Neck Level 1 - Casuarina Room	TRACK 4 AOCNR SGCR-WIRES Scientific Oral/Poster	
				Mezzanine - Azalea Room	Level 1 - Tower Ballroom Foyer

Session 1
08:30 – 09:50

Track 1 — Neurodevelopment, Psychoradiology & Brain Networks
- Multimodal Mapping of the Developing Human Brain: Insights From Singapore's Largest Birth Cohort Study — A/Prof Tan Ai Peng
- Psychoradiology Progress by Neuroradiologist, for Neuroradiologists — Prof Gong Qiyong
- Limbic System — Prof Kei Yamada

Track 2 — Interventional Radiology
- Techniques in Overcoming Discordant Mapping and Post implantation Uptake - How I do it. — Prof Bulent Arslan
- Discovery of biomarkers for clinical response to radiotherapy in HCC via Deep Immunoprofiling — Dr Valerie Chew
- Endovascular management in Portal Hypertension in Oncology — Prof Muneeb Ahmed
- IRE: getting started and beyond — Prof Pua Uei
- Microwave ablation of liver lesions: old and new — A/Prof Too Chow Wei

Track 3 — Imaging of the Post-Treatment Neck
- What the Radiotherapist needs to know — Dr Timothy Cheo
- Post-Radiation Changes In Head And Neck Cancer Treatment — Prof Christine Glastonbury
- Recurrent disease - CT & MR features — Prof Eugene Yu
- How to prepare for the Tumour Board — Prof Eugene Yu

Track 4 — SGCR-WIRES Scientific Oral Presentation
View schedule on e-Proceedings Booklet Page 46

Track 4 — AOCNR Scientific Oral Poster Presentation
View schedule on e-Proceedings Booklet Page 47

10:00 - 10:30
Opening Ceremony

Morning Break
10:30 – 10:55
stryker
Tea Symposium
* Tea Break (Bento) will be served in room

Morning Break / Visit Exhibition Booths

Session 2
11:00 – 12:20

Track 1 — Dementia: Neuroimaging and Clinical Impact
- Brain Molecular Imaging in Neurodegenerative Dementing Disorders — A/Prof Tanyaluck Thientunyakit
- Perivascular Spaces in Vascular and Alzheimer's Dementia — Prof Meng Law
- Dementia Updates and Clinical Impact — Dr Simon Ting

Track 2 — CNS AVM & AVF
- NASSAU study & Indications for treatment of unruptured AVM — Dr Bengt Karlsson
- Curative AVM embolisation — Prof Rene Chapot
- Reconstructive and Deconstructive Strategies for DAVF — Prof Zsolt Kulcsar
- DAVF: Indications, Principles and Strategies of endovascular management — Prof Luo Chao-Bao
- Endovascular strategies in the management of Direct Caroticocavernous fistulas — Dr Wickly Lee

Track 3 — Nasopharyngeal Cancer Screening - Current Techniques and Challenges
- Screening with EBV DNA - current status and role — Prof Allen Chan
- Endoscopic screening of NPC — Dr Lim Chwee Ming
- MRI screening of NPC - role and challenges — Prof Ann D King
- Challenges of instituting an NPC screening program — A/Prof Melvin Chua

Track 4 — AOCNR Scientific Oral Presentation
View schedule on e-Proceedings Booklet Page 46

Track 4 — SGCR-WIRES Scientific Oral Poster Presentation
View schedule on e-Proceedings Booklet Page 47

12:25 - 13:05
Takahashi Lecture
The changing role of neuroradiology, a SWOT analysis of visions past, present and future — Prof Paul Parizel

* please proceed to Track 1 for plenary session

Lunch
13:15 – 14:00
UNITED IMAGING — Lunch Symposium * Bento lunch will be served in room 13:15 - 13:45

SIEMENS Healthineers — Lunch Symposium * Bento lunch will be served in room 13.05 - 14:00

Lunch / Visit Exhibition Booths

Session 3
14:05 – 15:25

Track 1 — Imaging Controversy in Parkinsonism: Is There A Clinical Role?
- High Resolution Midbrain MRI in Parkinson's Disease — Prof Lee Jungho
- Imaging Parkinson's Disease: Radiological Perspective — Prof Chan Ling Ling
- *Proposition Expert Panel Debate:* Does Midbrain Imaging Have Clinical Value in Parkinsonism? — Prof Tan Eng King / Prof Kim Eung Yeop
- *Opposition Expert Panel Debate:* Does Midbrain Imaging Have Clinical Value in Parkinsonism? — Prof Louis Tan / Clin Asst Prof Xie Wanying

Track 2 — Cerebral Aneurysms
- Cerebral Aneurysms: Critical analysis on technical evolutions — Prof Rene Chapot
- Stent Assisted Coiling Vs Flow diversion — Prof Sirintara (Pongpech) Singhara Na Ayudhaya
- Flow diverters in Cerebral aneurysms: New horizons and changing landscapes — A/Prof Anil Gopinathan
- Complications of Flow Diversion & how to manage them — Prof Tufail Patankar
- Approach to Large and Giant Posterior Circulation Aneurysms — Prof Shin Yong-Sam

Track 3 — Hyperparathyroidism - Finding and Managing the Adenoma
- Clinical aspects & perspectives - What the clinician needs to know — Dr Chew Chee Kian
- 4D CT - current role and imaging pitfalls — Prof Lee Jeong Hyun
- Parathyroid Ablation — Prof Baek Jung Hwan
- Surgical Management of Hyperparathyroidism — Dr Lim Ming Yann

Track 4 — AOCNR Scientific Oral Presentation
View schedule on e-Proceedings Booklet Page 46

Afternoon Break
15:30 – 15:55
Medtronic — Tea Symposium * Tea Break (Bento) will be served in room

Boston Scientific — Tea Symposium * Tea Break (Bento) will be served in room

GE HealthCare — Tea Symposium * Tea Break (Bento) will be served in room

Afternoon Break / Visit Exhibition Booths

Session 4
16:00 – 17:20

Track 1 — Francis Hui Quiz & AOCNR Masters of Image Interpretation
- Francis Hui Quiz — Dr Dinesh Singh / Asst Prof Saravana Kumar Swaminathan
- AOCNR Masters of Image Interpretation — Prof Lee Seung Koo / Prof Christine Glastonbury / Prof Tufail Patankar

Track 2 — Peripheral Vascular Disease - Below the Knee / Below the Ankle Interventions
- Atherectomy Below the Knee — Prof Fabrizio Fanelli
- Advance BTK Revascularisation — Prof Fabrizio Fanelli
- Deep Venous Arterialization - What Works, What Doesn't — Dr Steven Kum
- Option in No Option Chronic Limb Ischaemia — Prof Bulent Arslan
- IVUS Guided Peripheral Intervention — Dr Shigeo Ichihashi

Track 3 — Salivary Gland Masses
- Multiparametric Imaging in the Differential Diagnosis of Parotid Masses — Prof Tao Xiao Feng
- Salivary gland neoplasms and their mimics — Prof Can Zafer Karaman
- Cytopathologic assessment of salivary gland lesions - uses and clinical implications — Dr Manish Bundele

Track 4 — Hydrocephalus & Neurofluids
- CSF Clearance Pathways- what a neuroradiologist needs to know — Dr Nivedita Agarwal
- Normal Pressure Hydrocephalus- a Neurosurgeon's perspective — Asst Professor Nicole Keong
- CSF and Blood biomarkers in neurodegenerative diseases — A/Prof Adeline Ng

17:30 - 18:30
AOCNR Live AI-Lounge

19:00 - 22:00
Faculty Dinner

Legend:
- Diagnostic NR-AI
- WIRES
- Head & Neck
- Spine
- SGCR
- Allied Health
- Scientific Oral
- Resident Review/Quiz
- Plenary
- Lunch / Tea Symposium

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DAY 2

Time	TRACK 1 AOCNR-Neuroradiology Level 1 - Island Ballroom	TRACK 2 AOCNR-WIRES Level 1 - Katong Room	TRACK 3 AOCNR-Head & Neck, Spine, KSR-SRS Symposium Level 1 - Casuarina Room	TRACK 4 SGCR Mezzanine - Azalea Room	Poster Presentation Level 1 - Tower Ballroom Foyer
07:30 - 08:30	**Sunrise Course** Pediatric Neuroradiology: How to Approach? A/Prof Jennifer Becker				
Session 5 08:30 - 09:50	**Innovations in Paediatric Neuroradiology** Neuroimaging of Pediatric White Matter Disease in the NGS Era Prof Lee Seung Koo Implications of new histopathology classification on imaging of Pediatric Brain Tumours A/Prof Kenneth Chang Optimising MRI experience for the pediatric patient with Ultrafast MRI brain A/Prof Tang Phua Hwee	**Spine & Musculoskeletal Interventions - Embolotherapy, Ablation & Reconstructive techniques** Treatment Gap That IR Can Fulfill: Orthopedic Oncologist Perspective Dr Lester Chan Ablation-Osteoplasty-Reinforcement-Internal Fixation (AORIF) in Osteolytic Metastases in Pelvis and Hip: Principle, Techniques, and Clinical Outcome Dr Francis Lee Role of Combination Treatment in Bone Metastases Prof Muneeb Ahmed Spine: Implant and Non-implant based Treatment of Spinal Metastases A/Prof Steven Yevich IR Treatment in Appendicular Extra-axial Bone Metastases A/Prof Steven Yevich MSK embolization beyond the knee Dr Yuji Okuno	**Dizzy or Deaf? Imaging of Hearing Loss and Meniere's Disease** 7T - Are we ready for primetime? Prof Berit Verbist Conductive Hearing loss in adults; approach and case based review Dr Geoiphy George Pulickal Sensorineural hearing loss in adults Prof Xian Jun Fang MR imaging of endolymphatic hydrops in Meniere's disease; what neuroradiologists should know Prof Shinji Naganawa	**Molecular Imaging & Therapeutics** PSMA-targeted radioligand therapy for prostate cancer Dr Thang Sue Ping Peptide receptor radionuclide therapies in neuroendocrine and somatostatin receptor rich tumours Asst Prof Zhang Jingjing Dosimetry after LEGACY/DOSISPHERE-01: What has changed in treatment of HCC and metastatic liver disease using SIRT Prof Bulent Arslan	**Poster Presentation**
Morning Break 09:55 - 10:20	Morning Break / Visit Exhibition Booths	**MicroVention TERUMO** Tea Symposium * Tea Break (Bento) will be served in room	**BAYER** Tea Symposium * Tea Break (Bento) will be served in room	Morning Break / Visit Exhibition Booths	
Session 6 10:30 - 11:50	**Future-Ready Radiologist: Infection, COVID, AI, Youth** Pandemic Preparation Expert Panel: Infectious Disease A/Prof Brenda Ang Pandemic Preparation Expert Panel: Neurology Prof Tan Chong Tin Pandemic Preparation Expert Panel: CNS infection A/Prof Suyash Mohan Pandemic Preparation Expert Panel: Radiology Dr Tan Bien Peng Young Leaders Roundtable: What to expect for AI Reading Room 2043 *In conjunction with Asian-Oceanian School of Radiology Youth Club Dr Rennie Chen / Dr Arunnit Boonrod / Dr Tan Min On / Dr Daiju Ueda	**Stroke 1: AIS & CVT** Acute ischemic stroke and ICAD: treatment concepts Prof Zsolt Kulczar Mechanical thrombectomy in DMVO: Indications and treatment strategies Dr Gaurav Goel Mechanical thrombectomy in posterior circulation stroke: How is different? A/Prof Kim Dong Joon Mechanical thrombectomy in low ASPECT stroke: Indications & special considerations Prof Aanchalee Churojana Endovascular treatment in Cerebral venous thrombosis A/Prof Winston Lim	**Orbit and Sella: What's New?** Functional MR imaging in the orbit Prof Tao Xiaofeng Deep Learning Application in the Orbit Dr Noriyuki Fujima Applications of Advanced MRI Sequences Useful in Diagnosing Sellar Lesions Prof Minako Azuma Perioperative Imaging of Pituitary Adenomas: What the Surgeon Wants to Know Asst Prof Robert Chen	**Lung Cancer Screening** From Research to a National Programme: Lung Cancer Screening in Taiwan Prof Chang Yeun-Chung Lung Cancer In Singapore Asst Prof Gillianne Lai Early Experience from SOLSTICE - a Singapore Lung Cancer Screening Study Asst Prof Gideon Ooi Roundtable Discussion Prof Chang Yeun-Chung / Asst Prof Gillianne Lai / Asst Prof Gideon Ooi / Asst Prof Jasleen Pannu	
11:55 - 12:40	**Plenary 2** The Future of Interventional Neuroradiology- Looking and Treating Beyond the Obvious Prof Timo Krings	* please proceed to Track 1 for plenary session			
Lunch 12:45 - 13:30	**Lunit** Lunch Symposium * Bento lunch will be served in room	**Canon CANON MEDICAL** Lunch Symposium * Bento lunch will be served in room	Lunch / Visit Exhibition Booths	**AstraZeneca** Lunch Symposium * Bento lunch will be served in room	
Session 7 13:45 - 15:05	**Challenges in Glioma - Tips, Tricks and Pearls** What the Neurosurgeons See in Tractography A/Prof David Low Managing Gliomas - What the neuro-oncologist wants to know in the radiology report besides "Please correlate clinically" A/Prof Lin Xuling Treatment Related Changes Versus Tumor Recurrence in High Grade Glioma: Where Do We Stand? A/Prof Suyash Mohan Practice like an 'expert': Masterclass in glioma management A/Prof David Low / A/Prof Lin Xuling / A/Prof Suyash Mohan	**Stroke 2: ICAD and Extracranial Carotid Disease** Cryptogenic Stroke: Current understanding of potential causes A/Prof Chang Hui Meng Embryological consideration of extracranial carotid atherothrombosis Prof Michihiro Tanaka Carotid stenting: Current indications and new developments Prof Timo Krings Modern management of ICAD with flow estimation Prof Adnan H Siddiqui Case Selection and Treatment Strategies in elective treatment of ICAD Prof Wong Ho Fai	**Spine MRI: Beyond the Conventional** AI applications in Spine MRI Asst Prof James Hallinan Spinal Diffusion Tensor and Kurtosis Imaging in Clinical Practice A/Prof Jennifer Becker Advanced Spinal Imaging Prof Johan Van Goethem	**Women's Imaging** Ultrasound Features of Uncommon Ectopic Pregnancy A/Prof Ong Chiou Li Imaging of Endometriosis Asst Prof Thida Win Imaging of Endometriosis Prof Bernard Chern Update on US O-RADS Asst Prof Teo Sze Yiun Uterine Artery Embolization in the treatment of Leiomyoma and Adenomyosis A/Prof Kim Man Deuk	
Afternoon Break 15:10 - 15:35	**Guerbet** Tea Symposium * Tea Break (Bento) will be served in room	**MicroVention TERUMO** Tea Symposium * Tea Break (Bento) will be served in room	Afternoon Break / Visit Exhibition Booths		
Session 8 15:40 - 17:00	**Molecular therapeutics Brain Tumours** "WHO" changed the CNS tumor classification and WHY? WHAT Neuroradiologists Need to Know! A/Prof Suyash Mohan Harnessing AI and Radiomics for Enhanced Neuroradiology: Focused on Brain Tumor Imaging Dr Choi Yoon Seong The Molecular Basis for Therapeutics in Glioblastoma A/Prof Ang Beng Ti	**New Devices and Treatments** CSF venous fistula: diagnosis and management from neurointerventional perspective Dr Laetitia de Villiers Endovascular trans-vessel wall technique for direct tissue access Prof Staffan Holmin Endovascular Vision salvage in Central Retinal Artery Occlusion A/Prof Chai Kobkitsuksakul Neck focused intrasaccular devices: The next step in cerebral aneurysm management Prof Tufail Patankar MMA embolisation in cSDH: Techniques and Evidence Prof Adnan H Siddiqui	**KSR-SRS Symposium** Acute stroke imaging : Focus on 'Core' and 'Penumbra' Prof Sohn Chul-Ho Susceptibility map-weighted imaging and neuromelanin -sensitive imaging: recent updates and clinical applications Prof Kim Eung Yeop Implementing AI Solutions – Promises and Challenges Asst Prof Lim Kheng Choon Atypical brain metastasis: what we missed or ignored A/Prof Ahn Sung Jun	**Osteoporosis in the Asian Population: Multidisciplinary Perspectives** LKC-HELIOS Bone Mineral Densitometry (BMD) for Singaporeans A/Prof Gervais Wansaicheong Trabecular Bone Score (TBS) in the evaluation of osteoporosis in the Asian population Dr Linsey Utami Gani Orthopaedic perspectives of atypical femoral fractures in the Asian population A/Prof Joyce Koh Artificial Intelligence in the Diagnosis of Osteoporosis and Sarcopenia Dr Chen Yu Pin	
19:00 - 22:00	**FY Khoo Dinner Lecture / Gala Dinner**				

Legend:

- Diagnostic NR-AI
- WIRES
- Head & Neck
- Spine
- SGCR
- Allied Health
- Scientific Oral
- Resident Review/ Quiz
- Plenary
- Lunch / Tea Symposium

DAY 3

	TRACK 1 AOCNR-Neuroradiology Level 1 - Island Ballroom	TRACK 2 AOCNR-WIRES Level 1 - Katong Room	TRACK 3 SGCR Level 1 - Casuarina Room	TRACK 4 Allied Health Mezzanine - Azalea Room	Poster Presentation Level 1 - Tower Ballroom Foyer
07:30 - 08:30	**Sunrise Course** Long COVID: why should we care? Prof Christopher Filippi Long COVID clinical update and imaging findings A/Prof Puneet Belani				
Session 9 08:30 - 09:50	**Stroke, Intracranial Haemorrhage & Risk Prediction** Ischemic Stroke: MR Imaging Clues to Predict Patient Outcome Prof Lou Xin Impact of Neuroimaging Advances on Ischemic Stroke: Neurological Perspective" A/Prof Deidre de Silva Intracranial Hemorrhage: AI Models for CT Detection and Risk Prediction Asst Prof Septian Hartono	**Edifice: Strengthening the foundations** Transcranial doppler for the neurointerventionist A/Prof Vijay Sharma The many faces of intracranial arterial dissections Prof Timo Krings Therapeutic Strategy of Unruptured Aneurysms: Selection of optimal endovascular devices Prof Yuichi Murayama Liquid Embolics: case selection and tips and tricks for safe and effective utilisation Dr Lee Chung-Wei Transradial neurointerventions: Tips, tricks and pitfalls Asst Prof Chia Ghim Song	**Imaging the Pancreas & Biliary Tract** Radiomics in Liver Imaging A/Prof Linda Chu Application of CEUS in LI-RADS Asst Prof Teoh Wey Chyi Imaging of Hilar Tumours: What the Surgeon Needs to Know Dr. Low Hsien Min Percutaneous Transhepatic cholangioscopy and Intervention: Initial experience with the SpyGlass™ DS Direct Visualization System Dr. Alfred Tan	**Radiography** Establishment of Institutional Diagnostic Reference Level in Computed Tomography Mr Liang Chong Ri Application of Rotational Angiography in Neuro Interventional Radiology: An SGH experience Mr Michael Maximo Ladera Callosal angle in idiopathic normal pressure: Technical considerations Ms Lee Weiling Salivary Gland Ultrasound: Tips and Tricks Mr Stephen James Bird	**Poster Presentation**
Morning Break 09:55 - 10:20	Morning Break / Visit Exhibition Booths		**Tea Symposium** * Tea Break (Bento) will be served in room	Morning Break / Visit Exhibition Booths	
10:30 - 11:15	**Plenary 3** The Invisible Gorilla Re-visited: perceptual errors and the future of Radiology Prof Daniel Birchall		* please proceed to Track 1 for plenary session		
Session 10 11:20 - 12:40	**Artificial Intelligence** AI Assisted Detection of Brain Metastasis: Data Governance and Beyond Prof Guo Wan Yuo Unleashing AI: Adventures in Transforming the National University Health System Dr Andrew Makmur AI Implementation: To Err is Human? Dr Christopher Filippi AI Shaping Our Tomorrow - Industry Perspective Dr Ravi Shrestha Panel discussion and Q&A Prof Guo Wan Yuo / Dr Andrew Makmur / Prof Kei Yamada / Dr Ravi Shrestha	**Vascular Malformations: Peripheral & Head and Neck** Introduction and classification of vascular anomalies A/Prof Mark Koh Targeted therapy in Vascular Anomalies A/Prof Chan Mei Yoke IR management of AVM of the head and neck Prof Anchalee Churojana IR management of AVM of the trunk and peripheries Dr Lee Chung Wei IR management of slow flow vascular malformations A/Prof Manish Patel Thermal ablation of vascular malformations: initial SG experience A/Prof Too Chow Wei	**Abdominal Gastrointestinal Imaging** Bowel Ultrasound in IBD A/Prof Britt Christensen Cases for Aces - Go with your Gut Dr Keefe Lai / Dr Thian Yee Liang / Dr Peter Choo	**Nursing** "Golden Period" Importance of Time Management in Stroke Nursing Ms Zhang Fangfang Carotid Stenting: Nursing perspective and challenges Ms Chong Pau khee Nursing Role in Intra-arterial chemotherapy (IAC) for Retinoblastoma Ms Michelle D. Cano Feed and Wrap Technique, a Protocol for Nurses Preparing "Well" Infants for MRI Scan Ms Yenleyetha Yun Chiat Spinal Tap For Infants Using Ultrasonography Ms Natalie Grace Fontiveros Feguro	
12:40 - 13:10	**Prize Presentation & Closing Ceremony**				
Lunch 13:10 - 14:00	Lunch / Visit Exhibition Booths				

Legend:

- Diagnostic NR-AI
- Head & Neck
- SGCR
- Scientific Oral
- Plenary
- WIRES
- Spine
- Allied Health
- Resident Review/Quiz
- Lunch / Tea Symposium

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Speaker Abstract
Plenary / Sunrise Course

TAKAHASHI LECTURE

MODERATOR: Prof Tchoyoson Lim

DAY 1 - Session 2 | Prof Paul Parizel
The changing role of neuroradiology, a SWOT analysis of visions past, present and future

During the past half century, neuroradiology has emerged as a specialized discipline that plays a crucial role in the diagnosis, management, and treatment of neurological disorders. Technological progress has transformed diagnostic and therapeutic neuroradiology, revolutionising patient care and enhancing outcomes. Advanced high-resolution diagnostic imaging techniques provide unparalleled anatomical and functional insights into the complexities of central nervous system diseases. Interventional neuroradiology is an essential component in treatment planning with minimally invasive techniques that reduce risks and improve outcomes for patients. The advent of artificial intelligence significantly impacts the field of neuroradiology, enabling personalized and data-driven healthcare, improving patient outcomes. In this presentation, I will develop a SWOT matrix, which is a strategic planning tool used to evaluate Strengths, Weaknesses, Opportunities, and Threats. The purpose is to identify internal and external factors that are favourable and unfavourable to achieving to our discipline. "Internal" factors should be understood as strengths and weaknesses; "external" factors are opportunities and threats.

STRENGTHS: Diagnostic neuroradiology plays a key role in the diagnosis, treatment planning, follow-up monitoring, and screening of patients with central nervous system disorders. Interventional neuroradiology is the treatment of choice for acute ischaemic stroke, intracranial aneurysms, vascular malformations, vertebral fractures. Neuroradiologists are leaders in multidisciplinary collaboration and patient-centric care. Our discipline sets high quality standards and recruits top medical graduates for fellowships and advanced training. Neuroradiology societies provide outstanding high-quality and well-structured continued medical education programs. Neuroradiology offers great untapped potential for research and scientific output. By providing accurate and timely diagnostic information, neuroradiology helps expedite the diagnosis and treatment process, leading to more efficient patient management with minimally invasive interventions and potentially shorter hospital stays.

WEAKNESSES: Neuroradiology is labour-intensive, capital-intensive and requires on costly equipment. Due to the complexity of our discipline, communication barriers, and the rapidly changing technological landscape, neuroradiology tends to be poorly understood by healthcare administrators or academic authorities; this may negatively impact resource allocations, strategic planning, and investment in innovative technologies. Neuroradiology has insufficient human resources to tackle the volume and complexity of our work. There are not enough scientifically qualified neuroradiologists, which results in difficulties to fill academic positions. Ever-increasing clinical responsibilities, with growing demands for productivity and speed (volume-based care) lead to decreased opportunities for patient contact, teaching, and research. Limited free academic time interferes with successful competition for funding. Neuroradiologists are under-represented as applicants of major research grants; the paucity of competent neuroradiology researchers threatens our scientific and academic future of neuroradiology.
The modest impact factors of our journals reflect of this weakness in research. Neuroradiology departments rely on patient referral by other clinicians (except for interventional neuroradiology).

OPPORTUNITIES: Increasing clinical involvement allows neuroradiologists to take a leading role in multidisciplinary team meetings (MDTs). Neuroradiologists should aspire to have direct interaction with patients and to create a patient-centred environment, thereby enhancing the visibility of our profession. Mobile point-of-care imaging capabilities have the potential to bring neuroimaging to the patient rather than the other way round (e.g. mobile CT, low field MRI). A fully integrated IT environment enables promising clinical applications for AI in neuroradiology, allowing automated analysis and interpretation of medical images. AI algorithms can aid neuroradiologists in lesion detection and characterisation, use of quantifiable disease activity biomarkers to assess disease progression, response to treatment, and outcome prediction, accelerated data acquisition and image reconstruction, and optimised patient workflow trajectories. AI can also assist to develop a structured scientific plan for research and development.

THREATS to neuroradiology can be external and internal. Diagnostic neuroradiology is prone to external "turf battles" with other specialists who aim to become major players in imaging of the brain (neurologists, psychiatrists, ...). Interventional neuroradiology sees conflicts of interest with interventional neurologists (endovascular stroke treatment), with neurosurgeons (aneurysm treatment), with vascular surgeons and cardiologists (endovascular stenting), and with orthopaedic surgeons (interventional spine procedures). A tendency towards further subspecialisation may cause fragmentation of neuroradiology into smaller sub-fields (interventional, functional, paediatric, skull base, head & neck, ...). The shortage of neuroradiologists can result in outsourcing (teleradiology) or the loss of work to other professional groups.
Our workforce has not kept pace with the increasing demand for diagnostic and interventional neuroradiology services. The large financial gradient between remuneration of academic versus private neuroradiologists contributes to the lack of interest for academically driven research and development. Finally, as with any big organisation, the ongoing political division between neuroradiology societies and special interest groups constitutes a threat for the discipline.

In CONCLUSION, neuroradiology is an essential component of patient care in the field of neuroscience. Through innovations in imaging technology, treatment planning, minimally invasive interventions, AI integration, and multidisciplinary collaboration, neuroradiologists have transformed the way neurological disorders are diagnosed, treated, and managed. As healthcare continues to progress, the role of neuroradiology will continue to expand, leading to further advancements. AI-driven solutions will enable personalized, value-based and data-driven healthcare, leading to improved patient management and outcomes.

SUNRISE COURSE DAY 2

MODERATOR: Dr Samuel Ng

DAY 2 - Session 5 | A/Prof Jennifer Becker
Pediatric Neuroradiology: How to Approach?

This presentation will include tips and tricks for evaluation of the pediatric brain following seizure and in the acute setting of altered consciousness. It is primarily intended for those training as Neuroradiologists and will also be useful for those in general radiology practices who report occasional pediatric

neuroradiology cases. The presentation will be primarily case based and will include a wide range of both common and more unusual pathologies that should be identified by the practicing clinician.

PLENARY 2

MODERATOR: A/Prof Anil Gopinathan

DAY 2 - Session 6 | Prof Timo Krings
The Future of Interventional Neuroradiology- Looking and Treating Beyond the Obvious

Recent advances in imaging, devices and diseases treated have expanded the field of Neurointervention. In this plenary lecture current and future trends will be discussed. Neuroimaging related to Neurointervention has opened a window into pathophsyiology of why Aneurysms or AVMs rupture. Devices have become more intricate and have lead often to safer interventions but at the same time have also introduced novel challenges and complications. Expanding the scope of diseases tackled through endovascular means poses likewise an opportunity and a threat as evidence for the management of this diseases is sometimes lacking behind the technical prowess of the interventionalists. Ethical concepts as well as system wide approaches to healthcare are important to consier when approaching neurointerventional procedures in the future.

SUNRISE COURSE DAY 3

MODERATORS: Dr Geoiphy Pulickal / Dr Nirmala Wijesinha

DAY 3 - Session 9 | Prof Christopher Filippi
Long COVID: why should we care?

DAY 3 - Session 9 | A/Prof Puneet Belani
Long COVID clinical update and imaging findings

The talk will comprise of an update on post acute COVID-19 syndrome ("Long COVID"). This syndrome occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis. Varying reports have noted the rates of developing long COVID with little insight and knowledge about known determinants. There are various classification schemes for this syndrome. One classification system suggests six potential subtypes: non-severe COVID-19 multiorgan sequelae, pulmonary fibrosis sequelae, myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS), postural orthostatic tachycardia syndrome (POTS), post intensive care syndrome, and medical or clinical sequelae. The pathological basis behind this syndrome has not be clearly elucidated. It is possible that COVID develops a cytotoxic memory immune T cell that affects the autoimmune response. Another potential cause of long COVID may be that the immune system does not attack the virus, in cases where COVID-19 is replicated in a protected anatomical location, such as the central nervous system or the gut-associated lymphoid tissue. Since the impact of Long COVID has continued to resonate worldwide, an update will be provided on the latest imaging and clinical findings in patients with this syndrome.

PLENARY 3

MODERATOR: Prof Tchoyoson Lim

DAY 3 - Session 9 | Prof Daniel Birchall
The Invisible Gorilla Re-visited: perceptual errors and the future of Radiology

Errors in Radiology are common, with one recent paper indicating that discrepancies occur in 20% of all reported CT and MR scans. Much has been written on the subject, with increasing recognition of its prevalence: "Errors meetings" are standard in many Radiology departments and there is increasing prominence of regular publications that highlight and present cases of radiological mistakes. Perceptual failure is known to be a major type of radiological error, and cognitive factors are increasingly recognised as being of fundamental importance in this process. However, recognition of the role of cognitive factors is largely based on anecdotal, situational observations, and little is known about the strength of these cognitive factors or about the relative contribution of different cognitive factors. This understanding is important not only so that we can understand better why we make mistakes, but also to help us plan the future of radiology – especially with the increasing challenge to existing practices posed by AI. It is also important so that we can manage our existing exposure to medico-legal risk. In this paper, I will present original research that attempts to quantify the nature of the cognitive factors that lead us to make mistakes in our work. This is based on a number of semi-objective experiments and studies, including: quantitative analysis of the cognitive factors involved across a range of radiological errors; comparative analysis of the effects of the nature of provided clinical information versus situational factors (including distraction); quantitation of the prevalence of perceptual failure in the context of leading clinical information; and analysis of the effect of double-reading, or verification, of a first observer's report. Clear conclusions will be drawn from these study findings with important implications, which help is to understand of the future place of Radiologists in a rapidly changing and challenging world.

NEURODEVELOPMENT, PSYCHORADIOLOGY AND BRAIN NETWORKS

MODERATORS: Prof Chan Ling Ling / A/Prof Sitoh Yih Yian

DAY 1 - Session 1 | Asst Prof Tan Ai Peng
Multimodal Mapping of the Developing Human Brain: Insights From Singapore's Largest Birth Cohort Study

It has been a long-standing ambition of neuroscience to map the function of the human brain, which has the prospect of informing the development of precision treatments for brain disorders. Our ultimate goal is to create an accurate structural and functional map of the developing human brain throughout childhood using cutting-edge MRI techniques in order to provide mechanistic insights into the link between environmental exposures, brain development in early childhood, and later cognitive and mental health outcomes. In the age of precision medicine, the goal of neuroimaging extends beyond static and group-level inference to incorporate individual-level assessment. Precise brain mapping in a large cohort of typically developing children will allow us to characterize deviation patterns in clinical populations for accurate biological subtyping, laying the critical foundation for precision medicine in neurodevelopmental and mental health disorders. Growing Up in Singapore Towards healthy Outcomes (GUSTO), our national flagship longitudinal developmental cohort with neuroimaging, biosampling, and deep phenotyping of cognitive and behavioral outcomes at multiple time points across childhood, provided us with an unprecedented opportunity to achieve these visions. GUSTO serves as a microscope, looking at how biological, social, and environmental factors affect health and well being. It also highlights gaps and opportunities for us to improve the health and human potential of Singaporeans at key timepoints across the life course. Our research focuses on improving both the mental capital and mental well-being of Singaporeans, as well as the diagnosis and treatment of disease.

DAY 1 - Session 1 | Prof Gong Qiyong
Psychoradiology Progress by Neuroradiologist, for Neuroradiologists

Psychoradiology is a subspecialty of radiology with the growing intersection between fields of radiological imaging and psychiatry/psychology. It applies radiological technologies, particularly the multimodal MR imaging along with the comprehensively designed image acquisition and analysis algorithm, to investigate and guide optimal reatment for mental illnesses. Because brain alterations of psychiatric patients are relatively subtle, quantitative, rapid and efficient image analysis tools that combine information from different imaging analyses are needed to obtain clinically meaningful information about patients' brain anatomy and function. The present talk will therefore summarize the most recent findings of the psychoradiology, and their implications for clinical care of the psychiatric patients.

DAY 1 - Session 1 | Prof Kei Yamada
Limbic System

The limbic system (LS) is the brain structures located on both sides of the thalamus and medial temporal lobes. The name "limbic" comes from the Latin word for the "border." It supports a variety of functions including behavior, emotion, memory, and olfaction. Understanding the anatomy of LS will be very important in assessing the brain lesions of various kinds. For instance, brain infarcts involving the strategic locations can lead to devastating symptoms, even if it is a small lesion. LS is also important in understanding the pathophysiology of epilepsy. For instance, mesial temporal sclerosis is one of the most common causes for intractable temporal lobe epilepsy and it will cause various abnormalities in the LS.

To understand the complex structure of LS, basic knowledge of thalamus, hippocampus and basal ganglia will be necessary. Diffusion-tensor imaging (DTI) and tractography has made contributions in understanding these structures in three-dimensional fashion. In this lecture, I will first talk about the basic anatomy of LS and then try elucidating the clinical relevance of the lesions involving these areas.

DEMENTIA: NEUROIMAGING & CLINICAL IMPACT

MODERATORS: Asst Prof Xie Wanying / Prof Norlisah Ramli

DAY 1 - Session 2 | A/Prof Tanyaluck Thientunyakit
Brain Molecular Imaging in Neurodegenerative Dementing Disorders

In an aging society, we encounter an increasing number of patients suffering from dementing disorders. While effective treatments for neurodegenerative diseases are limited, it is critical to establish an accurate diagnosis so that patients can be triaged to the appropriate care and management, as well as help therapeutic developments via the enrollment of patients into research and clinical trials. The merging advances in molecular imaging methods, with brain positron emission tomography (PET) imaging in particular, allow for in vivo visualization and quantitation of specific neurochemical and molecular pathophysiologic changes in the brain tissue. PET imaging using different radiopharmaceuticals have been used extensively for research and clinical applications to better understand the pathophysiology of dementing disorders, help establish a diagnosis for dementia patients, and evaluate therapeutic effects in patients with neurodegenerative disorders. This talk will focus on the recent advances in molecular PET imaging of the brain and its clinical applications in neurodegenerative dementing disorder.

DAY 1 - Session 2 | Prof Meng Law
Perivascular Spaces in Vascular and Alzheimer's Dementia

The major risk factors for neurodegenerative disease such as Alzheimers Disease (AD) are genetic, ageing, cardiovascular disease, traumatic brain injury (TBI) and sleep disturbance (SD). The glymphatics are a brain-wide network of perivascular spaces along which cerebrospinal fluid (CSF) exchange, supporting nutrient distribution and toxic waste clearance throughout the CNS. However, little is known of the interaction between the blood-brain-barrier (BBB) and perivascular spaces (PVS). Mechanistically, our research shows that genetics, ageing, cardiovascular disease and TBI affects the BBB and PVS clearance of wastes such as β-amyloid from the brain.

Our goal is to prevent neurodegenerative diseases such as AD. Our past discoveries have used multimodal MRI (MMRI) to image the BBB and PVS in ageing, TBI and AD. We will use these novel MMRI methods to demonstrate how modifiable risk factors causes BBB/PVS dysfunctional and affects glymphatic/CSF clearance. We will demonstrate the lifespan trajectory, diurnal variation and physiological function of the PVS is highly

dependent on the function of two components of the BBB, 1) the passive endothelial-pericyte component; 2) the active Aquaporin 4 ion channels at the CSF-astrocytic interface with the brain. This will inform new therapeutic targets, such as statins which improves polarization of AQP4. This project will address many unanswered questions in this field: what is the normal calibre and trajectory of PVS from 'cradle to grave' through the lifespan; what are the diurnal 24 hour variations in the PVS; how do genetic (APOE4) & modifiable non-genetic risk factors, vascular risks, TBI, sleep disturbance affect the PVS through the lifespan; can variation in the PVS trajectory predict onset and progression of AD; are statins which improve AQP4 polarisation, a good therapeutic target in AD. Our team's expertise and track record has proven our ability to achieve these outcomes. Our work hopes to address many unanswered questions in this field: what is the normal calibre and trajectory of PVS from 'cradle to grave' through the lifespan; what are the diurnal 24 hour variations in the PVS; how do genetic (APOE4) & modifiable non-genetic risk factors, vascular risks, TBI, sleep disturbance affect the PVS through the lifespan; can variation in the PVS trajectory predict onset and progression of AD; are statins which improve AQP4 polarisation, a good therapeutic target in AD. Our team's expertise and track record has proven our ability to achieve these outcomes.

DAY 1 - Session 2 | Dr Simon Ting
Dementia Updates and Clinical Impact

The etiological diagnosis of cognitive impairment remains a challenge in clinical practice. Radiological input, such as computed tomography (CT) and magnetic resonance imaging (MRI), is commonly used in the evaluation of cognitive impairment due to its ability to provide detailed structural information about the brain. However, the role of neuroimaging is frequently limited to excluding other etiologies for cognitive decline secondary to neurodegenerative causes, especially in the earlier phases. On the other hand, FDG-PET brain, which is complementary to structural imaging, can provide functional information that helps to provide a more precise diagnosis. In this talk, we will discuss a few common clinical encounters and emphasize how neuroimaging provides significant value in assisting with reaching a clinical diagnosis.

IMAGING CONTROVERSY IN PARKINSONISM: IS THERE A CLINICAL ROLE?

MODERATORS: Asst Prof Robert Chen / Dr Simon Ting

DAY 1 - Session 3 | Prof Lee Jungho
High Resolution Midbrain MRI in Parkinson's Disease

This talk will provide an overview of the technical advances in high resolution midbrain MRI imaging and their application in Parkinson's disease diagnosis. Parkinson's disease is a neurodegenerative disorder that affects the dopamine producing neurons in the substantia nigra of the brain. The diagnosis of Parkinson's disease is primarily based on clinical symptoms, which can be assisted by advanced neuroimaging using MRI. Iron-sensitive susceptibility map weighted imaging (SMWI) is a relatively new neuroimaging technique that has been gaining momentum in assisting the diagnosis of Parkinson's disease. This technique is designed to visualize nigral hyperintensity or nigrosome 1 in substantia nigra. The loss of nigral hyperintensity is one of the earliest signs of Parkinson's disease and can be detected using SMWI. The loss of the visualization of

nigral hyperintensity with SMWI has been found to have a highcorrelation with Parkinson's disease, making it an important tool for the diagnosis of the disease. Another novel neuroimaging technique that has been gaining attention in Parkinson's disease diagnosis is neuromelanin-sensitive imaging. Neuromelanin is a pigment found in the dopaminergic neurons of the substantia nigra, and its content decreases as the disease progresses. Neuromelanin-sensitive imaging is designed to visualize the neuromelanin content in substantia nigra, which can aid in the diagnosis of Parkinson's disease. This technique has shown promising results in distinguishing between Parkinson's disease and other neurodegenerative disorders that have similar clinical presentations. The technical advances in these two neuroimaging techniques have significantly improved our ability to diagnose Parkinson's disease accurately. These techniques have been shown to be reliable, sensitive, and specific in identifying the characteristic changes in the substantia nigra associated with Parkinson's disease. The clinical evaluation outcomes of these techniques have been encouraging, and they have the potential to revolutionize the diagnosis and management of Parkinson's disease. I will also provide information for the design, analysis and translation of the two techniques for routine clinical evaluation.

DAY 1 - Session 3 | Prof Chan Ling Ling
Imaging Parkinson's Disease: Radiological Perspective

This talk will review the clinical heterogeneity of Parkinson's disease and the use of different imaging modalities in Radiology to aid in its diagnosis, including transcranial ultrasound, MRI (multimodal, quantitative and ultrahigh field) and functional imaging. In addition, the role of the Radiologist in the evaluation of comorbidities and management of late-stage Parkinson's disease are also explored

DAY 1 - Session 3 |
Prof Tan Eng King / Prof Kim Eung Yeop (Proposition),
Prof Louis Tan / Asst Prof Xie Wanying (Opposition)
Expert Panel Debate Motion: Does Midbrain Imaging Have Clinical Value in Parkinsonism?

The role of neuroimaging in clinical management of Parkinsons disease (PD) has been debated. Many argue that PD is essentially a clinical diagnosis, based on certain characteristic signs and symptoms, and clinical response to levodopa. Hence neuroimaging in "typical" PD patients has a limited role. However, the advancement and development of various techniques in imaging the midbrain dopaminergic neurons have the potential to change the paradigm of diagnostics and management of PD patients. In this panel debate, experts will argue on the merits, cost effectiveness and limitations of midbrain imaging in PD patients, and discuss its potential clinical role.

HYDROCEPHALUS & NEUROFLUIDS

MODERATORS: Asst Prof Sumeet Kumar / Prof Shigeki Aoki

DAY 1 - Session 4 | Dr Nivedita Agarwal
CSF Clearance Pathways- what a neuroradiologist needs to know

Identifying flow pathways of neurofluids has been the subject of intense research since mid-1900s. Tracers injected in the cisternal spaces enter the brain parenchyma together with

the cerebrospinal fluid (CSF) in a centripetal manner, along the pial-glial basement membranes that line the outer wall of penetrating arterioles in the gray matter. The CSF that enters the brain parenchyma "mixes" with the interstital fluid (ISF) such that waste proteins can be transported out of the brain. The brain parenchyma lacks the anatomical lymphatic network, present in other body organs. The different pathways through which fluids exit the brain parenchyma are: along para-venous channels (glymphatic pathway), within the intramural space of the arterial wall (periarterial intramural drainage pathway) and via meningeal channels in the paradural pathways. In this talk, we will highlight a few groundbreaking research work that demonstrate such clearance pathways in animals and humans.
I will go through a few research applications of advanced MR techniques. In clinical neuroradiological setting, it is still difficult to directly examine clearance pathways but a knowledge of them is fundamental to search for some indirect findings in magnetic resonance imaging. The identification of perivascular spaces, the role of intravenous and intrathecal post gadolinium based imaging will be illustrated with some everyday clinical examples of immediate interest to neuroradiologists. A brief mention on the meningeal lymphatic drainage will be made.

DAY 1 - Session 4 | Asst Professor Nicole Keong
Normal Pressure Hydrocephalus - a Neurosurgeon's perspective

Normal pressure hydrocephalus (NPH) is a condition in which gait disturbance, urinary incontinence and cognitive decline present as a disorder of circulation of cerebrospinal fluid (CSF), resulting in progressive ventriculomegaly and other neuroradiological features. NPH syndrome may be reversible with CSF diversion in the form of the surgical implantation of a shunt. Whilst relatively uncommon within the spectrum of dementia, its potential reversibility elevates NPH in importance in terms of screening for neurological decline. Imaging plays a crucial role in this regard. The pathophysiological basis for the development of the NPH syndrome is still debated and there is an increasing understanding of the presentation of patient cohorts in its differing forms, such as Classic vs. Complex NPH and/or with overlay from frailty and co-morbidities such as neurodegenerative disorders. In this talk, I aim to lay the foundation for the current theories for how NPH evolves as a condition, its salient multi-modal neuroimaging features and how these relate to the spectrum of NPH patients presenting to neuroscience clinicians.

DAY 1 - Session 4 | A/Prof Adeline Ng
CSF and Blood biomarkers in neurodegenerative diseases

Biomarkers for neurodegenerative diseases are needed to improve diagnostic and prognostic accuracy and facilitate monitoring of effective disease-modifying therapies. Cerebrospinal fluid (CSF) biomarkers have been well-established in Alzheimer's disease (AD), but the relatively invasive nature of CSF collection has led to the development and growth of novel blood-based biomarkers in neurodegenerative disorders. In recent years, easily accessible blood-based biomarkers detecting AD pathologies have been developed and increasingly validated, alongside growth of novel biomarkers for specific disorders such as Parkinson's disease, as well as markers of general neurodegeneration. In this talk, we will provide a brief overview of updates in biomarker development in the main neurodegenerative disorders, as well as ongoing clinical biomarker work in neurodegeneration from the National Neuroscience Institute, Singapore.

INNOVATIONS IN PAEDIATRIC NEURORADIOLOGY

MODERATOR: Prof Chen Cheng-Yu

DAY 2 - Session 5 | Prof Lee Seung Koo
Neuroimaging of Pediatric White Matter Disease in the NGS Era

Hereditary leukodystrophy syndrome is rare disorders with diverse clinical and radiologic features. Next generation sequencing (NGS) enables more precise diagnosis of leukodystrophy by analyzing genetic feature. The purpose of this study was to re-organize MRI findings of leukodystrophy according to NGS, not clinical manifestations. From 2015 to 2023, total 30 patients (M:F=19:11, mean age=6.5) diagnosed to have leukodystrophy syndrome were retrospectively reviewed. NGS was performed for all patients. Location and extent of dysmyelination, enhancement pattern and diffusion restriction were reviewed according to responsible gene abnormality. Eleven patients were confirmed to have denosine triphosphate-binding cassette subfamily D (ABCD) member 1 gene mutation and they showed uniform and typical appearance of peritrigone dysmyelination with linear enhancement zones. Eight patients showed arylsulfatase A (ARSA) gene mutation and they showed diffuse dysmyelination without zone preference and preservation of subcortical u-fibers. Five patients had proteolipid protein 1 (PLP1) gene mutation and showed diffuse dysmyelination, involvement of brain stem, subcortical u-fibers. Others showed more severe and extensive dysmyelination was seen in megalencephalic leukodystrophy (MLC1) gene, galactosylceramidase (GALC) gene mutation. Diffusion restriction was noted in white matter involvement of Charcot Marie Tooth disease and thalassemia. NGS provides precise genetic diagnosis of leukodystrophy syndrome. Zone preference, extent of dysmyelination, severity of white matter involvement can be assessed according to each gene mutation and will be helpful for differential diagnosis of various leukodystrophy syndrome.

DAY 2 - Session 5 | A/Prof Kenneth Chang
Implications of new histopathology classification on imaging of Pediatric Brain Tumours

In this presentation, the recent 5th edition update to the World Health Organization classification of Central Nervous System Tumours will be discussed, with a focus on paediatric brain tumours and the role of molecular diagnostics in CNS tumour classification.

DAY 2 - Session 5 | A/Prof Tang Phua Hwee
Optimising MRI experience for the pediatric patient with Ultrafast MRI brain

Undergoing an MRI experience can be intimidating for the young child as MRI scans requires them to stay very still in an unfamiliar environment with constant loud strange sounds. Young children thus may require sedation or general anaesthesia for the MRIs. Department of Diagnostic and Interventional Imaging, KK Women's and Children's Hospital, Singapore has put in place measures to improve the MRI experience for our young patients as well improve the departmental workflow for staff. These include having a short checklist to determine which children would be able to co-operate with MRI scans versus those who would require sedation or general anaesthesia and having interactive videos for children to explore prior to their MRI scans (shown to be effective in increasing child's confidence in keeping still for MRI and associated with less requirement for

repeated MRI sequences). Department has recently optimized and implemented Ultrafast MRI brain protocols for patients with low probability of having significant brain abnormalities and created a neural network based model with friendly user graphic interface to select suitable cases for the Ultrafast MRI brain protocols. This talk will cover how the department has harnessed technological advances and put in place measures shown to be effective to optimize MRI for our young patients.

FUTURE-READY RADIOLOGIST: INFECTION, COVID, AI, YOUTH

MODERATORS: Prof Tchoyoson Lim / Prof Yoshiyuki Watanabe

DAY 2 - Session 6 | A/Prof Brenda Ang / Prof Tan Chong Tin / A/Prof Suyash Mohan/ Dr Tan Bien Peng
Pandemic Preparation Expert Panel

As the world emerges from the COVID-19 pandemic, we are reminded that in Asia, as in the world, infectious disease still has major health impacts despite the growing importance of chronic non-infectious disease. What did we learn or fail to learn these outbreaks? Can we learn in time for next pandemic: what are the odds of the next Disease X?

The multidisciplinary expert panel will discuss some questions about future preparations:
- A/Prof Brenda Ang (Infectious Disease): what are some future trends of infectious disease outbreaks?
- Prof Tan Chong Tin (Neurology): what are some endemic/pandemic CNS infections of concern?
- A/Prof Suyash Mohan (Neuroradiologist): what are some basic principles for CNS infection diagnosis we should be familiar with?
- Dr Tan Bien Peng (Radiologist): how did SARS/past outbreaks prepare Radiology systems for COVID?

DAY 2 - Session 6 | Dr Rennie Chen / Asst Prof Arunnit Boonrod / Dr Tan Min On / A/Prof Daiju Ueda
Young Leaders Roundtable: What to expect for AI Reading Room 2043 (in conjunction with Asian-Oceanian School of Radiology Youth Club)

Many scholarly articles, opinion-editorials, and presentations on the subject of artificial intelligence (AI) in radiology by key opinion leaders today describe what they think will happen with AI in the future (such as in the year 2043). However, these key opinion leaders will be retired in 2043: and it is today's young radiologists who will suffer consequences or reap benefits of policies and decisions being made today. The voice of young radiologists is not being heard. This panel discussion invites young leaders in the Asian-Oceanian region to engage, discuss and plan for AI in future radiology practice in 2043. Guided by Prof Yoshiyuki Watanabe (Shiga, supported by Asia-Oceania School of Radiology Youth Club) and Prof Tchoyoson Lim (Singapore), the panel brings together doctors Tan Min-On (Singapore), Rennie Yung-Chieh Chen (Taipei), Arunnit Boonrod (Khon Kaen) and Daiju Ueda (Osaka), and invites audience participation. Panelists will reflect on how they need to direct their focus today in order to have the best outcome in 2043, when they are at the top of their career. It is hoped that this session will start discussion and activism among young radiologists to have their voices heard.

CHALLENGES IN GLIOMA - TIPS, TRICKS AND PEARLS

MODERATORS: Asst Prof Lim Kheng Choon / Asst Prof Jocelyn Wong Yen Ling

DAY 2 - Session 7 | A/Prof David Low
What the Neurosurgeons See in Tractography

DTI has been used for neurosurgical pre-operative planning in order to appreciate the intricate relationship of intra-axial tumours adjacent critical fiber tracks. Examples include the cortico-spinal tracks, the complex network fibers around the language area and the visual pathway. The greater extent of resection of low grade gliomas, high grade gliomas as well as recurrent gliomas have been shown to improve overall survival as well as progression free survival outcomes. Hence, the vital information provided by DTI imaging allows planning and identification of suitable surgical corridors to approach resection of tumours and allows for maximal safe resection of the tumours to achieve optimal onco-functional balance. We discuss the above with different case examples to share application of pre-operative DTI and the intra-operative process of tumour resection.

DAY 2 - Session 7 | A/Prof Lin Xuling
Managing Gliomas - What the neuro-oncologist wants to know in the radiology report besides "Please correlate clinically".

This case-based discussion, Dr Lin will discuss the oncological management of gliomas and highlight the essential components of radiological reports that can impact management.

DAY 2 - Session 7 | A/Prof Suyash Mohan
Treatment Related Changes Versus Tumor Recurrence in High Grade Glioma: Where Do We Stand?

Glioblastoma carries a dismal prognosis despite aggressive multimodal therapy. Novel/alternative therapies such as immunotherapies, are known to intensify the inflammatory response in the treatment field often mimicking disease progression on conventional MRI, making accurate evaluation extremely challenging. Existing criteria for assessment of treatment response in high-grade gliomas have several limitations. This talk will address these limitations and highlight the role of a more objective and quantifiable "treatment agnostic" model, integrating advanced multimodal neuroimaging techniques along with 'augmented' intelligence (combination of humans & computers) to address this complex issue of treatment-related changes versus tumor progression in "real-time", particularly in the early post-treatment window. The overall goal is to improve consistency and automation for the assessment of early treatment response in this era of precision neuro-oncology.

DAY 2 - Session 7 | A/Prof David Low / A/Prof Lin Xuling / A/Prof Suyash Mohan
Practice like an 'expert': Masterclass in glioma management

Gliomas are complex diseases that require a multi-disciplinary team to manage, and imaging plays an important role in the treatment of these patients. Join our multidisciplinary expert panel as they review actual cases of both typical and unusual presentations of adult gliomas. Through this session, participants will hear from our experts practical tips, tricks and pitfalls in the imaging and management of glioma patients,

understand how the neuro-radiologist, neuro-surgeon and neuro-oncologist approach the management of these patients and see some interesting and unusual presentations of adult gliomas.

MOLECULAR THERAPEUTICS BRAIN TUMOURS

MODERATORS: Asst Prof Sumeet Kumar / Prof Liu Ya Ou

DAY 2 - Session 8 | A/Prof Suyash Mohan
"WHO" changed the CNS tumor classification and WHY? WHAT Neuroradiologists Need to Know!

Neuroimaging plays a vital role in the diagnosis and management of brain tumors. The World Health Organization (WHO) published the 5th edition of the Classification of Tumors of the Central Nervous System (WHO CNS5) in 2021, incorporating the recommendations from the Consortium to Inform Molecular and Practical Approaches to CNS Tumor Taxonomy (cIMPACT-NOW) emphasizing the importance of several genetic and molecular alterations as they correlate with overall prognosis. This talk will summarize the key concepts of the new WHO 2021 classification and illustrate the "must know" topics for practicing neuroradiologists as they approach a 'new brain tumor' diagnosis.

DAY 2 - Session 8 | Dr Choi Yoon Seong
Harnessing AI and Radiomics for Enhanced Neuroradiology: Focused on Brain Tumor Imaging

In this presentation, we will explore the application of radiomics and deep learning in brain tumor imaging, focused on their limitations and strengths. The main objectives of incorporating artificial intelligence (AI) in medical imaging are twofold: to address workforce shortages by automating labor-intensive tasks, and to extract deeper image information that transcends human visual cognition. Particularly in brain tumor imaging, the latter aim has been pivotal for predicting gene mutation statuses or disease prognosis based on baseline MRI scans, tasks that may not be as effectively achieved by human radiologists. Radiomics, the process of extracting large quantities of advanced quantitative features from medical images, has been actively employed, especially in brain tumor imaging. This method allows us to translate the interspatial relationship of voxel values and lesion shape into specific disease characteristics. Despite a flurry of research, clinical implementation remains challenging due to issues such as limited generalizability and reproducibility, stemming from the lack of standardization in processing and feature computation. Our discussion will review recent papers that have identified these limitations and proposed standardization processes for radiomics. Unlike conventional machine learning with handcrafted radiomic features, deep learning identifies relevant features directly from images, bypassing the need for handcrafted feature extraction. This ensures higher reproducibility and robustness. Since application of simple multilayer perceptron and convolutional neural network in neuroimaging, other types of deep learning have been also used, such as generative model (i.e., generative adversarial network), and more recently, natural language processing. While deep learning bypasses the standardization issues faced by radiomics, it does require substantial data quantities. Various strategies have been employed to overcome the limitation of sample size. A prime example is the formation of consortia for multinational and multi-institutional datasets, alongside the creation & utilization of open source datasets and deep learning algorithms. Some of such recent approaches are designed to be more generalizable across different protocols, diseases, and even different organs and modalities. We will briefly review these recent approaches during our talk.

DAY 2 - Session 8 | A/Prof Ang Beng Ti
The Molecular Basis for Therapeutics in Glioblastoma

Our research program is centered on precision medicine in glioblastoma (GBM), which has led to the development of a clinical multi-disciplinary effort that incorporates the neuro-oncologist, neurosurgeon, radiation oncologist and neuropathologist, in addition to the translational research team. In this way, a valuable database of patient characteristics, treatment response and outcomes, linked to tumor specimens and their molecular data is created as a bio-resource. Our precision medicine initiative is directed at matching molecular signatures in different patient groups to specific treatments and to this end, with our collaborator, we have also created a nanosensor diagnostic platform for blood-based assays able to achieve direct and multiplexed profiling of exosome-derived circulating RNAs. This will allow for a rapid and minimally invasive means of assaying for tumor heterogeneity and for elucidation of both prognostic and therapeutic biomarkers. The conception of our "Glioportal" as a bio-banking effort and the means by which we employ it to devise and validate research hypotheses will be described. Pertinent to this conference, we will also describe our efforts in radiogenomics as part of the precision medicine effort. This integrated research program is a core capability that will allow our institutions to serve as clinical trial centers and our local patients will have recourse to cutting-edge therapies in the future.

STROKE, INTRACRANIAL HAEMORRHAGE & RISK PREDICTION

MODERATORS: Prof Sohn Chul-Ho / Prof Chan Ling Ling

DAY 3 - Session 9 | Prof Lou Xin
Ischemic Stroke: MR Imaging Clues to Predict Patient Outcome

Cerebral stroke is a leading cause of death and disability worldwide. Ischemic stroke accounts for more than 80% of all strokes. In ischemic stroke, clinical outcome prediction is crucial in determining the patients' treatment strategy and management. Early identification of high risk patients developing poor outcomes can help guide treatment decisions and improve the outcomes. Imaging, particular MR imaging, is essential in the workup of ischemic stroke. MR imaging is capable to provide valuable in vivo pathophysiological information about the location and severity of ischemic lesion, as well as cerebral blood flow changes and collateral circulation which may impact the patients' prognosis. This information can be obtained by a spectrum of imaging sequences in the clinic, making MR imaging a powerful tool in the prediction of clinical outcomes. During this presentation, we will begin by providing an overview of the MR imaging techniques that are currently utilized in clinical practice for ischemic stroke. Subsequently, we will review the correlation between a range of MR imaging indicators, including both traditional and advanced novel markers, and clinical outcomes in ischemic stroke. We will evaluate the practicality and effectiveness of these indicators in predicting the likelihood of recurrent stroke, as well as disability or death. Additionally, we will

explore recent advancements in the use of AI for predicting patient outcomes. This presentation aims to provide clinical practical recommendations for the application of MR imaging clues in ischemic stroke outcomes prediction, and to highlight the potential of AI in the management of cerebral stroke in the coming years.

DAY 3 - Session 9 | A/Prof Deidre de Silva
Impact of Neuroimaging Advances on Ischemic Stroke: Neurological Perspective"

DAY 3 - Session 9 | Asst Prof Septian Hartono
Intracranial Hemorrhage: AI Models for CT Detection and Risk Prediction

Computed tomography (CT) is a widely used imaging modality in the diagnosis and management of neurological conditions. The advent of artificial intelligence (AI) has brought new opportunities to expand the utility of CT imaging in various applications. In this talk, we will discuss the latest advancements in AI models for intracranial haemorrhage (ICH) detection and risk prediction with head CT. The first part of the talk will focus on the application of AI models to automate ICH detection and segmentation, which may be critical for the diagnosis and treatment of stroke patients in Emergency Departments. We will present an overview of the different deep learning techniques and frameworks that have been used in ICH detection and segmentation in CT. Furthermore, we will discuss the challenges in developing reliable and accurate models for ICH detection and segmentation, including the need for accessible annotation tools and interpretability and explainability of the AI models. The second part of the talk will delve into the application of AI models for brain volumetry, which may be crucial for risk prediction with head CT and early detection of neurodegenerative diseases such as Alzheimer's and Parkinson's disease, as well as for the monitoring of brain atrophy in TBI patients. While magnetic resonance imaging (MRI) is the gold standard for brain volumetry, it is often expensive and time-consuming, making it not ideal to implement in routine clinical practice. CT is a more widely available and cost-effective imaging modality that can provide useful information about brain volume and structure, but it has lower resolution and less soft tissue contrast than MRI. In this talk, we will review the recent developments in AI models for brain volumetry in CT imaging, including studies that have incorporated MRI as a gold standard for validation.

ARTIFICIAL INTELLIGENCE

MODERATORS: Asst Prof Charlene Liew
PANELIST: Prof Kei Yamada

DAY 3 - Session 10 | Prof Guo Wan Yuo
AI Assisted Detection of Brain Metastasis: Data Governance and Beyond

Introduction
The performance of a deep learning AI model for medical imaging is reduced when tested on an external dataset. The reason for the decrease in performance is atributed to variations or differences in image quality, imaging parameters, or equipment used. We used a nationwide population-based imaging dataset from 23 hospitals, which includes MR scanners with different imaging parameters for model refinement.
Methods

We conducted initial AI model training using MRI scans from 1029 patients with brain metastases, all obtained from a single institute and a single MRI brand. For the initial model, we utilized a benchmark algorithm called 2D Mask R-CNN, which resulted in the creation of DeepMets®. Deep active learning techniques were subsequently applied to the nationwide population-based dataset using the ResNext50 U-Net architecture with atention mechanisms to refine the model. A final testing on a dataset consisting of MRI scans from 152 patients from 19 different hospitals with brain metastasis was conducted. The ground truth for this test was obtained from a consensus of three experienced neuroradiologists with an average of 30 years of professional experience in neuroradiology. The metastases in this dataset had a median maximum diameter of 7 mm (ranging from 4 to 40 mm).

Results
The intersection over union between the ground truth and the model's inference resulted in a median value of 0.718, ranging from 0.210 to 0.904. The centroid and Hausdorff distances were 0.617 mm (ranging from 0.124 to 2.154 mm) and 2.512 mm (ranging from 0.469 to 7.469 mm), respectively. The final model achieved a sensitivity of 85%, precision of 93%, an f1 score of 89%, and a false positive rate of 0.21 per patient.

Discussion and Conclusion
The nationwide dataset provides compelling evidence of model generalization across different vendors and imaging parameters when it comes to detecting brain metastasis. As a result, the model can now be effectively utilized to assist in the detection and contouring of brain metastasis for clinical purposes. To achieve better generalization of an AI model, one approach is to train the model using datasets from various sources that exhibit heterogeneity in terms of data properties. However, in real-world scenarios, it is often impractical to collect and centralize datasets due to concerns related to privacy and data autonomy. Federated learning offers a promising solution by enabling model training and refinement based on smaller non-centralized datasets. This approach allows for the sharing of model weights rather than the actual datasets, ultimately leading to the development of a final model with improved performance through the input of "larger datasets".

DAY 3 - Session 10 | Dr Andrew Makmur
Unleashing AI: Adventures in Transforming the National University Health System

In the multifaceted domain of healthcare, leveraging the power of artificial intelligence (AI) is a journey filled with complexities and valuable insights. Our experience at the National University Hospital System, Singapore, has been one of continuous learning, teamwork, and practical problem-solving. A significant step in our infrastructure setup was the creation of a DICOM extraction pipeline. This process, while challenging, proved pivotal in ramping up our R&D throughput, thereby accelerating our progress in AI research within our radiology department. Our journey includes several AI projects such as Spine AI, Scoliosis AI, and Spine Mets AI. Each project has brought unique challenges and invaluable learnings, reinforcing our understanding of AI's transformative role in healthcare. On top of Endeavour AI, our real-time operational platform, we built an operational dashboard using a low code solution - TIBCO Spotfire. This combination demonstrates the practical implementation of AI to improve operational safety and reduce errors. In this presentation, we look forward to sharing our experiences, obstacles, and insights. Our goal is to encourage a relatable and productive dialogue,

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inspire shared learning, and collectively envision the future of AI in healthcare.

DAY 3 - Session 10 | Prof Christopher Filippi
AI Implementation: To Err is Human?

DAY 3 - Session 10 | Dr Ravi Shrestha
AI shaping our tomorrow- Industry Perspective

With massively increasing data volumes, new developments in artificial intelligence (AI), and associated hype and hope: there are unique demands posed on your fast evolving imaging ecosystem. This session provides an industry perspective on how AI is shaping and disrupting our tomorrow. No matter where your organisation is on your unique AI journey, this session will provide valuable insights, challenges and examples of both success and lessons learnt through their AI experience. The topics for discussion include evolving AI shifts within healthcare, barriers and tailwinds, AI investments, evolving regulatory landscape, context of real-world applications on clinical workflow and how AI is evolving the modern healthcare landscape. The session has a special focus on the value of clinical insights gained from AI as part of the end-to-end clinical imaging workflow, and how this is helping the healthcare professionals accelerate productivity and increase patient benefits.

Speaker Abstract
AOCNR WIRES

INTERVENTIONAL ONCOLOGY

MODERATOR: A/Prof Too Chow Wei

DAY 1 - Session 1 | Prof Bulent Arslan
Techniques in Overcoming Discordant Mapping and Post-Implantation Uptake - How I Do It

The discrepancies in mapping and post Y90 delivery has been shown in several articles. This session will focus on challenges of Y-90 radioembolization mapping problems and how to prevent and overcome these issues. Benefits of Cone-beam CT and Hybrid CT/fixed Fluoro rooms in mapping procedures will be discussed. The discrepancies in mapping and post Y90 delivery has been shown. Techniques, especially related to catheter position and potential dependent flow of the Y-90 microspheres will be discussed. Delivery issues for tumors in watershed areas and also ways to minimize or eliminate these issues will be discussed by case examples.

DAY 1 - Session 1 | Dr Valerie Chew
Discovery of biomarkers for clinical response to radiotherapy in HCC via Deep Immunoprofiling

YΣrium-90 (Y90)-radioembolisation (RE) significantly regresses locally advanced hepatocellular carcinoma and delays disease progression. The current study is designed to deeply interrogate the immunological impact of Y90-RE, which elicits a sustained therapeutic response. Time-of-flight mass cytometry and next-generation sequencing (NGS) were used to analyse the immune landscapes of tumour-infiltrating leucocytes (TILs), tumour tissues and peripheral blood mononuclear cells (PBMCs) at different time points before and after Y90-RE. TILs isolated after Y90-RE exhibited signs of local immune activation: higher expression of granzyme B (GB) and infiltration of CD8+ T cells, CD56+ NK cells and CD8+ CD56+ NKT cells. NGS confirmed the upregulation of genes involved in innate and adaptive immune activation in Y90-RE-treated tumours. Chemotactic pathways involving CCL5 and CXCL16 correlated with the recruitment of activated GB+CD8+ T cells to the Y90-RE-treated tumours. When comparing PBMCs before and after Y90-RE, we observed an increase in tumour necrosis factor-α on both the CD8+ and CD4+ T cells as well as an increase in percentage of antigen presenting cells after Y90-RE, implying a systemic immune activation. Interestingly, a high percentage of PD-1+/Tim-3+CD8+ T cells coexpressing the homing receptors CCR5 and CXCR6 denoted Y90-RE responders. A prediction model was also built to identify sustained responders to Y90-RE based on the immune profiles from pretreatment PBMCs. High-dimensional analysis of tumour and systemic immune landscapes identified local and systemic immune activation that corresponded to the sustained response to Y90-RE. Potential biomarkers associated with a positive clinical response were identified and a prediction model was built to identify sustained responders prior to treatment.

DAY 1 - Session 1 | Prof Muneeb Ahmed
Endovascular management in Portal Hypertension in Oncology

Portal hypertension in cancer patients from either portal vein compression or primary or secondary liver dysfunction can have a significant impact on patients. Several endovascular treatment options can be considered in the management of portal hypertension in this group. In this lecture, the clinical manifestations of portal hypertension will be reviewed with a specific focus on endovascular options to treat pre-hepatic portal vein compression. Principles of patient preparation, technical options, and post-procedure care will be reviewed. Clinical outcome data will also be reviewed and discussed.

DAY 1 - Session 1 | Prof Pua Uei
IRE: getting started and beyond

DAY 1 - Session 1 | A/Prof Too Chow Wei
Microwave ablation of liver lesions: old and new

CNS AVM & AVF

MODERATORS: Asst Prof Saravana Kumar Swaminathan / Prof Khairul Azmi

DAY 1 - Session 2 | Dr Bengt Karlsson
NASSAU study & Indications for treatment of unruptured AVM

DAY 1 - Session 2 | Prof René Chapot
Curative AVM embolisation

DAY 1 - Session 2 | Prof Zsolt Kulcsár
Reconstructive and Deconstructive Strategies for DAVF

The endovascular treatment of DAVF has as prerequisite the detailed analysis of understanding of the correct pathophysiology, fistula location, involved venous channels. In this lecture, I present our concept of imaging the pathophysiology of DAVFs with special interest on the therapeutic concepts.

DAY 1 - Session 2 | A/Prof Luo Chao-Bao
DAVF: Indications, Principles and Strategies of endovascular management

Intracranial dural arteriovenous fistulas (DAVFs) are abnormal arteriovenous communications within the dura locating near a major venous sinus and are supplied by pachymeningeal arteries. DAVFs represent 10%–15% of all intracranial arteriovenous malformations. The natural history and clinical manifestations are determined by location of the DAVFs and their angioarchitectures. The clinical presentations of DAVS are variable and include exophthalmos, bruit, cranial nerve deficits, tinnitus, bruit, hemorrhagic or non-hemorrhagic neurological deficits, increased intracranial pressure, papilledema and CSF reabsorption abnormalities resulting in ventricular enlargement or congestive heart failure. Those revised classification of DAVFs by Cognard et al. and Borden et al. are the most widely used. All these classifications emphasize the fistula venous drains. DAVFs with antegrade dural sinus drains and only association with sinus reflux usually present with benign symptoms. By contrast, DAVFs with retrograde leptomeningeal cortical venous drainage channel may show aggressive symptoms such as hemorrhagic and non-hemorrhagic neurologic clinical manifestation. The goal of embolization is to achieve angiographic cure by obliteration of all feeders and proximal draining veins with preservation of the patency of the affected sinus. In those difficult and complex DAVFs with difficulty of achieving total occlusion of the fistula, the goal of embolization is to achieve partial treatment with reversal of the aggressive type of DAVF to benign type. If a sinus is occluded or severely stenosed, treatment should be directed

to reestablish sinus patency; if that fails, sinus occlusion with angiographic cure of DAVF is considered. If there is a functional venous pathway that was not previously occluded, it should not be sacrificed. Treatment should not induce redirection of flow to other cortical veins. There are two major endovascular routes to manage DAVFs: transarterial embolization (TAE) of arterial feeders, transvenous embolization (TVE). Selective TAE requires that the microcatheter be positioned into the ideal distal aspect of the feeding artery, with delivery of the embolic material through feeding artery to the shunt and then into the most proximal venous outlet. Some risks may occur by inadvertent embolization of carotid territory with ischemic stroke or ischemic injury of cranial nerves. Embolic material may also migrate to the venous site resulting in venous occlusion exacerbating venous hypertension. TVE with coil packing of affected non-functional dural sinus can be selected. In some complex DAVFs, combination of TAE and TVE is considered. Different embolic materials have been used and include adhesive or non-adhesive liquid embolic materials, particles or detachable coils. Coils usually are selected for transvenous occlusion of affected non-functional dural sinus. Non-adhesive liquid embolic materials provide advantages by the ability to perform a slow, controlled injection with achievement of complete obliteration of DAVFs. In conclusion, endovascular management by TAE, TVE can be used depending on angioarchitecture and individual clinical scenarios. Endovascular embolization of is a proven safe and effective method to manage DAVFs.

DAY 1 - Session 2 | Dr Wickly Lee
Endovascular strategies in the management of Direct Caroticocavernous fistulas

Purpose
Endovascular treatment strategies for treatment of direct carotid cavernous fistula (dCCF) has evolved over the years, in tandem with the evolution and advancement of endovascular tools. Current treatment strategies range from detachable balloons to combined techniques using flow diversion, coiling and liquid embolics. The purpose of this presentation is to share our single centre experience with endovascular treatment of patients with dCCF.

Methods
Cases of dCCF performed in our institution over the last 15 years have been reviewed. Assessment of the vasculature, fistula morphology and venous drainage patterns was performed on cross–sectional imaging and angiogram.

Results
DCCF cases were largely categorized into simple small hole fistula vs complex fistula. Fistula morphology, location, venous drainage patterns, access routes are important considerations when deciding the mode of treatment. Although detachable balloon is still regarded as the gold standard of treatment, limitations of their use with regards to situations of availability, failure or recurrence is now mitigated with the use of combined techniques using flow diversion devices, coils and liquid embolics, performed via trans-arterial and/or transvenous routes. There was low morbidity with no mortality reported in our experience.

Conclusions
Current endovascular treatment strategies for dCCF have been proven to be effective in complete cure of these high flow lesions. Careful angiographic analysis and proper treatment planning are key to successful treatment outcome.

CEREBRAL ANEURYSMS

MODERATORS: Dr Wickly Lee / Prof Zsolt Kulczar

DAY 1 - Session 3 | Prof René Chapot
Cerebral Aneurysms: Critical analysis on technical evolutions

DAY 1 - Session 3 | Prof Sirintara (Pongpech) Singhara Na Ayudhaya
Stent Assisted Coiling Vs Flow diversion

Stent-assisted coiling and flow diverters are two different treatment options for complex intracranial aneurysms that cannot be treated by routine devices. However, they may differ in their mechanisms and indications, advantages and disadvantages (i.e.Stent-assisted coiling can be used for a broad range of aneurysm shapes, sizes, and locations, more wide applicability: and also can preserve the parent artery as the stent provides support to the weakened artery, minimizing the risk of occlusion and maintaining normal blood flow while Flow diverters have shown higher rates of aneurysm occlusion compared to traditional coiling techniques and ?reducing the risk of recanalization or regrowth, but may have limited applicability typically reserved for complex aneurysms that are not suitable for traditional coiling methods but may cause delayed aneurysm healing: due to the slower process of thrombosis induction and it may take longer for the aneurysm to completely heal. Potential complications associated with both devices procedure must be considered including Thromboembolic events, incomplete aneurysm occlusion, in-stent stenosis, perforation or dissection, allergic reactions or contrast-related complications, infection and side-branch occlusion and delayed aneurysm healing which FD seems to relate more than stent-assisted coiling including perianeurysmal vasogenic edema and thrombus induce aneurysmal wall leakage and re-rupture of the aneurysm. The long-term outcomes of stent-assisted coiling and flow diverters are another important factor, as the field of endovascular aneurysm treatment is still evolving, and long-term data for some specific aspects may be limited. About aneurysm occlusion: Stent-assisted coiling has shown good long-term results in terms of aneurysm occlusion rates while flow diverters have shown promising mid to long-term results. About aneurysm stability: the use of a stent provides support to the weakened artery, reducing the risk of aneurysm rupture while Flow diverters aim to redirect blood flow away from the aneurysm, allowing the vessel wall to heal and reducing the risk of rupture.. In terms of follow-up requirements: Patients who undergo stent-assisted coiling typically require long-term follow-up imaging to monitor the stability of the coiled aneurysm and assess for any potential complications, same as FD group.Finally the cost-effectiveness of stent-assisted coiling and flow diverters can depend on various factors, including the specific healthcare system, geographical location, device costs, procedural costs, long-term follow-up costs, and the likelihood of complications and retreatment. For cost considerations: Stent-assisted coiling generally has lower upfront device costs compared to flow diverters. However, there may be additional costs associated with the use of coils and stents while Flow diverters generally have higher upfront device costs. The cost of the flow diverter device itself and additional materials can contribute to the overall cost. Their effectiveness in achieving long-term aneurysm healing may contribute to cost-effectiveness. About retreatment and follow-up costs: Stent-assisted coiling may require long-term follow-up imaging and potentially retreatment if there is aneurysm recurrence or regrowth, which can incur additional costs: while

flow diverters aim to promote long-term aneurysm occlusion, retreatment may still be necessary in some cases. Long-term follow-up imaging and potential retreatment can add to the overall costs. We will present examples of variable indication to use stent-assisted coiling and FD in complex aneurysmal treatment cases, the results and complications will be shown. The selection of treatment approach depends on several factors, including the characteristics of the aneurysm, patient-specific factors, and the expertise of the treating team. Long-term outcomes can also be influenced by the specific devices used, patient compliance, and ongoing advances in endovascular techniques. Individualized discussions with a neurosurgeon or interventional neuroradiologist are essential to determine the most appropriate treatment option and understand the potential long-term outcomes for a specific case.

DAY 1 - Session 3 | A/Prof Anil Gopinathan
Flow diverters in Cerebral aneurysms: New horizons and changing landscapes

In the last 15 years, flow diversion has revolutionized the treatment of cerebral aneurysms. Complex aneurysms that were once considered beyond the realm of endovascular therapy are being elegantly treated using this concept of flow diversion. However, the role of a flow diverter is still not as well established when it comes to distal cerebral aneurysms beyond the ICA or for ruptured aneurysms. This lecture will be a concise and case-based illustration of how flow diverters are scaling these new horizons and successfully treating distal aneurysms as far as the A2- A3 ACA, P2- P3 PCA or M2 – M3 MCA. Clinical evidence and few tips & tricks for using them safely and effectively for these indications, would be discussed here.

DAY 1 - Session 3 | Prof Tufail Patankar
Complications of Flow Diversion & how to manage them

Flow diversion is become very standard part of neurointerventional management of brain aneurysm. However the risk and complications related to the technique are not inconsequential and underreported. The talk will focus on Indications, risk and complications related to FD. I will also discuss when and what to avoid and and if in trouble what can be done to rescue during the treatment.

DAY 1 - Session 3 | Prof Shin Yong Sam
Approach to large and giant posterior circulation aneurysms

Posterior circulation very large and giant intracranial aneurysms are among the most challenging lesions whether with surgery and/or endo-vascular treatment. There would be three categories of posterior circulation very large and giant aneurysms including giant saccular aneurysms, dissections with or without brainstem compression and giant serpentine dolichoectatic changed aneurysms. The majority of patients harboring very large and giant intracranial aneurysms present with thromboembolic events or symptoms of mass effect, whereas subarachnoid hemorrhage (SAH) often occurs. In view of the poor natural course of these lesions, aggressive treatment aiming for prevent bleeding and relief of mass effect have been recommended. Both reconstructive (clipping, coiling, stent-assisted coiling, flow diversion), deconstructive techniques including parent artery occlusion in conjunction with / without bypass surgery and strategies of flow modification are available for the treatment of very large and giant posterior circulation aneurysms. Sometimes, microsurgical and endo-vascular

PERIPHERAL VASCULAR DISEASE - BELOW THE KNEE / BELOW THE ANKLE INTERVENTIONS

MODERATORS: Asst Prof Lawrence Quek / Dr Steven Kum

DAY 1 - Session 4 | Prof Fabrizio Fanelli
Atherectomy Below the Knee

DAY 1 - Session 4 | Prof Fabrizio Fanelli
Advance BTK Revacsularisation

DAY 1 - Session 4 | Dr Steven Kum
Deep Venous Arterialization - What Works, What Doesn't

DAY 1 - Session 4 | Prof Bulent Arslan
Option in No Option Chronic Limb Ischaemia

In critical limb ischemia endovascular options has significantly progressed during the past 1-2 decades. SAFARI (subintimal arterial flossing with antegrade/retrograde intervention) approach has improved outcomes of interventional therapies and allowed interventionalists to achieve higher recanalization rates. However most of the intervened arterial territories involved femoropopliteal and above ankle tibial arteries. In this session we will discuss techniques in recanalization of arteries below the ankle. Review what is considered a desert foot and what is not? Impact of pedal revascularization on clinical/amputation prevention outcomes will be reviewed. Specific devices, techniques and indications will be discussed by case examples. Lastly, last resort option such as DVA (Deep venous arterialization) procedure will be mentioned.

DAY 1 - Session 4 | A/Prof Shigeo Ichihashi
IVUS Guided Peripheral Intervention

The role of IVUS in the peripheral vascular intervention is gaining attention worldwide. In Japan, many physicians have been actively using IVUS for many years to evaluate the lumen of wire passage, dissection, calcification, and acute luminal gain after lesion expansion. Besides these, IVUS is extremely effective in wire passage of chronic total occlusion. In this talk, a basic method of IVUS-guided intervention will be presented.

SPINE & MUSCULOSKELETAL INTERVENTIONS - EMBOLOTHERAPY, ABLATION & RECONSTRUCTIVE TECHNIQUES

MODERATORS: Asst Prof Lawrence Quek / Dr Peter Goh / A/Prof Lester Chan

DAY 2 - Session 5 | A/Prof Lester Chan
Treatment Gap That IR Can Fulfill: Orthopedic Oncologist Perspective

DAY 2 - Session 5 | Dr Yuji Okuno
MSK embolization beyond the knee

Many people suffer from chronic joint pain, such as shoulder pain that interrupts their daily sleep, low back pain that prevents them from enjoying playing golf, or knee pain when doing housework. However, when these people go to hospitals,

what they are suggested is painkillers or temporary injections, and their underlying problem still needs to be resolved. We have developed a new treatment option for such chronic pain that resolves the cause of chronic joint pain and have been spreading this treatment worldwide. This treatment eliminates problematic blood vessels that form at the painful site. When we hear the word "blood vessels," we recognize it as something essential and sound that is indispensable to the human body. Indeed, normal blood vessels are essential and valuable. However, two types of blood vessels can be developed in our human body: normal and problematic blood vessels, which can cause disease and inflammation. The formation of this problematic blood vessel around the joints can cause chronic low back pain, shoulder pain, knee, and other joint pain. Problematic blood vessels cause chronic pain through two effects: 1) Inflammatory cells in the blood leak from it, and 2) It Allows nerves to grow around it (nerve and blood vessels can grow each other). In the 20-minute treatment we have developed, we use a thin, soft tube, advance it very close to the problem vessel, and administer a small particle to stop the abnormal blood flow to the problem vessels and recover the normal blood flow, thereby improving prolonged pain. To date, more than 15,000 people have received this treatment in Japan. In addition, it has proven to be very safe and performed in more than 20 countries overseas, including Thailand. In the present session, the detail of this innovative treatment option and how we developed this will be shared.

DAY 2 - Session 5 | Prof Francis Lee
Ablation-Osteoplasty-Reinforcement-Internal Fixation (AORIF) in Osteolytic Metastases in Pelvis and Hip: Principle, Techniques, and Clinical Outcome

Interventional oncology is bridging medical oncology and orthopaedic oncology in the setting of osteolytic metastatic cancers in the spine, pelvis, and peri-articular metaphyseal bones. Interventional oncology procedures using percutaneous cancer reduction by ablation, cement augmentation, and screw fixation preclude open surgical exposure and muscle dissection, allowing immediate improvement in pain and ambulatory function. Biomechanical experiments showed that combination of cement reinforcement and screw fixation provided enhanced strength against failure testing and cyclic loading. Cancer cells are known to cause inflammation that inhibit osteoblastic bone formation and increase osteoclastic bone resorption. Therefore, patients were treated by percutaneous combinatorial Ablation-Osteoplasty-Reinforcement-Internal Fixation (AORIF). In comparison to historical control of traditional open surgical reconstruction using mega-implant total hip arthroplasty, patients were discharged on the day of AORIF. In our prospective cohort of 72 patients, we observed immediate improvement in pain and ambulatory function in the first 2 weeks, and this improvement lasted beyond one year in surviving patients. AORIF was not associated with complications such as infection, wound dehiscence, or readmissions. We also observed prolonged survival in patients who received AORIF procedures in comparison to Path-Fx AI-predicted survival, which was attributed to modern oncologic drug therapies without delay. To this end, increased bone mass was seen by measurement of CT Hounsfield Units immediately after AORIF and beyond 6 months to 3 years following radiofrequency ablation and cementoplasy both of which resulted in thermal necrosis of cancers. AORIF were occasionally performed in patients with bilateral hip involvement, concurrent spine lesions, and renal cell cancer metastases that were effectively managed with simultaneous angiography and embolization. With respect to osteolytic lesions in the femoral head and neck in 67 patients who underwent either intramedullary nailing, AORIF, or hemiarthroplasty stabilization, AORIF provided equivalent pain and functional outcomes in comparison to traditional intramedullary rodding or hemiarthroplasty while decreasing complications. Taken all together, the AORIF technique was an effective first-line treatment for short-term and long-term improvement of pain, ambulatory function, and bone mass in patients with osteolytic metastases.

DAY 2 - Session 5 | A/Prof Steven Yevich
Spine: Implant and Non-implant based Treatment of Spinal Metastases

DAY 2 - Session 5 | A/Prof Steven Yevich
IR Treatment in Appendicular Extra-axial Bone Metastases

DAY 2 - Session 5 | Prof Muneeb Ahmed
Role of Combination Treatment in Bone Metastases

Bone metastases can be quite debilitating, with an impact on patient quality of life and overall outcome. A number of treatment options are available, including surgical fixation, external beam radiation, and increasingly, interventional treatment with tumor ablation, embolization, and bone augmentation techniques. Many of these treatment options can be combined to tailor the treatment approach to the patient, and offer optimal symptomatic relief and local control. In this lecture, potential combination therapy approaches will be reviewed for extraspinous osseous metastases. In particular, considerations of patient selection, principles of combination therapy selection, and current clinical outcomes to-date will be reviewed.

STROKE 1: AIS & CVT

MODERATORS: Dr Joanna Ti / Dr Tran Quoc Tuan

DAY 2 - Session 6 | Prof Zsolt Kulcsár
Acute ischemic stroke and ICAD: Treatment concepts

The incidence of symptomatic ICAD in the European population is lower as compared to the Asian population. We present the data from the University Hospital of Zurich, with special focus on the acute treatment strategy and medical management.

DAY 2 - Session 6 | Dr Gaurav Goel
Mechanical thrombectomy in DMVO: Indications and treatment strategies

Background
Various techniques have been evolved and used by different operators for mechanical thrombectomies for improved procedural performance, lower intraoperative times and better recanalization rates The widely used, isolated stent-retriever and contact aspiration technique for medium vessel occlusions (MeVOs) carries a high risk for clot fragmentation, spasm and distal migration. The stent–aspiration (Solumbra) technique uses a large bore aspiration catheter with a stent retriever device for potential synergistic effects. However, its use is limited in distal thrombectomies. Hereby, we assess the efficacy and safety of solumbra 'Pinching' technique by using a smaller profile aspiration catheter for MeVO thrombectomy.

Methods

We retrospectively analyzed our prospective institutional database for medium vessel occlusions (M2, M3 MCA/ A2, A3 ACA/ P2 PCA) who underwent endovascular mechanical thrombectomy using stent retriever or aspiration or combined (solumbra) technique. The technique involves deploying a stent retriever through microcatheter and large bore aspiration catheter like ACE 68 (Penumbra, Inc.), followed by both microcatheter and aspiration removal, clot localization and blind navigation of a correctly sized lower profile (3MAX or 4MAX, Penumbra, Inc.) aspiration catheter over stent bare wire to "pinch" the primal end of the clot. Besides various demographic parameters, we collected final recanalization rates with first pass effect [using modified Thrombolysis in Cerebral Infarction (TICI) score]. All the intra-procedural complications (haemorrhage, vasospasm) were analysed. Clinical outcome was analysed using modified ranking score (mRS) on 7th day post procedure/ discharge(whichever is earlier) and at 90 days.

Results

Total 26 MeVOs were successfully treated in twenty-five patients with solumbra 'Pinching' technique since January 2022 (Male: female 16:7, mean age 58.6 years, mean NIHSS 9.1). Majority of the procedures were done for primary MeVOs and 72% consisted of M2 MCA occlusions. Whether to use a 3MAX or 4MAX aspiration catheter was determined by eyeballing the appropriate calibre for target vessels. Final first pass mTICI 2c/3 recanalization was achieved in 24 patients (88%). Minor Intra-procedural complications were observed in 13 patients. Favorable modified ranking score (mRS 0-2) was achieved in approximately 80% patients at the end of 7 days/discharge and 14 out of 16 follow up patients achieved good clinical outcome at 90 days.

Conclusion

Solumbra 'Pinching' technique, using a low profile aspiration catheter like 3 MAX or 4 MAX (Penumbra, Inc.) with a stent retriever, can be effectively used in management of acute ischaemic stroke secondary to a MeVOs with significantly enhancing the first-pass recanalization with lesser risk of intimal injury, dissection and secondary embolization.

DAY 2 - Session 6 | A/Prof Kim Dong Joon
Mechanical thrombectomy in posterior circulation stroke: How is different?

The lessons learned from the posterior circulation endovascular therapy (EVT) studies and trials have finally accumulated into the successful posterior circulation EVT trials. The recent results of the ATTENTION (Endovascular Treatment for Acute Basilar Artery Occlusion) & BAOCHE (Basilar Artery Occlusion Chinese Endovascular Trial) trials have proved the benefits of endovascular therapy for basilar artery occlusion within 24 hours of onset with similar treatment effect with the anterior circulation stroke. However, these and the preceding studies have disclosed some key differences between the anterior and the posterior circulation stroke. The different anatomy may be an important cause for the differences between the anterior circulation and posterior circulation large vessel occlusion. The posterior circulation harbors a plethora of critical perforating arteries, different anatomical collateral patterns, and the apparent bilateral VA configuration merging into a basilar artery. These differences may have different implications in terms of the patient selection, impact of time, therapeutic strategy, and outcome. Also, underlying atherosclerosis may be a more frequent etiology of the stroke in the posterior circulation which warrants an aggressive EVT protocol including rescue angioplasty and permanent stenting. These differences should be incorporated in the diagnosis and therapy of the posterior circulation.

DAY 2 - Session 6 | Prof Anchalee Churojana
Mechanical thrombectomy in low ASPECT stroke: Indications & special considerations

Mechanical thrombectomy (MT) has emerged as an effective endovascular treatment in acute ischemic stroke caused by large vessel occlusion. Although the American Heart Association/American Stroke Association (AHA/ASA) guideline from 2019 has extended the time window for MT up to 24 hours, patient eligibility for this procedure, in the anterior circulation stroke, is commonly determined based on the Alberta Stroke Program Early CT Score (ASPECTS) criteria, typically requiring a score > 6. However, recent studies have suggested potential benefits of successful recanalization in patients with low ASPECTs (ASPECTS 2-5). This study aims to investigate the clinical outcomes of patients with low ASPECTs after successful mechanical thrombectomy in comparison to those with higher ASPECTs (> 6), thereby providing insights into indications and special considerations. A retrospective analysis was conducted on a cohort of 304 patients who underwent successful recanalization (mTICI 2b or 3) via mechanical thrombectomy for anterior circulation strokes at Siriraj Hospital between November 2009 and November 2020. Among these patients, 35 (11.5%) were identified with low ASPECTs during a retrospective review of preprocedural CT scans. Importantly, none of these patients exhibited an ASPECTS score lower than 3. Impressively, 15 patients (42.9%) with low ASPECTs achieved a favorable outcome (defined as a modified Rankin Scale [mRS] score of 0-2) at the 90-day follow-up. Statistical analysis did not reveal a significant difference in favorable outcomes (p = 0.083) when comparing patients with low ASPECTs to those with higher ASPECTs. Furthermore, the rates of both symptomatic and asymptomatic intracranial hemorrhage, as well as the need for craniectomy, demonstrated no significant differences between the low and high ASPECTs groups. Notably, the average time from symptom onset to recanalization in patients with low ASPECTs who achieved a favorable outcome was 4.53 hours, with three out of 15 patients exceeding the 6-hour time window. Additionally, two-thirds of patients (66.7%) who experienced a favorable outcome were younger than 55 years old. Furthermore, maximal perioperative systolic blood pressure lower than 139 mmHg (p = 0.014) was associated with a favorable outcome. Conversely, a history of diabetes mellitus (p = 0.009) and cardiac arterial disease (p = 0.010) were significantly correlated with an unfavorable outcome. In conclusion, these findings suggest that acute ischemic stroke patients with initial ASPECTs scores of 3-5 may derive benefits from successful mechanical thrombectomy, yielding comparable favorable outcomes at the 90-day follow-up to those with higher ASPECTs scores. This holds particularly true for patients younger than 55 years old exhibiting good leptomeningeal collaterals. These insights provide valuable indications and considerations for the utilization of mechanical thrombectomy in low ASPECTs (3-5) stroke cases.

DAY 2 - Session 6 | A/Prof Winston Lim
Endovascular treatment in Cerebral Venous Thrombosis

CVT is uncommon cause for stroke, accounting for 0.5 to 1 % of all strokes. It is more common in younger patients and may be associated with prothrombotic states eg. pregnancy,

puerperium, use of oral contraceptives and fertility drugs, infections, head trauma, tumours and dehydration. Vaccine-Induced Immune Thrombotic Thrombocytopenia (VITT) associated with the administration of adenovirus vector vaccine, most commonly manifesting as CVT , is another association. Clinical presentation may be acute or chronic and often with nonspecific and variable symptoms and signs. Headache, focal neurological deficit, fits and altered mental state are the most common presenting symptoms and imaging is essential to establish diagnosis. Cross sectional imaging including vascular imaging has replaced catheter angiography as the gold standard radiological study to confirm diagnosis. CT and MRI with and without contrast as well as vascular imaging with CT and MR venography in their various forms are complementary and the following are common imaging signs in CVT:

Direct Signs
Dense sinus on NECT / Dense triangle
Cord sign on NECT or MRI (Susceptibility); SWI sequences will accentuate blooming
Empty Delta on enhanced CT/ T1W MRI

Indirect Signs
Cerebral oedema (both vasogenic and cytotoxic), reflecting venous congestion and cellular damage
Haemorrhagic infarction, with finger / flame like haemorrhage
SAH and SDH

Vascular imaging (CTV and MRV)
Non or partial demonstration of cortical veins and sinuses, with filling defects and irregular luminal outline
Prominent collateral venous pathways

Treatment of CVT
Current guidelines recommend the use of Anticoagulation with UFH or LMWH for non VITT associated and Non heparin anticoagulants and immunoglobulin in VITT associated CVT. Endovascular treatment (EVT) is indicated when there is:
- Clinical deterioration despite anticoagulation
- Contraindications to anticoagulation
- Coma
- Deep CVT
- ICH   (SNIS guidelines 2018)

Other SNIS recommendation include hemicraniectomy for mass effect and use of ICP monitoring. The European Stroke Guidelines on CVT (2017) refrained from recommending EVT. Various methods including Angiojet / Guidewire disruption / Balloon disruption / Stent thrombectomy / Chemical thrombolysis amongst other have been utilized to restore patency. Partial versus Complete recanalization of the venous outflow channels, allowing for passage of blood and thus anticoagulation contact as well as relief of venous congestion may be sufficient for treatment response.

STROKE 2: ICAD AND EXTRACRANIAL CAROTID DISEASE

MODERATORS: A/Prof Winston Lim / Prof Shailesh Gaikwad

DAY 2 - Session 7 | A/Prof Chang Hui Meng
Cryptogenic Stroke: Current understanding of potential causes

DAY 2 - Session 7 | Prof Michihiro Tanaka
Embryological consideration of extracranial carotid atherothrombosis

Atherothrombosis is characterized by its association with metabolic syndrome as a risk factor. Although risk factors related to metabolic syndrome, such as hypertension, hyperlipidemia, smoking, diabetes, and obesity, suggest a uniform effect on systemic blood vessels, in reality, vascular events triggering extracranial atherothrombosis are concentrated in three specific locations: (1) the posterior wall of the proximal internal carotid artery, (2) the aortic arch, and (3) the coronary arteries. In coronary artery bypass grafting (CABG) for coronary artery disease, the internal thoracic artery is commonly used as a donor vessel. It is known that even in the presence of severe ATIS in the coronary arteries, the internal thoracic artery remains unaffected. Although severe stenotic lesions in the proximal internal carotid artery, which can lead to cerebral infarction, are frequently observed, the external carotid artery and the common carotid artery at the same level do not narrow. Similarly, the brachial artery, radial artery, and ulnar artery typically remain unaffected by ATIS. This paper will provide an embryological perspective on ATIS.

DAY 2 - Session 7 | Prof Timo Krings
Carotid stenting: Current indications and new developments

Atherosclerotic narrowing of the extracranial internal carotid artery can be a cause of ischemic strokes. Patients who recently presented with symptoms attributable to the carotid narrowing are at a significantly higher risk of developing future strokes but depending on the plaque morphology and composition even patients with asymptomatic carotid stenoses may benefit from revascularization. Although open surgical revascularisation has been the gold standard of treatment for carotid stenosis for many years, review of the current literature demonstrates that both open vascular and endovascular treatment options produce overall similar results. Still, both in symptomatic and in asymptomatic patients, certain patient-specific factors such as age, comorbidities, plaque morphology, degree of stenosis, status of other vessels, prior surgical intervention, type and acuity of presentation may favor one treatment over the other and as in many other vascular conditions a "one size fits them all approach" is unlikely to be of benefit for a patient and an individualized approach to patients will likely lead to better outcomes, esp when treatment is offered by a multidisciplinary team.

DAY 2 - Session 7 | Prof Adnan H Siddiqui
Modern management of ICAD with flow estimation

Intracranial atherosclerotic disease (ICAD) is a Common cause of stroke worldwide (10-15%), with a higher incidence in certain ethnic populations including Asians (30-50%), African-Americans and Hispanics (15-30%). Patients present with stroke/TIA caused by hypoperfusion ischemia, artery to artery emboli, occlusion at site of plaque, or a combination of factors. While prior trials investigating the use of angioplasty and stenting for ICAD have been unsuccessful due to high rates of periprocedural stroke, new technology including the use of intra-procedural pressure monitoring and measurement of fractional flow reserve (FFR) across the site of stenosis may be useful at preventing peri-procedural complications. While medical management remains the mainstay of therapy for symptomatic ICAD, evolving technology has made submaximal angioplasty with or without stenting safe and effective at improving perfusion deficits while minimizing periprocedural complications. Multiple series from North America and Asia have demonstrated that measuring FFR provides real-time details regarding the improvement in blood flow across a stenotic segment, even in the absence of significant improvements in

vessel diameter on digital subtraction angiography. Recent series have also demonstrated that those intra-procedural FFR findings correlate well with improved perfusion parameters. The use of FFR-guided submaximal angioplasty with or without stenting for medically refractory symptomatic ICAD is both safe and effective in multiple series. We provide existing data as well as case examples of adjunctive use of FFR to help guide treatment plans during neurointervention for symptomatic ICAD. Future clinical trials are needed to verify safety and efficacy.

DAY 2 - Session 7 │ Prof Wong Ho-Fai
Case Selection and Treatment Strategies in Elective Treatment of ICAD

Intracranial atherosclerotic stenosis (ICS) is the cause of up to 10 % of ischemic strokes and transient ischemic attacks, resulting in significant morbidity and mortality. Even with best medical therapy, the risk of recurrent stroke remains high. So far, two randomized controlled trials (SAMMPRIS) trial and (VISSIT) trial have been concluded investigating endovascular intervention with stenting for ICS. The specific profile of procedure-related complications of SAMMPRIS and VISSIT, any technical modification of the endovascular ICS treatment technique may reduce risk and improve the safety profile of ICS intervention which is still highly desirable for a substantial number of patients refractory to best medical treatment The Wingspan system, which was exclusively employed in SAMMPRIS, requires several exchanges of microcatheters over a 300-cm exchange micro-guidewire. In contrast to the Wingspan stent delivery system, balloon-expandable stents can be deployed in a single step eliminating the need of microcatheter exchange. However, failure of balloon-expandable stents which particularly applies to the intracranial circulation in elderly patients is their relative lack of flexibility regularly impeding to navigate these devices to the target lesion. In addition, balloon-expandable stent deployment is the requirement of higher inflation pressures which might harm the vulnerable wall of intracranial vessels. Alternatively, angioplasty/PTA followed by deployment of an off label self-expandable stent design for neck remodeling in the treatment of wide-necked intracranial aneurysms or which is delivered over a system not requiring further manipulation of the microcatheter for exchange maneuvers seems promising. Herein, I present the use of different intracranial stent device in management ICS in specific situation and discussion.

NEW DEVICES AND TREATMENTS

MODERATORS: Asst Prof Chia Ghim Song / Prof Adnan H Siddiqui

DAY 2 - Session 8 │ Dr Laetitia de Villiers
CSF venous fistula: diagnosis and management from neurointerventional perspective CSF spinal fistula are an important cause of spontaneous intracranial hypotension which may be an extremely disabling condition with symptoms of orthostatic headache, neck pain, tinnitus, changes in hearing, vertigo and nausea. CSF spinal fistula can be challenging to diagnose on conventional imaging and requires specialized imaging techniques and a detailed knowledge of the anatomy. Diagnosis and management has developed over the past 10 years and an awareness of both is necessary for clinicians, neuroradiologists and neurointerventionists and treatment can be life changing for patients.

DAY 2 - Session 8 │ Prof Staffan Holmin
Endovascular trans-vessel wall technique for direct tissue access

We have over the recent years developed a trans-vessel wall technique and device, the Extroducer, that makes it possible to get direct tissue access to any organ via the endovascular route. Using standard micro-catheter technique and navigation to any desired location, one can then use the Extroducer to penetrate the vessel wall for access to the organ parecnhyma without causing hemorrhage or thrombosis. The device is now FDA-approved for use in abdominal organs. The concept has been developed in large animals to include delivery also to the CNS and the heart via transvenous and trans-arterial approaches. Different biological payloads have been tested successfully such as heart progenitor cells, adenovirus-mediated transfection and mesenchymal stem cells containing modRNA coding for VEGF. Data on delivery efficacy, safety and biological effects will be presented. We have explored different aspects of sampling via the endovascular route. A micro heart bioptome, that fits into a 2.7 French microcatheter has been developed which safely and efficiently produces samples for transcriptomic and proteomic analysis. A micro-catheter based device for selective endothelial cell sampling has been developed and works for - omics characterization of cells in any vascular location. In addition, we have recently developed a concept and device for obtaining ultra-small samples via the Extroducer trans- vessel wall technique. This enables repeated minimally invasive sampling of any organ via the transvenous or trans-arterial route. Data will be presented regarding the sampling procedure and the analysis of tissue from heart, endothelial cells, kidney, liver, pancreas and brain. In summary, micro-endovascular technique can be used for delivery of different payloads and for sampling in any organ.

DAY 2 - Session 8 │ A/Prof Chai Kobkitsuksakul
Endovascular Vision salvage in Central Retinal Artery Occlusion

We investigate the efficacy and safety of selective intra-ophthalmic arterial combined nimodipine and alteplase infusion in patients with central retinal artery occlusion (CRAO). All patients with CRAO who presented at our institute within 24 hours from the onset were included. Intra-arterial nimodipine and alteplase were given selectively into the ophthalmic artery. Visual acuity was recorded during and after the procedure. Change in best corrected visual acuity (BCVA) 1-month post-treatment, relative to baseline, was set as the primary outcome measure. Significant improvement in vision and adverse events are reported as secondary outcomes. A total of nine patients with CRAO underwent selective intra-ophthalmic arterial nimodipine and alteplase injection. Overall, BCVA had statistically significantly improved by 0.78 logarithm of the minimum angle of resolution (logMAR) at 1 month compared with baseline (95% confidence interval: (-1.24, -0.31), p-value = 0.001). Seven (77.8%) patients had significant visual improvement (≥0.3 logMAR) at 1-month post-treatment. The treatment benefit was more pronounced in the patients with incomplete CRAO, with 83.3% of them having a final BCVA better than or equal to 20/50.

DAY 2 - Session 8 │ Prof Tufail Patankar
Neck focused intrasaccular devices : The next step in cerebral aneurysm management

This talk will highlight role of intrasaccular devices and evidence behind these devices , advantages and disadvantages . I will discuss various devices particularly focusing of the new generation devices like WEB, Contour and Neqstent. My presentation will highlight the benefits of this technology and I

will try to discuss my last 10 years using intrasaccular technology so new operators can learn from my 10 year journey.

DAY 2 - Session 8 | Prof Adnan H Siddiqui
MMA embolisation in cSDH: Techniques and Evidence

Chronic subdural hematoma (cSDH) is a common disorder, historically treated with either burr hole drainage or craniotomy. Though the exact etiology is not known, frequent microbleeding and fluid exudates from inflammatory neovascular membranes are often implicated. Middle meningeal artery (MMA) embolization has been shown to be an effective stand-alone and adjunctive treatment in the management of cSDH. Multiple cohort studies have shown MMA embolization to be safe and effective for cSDHmanagement, either as a stand-alone therapy or, more commonly, as an adjunct to burr hole drainage/craniotomy for evacuation. Predictors of successful resolution of cSDH have been described from these series. As a result of the profound success thus far, multiple randomized clinical trials have been initiated in the United States and internationally, studying the utility of MMA embolization using a variety of neurointerventional embolic agents. Even so, pitfalls to MMA embolization have been well-described and such "mis-adventures" are outlined herein. The use of MMA embolization for cSDH has been shown to be both safe and effective in multiple series. We provide existing data as well as case examples of adjunctive use of MMA embolization with a particular focus on pitfalls that should be avoided. Finally, we discuss the active clinical trials that will inform future guidelines.

EDIFICE: STRENGTHENING THE FOUNDATIONS

MODERATORS: A/Prof Anil Gopinathan / Prof Anchalee Churojana

DAY 3 - Session 9 | A/Prof Vijay Sharma
Transcranial doppler for the neurointerventionist

Stroke remains a leading cause of mortality and long-term disability worldwide. Rapid recognition, early arrival to the hospital and fast access to treatment remain the key for improved survival and functional outcomes in stroke. The concept of 'Time is brain' has led to rapid advances in stroke treatment during past three decades. Transcranial Doppler (TCD) is a widely available, portable and non-invasive tool that provides information about cerebral hemodyamics in real-time. In addition to providing beat-to-beat information about cerebral blood flow and arterial patency, advanced applications of TCD help clinicians in establishing diagnosis and prognosis, in addition to selection of patients for various interventions. TCD is considered as an essential component of comprehensive stroke centres. Bedside assessment of cerebral hemodynamics and autoregulation in intensive care serves as a useful tool in therapeutic decision making as well as neuro-monitoring. In this talk, various advanced applications of TCD will be presented.

DAY 3 - Session 9 | Prof Timo Krings
The many faces of intracranial arterial dissections

Intracranial arterial dissecting diseases are rare and challenging diseases with a high associated morbidity and mortality. Their common pathomechanic origin is related to blood entering the vessel wall via an endothelial and intimal tear. Depending on the fate of the thus established intramural hematoma, different

symptoms may ensue including mass effect, subarachnoid hemorrhage or ischemia. If the mural hematoma ruptures all vascular layers of the intradural artery, a subarachnoid hemorrhagic will occur. If the intramural hematoma reopens distally into the parent vessel on the other hand, ischemic embolic events may happen following intramural clot formation. If the mural hematoma does neither open itself into the parent vessel nor into the subarachnoid space, the vessel wall may dilate leading to occlusion of perforator branches and local ischemia. Organization of the mural hematoma may result in a chronic dissecting process which may eventually lead to formation of a "giant partially thrombosed" aneurysm with thrombus of varying ages within the vessel wall. Treatment strategies of these diseases should take the underlying pathomechanism into consideration and include, depending on the presentation medical treatment, parent vessel occlusion, flow reversal or diversion, surgical options or a combined treatment protocol.

DAY 3 - Session 9 | Prof Yuichi Murayama
Therapeutic Strategy of Unruptured Aneurysms: Selection of optimal Endovascular devices

Endovascular therapy was established last 3 decade as an effective treatment for ruptured/unruptured cerebral aneurysms. We report the current status and future direction of endovascular aneurysms therapy. All patients treated with endovascular technique for their intracranial aneurysms at our hospital between 2003 and 2022 were reviewed. All procedures were performed in the Hybrid operating rooms in our institution. Overall 2780 ruptured/unruptured aneurysms were treated. Before 2017, any kind of stents assisted coiling ration was 20%. After, 2017 60% aneurysms were treated with stents or other new technologies including Flow diverter or WEB. For unruptured aneurysms, we create 3D printer aneurysm model for optimal microcatheter shaping. Overall complication rate did not differ between conventional coiling and new generation devices. In this report we discuss optimal treatment strategy with modern endovascular technique/devices.

DAY 3 - Session 9 | Dr Lee Chung-Wei
Liquid Embolics: case selection and tips and tricks for safe and effective utilisation

In this brief talk, I will introduce the frequently used liquid embolic materials in neurovascular and peripheral vascular treatment. These include n-butyl-2-cyanoacrylate (nBCA) mixed with iodized oil, ethylene vinyl alcohol (EVOH) copolymer, hydroxyethylmethacrylate (HEMA) copolymer (PHEMA), and mixture of nBCA, alcohol and iodized oil. Their characters, preparation, guide for use will be presented. Some cases will be presented to illustrate how and when to choose the liquid embolic materials and how to use them safely and efficiently.

DAY 3 - Session 9 | Asst Prof Chia Ghim Song
Transradial neurointerventions: Tips, tricks and pitfalls

In recent years, the transradial approach for neurointervention procedures has garnered significant attention due to its potential to minimize access site complications and improve patient satisfaction when compared with the traditional transfemoral approach. Moreover, it provides a reliable alternative when the transfemoral route is not viable. For interventionists who want to incorporate the transradial approach into their daily practice, it can be challenging. The objective of this lecture is to shed light

on the standard radial set-up and offer valuable tips and tricks for performing diagnostic angiograms and neurointerventional procedures. By equipping you with these essential insights, we aim to enhance your overall success in adopting the transradial approach.

VASCULAR MALFORMATIONS: PERIPHERAL & HEAD AND NECK

MODERATORS: A/Prof Mark Koh / A/Prof Manish Patel

DAY 3 - Session 10 | A/Prof Mark Koh
Introduction and classification of vascular anomalies
DAY 3 - Session 10 | A/Prof Chan Mei Yoke
Targeted therapy in Vascular Anomalies

Vascular anomalies have traditionally been treated either with surgery or interventional procedures like sclerotherapy and embolization. The serendipitous discovery of propranolol in the treatment of infantile haemangioma paved the way for medical treatment of vascular anomalies, particularly those not amenable to surgery or other interventional procedures. With the identification of putative causative genetic mutations in proliferative cellular pathways familiar to oncologists, like the PI3K/AKT/mTOR and the RAS/MAPK/ERG pathways; and the repurposing of oncology drugs that target these pathways to treat vascular anomalies, there is now a viable medical option in the therapeutic armamentarium of these complex and often difficult to treat conditions.

DAY 3 - Session 10 | Prof Anchalee Churojana
IR management of AVM of the head and neck

Head and neck vascular malformations encompass a spectrum of abnormalities classified as tumors and malformations based on their biological characteristics and behavior. Within the malformation category, there are simple forms (capillary, arteriovenous, venous, and lymphatic) and complex-combined forms. Management of vascular malformations are depended on each type, taking into account symptomatic manifestations such as distortion, pain, bleeding, and cosmetic concerns. Capillary malformations (CMs), often referred to as birthmarks such as port-wine stains and telangiectases, typically do not require endovascular treatment. Arteriovenous malformations (AVMs), characterized by high-flow lesions with multiple arteriovenous fistulas, can be effectively managed using transarterial embolization techniques utilizing liquid embolic materials. The primary objective is to occlude distal arteries and proximal veins. In cases where complete eradication is not feasible, targeted partial embolization should be considered for symptom control. Superficial lesions, such as scalp AVMs and mandibular AVMs with large venous pouches, are suggested to access via a percutaneous approach. However, ligation or occlusion of feeding arteries is discouraged because this procedure will cut the access of embolization and result in rapid recruitment of new vessels and subsequent lesion enlargement. For select patients, a combined treatment strategy involving embolization and surgical resection may lead to successful outcomes. Venous malformations (VMs) are the most prevalent type of vascular malformation. They consist of thin-walled, dilated channels with abnormal smooth muscles. Diagnosis is typically achieved through CT scans or MRI, which provide valuable information on the extent of the malformation. Sclerotherapy, by mean of percutaneous injection of sclerosing agents, is the preferred treatment approach for VMs. The aim is to induce thrombosis and gradual shrinkage of the

malformation. Absolute alcohol is known as the most effective sclerosing drug, however, it is important to note that it may lead to complications such as severe swelling, skin necrosis, and neuropathy. Currently, intralesional bleomycin injection has demonstrated effectiveness as a sclerosing agent, causing specific endothelial damage. It is mixed at the dilution of 1 mg/ml by normal saline. The amount of the injection varies according to the size of the lesion, however, never exceed 15mg in each time. For the large lesion, the volume can be expanded up to 45 ml by mixing with 20% albumin and air. In children under one year of age, the maximum dose is limited to 0.5-1 mg/kg, Repeat injections are typically scheduled at 6-8 week intervals. Lymphatic malformations (LMs) present as microcystic, macrocystic, or combined forms, and they are usually apparent at birth or within the first two years of life. Intralesional bleomycin injection has demonstrated remarkable results in the treatment of macrocystic LMs. However, absolute alcohol has shown no significant effect on LMs. In summary, effective management of head and neck vascular malformations necessitates accurate diagnosis and individualized treatment strategies. Interventional radiology techniques, including embolization and sclerotherapy, offer valuable options for achieving symptom control and favorable outcomes in patients with these challenging conditions.

DAY 3 - Session 10 | Dr Lee Chung Wei
IR management of AVM of the trunk and peripheries

DAY 3 - Session 10 | A/Prof Manish Patel
IR management of slow flow vascular malformations

DAY 3 - Session 10 | A/Prof Too Chow Wei
Thermal ablation of vascular malformations: initial SG experience

IMAGING OF THE POST-TREATMENT NECK

MODERATORS: Dr Goh Lin Wah / Dr Alvin Soon

DAY 1 - Session 1 | Dr Timothy Cheo
What the Radiotherapist needs to know

More than ever, modern radiotherapy has the ability to deliver therapeutic doses to tumour targets while sparing adjacent normal tissue. The quality of radiotherapy thus depends on the ability to visualize tumour. The development of high-quality imaging modalities like MRI and PET-CT for head and neck cancers have led the way in this regard. How does the radiologists and radiation oncologist's work intersect? What does a radiologist bring to the multi-disciplinary discussion? How can we work more closely together to improve cancer outcomes? Join me as I unpack these issues from the perspecϴve of a radiation oncologist.

DAY 1 - Session 1 | Prof Christine Glastonbury
Post-Radiation Changes In Head And Neck Cancer Treatment

Radiation destroys endothelial cells lining small blood vessels. Early in the post-radiation phase [1-4months] this results in ischemia, edema, and inflammation of radiated tissues. Diffuse edema may be evident in all tissues with reticulation of subcutaneous and deep fat planes, thickening and enhancement of the mucosa and a swollen, heterogeneous appearance of glandular tissues. The muscles of the neck may also appear edematous. As a late expected finding [≥12months] fibrosis is typically evident in all tissues once the initial inflammatory reaction subsides. While edema and reticulation of fat tends to resolve and mucosal thickening and enhancement may resolve, glandular and tonsillar tissues atrophy although typically show persistent increased enhancement. Fat planes tend to atrophy also, with these diffuse soft tissue changes being most evident if radiation has been unilateral. Such post-radiation side effects are expected findings and are predictable in most patients. The severity of these changes can, however, vary between patients even for the same radiation dose. Some patients, particularly those with known collagen vascular disease including scleroderma, will show a more florid inflammatory reaction to radiation. These patients are also more likely to experience complications of radiation which can affect any tissue in the radiated area, and which are most likely to occur within the first two years after radiation. Such complications can be devastating to patients with necrosis of soft tissues and bones. There is also an increased incidence of radiation-induced malignancies at least 8 years after therapy. The expected radiation side effects and the unexpected complications of radiation therapy can make evaluating post treatment scans more complex for the radiologist, and cam make it more difficult to detect residual viable tumor or early tumor recurrence. In this lecture the learner will become more familiar with the expected early and late changes of radiation in the neck, the use of different imaging modalities to facilitate diagnosis, and we will discuss strategies to better enable radiologists to recognize complications and to detect tumor recurrence.

DAY 1 - Session 1 | Prof Eugene Yu
Recurrent disease - CT & MR features

Radiology plays an important role in the multidisciplinary treatment approach to patients with head and neck cancer. The initial radiographic exam is important in establishing disease stage which in turn, guides prognosis and treatment approach.

Also important, is the identification of recurrent disease following treatment. The post-therapy appearance of the head and neck patient can be complicated by post surgical distortion. Inflammatory change secondary to radiation and chemotherapy can further add to a confusing appearance on imaging. This lecture will show, via case examples, an approach to assessing the post treatment neck for recurrent disease. Key radiographic features to evaluate in the neck will be emphasized that can help in the detection of early disease recurrence.

DAY 1 - Session 1 | Prof Eugene Yu
How to prepare for the Tumour Board

The multidisciplinary tumor board (MDTB) plays an important role in the model of patient centered care in modern oncologic practice. It affords an opportunity for the collegial and open discussion of challenging and controversial cases and also allows the opportunity for quality control of more standard cases. Radiologists are an important part of this process, tasked with showing relevant imaging that helps guide staging, prognosis and treatment. It is important for the imager to be able to tease through the multitude of imaging studies and be able to present the case in a concise, efficient manner. This lecture will detail an approach and the considerations and various "do's and don'ts" in how to prepare for a head and neck cancer MDTB from the point of view of a radiologist.

NASOPHARYNGEAL CANCER SCREENING - CURRENT TECHNIQUES AND CHALLENGES

MODERATORS: Prof Christine Glastonbury / Dr Julian Goh

DAY 1 - Session 2 | Prof Allen Chan
Screening with EBV DNA - current status and role

Nasopharyngeal carcinoma (NPC) is one of the commonest cancers in Southern China and Southeast Asia. Early-stage NPC patients had much better treatment outcomes than those with advanced disease, with a five-year survival of over 95%. However, almost 80% NPC patients present with locally advanced or metastatic disease because early NPC is relatively asymptomatic. Making use of the close relationship between Epstein-Barr virus (EBV) infection and NPC, we developed circulating EBV DNA as a marker for NPC. We screened over 20,000 asymptomatic men using real-time PCR analysis for plasma EBV DNA. Individuals with positive test results were further investigated with nasal endoscopy and MRI. Thirty-four cases of NPC were identified with this arrangement. Remarkably, almost half of the NPC cases had stage I disease. Compared with historical cohorts, NPC patients identified by screening had much improved progression-free survival with a hazard ratio of 0.1. In the second generation assay, we used next generation sequencing to analyze the fragmentation of plasma EBV DNA to identify the cancer-specific features so as to further improve the accuracy for NPC detection. We rescreened the participants at a median of 42 months of the initial screening and showed that subjects with positive plasma EBV DNA but no identifiable cancer at the initial round of screening had indeed increased risk of future development of NPC.

DAY 1 - Session 2 | A/Prof Lim Chwee Ming
Endoscopic screening of NPC

Globally, Epstein Barr Virus (EBV) driven nasopharyngeal

carcinoma (NPC) afflicts 130,000 patients annually and carries a mortality of 73,000 patients in 2018. This is unsurprising, considering that 80% of NPC patients are diagnosed at advanced stage of disease. When NPC is diagnosed in stage 1-2, the 5-year overall survival (OS) is approximately 84-90%. Conversely, the 5-year OS significantly diminishes to 58% among patients with Stage IV disease. Unfortunately, most patients with early stage NPC are often asymptomatic, or present with symptoms that are easily dismissed as common cold or upper respiratory tract infection. Early diagnosis of NPC is difficult as definitive diagnosis will require the expertise of an otorhinolaryngologist (ENT) to examine the nasopharynx using flexible nasoendoscopy; and biopsy any suspicious tumours or lesions identified in the nasopharynx. Numerous studies have shown the potential of screening of NPC, either in community screening in endemic countries or in family members with an index NPC patient. While most screening studies use EBV related serology and/or plasma EBV-DNA, direct examination of the nasopharynx is crucial to pick up early lesions that may harbour NPC. In this presentation, I will discuss endoscopic evaluation of the nasopharynx, especially in the context of NPC screening and presents some data looking at spectroscopy for real time mucosal evaluation of the nasopharynx. Finally, I will briefly discuss the role of machine machining for imaging analyses of the nasopharynx in order to screen for early NPC lesions.

DAY 1 - Session 2 | Prof Ann D King
MRI screening of NPC - role and challenges

Plasma EBV-DNA or EBV-antibody screening programmes have dramatically increased the early detection of nasopharyngeal carcinoma (NPC), 70% of which are stage I/II cancers. Endoscopy is used to distinguish the minority of EBV-positive patients who have NPC from the majority of EBV-positive patients who do not have NPC. However, early-stage cancers can be challenging to detect on endoscopy because they may be hidden from view in the pharyngeal recess or corner of the roof, or masked by coexisting benign lymphoid hyperplasia. MRI has a higher sensitivity than endoscopy for NPC detection because it detects early cancers not seen on endoscopy. In three prospective studies comparing MRI and endoscopy, MRI detected 11% more NPCs in symptomatic patients and 17%–34% more NPCs in EBV DNA/antibody-screen-positive asymptomatic patients. MRI also has a high NPV which is valuable for excluding cancer in EBV-positive patients who do not have NPC.

Assessment of contrast-enhanced MRI readily detects NPC that has spread beyond the nasopharynx or when early-stage NPC confined to the nasopharynx forms a unilateral focal mass. However, early-stage NPCs that are either diffuse and bilateral, or that form a central focal mass in the roof, must be distinguished from benign hyperplasia. Key to identifying these early-stage NPCs is asymmetry between the two sides of the nasopharynx, especially in the walls when the asymmetry is expansile, or in the adenoid when associated with disruption/displacement of the enhancing adenoidal septa. This lecture will illustrate the use of the MRI grading system to detect NPC, which was recently updated from a four to a five-grade system. An MRI grading system also has been proposed for use in the NPC screening setting which can be applied to a fast MRI protocol limited to a few sequences without intravenous contrast. A prospective MRI study in patients undergoing EBV-DNA screening again identified more cancers than endoscopy, detecting cancers in the endoscopically normal nasopharynx and in the endoscopically abnormal nasopharynx where initial biopsy was negative. Furthermore, deep learning algorithms

show promise for automatic detection of NPC on MRI screening scans. In summary, MRI has a complementary role to endoscopy in the detection of NPC to 1) detect early-cancers hidden from view or masked by lymphoid hyperplasia, 2) help decide which indeterminate lesions need biopsy or repeat biopsy, and 3) increase confidence that NPC has not been missed in EBV-positive patients who do not have NPC.

DAY 1 - Session 2 | A/Prof Melvin Chua
Challenges of instituting an NPC screening program

Nasopharyngeal carcinoma (NPC) remains a unique disease that has specific demographic and geographical distributions. NPC typically affects 30-50 year old males from South China, South-east Asia, and North Africa. Apart from these observations, the endemic variant of NPC is invariably linked with the Epstein-Barr virus (EBV) infection. These epidemiological associations argue for the impetus to deploy large-scale population screening in these endemic regions, especially with a broad panel of blood-based markers that can detect EBV (e.g. serology, plasma-based circulating DNA, methylation markers, etc). However, screening remains a contentious issue to date, despite prospective screening studies showing the utility of screening in detecting early disease, potentially leading to improved survivorship. Many reasons temper the enthusiasm of implementing screening programmes for NPC – These include the global declining incidence of NPC; differing opinions on the preferred blood-based marker, accounting for cost and ease of implementation versus accuracy; and the lack of good data to guide the management of test-positive but clinically asymptomatic high-risk individuals. Despite these prevailing issues, the benefits of NPC screening are compelling, as >70% of patients present with locoregionally-advanced Stage 3-4 disease at diagnosis, and in Singapore, the updated cancer registry data (https://nrdo.gov.sg/publications/cancer) reported that NPC ranks among the top 10 causes of cancer deaths. In my talk, I will highlight some of these issues, and discuss the current progress, and future research on EBV-based screening for NPC.

HYPERPARATHYROIDISM - FINDING AND MANAGING THE ADENOMA

MODERATORS: Dr Khoo Hau Wei / Prof Ann King

DAY 1 - Session 3 | Dr Chew Chee Kian
Clinical aspects & perspectives - What the clinician needs to know

Primary hyperparathyroidism is one of the most common endocrine disorders characterized by increased production and secretion of parathyroid hormone by one or more parathyroid glands leading to hypercalcemia. It is a biochemical diagnosis with increased serum and urinary calcium level, decreased serum phosphate level, increased urinary phosphate level and increased or inappropriately normal serum parathyroid hormone level. About 85% of primary hyperparathyroidism is caused by parathyroid adenoma, 15% by parathyroid hyperplasia and less than 1% by parathyroid carcinoma. Most patients have single gland disease and about 15% to 20% have multigland disease which is more common in familial syndromes. Primary hyperparathyroidism is more common in postmenopausal women with a female to male ratio of 3-4:1. The classic presentation of primary hyperparathyroidism includes skeletal involvement (osteitis fibrosa cystica characterized by bony

deformity, bone pain and pathological fracture, and reduced bone mineral density), renal involvement (nephocalcinosis and nephrolithiasis), gastrointestinal involvement (pancreatitis and peptic ulcer disease), neuropsychiatry involvement (anxiety, psychosis and loss of memory) and symptoms attributed to hypercalcemia (nausea, vomiting, constipation, polyuria, polydipsia and mental confusion). Other than baseline biochemical tests to diagnose the condition, evaluation of primary hyperparathyroidism should also include further investigations to look for complications of primary hyperparathyroidism which are also the criteria for surgical management. These include 24 hours urinary calcium level, renal imaging studies and dual-energy X-ray absorptiometry. It is also important to calculate urinary calcium to creatinine clearance ratio to exclude familial hypocalciuric hypercalcemia, an autosomal dominant disease characterized by mild hypercalcemia and hyperparathyroidism. It is a benign condition treated conservatively for which surgery is never indicated. Surgery is the only cure for primary hyperparathyroidism and should be offered to patients who are symptomatic and fulfil surgical criteria. Conventionally, bilateral neck explorations have been the surgical approach with 95% success rate in the hands of experienced parathyroid surgeons. However, with the advancements in imaging modality, successful localization of parathyroid lesion together with intra-operative measurement of parathyroid hormone level allow minimally invasive approach that has advantage of shorter operative time, lower risk to surrounding structures, less tissue scarring and lower hospital costs. For symptomatic patients who decline or are not fit for surgery, medical management includes vitamin D, calcium, antiresorptives and calcimemetic therapy.

DAY 1 - Session 3 | Prof Lee Jeong Hyun
4D CT - current role and imaging pitfalls

Preoperative imaging localization of parathyroid glands plays a crucial role in surgical planning, facilitating minimally invasive approaches, improving surgical success rates, and minimizing the need for repeat surgery. Ultrasound, technetium-99m sestamibi SPECT/CT, and 4D CT are the currently used Imaging modalities to accurately identify the location of abnormal parathyroid glands. Ultrasound is often the initial imaging modality used for parathyroid gland localization due to its widespread availability, cost-effectiveness, and real-time imaging capabilities, and technetium-99m sestamibi SPECT/CT is especially useful in cases of ectopic parathyroid glands. However, they also have disadvantages including low sensitivity and specificity, and often provide inconclusive or ambiguous results. 4D CT is a dynamic imaging technique to visualize parathyroid glands as a hypoattenuating perithyroidal nodule on non-contrast CT, which typically shows early contrast wash-in on arterial phase and wash-out of contrast agent on delayed phase. 4D CT has advantages to provide detailed anatomical information and also has the capability to find ectopic parathyroid glands. However, there are certain pitfalls associated with 4D CT imaging of the parathyroid glands. One limitation is the potential for false-positive or false-negative findings. Interpretation of the images can be challenging. First, anatomical variation is not uncommon for the parathyroid gland. In addition to congenital ectopia, parathyroid glands can migrate inferiorly with gaining weight by abnormal enlargement (so called acquired ectopia), which make interpretation more difficult.Second, not all the abnormal parathyroid gland shows typical 4D CT findings. Third, there are mimics of abnormal parathyroid glands, for example, exophytic thyroid nodule, which can be correctly interpreted by correlating with ultrasound findings. Forth, artifactsrelated with venous contrast stasis or suboptimal shoulder position can lead to incorrect

identification of abnormal glands or failure to detect them. The lecture will cover interpretation and reporting of 4D CT of parathyroid glands including its pitfalls as well as the current position among the imaging modalities for accurate localization of abnormal parathyroid glands.

DAY 1 - Session 3 | Prof Baek Jung Hwan
Parathyroid Ablation

The parathyroid glands, located near the thyroid gland in the neck, are small, pea-sized glands that play a crucial role in regulating the body's calcium levels. Various types of tumors can develop in the parathyroid glands, including parathyroid cysts, parathyroid adenomas, and parathyroid carcinomas. While these parathyroid lesions have traditionally been treated with surgery, more recently, radiofrequency ablation and ethanol ablation have been utilized as non-surgical approaches for patients with parathyroid lesions. In this lecture, I will discuss the non-surgical management of parathyroid lesions.
(1) Symptomatic large parathyroid cysts can be treated through simple aspiration or ethanol ablation.
(2) For parathyroid adenomas causing hyperparathyroidism, radiofrequency ablation (RFA) is a minimally invasive procedure that can be used as a non-surgical treatment option.
(3) Lastly, I will present some cases of recurrent parathyroid carcinoma treated with RFA.

DAY 1 - Session 3 | Dr Lim Ming Yann
Surgical Management of Hyperparathyroidism

Hyperparathyroidism can be primary, secondary and tertiary types. This presentation will focus on the surgical management of primary hyperparathyroidism. The principles of management are: (1) Correct diagnosis (2) Preoperative localization (3) Intraop localization (4) Surgical technique (5) Philosophy of extent of exploration. The diagnosis is usually made when there is a raised PTH with raised concomitantly raised corrected calcium. Familial hypocalciuric hypercalcemia has to be excluded with a urine calcium to creatinine ratio<0.01 and urine calcium < 200mg /day. Preoperative localization includes Ultrasound, Sestamibi, CT scan (contrast or 4D) and 4D MRI. The combination of these scans allows the surgeon to increase the chance of localizing a potential candidate. 4D MRI is an merging modality that has proved useful in some cases. Imtraoperatively, image guided localization on table is useful. The surgeon can use the US on table to mark the location of the adenoma. The laryngeal skeleton can be used as a reference point to correlate the location of the adenoma in a patient with the scan. Optimal surgical technique includes: Meticulous dissection, with the employment of the nerve monitor to reduce the risk of recurrent nerve injury. Minimal trauma to the adenoma should be practiced with close to "no touch" technique to avoid tearing of the adenoma, spillage and bleeding. If possible, a cuff of tissue is left on the gland to so that the gland can be manipulated. There are 2 schools of thought regarding extent of exploration. Image based targeted removal of adenoma versus 4 gland exploration. Both groups have high cure rates. For the targeted, image based technique, the original intent of exploration may be extended to a 4 gland exploration if the adenoma is not found in the expected position. Intraoperative PTH and intraoperative frozen section can be used to aid this decision making process. Preoperative low PTH (< 10) and preoperative non localizing adenoma on imaging may be more indicative of 4 gland hyperplasia, and the surgeon must be prepared to do 4 gland exploration in these instances.

SALIVARY GLAND MASSES

MODERATORS: Dr Amit Karandikar / Dr Geoiphy Pulickal

DAY 1 - Session 4 | Prof Tao Xiao Feng
Multiparametric Imaging in the Differential Diagnosis of Parotid Masses

DAY 1 - Session 4 | Prof Can Zafer Karaman
Salivary gland neoplasms and their mimics

Salivary gland tumors are rare and accounts for 3% of all head and neck neoplasms. The parotid gland is the most common site (80 %), followed by submandibular (10 %), minor salivary (8–9 %) and sublingual (1–2 %) glands. Most of the tumors are benign (80 %), pleomorphic adenoma (60–70 %) and Warthin tumor (5–12 %) are the most frequent ones. Malignant neoplasms (20 %) are mainly represented by mucoepidermoid carcinoma, adenoid-cystic carcinoma and lymphoma. The risk of malignancy increases when the harboring gland is smaller in size. Cytological or histological samples obtained by fine needle aspiration cytology and core needle biopsy are sometimes inconclusive because of procedural sampling errors and overlapping between benign and malignant tumors. Also, the deeper location in the gland may hinder those minimally invasive biopsy techniques. Accurate pre-operative differential diagnosis of benign and malignant tumors, and even the determination of the exact histologic subtype is essential, which strongly influences the treatment planning. More aggressive surgical approach with or without scarifying vital structures like the facial nerve is performed in malignant tumors. Local excision is suggested for benign tumors. Moreover, different approaches are suggested for certain benign tumors. Enucleation is usually recommended for Warthin's tumors, while superficial parotidectomy with a sufficient margin to embrace the tumor capsule is suggested for pleomorphic adenomas, to avoid the risk of malignant degeneration and recurrence in time. Ultrasonography together with color Doppler or with different techniques of elastography can be used as the first line imaging method to evaluate any tumorous lesion in or nearby the salivary glands. The major advantages of ultrasonography are the capabilities for immediate dynamic imaging, intraoperative use, and avoidance of radiation. However, it has limitations including operator dependency and incomplete visualization of deep and obstructed structures. Computed tomography (CT) and Magnetic resonance imaging (MRI) are more often used for salivary gland imaging. Regarding imaging of neoplasia, MR is superior to CT; where CT provide useful information from the total neck for staging, but has limited role in tumor characterization. CT perfusion may be promising in the field. Magnetic resonance imaging (MRI) is suitable for characterization and locoregional staging. Together with advanced methods such as diffusion-weighted imaging (DWI) and dynamic contrast-enhanced imaging (DCE) provides useful information in distinguishing benign from malignant neoplasms and to characterize them. Multiparametric approach using DCE and DWI may improve the accuracy of differentiating benign and malignant tumors. Newer techniques such as proton MR spectroscopy, intravoxel incoherent motion MR imaging needs time more data to be in routine daily practice. PET-CT is mainly used for detecting distant metastasis from salivary gland cancer. Some other benign diseases of the salivary glands may mimic true neoplasia on imaging. Congenital lesions like branchial cleft cysts, non-neoplastic benign cysts, inflammatory conditions for example IgG4 related disease may cause diagnostic dilemma even in most reliable imaging techniques. Conversely, some neoplasm appearing pure cystic on imaging may imitate benign cystic conditions.

DAY 1 - Session 4 | Dr Manish Bundele
Cytopathologic assessment of salivary gland lesions - uses and clinical implications

Salivary Gland-FNA is a fast, cost-effective, and safe diagnostic method. It can differentiate between neoplastic and non-neoplastic salivary gland lesions, and in cases of a neoplasm, FNA can diagnose many common benign tumors. In most cases, FNA can also differentiate between low- and high-grade carcinomas. However, the cytomorphologic diversity and the lack of common language in reports may confuse patients and clinicians, which can impede the clinical decision and peer communication. The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) is an effort by international consortium of experienced health care professionals, mainly cytopathologists to foster better communication between clinicians and between institutions in order to improve overall patient care. The MSRSGC consists of six diagnostic categories, including a "Non-Neoplastic" category and a "Neoplasm" category that is split into "Benign" and "Salivary Gland Neoplasm of Uncertain Malignant Potential (SUMP)". The cell block testing on dedicated FNA samples allows immunostaining and molecular testing and more specific diagnosis in certain instances. It is an evidence-based system derived from the literature which correlates diagnostic categories with risk of malignancy (ROM) and clinical management strategies.

Diagnostic category	Implied Risk of malignancy (%)	Recommended clinical management/ implications
I. Non-Diagnostic	25	Clinical and radiologic correlation/repeat FNA
II. Non-Neoplastic	10	Clinical follow-up and radiologic correlation
III. Atypia of undetermined significance (AUS)	20	Repeat FNA or surgery
IV. Neoplasm A. Neoplasm: Benign	<5	Surgery or clinical follow-up
B. Neoplasm: Salivary Gland Neoplasm of Uncertain Malignant Potential (SUMP)	35	Surgery
V. Suspicious for malignancy (SM)	60	Surgery
VI. Malignant	90	Surgery

First edition of MSRSGC was developed in 2018 and there are >140 studies done worldwide, including ours at Tan Tock Seng Hospital (PMID: 31131938) validating the system in last 5 years. The clinical utility of The MSRSGC to surgical specialists can be summarized as follows:
- Standardizes reporting and clarity of communication
- Correlates and stratifies the cytologic diagnosis with a risk of malignancy (ROM)
- Facilitates the use of a management algorithm (includes

a chapter on management options as per the diagnostic category)

- Is relevant, transferable, and practical for institutions with variable experience and expertise in salivary gland cytology
- Facilitates quality assurance review and clinical audits by setting standards (e.g., the proportion of inadequate samples less than 10%) as well as providing a potential outcome measure for further research.

DIZZY OR DEAF? IMAGING OF HEARING LOSS AND MENIERE'S DISEASE

MODERATORS: Dr Tan Tiong Yong / Dr Salman Qureshi

DAY 2 - Session 5 | Dr Berit Verbist
7T - Are we ready for primetime?

Since the FDA declared MRI-scanners up to 8 Tesla non significant risk devices for nonneonatal patients in 2003 ultrahighfield (UHF) MRI (7T and above) became available for human imaging with promising advantages in image quality due to increased signal-to-noise ratio, enhanced contrast and exquisite spatial and spectral resolution. Exploiting the benefits of UHF-scanning, however, requires optimization of hardware and software and development of dedicated scanprotocols to overcome the technical challenges related to intrinsic issues of lower image homogeneity, more localised power deposition in the patient and increased sensitivity to motion artefacts. Extensive research to enable routine operation of 7T has led to research applications in the fields of neuro imaging, musculoskeletal imaging and abdominal imaging. A growing presence of 7T MR systems opens the door for the use of UHF-imaging in clinical environments. In this lecture the challenges encountered during development of an imaging protocol for inner ear imaging at 7T will be described. The inner ear poses specific challenges when exposed to UHF: due to its location within the temporal bone and the presence of air-bone-fluid interfaces it is extremely vulnerable to image degradation by inhomogeneous RF and magnetic fields. The background of these technical issues will be explained and possible solutions to obtain highly-detailed inner ear images will be presented. Also patient safety and comfort issues related to 7T imaging will be discussed.

DAY 2 - Session 5 | Dr Geoiphy Pulickal
Conductive Hearing loss in adults; approach and case based review

Conductive hearing loss is an often encountered imaging indication in the day to day radiological practice. The lecture will briefly talk about the process of hearing and the different types of hearing loss and what distinguishes them from each other. An over view will be provided of how to incorporate relevant clinical information like audiograms and otoscopic findings into the radiological decision making process. The lecture will touch upon the standard imaging modalities, protocols and useful reconstructions. We will then proceed to formulate a comprehensive pathway and checklist that will cover all potential disease from the external ear to the inner ear. Each stop along the pathway i.e. external ear canal, tympanic membrane, tympanic cavity, ossicular chain, oval & round windows and the inner ear will be accompanied by relevant case examples that will showcase the importance of a systematic review. Classical topics like cholesteatoma and otosclerosis will be discussed in some detail and finally we will run through some rare out of the box cases that do not conform to the usual review process.

DAY 2 - Session 5 | Prof Xian Jun Fang
Sensorineural hearing loss in adults

Acoustic neuroma, labyrinthitis, malformation of inner ear, and otosclerosis are commonly found on imaging in adults with sensorineural hearing loss, in which acoustic neuroma accounts for nearly 50%. Magnetic resonance imaging (MRI) is the choice of evaluation of sensorineural hearing loss. MR hydrography (MRH) of the inner ear with a section thickness of 0.8-1mm is a screening method for acoustic neuroma, but Gadolinium-enhanced MRI is required to confirm acoustic neuroma. The positive rate of MRI for sensorineural hearing loss is not high, so MRI screening with MRH of the inner ear is indicated in patients with asymmetrical sensorineural hearing loss, tinnitus, or sudden hearing loss. Koos grading based on Gadolinium-enhanced MRI is the prognostic factor of cerebral nerve function after treatment of acoustic neuroma and more frequently employed in the evaluation of acoustic neuroma before treatment. In addition, the 3D FLAIR images 6-8 hours after intravenous injection of Gadolinium-based contrast agents was recently introduced for the evaluation of sensorineural hearing loss resulted from Ménière's disease (idiopathic endolymphatic hydrops).

DAY 2 - Session 5 | Prof Shinji Naganawa
MR imaging of endolymphatic hydrops in Meniere's disease; what neuroradiologists should know

Meniere's disease is a debilitating condition characterized by episodes of vertigo, hearing loss, tinnitus, and a sensation of fullness in the ear. The pathologic hallmark of Meniere's disease is endolymphatic hydrops, a condition in which there is an excessive accumulation of fluid in the endolymphatic space of the inner ear. Magnetic resonance imaging (MRI) has become an important tool in the diagnosis of Meniere's disease and the visualization of endolymphatic hydrops. The Japanese diagnostic guideline includes delayed contrast enhanced MRI as a diagnostic tool. In this lecture, we will discuss the current status of MR imaging of endolymphatic hydrops in Meniere's disease and what neuroradiologists should know. We will begin by discussing the pathophysiology of endolymphatic hydrops and the role of MRI in the diagnosis of Meniere's disease. We will then review the various MR imaging techniques and their pitfalls that are used to visualize endolymphatic hydrops, including conventional MRI, delayed gadolinium contrast-enhanced MRI, and intratympanic gadolinium-enhanced MRI. We will also discuss the challenges associated with MR imaging of endolymphatic hydrops, including the need for high spatial resolution, the potential for motion artifacts, and the need for careful interpretation of imaging findings. We will review the current literature on the sensitivity and specificity of MR imaging for the diagnosis of endolymphatic hydrops in Meniere's disease, as well as the potential use of MR imaging as a biomarker for disease progression and treatment response. Finally, we will discuss the role of neuroradiologist in the diagnosis and management of Meniere's disease, including the importance of close collaboration with clinicians and the need for ongoing research into the use of MR imaging for the diagnosis and monitoring of this challenging condition. We will also discuss the first trial to use the intratympanic injection of 17O-H2O as the new contrast agent for the evaluation of Meniere's disease. Overall, this lecture aims to provide neuroradiologists with a comprehensive overview of the current state of MR imaging of endolymphatic hydrops in Meniere's disease and its potential role in the diagnosis and management of this condition.

ORBIT AND SELLA: WHAT'S NEW?

MODERATOR: Asst Prof Melissa Lee / Prof Chan Ling Ling

DAY 2 - Session 6 | Prof Tao Xiao Feng
Functional MR imaging in the Orbit

Differential diagnosis of orbital diseases is a common clinical problem. The first step in the evaluation of orbital lesions is to locate the lesions. We divide the orbit into five spaces. Each space has its specific common diseases. After the disease has been accurately located, the use of magnetic resonance imaging, especially functional magnetic resonance methods (such as diffusion-weighted imaging and dynamic enhanced magnetic resonance imaging), will further improve the accuracy of diagnosis.

DAY 2 - Session 6 | Dr Noriyuki Fujima
Deep Learning Application in the Orbit

The orbit and its surrounding anatomical regions can exhibit a wide range of pathological changes, such as traumatic, inflammatory, benign/malignant neoplastic diseases. Radiological diagnostic imaging, mainly computed tomography (CT) and magnetic resonance imaging (MRI), plays an important role in disease detection, differentiation/classification, and prognostic prediction, etc. In recent years, there has been remarkable progress in the application of artificial intelligence-based technique, mainly by a convolutional neural network with the deep learning, in medical imaging as a crucial application anticipated for clinical use in the head and neck radiology including the orbit. Specifically, the roles of deep learning techniques are broadly divided into two categories: 1) image acquisition/reconstruction, and 2) disease diagnosis/classification. Image acquisition and reconstruction involves acquiring images of high signal-to-noise ratio with sufficient noise reduction, super-resolution imaging for high-resolution images, and rapid image acquisition with under-sampling conditions (mainly for MRI); numerous clinical benefits and efficient examination outputs have been reported in this regard. In addition, applications in disease diagnosis/classification include differentiation of various diseases, detection of the extent of lesion progression, and the prognosis prediction of the disease. Notably, several studies have reported their results in which the diagnostic accuracy of deep learning surpassed that of board-certified radiologists for disease diagnosis/classification. In this lecture, I will present the current state and the future perspective of radiological imaging applications using artificial intelligence-based technique, mainly the deep learning method, in the field of the orbit and its surrounding anatomical regions. Due to the presenter's academic background, the main focus will be targeted on MRI and CT.

DAY 2 - Session 6 | Prof Minako Azuma
Applications of Advanced MRI Sequences Useful in Diagnosing Sellar Lesions

There is a wide variety of neoplastic and non-neoplastic lesions in and around the sella. MRI is the imaging modality of choice for diagnosing these lesions. While conventional sequences, such as T1-weighted and T2-weighted spin-echo images, help obtain anatomical information regarding the presence, location and extent of the lesions, advanced MRI sequences provide additional useful information. 3D T1W volume isotropic turbo spin-echo acquisition (VISTA) imaging yields high-resolution image and fat suppressed 3D T1-VISTA helps to reduce chemical shift artifacts and to discriminate the orthotopic or ectopic posterior pituitary gland from the fatty marrow in the dorsum sellae. Turbo spin-echo diffusion-weighted imaging (TSE-DWI) sequence includes a primary 90°pulse followed by more than one 180° degree refocusing pulses; it may reduce susceptibility artifacts and image distortion in the regions with a heterogeneous magnetic field. For the evaluation of normal pituitary structures and lesions, TSE-DWI is more useful than echo planar (EP)-DWI. Contrast-enhanced (CE) 3D T2-FLAIR imaging is thought to show only signals of Gd in the interstitial space because the signal from inside the blood vessel is suppressed. Although it is sometimes difficult to discriminate cystic pituitary lesions including Rathke's cleft cyst, craniopharyngioma, and cystic PitNET on conventional MRI alone, CE 3D T2-FLAIR imaging may help discriminate these cystic pituitary lesions. This presentation demonstrates and discusses the use of advanced MR sequences for the evaluation of sellar lesions.

DAY 2 - Session 6 | Asst Prof Robert Chen
Perioperative Imaging of Pituitary Adenomas: What the Surgeon Wants to Know

Pituitary Adenoma (PA) is one of the most commonly encountered sellar lesion by the neuroradiologist with a reported increasing annual incidence rate. The specific treatment algorithm is determined predominantly by its size (macro/microadenoma), symptomology and endocrinological function. Surgery is the mainstay treatment of choice for a vast majority of cases except prolactinomas which are treated medically. The exception would be pituitary stalk compression-related lactotroph disinhibition which are surgically resected as well. Though most neuroradiologists are aware of the diagnostic features of PA, there is well-documented variability in reporting styles of radiologists. Furthermore, there is paucity of standardized imaging knowledge of what the surgeons would want to know from imaging in the peri-operative period.Through this talk, we aim to consolidate empirical evidence and familiarize radiologists on the key pre-operative MRI characteristics that will be crucial for pituitary surgery which surgeons would want to see in the report. The immediate and delayed post-operative imaging features would also be covered. A standardized synoptic reporting template of peri-operative PA imaging would also be suggested for neuroradiologists to incorporate into their practice. Dynamic contrast-enhanced Magnetic Resonance Imaging (MRI) is the modality of choice in effective diagnosis and differentiating PA from other differentials. A brief review of standard imaging technique and protocol for pre-operative MRI will be reviewed with attention to the specific diagnostic utility of each sequence. The common artefactual pitfalls we encounter when imaging the sella will also be briefly explained. Pertinent anatomical features for example the sellar barrier and type, the inter-carotid distance, native sphenoid sinus anatomy and pneumatization pattern, location of native pituitary gland and bright spot are crucial determinants for safe and effective surgery. Tumour characteristics like tumour vascularity, consistency (T2-weighted/ADC imaging features), optic apparatus compression, grade/severity of cavernous sinus invasion can also have significant prognostic ramifications post-operatively. Specific MRI characteristics may also have a predictive role in post-operative outcomes. Post-operative imaging follow-up continues to be a diagnostic challenge and imaging pearls to distinguish early and late normal post-surgical appearance from residual disease, assessment of completeness of resection and associated complications will

be discussed.It is essential for neuroradiologists to be armed with the pre-requisite knowledge when reporting PA in the peri-operative course. This will aid surgeons and endocrinologists with detailed planning and execution of pituitary surgery and subsequently appropriate post-operative follow up.

SPINE MRI: BEYOND THE CONVENTIONAL

MODERATOR: Dr Sri Andreani Utomo / Dr Ho Chi Long

DAY 2 - Session 7 | Asst Prof James Hallinan
AI applications in Spine MRI

MRI of the spine is one of the most common imaging studies worldwide and AI has the potential to significantly affect every step in the imaging workflow. AI can enable faster and higher-quality MRI acquisitions, and workflow triage for urgent cases. AI is also gaining ground in augmenting image interpretation and providing quantitative image analysis. It is clear that many challenges remain in the clinical deployment and adoption of AI tools in MRI spine, but the future looks bright.

DAY 2 - Session 7 | A/Prof Jennifer Becker
Spinal Diffusion Tensor and Kurtosis Imaging in Clinical Practice

Accurate and reliable means of assessing spinal tissue injury are essential for effective disease management. DTI of the spine has many useful but largely unexplored clinical applications. There are many applications of DTI that are potentially useful to the practicing clinician for evaluation of the spinal cord. This presentation will include important technical considerations of a clinical DTI protocol to ensure high quality imaging, tips and tricks for postprocessing DTI spine data and will review main clinical applications of DTI in the spinal cord including, trauma, compressive myelopathy, tumors, inflammation- MS, NMO, transverse myelitis and infection. This knowledge acquired should enable the adoption of this technique in clinical practice

DAY 2 - Session 7 | Prof Johan Van Goethem
Advanced Spinal Imaging

Until recently spinal imaging mainly focused on anatomical and structural imaging. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are excellent in visualizing disc herniations and spinal stenosis, including foraminal narrowing, which are often the cause of radicular pain. These techniques also depict degenerative disc and facet disease but degenerative changes many times are not associated with pain. Imaging techniques to find the pain generator in low back pain, nowadays focus on fat saturated T2-weighted sequences, preferably STIR, to look for focal edema. Bone edema in vertebral endplates, known as Modic type I changes, facet joints, around Schmorl nodes and in spinous processes, are all thought to be strongly associated with local – somatic – low back or neck pain. Recent research in spinal imaging has been able to make imaging more accurate, and also explores new ways to identify possible pain generators in the spine. BoneMRI is a technique to produce CT-like bone images derived from an MRI scan. Developed for the sacro-iliac joints, mainly to identify bone erosions, the scope of this new technique is now expanding to the whole spine. I will show examples of BoneMRI in the evaluation of bone fusion in the postoperative spine and in the diagnosis of spinal calcification/ossification. A very promising application is the evaluation of foraminal narrowing, especially in the cervical spine. MR-spectroscopy is a novel technique in the spine to probe the chemical composition of the intervertebral disc. Degenerative discs show a lowered proteoglycan content, and painful discs show an elevated lactate concentration. Finally, MR-perfusion is able to show perfusion changes in the disc and the endplates in degenerative disease, demonstrating possible painful discovertebral changes.

Speaker Abstract
SGCR / KSR-SRS Symposium

MOLECULAR IMAGING & THERAPEUTICS

MODERATOR: Asst Prof Winnie Lam / A/Prof Kelvin Loke

DAY 2 - Session 5 | Dr Thang Sue Ping
PSMA-targeted radioligand therapy for prostate cancer

Prostate-specific membrane antigen (PSMA) is a transmembrane protein overexpressed in most prostate cancer, making it an excellent target for imaging and treatment. Several trials have shown that radionuclide therapy targeting PSMA is a promising therapeutic option for men with metastatic prostate cancer, and many more studies are currently underway to optimize treatment. Here we would like to share on this topic as well as on our local experience on PSMA-based radionuclide therapy.

DAY 2 - Session 5 | Asst Prof Zhang Jingjing
Peptide receptor radionuclide therapies in neuroendocrine and somatostatin receptor rich tumours

YΣrium-90 (Y90)-radioembolisation (RE) significantly regresses locally advanced hepatocellular carcinoma and delays disease progression. The current study is designed to deeply interrogate the immunological impact of Y90-RE, which elicits a sustained therapeutic response. Time-of-flight mass cytometry and next-generation sequencing (NGS) were used to analyse the immune landscapes of tumour-infiltrating leucocytes (TILs), tumour tissues and peripheral blood mononuclear cells (PBMCs) at different time points before and after Y90-RE. TILs isolated after Y90-RE exhibited signs of local immune activation: higher expression of granzyme B (GB) and infiltration of CD8+ T cells, CD56+ NK cells and CD8+ CD56+ NKT cells. NGS confirmed the upregulation of genes involved in innate and adaptive immune activation in Y90-RE-treated tumours. Chemotactic pathways involving CCL5 and CXCL16 correlated with the recruitment of activated GB+CD8+ T cells to the Y90-RE-treated tumours. When comparing PBMCs before and after Y90-RE, we observed an increase in tumour necrosis factor-α on both the CD8+ and CD4+ T cells as well as an increase in percentage of antigen presenting cells after Y90-RE, implying a systemic immune activation. Interestingly, a high percentage of PD-1+/Tim-3+CD8+ T cells coexpressing the homing receptors CCR5 and CXCR6 denoted Y90-RE responders. A prediction model was also built to identify sustained responders to Y90-RE based on the immune profiles from pretreatment PBMCs. High-dimensional analysis of tumour and systemic immune landscapes identified local and systemic immune activation that corresponded to the sustained response to Y90-RE. Potential biomarkers associated with a positive clinical response were identified and a prediction model was built to identify sustained responders prior to treatment.

DAY 2 - Session 3 | Prof Bulent Arslan
Dosimetry after LEGACY/DOSISPHERE-01: What has changed in treatment of HCC and metastatic liver disease using SIRT

This session will focus on potential benefits and risks of high dose selective delivery of Y-90 for curative purpose. Y-90 radioembolization, initially approved mainly for palliative management of primary and metastatic liver tumors has evolved over time and more creative delivery options such as Y-90 segmentectomy became popular. Several studies suggested that the tumoricidal dose for Y-90 was around 200 Gray. Then many operators started calculating their Y-90 dose to be around 200 Gray for the volume of the segment they were planning to treat. This approach somewhat improved outcomes on treatment of smaller number and size lesions. However complete response rates were still not as good as heat based ablation. With the newest studies, higher dose approach has been shown not only to be safe and at the same time very efficacious, demonstrating significantly improved survival rates (10 vs 22 months) in patients where over 400 Gray was delivered to the tumor. The session will review techniques and outcomes of higher (ablative) dose Y-90 delivery in select patient population and supporting literature.

LUNG CANCER SCREENING

MODERATOR: A/Prof Too Chow Wei / Asst Prof Gideon Ooi

DAY 2 - Session 6 | Prof Chang Yeun-Chung
From Research to a National Programme: Lung Cancer Screening in Taiwan

Lung cancer is the leading cause of cancer mortality worldwide and in Taiwan. Lung cancer has been the highest cancer-related mortality for consecutive recent 11 years in Taiwan. The evidence of randomized control study of low dose computed tomography (LDCT) in lung screening show the benefits of reducing lung cancer related mortality in 20%-25% (National Lung Screening Trial and Nelson trial). The success for LDCT lung cancer screening relies on a correct identification of target subjects, quality LDCT examination and precise interpretation of LDCT examination, management and monitoring compliance with the CT abnormalities. A standardized and systemic approach for ensuring good to excellent quality of lung cancer screening is of great importance. Evidence has shown that different driver mutation profile of lung adenocarcinoma in the East and West. More EGFR mutation is found in lung adenocarcinoma which predominantly presents with ground glass nodule (GGN) in Asians (55% vs. Caucasians 10-15%). Characteristic findings of lung cancer in Taiwan include predominantly never smoker (55%), adenocarcinoma predominant (70%), female (40%). The multicenter TALENT (Taiwan Lung Cancer Screening for Never Smoker Trial) study started in 2014, including never smoker or smoking index < 10 py (55-75 years of age), family history (<= 3 degree), etc. The T0 lung cancer detection rate was 2.6% (313/12011), including invasive lung cancer 2.1% (255/12011). The majority of lung cancer diagnosis stage 0-1 (96.5%). Prevalence of lung cancer with and without family history: 3.2% vs 2.0% (p<0.0001). The Taiwan national project of Early Detection of Lung Cancer Using Low Dose CT (LDCT) was launched since 1 July, 2022 at biennial base. Enrollment criteria include heavy smokers (age 50-74 year old, > 30 pack year) and subjects with family history of lung cancer (male 50-74, female 45-74 year old) according to international guidelines and evidence from TALENT study. Modified Lung RADS (Version 1.1) is used for categorizing the LDCT interpretation results after adjusting the size criteria of nonsolid nodule (ground glass nodule) >20mm diameter as Category 3 (probably benign findings). At the end of the 2022, there were total 23246 subjects receiving LDCT for lung cancer screening and 198 lung cancers (0.8%) were identified (data from Health Promotion Administration, Ministry of Health and Welfare). Quality assurance was performed according to a) the result of positive findings of LDCT (category 3 and 4) (PPV1), b) positive evaluation after visiting chest specialists (PPV2), c) result of confirmed lung cancers (cancer detection rate). d) radiation exposure, etc. Quality measurement and audit of the LDCT lung cancer screening is an important issue not only for detecting early lung cancer but also for avoiding overdiagnosis and overtreatment. It is believed that under the efforts of

multidisciplinary professionals the mortality of lung cancer in Taiwan will significantly decrease in the near future.

DAY 2 - Session 6 | Asst Prof Gillianne Lai
Lung Cancer In Singapore

Lung cancer is the third most frequent incident cancer in men and women in Singapore. While the incidence and mortality rates of lung cancer have steadily declined over the last few decades, largely due to a reduction in smoking prevalence, over 60% of cases are still diagnosed at an advanced stage when the disease in incurable. Similar to other countries in Asia, a significant proportion of lung cancer patients locally are never smokers, and there are inherent differences in biology compared with lung cancers of the West. One of these key differences is the higher proportion of patients with oncogenic drivers in never-smoker lung cancer patients. In the last two decades, therapies targeted at sensitizing driver mutations such as epidermal growth factor receptor (EGFR) and anaplastic lymphoma kinase (ALK) have transformed the treatment landscape, with an ever-growing list of targetable driver mutations and approved therapies. Immune checkpoint inhibitors (ICI) have also significantly improved survival outcomes of patients with non-oncogene-driven non-small cell lung cancer (NSCLC) through invigorating the adaptive immune system to eliminate cancer cells. Additionally, improved treatment outcomes with a biomarker-driven approach in advanced NSCLC have led to developments in the early-stage setng, with data from recent trials leading to approvals in the neoadjuvant and adjuvant space. Despite new treatment strategies, majority of lung cancer in Singapore is diagnosed in the advanced stage, and thus lung cancer still accounts for the highest and third highest number of cancer deaths among men and women respectively. With a shift in emphasis in Singapore from reactively dealing with advanced cancers to proactively detecting and treating diseases at earlier stages, it is of paramount importance to embark on and evaluate the impact of a lung cancer screening programme locally, potentially leading to a stage shift in lung cancer diagnosis.

DAY 2 - Session 6 | Asst Prof Gideon Ooi
Early Experience from SOLSTICE - a Singapore Lung Cancer Screening Study

Lung cancer is a leading cause of cancer-related deaths worldwide and a major health burden. It is also the third most prevalent cancer in men and women in Singapore. Compared with many western countries, a sizeable proportion of lung cancers diagnosed in the Asian population occur in patients who are never smokers. There are also inherent differences in tumour biology compared with lung cancers of the West. Evidence from randomized controlled trials utilizing low dose computed tomography (LDCT) in lung cancer screening show benefits of reducing lung cancer related mortality by up to 25% (National Lung Screening Trial and Nelson trial) among smokers. Recent efforts in Taiwan which included screening for never smokers with positive family history of lung cancer also yielded positive results (TALENT study). Singapore Lung cancer Screening Through Integrating CT with other biomarkers (SOLSTICE) is a lung cancer screening study primarily utilizing LDCT in the detection of lung cancer among smokers and never smokers with positive family history (up to the second degree). The study adopts the American College of Radiology Lung Imaging Reporting and Data System (ACR Lung-RADS) classificaƟon system to standardize follow up and management of participants. Follow up decisions are discussed at a Research Multidisciplinary Team Meeting. Participants

are managed clinically at a dedicated Nodule follow up clinic addressing issues concerning nodules as well as any incidental findings detected on LDCT. The study also adopts an Artificial Intelligence (AI)-augmented reader approach where radiologists employ a standardized AI algorithm to aid nodule detection and measurement. While we are still in the early stages of this multi-year multi-site screening study, it will be useful to review initial experience, pitfalls and learning points learned during its initial months.

DAY 2 - Session 6 | Prof Chang Yeun-Chung / Asst Prof Gilliane Lai / Asst Prof Gideon Ooi / Asst Prof Jasleen Pannu
Roundtable Discussion

WOMEN'S IMAGING

MODERATOR: A/Prof Ong Chiou Li / Asst Prof Lee Yien Sien

DAY 2 - Session 7 | A/Prof Ong Chiou Li
Ultrasound Features of Uncommon Ectopic Pregnancy

Ectopic pregnancy results from abnormal implantation of the blastocyst outside of the endometrial cavity. 95% of ectopic pregnancies are implanted in the ampullary, infundibular and isthmic parts of the fallopian tube. The rest are in rare sites. They include the interstitial part of the fallopian tube, cervix, ovary, rudimentary uterine horn, uterine wall, and abdomen. Heterotopic pregnancies refer to the co-existence of intrauterine and ectopic pregnancies.

Transvaginal ultrasound scan (TVS) is recommended for assessment of suspected ectopic pregnancies due to its high spatial resolution and proven accuracy. Reported sensitivities and specificities are 87- 99% and 94-99.9%, respectively. Whilst this may apply to most tubal ectopic pregnancies, it is important to recognize ectopic pregnancies in rare locations when performing the pelvic ultrasound, particularly when an adnexal mass is not detected. Ultrasound diagnosis of rare ectopic pregnancies requires attention to certain details depending on their location. Interstitial pregnancies occur in the intramural part of the fallopian tube. The gestational sac is eccentrically located in the lateral aspect of the uterine fundus outside of the endometrium and may be covered by a thin layer of myometrium. An interstitial line sign may be identified. A mimicker of interstitial pregnancy is the angular pregnancy which is essentially an intrauterine pregnancy located eccentrically on one side of the upper uterine cavity. If available, 3-dimensional ultrasound can be particularly useful in distinguishing these pregnancies. Cervical pregnancies account for less than 1% of all ectopic gestations. They need to be distinguished from miscarriages in progress. Signs of a cervical ectopic pregnancy include a gestational sac below the internal os, absence of "sliding sign," presence of peritrophoblastic blood flow, presence of a live embryo, and barrel-shaped cervix. Cervical pregnancies need to be distinguished from Caesarean scar pregnancies and miscarriages in progress. Caesarean scar pregnancy is an implantation at the site of previous uterine incision typically in the lower anterior uterine wall close to the internal os. Depending on the location of the pregnancy, whether it is in the niche or in the uterine cavity "on the scar," and the development of the placenta, these pregnancies are often associated with high maternal risks. Ovarian ectopic pregnancy is the most challenging to diagnose as it is not possible to separate it from the ovary and may be mistaken for the corpus luteum or an ovarian tumour. The

pregnancy may present as a complex ovarian mass with the real diagnosis usually confirmed surgically and histologically. In general, the diagnosis of ectopic pregnancies depends on the correlation of serum hCG and ultrasound findings. In clinically stable patients where the location of pregnancy cannot be determined, repeated tests with hCG trending, and follow up ultrasound is indicated. Failure to identify an intrauterine pregnancy or adnexal mass in the presence of a rising serum hCG trend should alert the radiologist to the possibility of an ectopic pregnancy at a rare site.

DAY 2 - Session 7 | Asst Prof Thida Win
Imaging of Endometriosis

Endometriosis is a common gynecological inflammatory condition of reproductive age women, with a prevalence of approximately 10%. Endometriosis is defined as presence of ectopic endometrial glands and stroma outside the uterus. Endometriotic lesions could be superficial or deep in location. Deep pelvic endometriosis (DPE) is strongly associated with adenomyosis. Patients may be asymptomatic or present with chronic pelvic pain and/or infertility. DPE is often not diagnosed on ultrasound. It requires high suspicion and knowledge of the spectrum of the disease to detect the DPE.
Objectives:
1. To understand the pathological process of the DPE
2. To familiarize with sonographic features of the DPE
3. To correlate the sonographic and MRI features of DPE

DAY 2 - Session 7 | Prof Bernard Chern
Imaging of Endometriosis

Endometriosis is a complex gynaecological condition characterized by the presence of endometrial-like tissue outside the uterus, often leading to chronic pelvic pain and infertility. Over the years, the management of endometriosis has evolved, with advancements in understanding the disease pathology and the development of new treatment modalities. Recent advancements have shifted the focus towards early diagnosis and preventing disease progression. Individualized treatment plans tailored to the patient's symptoms, disease severity, and reproductive goals are crucial in managing a patient with endometriosis. Diagnosing endometriosis has long been challenging, with a defiinitive diagnosis often requiring invasive surgical intervention. However, newer guidelines recommend that laparoscopy is no longer the diagnostic gold standard and empirical medical treatment can be started with a non-surgical diagnosis of endometriosis. Decision for medical, surgical or assisted reproductive technologies (ART) should be individualised depending on the patient's symptoms and fertility desires. Pain should be treated early to avoid central sensitization and long term medical suppressive therapy should be considered. Surgical intervention remains an important aspect of endometriosis management, especially in cases where conservative measures fail to provide adequate relief. Ideally, a patient should only undergo one well planned, optimal surgery during her 'endometriosis life'. Selected cases of endometriosis, especially bilateral ovarian endometriomas, may be a potential indication for fertility preservation techniques such as oocyte freezing.

DAY 2 - Session 7 | Asst Prof Teo Sze Yiun
Update on US O-RADS

DAY 2 - Session 7 | A/Prof Kim Man Deuk
Uterine Artery Embolization in the treatment of Leiomyoma and Adenomyosis

Uterine fibroids are common tumors in women, affecting 20-40% of those of childbearing age. While not all women with fibroids experience symptoms, about 10-20% present with issues like heavy menstrual bleeding, pelvic pain, and urinary frequency. Uterine fibroids account for around 30% of the hysterectomies performed annually in the United States. Uterine artery embolization (UAE) has emerged as a successful treatment for symptomatic fibroids, providing symptom control in 85-95% of patients. MRI is recommended before the procedure to accurately assess fibroid size, number, vascularity, and differentiate from other conditions. UAE has some contraindications, including degenerated fibroids, pelvic radiation history, active vasculitis, and pelvic malignancy. Complications of UAE include postembolization syndromes, vaginal expulsion of myomas and fibroids becoming endocavitary. Postembolization syndromes typically involve low-grade fever, pain, nausea, and discomfort, which can be managed conservatively. The risk of ovarian failure is low in younger women but increases in those over 45 years old. Transvaginal expulsion of leiomyomas is a known side effect, which is usually not life-threatening. Endocavitary fibroids can cause pain, bleeding, infection, and prolonged discharge, potentially requiring further intervention. Uterine myomas primarily occur in the uterine corpus, with less than 5% occurring in the cervix. Treatment of fibroids larger than 10 cm may increase the risk of complications such as infection, sepsis. Pretreatment with GnRH agonists before UAE of large fibroids is safe and does not prevent the procedure. For uterine adenomyosis, UAE has shown positive short-term outcomes in terms of symptom relief and reduction of junctional zone thickness. However, the long-term durability of UAE for adenomyosis is still debated. The choice of embolic material, particularly the size of polyvinyl alcohol (PVA) particles, may impact the success rate and recurrence. Smaller PVA particles have been associated with higher rates of complete necrosis and lower recurrence rates. In summary, UAE is an effective treatment for symptomatic uterine fibroids, with a high success rate and low complication rate. It is a minimally invasive procedure that offers shorter recovery time and better quality of life compared to surgery. The effectiveness of UAE for adenomyosis is still being studied, and the choice of embolic material is crucial for optimal outcomes.

OSTEOPOROSIS IN THE ASIAN POPULATION: MULTIDISCIPLINARY PERSPECTIVES

MODERATORS: Dr Chong Le Roy / A/Prof Gervais Wansaicheong

DAY 2 - Session 8 | A/Prof Gervais Wansaicheong
LKC-HELIOS Bone Mineral Densitometry (BMD) for Singaporeans

DAY 2 - Session 8 | Dr Linsey Utami Gani
Trabecular Bone Score (TBS) in the evaluation of osteoporosis in the Asian population

Bone mineral density (BMD) as measured by dual-energy X-ray absorptiometry is the gold standard for diagnosis and management of osteoporosis. However BMD does not fully explain bone strength and a number of skeletal features other than BMD contribute to bone strength and fracture risk. Advanced imaging modalities can assess some of these skeletal features. Trabecular bone score (TBS) is a grey-level textural

index derived from the lumbar spine DXA image. Studies have shown association of TBS with osteoporotic fracture risk on postmenopausal women and men. In this lecture we will examine the evidence for the utility of TBS in the assessment of fracture risk in the Asian population as well as its clinical implications

DAY 2 - Session 8 | A/Prof Joyce Koh
Orthopaedic perspectives of atypical femoral fractures in the Asian population

Although early authors have postulated the potential effects of chronic suppression on bone turnover by anti-resorptive agents, clinical manifestation of atypical femur fractures (AFFs) were first described by Orthopaedic surgeons. They were documented among low energy hip and femoral fracture databases, but with distinctively unique characteristics. Currently, the Orthopaedic surgeons' role in atypical femur fractures include diagnosis, the surgical management of complete AFFs and decisions for prophylactic nailing. Incomplete atypical fractures with the presence of a "dreaded black line" and thigh pain have an increased risk of complete fractures and prophylactic nailing is indicated. Due to its unique biological and mechanical characteristics, AFFs present unique challenges in treatment. Load-sharing devices which span the entire diaphysis remain the modality of choice due to the known occurrence of multiple lesions and its slow potential to heal. The locality and femoral morphology can also present challenges. Nailing of bowed femurs present technical challenges, in particular when the femur is intact. This lecture will highlight the ongoing challenges we face in the surgical management of AFFs.

DAY 2 - Session 8 | Dr Chen Yu Pin
Artificial Intelligence in the Diagnosis of Osteoporosis and Sarcopenia

Background
Dual-energy X-ray absorptiometry (DXA) is recognized as the gold standard for diagnosing osteoporosis and assessing low muscle mass. However, its utilization for osteoporosis and sarcopenia screening is infrequent. Our study seeks to introduce and validate a convolutional neural network (CNN) model, featuring a controllable layer and an image pre-processing algorithm. The objective is to facilitate osteoporosis and low muscle mass screening in the proximal hip area using straightforward hip radiographs.

Method
We used a dataset of 1730 patients over 50 years old to train and test the CNN model for osteoporosis screening. This data included DXA assessments for T-scores corresponding to the proximal hip regions. Training utilized 2473 unilateral hip images from 1430 patients, while testing used 497 unilateral hip images from 300 patients. For low muscle mass detection, a dataset of 1176 patients over 50 years old, with DXA assessments matching appendicular lean muscle mass, was employed. In this instance, training and testing of the CNN model involved data from 996 and 242 patients, respectively.

Results
The screening tool we proposed exhibited excellent performance in osteoporosis screening, achieving a sensitivity of 97.2%, specificity of 95.6%, PPV of 95.7%, NPV of 97.1%, and an AUC of 0.96. Incorporating patient factors like age, body mass index, and sex as features in the training metric enabled our CNN model to predict the T-score in the targeted hip areas directly, exhibiting a strong correlation with the DXA-measured

T-score (r=0.996, p<0.001). For low muscle mass screening, the proposed tool displayed robust performance, with a sensitivity of 80.7%, specificity of 84.5%, accuracy of 82.8%, precision of 81.6%, and an AUC of 0.89.

Conclusion
The proposed CNN model shows immense potential for future use in population-based opportunistic screenings for osteoporosis and sarcopenia. This approach can widen the reach to at-risk populations, offering a cost-effective and highly adaptable solution.

IMAGING THE PANCREAS & BILIARY TRACT

MODERATORS: Dr Elizabeth Cheong / Dr Rebekah Lee

DAY 3 - Session 9 | A/Prof Linda Chu
Radiomics in Liver Imaging

Artificial intelligence is poised to transform medical imaging by leveraging the vast data contained in medical images. Radiomics converts imaging data into high-dimensional quantitative imaging features that cannot be readily appreciated with human eyes. These features can be classified into first-order, shape, and texture features. This process typically generates hundreds of features, which are subsequently analyzed with machine learning models. Radiomics has shown promise in improving the classification of focal liver masses, prediction of high-risk tumor features, and prediction of treatment response. Accurate classification of liver masses is clinically important in triaging suspicious liver masses that warrant further evaluation, and in avoiding unnecessary work-up in benign "leave alone" masses. Studies have applied radiomics to differentiate a wide variety of malignant and benign liver lesions, with reported accuracies greater than 90%. These models could potentially be used to improve the performance of an average radiologist to match or one day exceed the level of an expert in liver mass characterization. Liver resection is one of the primary treatments for patients with hepatocellular carcinoma, and microvascular invasion has been validated as an independent predictor of early recurrence and poor survival after liver resection. Studies have shown that radiomics features may be superior to conventional clinical and imaging models in predicting microvascular invasion and other high-risk features. Radiomics models have also been used to predict recurrence and survival following curative resection, ablation, or liver transplantation in patients with hepatocellular carcinoma. These radiomics models have been able to predict disease recurrence with higher accuracy than traditional clinical models, which may help optimize patient management. Radiomics has the potential to provide unique imaging biomarkers for disease detection, risk stratification, and prognostication. However, several issues must be addressed before translation into clinical practice. Firstly, most published reports are single-center studies with relatively small sample sizes. These promising results will need to be validated in larger multicenter trials. Secondly, there is lack of standardization in the radiomics methodology. Radiomics models can be affected by variations in image acquisition, segmentation, feature extraction, and machine learning steps. Expert panels are currently developing guidelines on radiomics study design to ensure generalizability and reproducibility of these radiomics models. Thirdly, most studies in radiomics literature require manual segmentation of region of interest, which is labor intensive and impractical for routine clinical implementation. Several studies have developed end-to-end automatic segmentation and classification models

that can automatically segment the region of interest and extract radiomics features for classification. This automation is essential in scaling up the sample size for robust multi-center validation studies and eventual clinical deployment.

DAY 3 - Session 9 | Asst Prof Teoh Wey Chyi
Application of CEUS in LI-RADS

Contrast enhanced ultrasound (CEUS) is a useful adjunct in liver imaging and is now commonly applied in many imaging practices. It is particularly helpful for troubleshooting lesions which remain indeterminate after CT/MR imaging or for patients who are unable to undergo CT/MR contrast imaging. The American college of Radiology (ACR) first published LIRADS (liver imaging reporting and data system) in 2011, to standardize the reporting and data collection of CT and MR imaging for patients at risk of hepatocellular carcinoma (HCC). It uses a graded classification system based on size and enhancement characteristics, to determinate the likelihood of HCC in an observed liver lesion. Over the years, LIRADS has gain popularity and good acceptance, particularly in multidisciplinary meetings as it allows radiologists to discuss and communicate the risk of HCC in an unambiguous manner. In 2016, the US FDA approved the use of ultrasound contrast agent for liver imaging. Subsequently in the same year, ACR published its first version of CEUS LIRADS, followed by an updated version in 2017. In this lecture, we will discuss the application of CEUS LIRADS and how it has been helpful. We will also review the current evidence for use of CEUS in liver imaging.

DAY 3 - Session 9 | Dr Low Hsien Min
Imaging of Hilar Tumours: What the Surgeon Needs to Know

Liver hilar tumours are challenging for both surgeons and radiologists due to the number of complex structures that are located in a narrow space. This talk aims to give a brief primer on the details that should be described in a radiology report for it to be useful to the attending surgeon

DAY 3 - Session 9 | Dr Alfred Tan
Percutaneous Transhepatic cholangioscopy and Intervention: Initial experience with the SpyGlass™ DS Direct Visualization System

Endoscopic retrograde cholangiopancreatography (ERCP) is the referred standard for the management of biliary diseases. However, in cases of ERCP failure, minimally invasive radiologically guided methods have been sought as a diagnostic and treatment alternative. Percutaneous Transhepatic Cholangioscopy (PTCS) is an emerging hybrid endoscopic and fluoroscopic guided option that is being introduced into the interventional radiology practice. This technique is particularly useful in patients with altered gastrointestinal or biliary anatomy which pose surgical and endoscopic challenges for the management of biliary calculi, biliary strictures and other biliary pathologies. Through a series of clinical vignettes, we aim to share our initial experience with the use of PTCS and the various methods of biopsy and lithotripsy. Finally, we hope to offer some tips and tricks for the novist looking to introduce this technique into their practice.

ABDOMINAL GASTROINTESTINAL IMAGING

MODERATORS: Dr Rebekah Lee / Dr Elizabeth Cheong

DAY 3 - Session 10 | A/Prof Britt Christensen
Bowel Ultrasound in IBD

Inflammatory bowel disease (IBD) consists of Crohn's disease and ulcerative colitis which are two chronic diseases characterised by inflammation of the gastrointestinal tract. IBD follows a chronic, relapsing pattern that causes permanent bowel damage long-term. Chronic active mucosal inflammation leads to the development of bowel strictures, fistula, abscesses and bowel cancer and is ultimately associated with a decreased quality of life. Therefore, endoscopic mucosal healing has emerged as a significant treatment target when managing IBD. Achievement of mucosal healing has been associated with a reduced risk of clinical flare, reduced risk of disease complicatiions and ultimately improves a patient's quality of life Despite endoscopic mucosal healing being the gold-standard treatment target, its role is limited due to the requirement of endoscopic assessment which is invasive, expensive and has poor patient tolerance. Endoscopic assessment does not lend itself to be repeated frequently and hence is an impractical assessment tool. Intestinal ultrasound can accurately assess for bowel inflammation and damage and unlike endoscopy has relatively low cost and excellent patient acceptance. It has demonstrated utility in IBD diagnosis, assessment of disease extent and activity, treatment response monitoring as well as detection of disease complications including stricture, fistulas or abscesses. Intestinal ultrasound can be performed in a point-of-care setting, leading to immediate treatment optimisation and allows for repeated evaluations to monitor disease over time. Therefore, intestinal ultrasound has emerged as a preferred non-invasive tool for IBD monitoring. This talk will focus on the role of inteŝnal ultrasound in IBD. The accuracy, benefits and limitations of intestinal ultrasound in IBD diagnosis, disease activity evaluation, post-operative monitoring and evaluation of disease related complications and response to therapy in CD and UC will be explored. Intestinal ultrasound plays a crucial role in the non-invasive assessment of IBD patients. It lends itself perfectly to a treat-to-target strategy where adjustments of therapeutic strategies based on intestinal ultrasound response may lead to improved rates of mucosal healing and better patient outcomes. It is a reliable instrument for closely monitoring patients with IBD and predicting therapeutic response and should be implemented into tertiary IBD services.

DAY 3 - Session 10 | Dr Keefe Lai / Dr Thian Yee Liang / Dr Peter Choo
Cases for Aces - Go with your Gut

Dr Thian, Dr Lai and Dr Choo are a panel of body radiologists who will be going through a series of challenging cases throughout the gastrointestinal tract. We will be covering pearls, pitfalls and phraseology for complex or surprising pathology. This section will include audience interaction and polling (phone and Internet connection required) and is targeted at trainees or budding body radiologists.

Speaker Abstract
SGCR / KSR-SRS Symposium

KSR-SRS SYMPOSIUM

MODERATORS: Prof Chan Ling Ling / Prof Kim Ji Hoon

DAY 2 - Session 8 | Prof Sohn Chul-Ho
Acute stroke imaging : Focus on 'Core' and 'Penumbra'

DAY 2 - Session 8 | Prof Kim Eung Yeop
Susceptibility map-weighted imaging and neuromelanin-sensitive imaging: recent updates and clinical applications

The "Swallow tail sign" was the first term used to describe nigral hyperintensity on iron-sensitive imaging, and since then, it has been extensively studied. However, there is currently no standardization of the imaging methods and parameters for this marker. This lack of standardization may make it difficult for clinicians without expertise in visual assessment of the substantia nigra to apply this imaging marker in their practice. Recent research has suggested that susceptibility map-weighted imaging (SMwI) is more diagnostically effective than conventional susceptibility-weighted imaging (SWI) for visual assessment of nigral hyperintensity. Nonetheless, improving visual interpretation skills remains a challenge even with this advanced imaging method. A recent study demonstrated that there are various shapes of nigral hyperintensity, where the authors were able to obtain both SMwI and neuromelanin-sensitive imaging simultaneously using multi-echo gradient-recalled echo imaging. Through experience with over 4,000 SMwI scans along with dopamine transporter PET, the speaker was able to identify a small hyperintense region in the substantia nigra on SMwI that is believed to be criӨcally affected in patients with nigrostriatal degeneration. To minimize the partial volume effect, the speaker obtained SMwI (0.5 × 0.5 × 1.0 mm3) parallel to the line from the upper border of the pons to the posterior commissure (oblique coronal plane). However, it has been shown that SMwI obtained with the same spatial resolution parallel to the anterior commissure-posterior commissure (AC-PC) line had comparable diagnostic performance to oblique coronal imaging. Therefore, the imaging plane of SMwI may not be an issue if obtained with high spatial resolution. The optimal spatial resolution for SMwI is still a matter of debate. In this presentation, the speaker intends to discuss these various issues, including how to visually assess nigral hyperintensity and the optimal imaging plane/spatial resolution for SMwI, using clinical cases to illustrate their points. Neuromelanin-sensitive MRI (NM MRI) has been extensively studied in various diseases alongside iron-sensitive imaging of the substantia nigra. Recent studies have shown that NM MRI can be used to longitudinally assess the substantia nigra in patients with parkinsonism, which is a significant breakthrough as it provides a non-invasive imaging marker. Nevertheless, conventional gradient-recalled echo (GRE)-based NM MRI with magnetization transfer (MT) contrast has a significant limitation. The pulse sequences for MT contrast are not standardized among vendors, making it extremely challenging to conduct multi-center studies with various scanners. To address this issue, the speaker collaborated with a physicist to develop a new NM MRI method called "Sandwich NM MRI," which simply uses an even number of saturation bands. This vendor-neutral imaging technique was tested among three different vendors using the same subjects and showed higher quality compared to conventional T1-weighted GRE with MT contrast. The speaker would like to share his experiences using this method in patients with parkinsonism during the talk.

DAY 2 - Session 8 | Asst Prof Lim Kheng Choon
Implementing AI solutions: promises and challenges

With the rapid growth in research and development of AI technology in medical imaging, many promises have been made on how AI is going to improve the care and delivery of medical imaging. While there are many AI-based commercial products that can improve MRI acquisition and image quality, validation and implementation of these solutions within a busy clinical environment and making sure the expectations of various stakeholders are met, may not be as straightforward as it seems. In this session, we will share the framework that we developed to validate and pilot these solutions and also the implementation challenges that we faced.

DAY 2 - Session 8 | A/Prof Ahn Sung Jun
Atypical brain metastasis: what we missed or ignored

Despite various modern techniques and artificial intelligence technologies, the characteristics of brain metastases have not been well elucidated. This is because the characteristics of brain metastases vary depending on the type of primary cancer and genetic subtype. The aim of my lecture is to explain conventional imaging findings of brain metastasis according to the type of primary cancer and biological subtypes we might miss; the extent of necrosis, bleeding tendency, and dural metastasis

Speaker Abstract
Allied Health

RADIOGRAPHY

MODERATORS: Mr Tay Yi Xiang / Mr Abdul Syafiq

DAY 3 - Session 9 | Mr Liang Chong Ri
Establishment of Institutional Computed Tomography Diagnostic Reference Level – A Single Centre Experience

Computed tomography (CT) is a widely used imaging modality that provides high-resolution anatomical images of the body. Despite its clinical benefits, CT scans can expose patients to significant levels of ionizing radiation, which increases the risk of developing cancer and other radiation-induced diseases. Therefore, it is crucial to establish diagnostic reference levels (DRLs) for CT to minimize radiation exposure without compromising the quality of clinical images. In this presentation, a methodology for establishing CT DRLs and the results of our institutional analysis will be discussed. Radiation dose data including CT dose index (CTDIvol), dose-length product (DLP) and effective dose (ED) was collected from six CT systems across the region via an automatic radiation dose tracking software. Data was analyzed to determine the mean, 75th percentile and 90th percentile of the dose spread for various types of CT scans. These values were than compared with published DRLs and international guidelines to identify any significant differences. We also evaluated the impact of various CT scan parameters such as tube voltage, current, scan length and post-processing technique on radiation dose to optimize CT protocols and minimize radiation exposure. The institutional DRL for our six CT systems were established as mean (50th percentile) of CTDIvol (mGY), DLP (mGy.com) and ED (mSv) for various types of CT scans. Our analysis showed that certain CT system had mean dose values that exceeded the established DRLs for certain types of CT scans. The causes of these higher dose values were multifactorial and included inappropriate patient positioning, and suboptimal CT protocol selection. By identifying these issues and implementing corrective actions, we were able to reduce radiation exposure for CT scans without affecting the diagnostic quality of the images. We also found that optimizing CT scan parameters such as tube voltage, current, and scan length can lead to significant reductions in radiation dose. Establishing CT DRLs is an essential step towards optimizing CT imaging protocols and reducing radiation exposure to patients. Our methodology for establishing DRLs and optimizing CT protocols is a useful tool to ensure that their CT imaging practices are safe and effective. Regular monitoring and adjustment of DRLs are essential to maintain their relevance and effectiveness over time. By adopting best practices in CT imaging, we can reduce radiation exposure and improve patient safety while still obtaining high-quality diagnostic images.

DAY 3 - Session 9 | Mr Michael Maximo Ladera
Application of Rotational Angiography in Neuro Interventional Radiology: An SGH experience

Rotational angiography is used widely in Neuro Interventional Radiology as well as in hybrid surgery and has become indispensable imaging tool to have in any set-up. Over the years, there have been development and innovation made by various companies in this imaging technology. Rotational angiography uses a flat panel detector and a fixed C-arm to rotate around the patient anatomy for a series of X-ray images which then converted into a volumetric data. The acquired volumetric data can be reconstructed into multi-planar two-dimensional (2D) sectional images such as axial, coronal and sagittal as well as displaying a three-dimensional (3D) dataset for better appreciation of vessel anatomy before and after endovascular treatment. The key to successful rotational angiography lies in the understanding of the different system capabilities and the appropriate use of its post-processing applications. In my presentation, I would like to shared our experience from SGH on the application of rotational angiography in the field of Neuro Interventional Radiology.

DAY 3 - Session 9 | Ms Lee Weiling
Callosal angle in idiopathic normal pressure: Technical considerations

Normal pressure hydrocephalus (NPH) is important for consideration in elderly with walking difficulties and cognitive deficits. This is because the enlarged ventricles secondary to the build-up of cerebrospinal fluid in these patients is reversible, with potential improvement in gait and dementia. The callosal angle (CA) is a useful biomarker in the diagnosis and management of idiopathic NPH. Used incorrectly, CA measurements are variable, affecting its reliability as a clinical tool. This talk illustrates the effects of small angular mal-rotation and the importance of using a standardised protocol when using this clinical tool in NPH.

DAY 3 - Session 9 | Mr Stephen Bird
Salivary Gland Ultrasound: Tips and Tricks

Salivary glands are particularly well suited to sonographic assessment due to their superficial and accessible location. A wide range of disorders may afflict the salivary glands including obstructive, inflammatory, neoplastic and auto immune disease conditions. This presentation will discuss the sonographic technique, key landmarks, anatomical appearances and a comprehensive range of pathological patterns involving the parotid, submandibular, sublingual and minor salivary glands.

NURSING

MODERATORS: Ms Chan Wai Yee / Ms Rozana Binte Othman

DAY 3 - Session 10 | Ms Zhang Fangfang
"Golden Period" Importance of Time Management in Stroke Nursing

Neuro-intervention radiology nurse is a very little known speciality in nursing. As its name implies, it is one group nurses work in radiology department specialist for Neuro procedures. With the promote of signs and symptoms of stroke, more and more strokes recognised early. it is important to let people know about the treatment method and this profession. this talk is to explain the roles of this small group of nurses. For better understanding, this presentation used endovascular thrombectomy as one of the example to explain the role of Neuro- interventional radiology nurse, Including pre-procedure preparation, circulating, scrubbing and post-procedure managements.

DAY 3 - Session 10 | Ms Chong Pau Khee
Carotid Stenting: Nursing perspective & challenges

Carotid artery stenosis, resulting from the build-up of plaque within the artery wall, can lead to a reduction or complete occlusion of blood flow to the brain, potentially causing transient ischemic attacks or strokes. Ischemic events of

this nature can result in significant morbidity, mortality, and long-term disability. Various risk factors, such as smoking, hyperlipidemia, hypertension, gender, and age, contribute to the development of carotid artery stenosis. Carotid artery stenting and carotid endarterectomy are the primary interventions recommended for managing this condition. With recent years of continual advancements in endovascular technique and apparatus, carotid artery stenting has emerged as a promising alternative for patient at high surgical risk. Therefore, it is crucial for interventional radiology nurses to be familiar with the preparation, techniques, and patient education involved in this procedure, enabling them to provide holistic care. Nursing management and the challenges associated with carotid artery stenting, covering the pre-procedure, intra-procedure, and post-procedure phases will be on focus. The roles of the scrub nurse and circulating nurse in the carotid stenting procedure will also be mphasized, highlighting their responsibilities and contributions to patient care. By gaining a comprehensive understanding of carotid artery stenting and its nursing implications, healthcare professionals can optimize patient outcomes and ensure the delivery of high-quality, patient-centered care.

DAY 3 - Session 10 | Ms Michelle D. Cano
Nursing Role in Intra-arterial chemotherapy (IAC) for Retinoblastoma

Retinoblastoma is the most common intraocular malignancy in children. Both males and females are equally affected. It comprises 6.1% of childhood cancers in ages 5 and below. It develops in the layer of nerve tissue that covers the retina. In such cases, it is being treated through radiation and intra-arterial chemotherapy to eradicate the cancerous cells. By this means, the majority of children diagnosed with Retinoblastoma were able to retain their vision. With this, what vital roles an interventional radiology nurse must fulfill in order to achieve its goal? Involvement in the procedure, we can guarantee for the timely procedure, aseptic technique should be observed and safe handling of chemotherapy drugs. Before being transferred to PACU, each patient must be monitored by an IR nurse for post procedure complications. Furthermore, by offering the child and family psychological help. As an IR nurse, it is a must to possess knowledge, skills and the best of its abilities to provide safe and highest quality care to patients.

DAY 3 - Session 10 | Ms Yenleyetha Yun Chiat
Feed and Wrap Technique, a Protocol for Nurses Preparing "Well" Infants for MRI Scan

MRI is a widely used imaging modality for infants as it does not have radiation. It also provides excellent soft tissue contrast. However, for infants who need to undergo a MRI scan, it can create a lot of fear and fidgety as the machine resembles an enclosed tunnel. Besides, any slightest motion during the scan will degrade the image quality significantly. The patient would need to keep very still for the entire duration of the procedure, which ranges from 30 to 45 minutes for a single region to several hours for multiple studies. As a result, the infant may have to undergo sedation or General Anesthesia (GA) for this purpose. Although GA is now generally safe, it is not entirely risk-free as with all the interventions. Common side effects of GA include headache, nausea, vomiting, shivering and restlessness. As the hospital of choice for infant, we would want our neonate patients who require MRI to have a pleasant experience. Therefore, the Feed and Wrap Technique refers to the use of Feeding and Wrapping to induce natural sleep in

infants. Generally, Infant tend to fall asleep after a feed, we take advantage of this and scan them while asleep. A standardized protocol and technique performed by experienced personnel may avoid sedation or GA in infants who require MRI.

DAY 3 - Session 10 | Ms Natalie Feguro
Spinal Tap For Infants Using Ultrasonography

Lumbar puncture is a common and minimally invasive procedure performed by inserting a needle into the thecal sac to obtain cerebrospinal fluid (CSF) for analysis. It is useful in a variety of conditions including meningitis, inflammation, and central nervous system malignancies. Lumbar puncture for infants is commonly done in the ward without any imaging guidance however, after failed attempts, image-guided lumbar puncture by an Interventional Radiologist in the Angiography Suite may be considered. Lumbar puncture performed by an Intervention Radiologist is done under ultrasound guidance. The ward is instructed to hydrate the patient prior to the procedure, which can be via drinking of milk. Hydration helps to increase the volume of CSF. Topical anaesthesia, like Ametop, is applied to the site before sending the patient for image-guided LP. Prior to the start of the procedure, ultrasound is used to image for adequate CSF, locate the conus level, and plan the needle trajectory. Next, the patient and hockey stick ultrasound probe are draped. Under ultrasound guidance, the LP needle is inserted into the thecal sac and CSF obtained. Sucrose 24% is often given orally during the procedure to pacify the baby. Some patients may not have enough CSF, resulting in repeated failed LP in the ward. Ultrasound can assess the CSF volume before commencing the LP procedure. Ultrasound can also identify any blood vessels in the course of planned needle puncture. This ensures the safety of our patients and minimises adverse effects and complications such as bleeding or spinal injury. In conclusion, based on our experience, ultrasound guided lumbar puncture has a high success rate. As a common procedure, ultrasound-guided LP aids in the diagnosis of infants with unexplained fever, seizures, and inflammation.

Oral Competition & E-poster Presentation

SGCR WIRES SCIENTIFIC ORAL PRESENTATION	
Judges: Dr CHAN Lai Peng, Dr Peter GOH Yu-Tang, Professor KHONG Pek Lan	
Dr Nicholas SOH	Application of a Deep Learning Algorithm in the Detection of Hip Fractures (SID-3, p 49)
Mr Arvind Channarayapatna SRINIVASA	Comprehensive Adipose Tissue/Muscle Segmentation and Quantification Tool for Sarcopenia Prediction (SID-153, p 52)
Dr LEONG Siang Huei	Artificial Intelligence-Guided Segmentation and Path Planning Software for Transthoracic Lung Biopsy (SID-238, p 99)
Dr MENG Xiangpan	Recurrence prediction for resected hepatocellular carcinoma by integrating radiomic-based surrogates of distinct vascular patterns (SID-245, p 82)
Mr CHENG I-No	Deep learning-based auscultation models for diagnosing arteriovenous fistula/graft stenosis assessed by angiography in hemodialysis patients (SID-277, p 101)
Dr ZHUANG Kun Da	Extended 5-Year Amputation and Survival Outcomes From SINGAPACLI: A Randomised Clinical Trial Comparing Drug-Coated Balloon to Conventional Balloon Angioplasty for Below-the-Knee Arteries in Critical Limb Ischemia (SID-309, p 107)
Dr LOW Xi Zhen	Deep learning assistance for Cobb's angle assessment in the Singapore national scoliosis screening programme (SID-311, p 56)

AOCNR SCIENTIFIC ORAL PRESENTATION (SESSION 1)	
Judges: Professor KIM Ji Hoon, A/Professor SITOH Yih Yian, Professor Michihiro TANAKA	
Ms LU Haoxuan	Widespread changes in white matter microstructure following MR-guided focused ultrasound thalamotomy in patients with essential tremor (SID-33, p 142)
Dr LI Chenxi	The value of three-dimensional pseudo-continuous arterial spin labeling at 7T in predicting glioma grade prior to surgery (SID-154, p 201)
Dr HUNG Kuang	The MRI Disparities between CADASIL and Multiple Sclerosis in Middle-aged Subjects: a Semiquantitative Analysis (SID-331, p 262)
Dr LEUNG Ho Sang	Depicting facial nerve branches with a tale of two Magnetic Resonance Neurogram Techniques – Preliminary results (SID-29, p 139)
Dr GOH Shu Wen	4D MR Parathyroids: A Review and Our Institutional Experience (SID-206, p 69)
Dr SEOW Pohchoo	Non-motor Correlates of Pedunculopontine Nucleus (PPN) Projection Denervation with Sleep Disturbances in Parkinson's Disease (SID-201, p 220)

AOCNR SCIENTIFIC ORAL PRESENTATION (SESSION 2)	
Judges: Professor CHEN Cheng-Yu, Professor Shailesh B GAIKWAD, Dr KEI Pin Lin	
Prof Toshiaki TAOKA	Interstitial fluid dynamics in the cases of whole brain radiation by diffusion weighted image analysis along the perivascular space (DWI-ALPS) method (SID-26, p 136)
Prof MOON Won-Jin	The Temporal Relationship between BBB Permeability and Cognitive Function in Mild Traumatic Injury: Preliminary Results of a Longitudinal DCE-MRI Study (SID-115, p 180)
Dr PAK Arim	Bright diffusion sign: Accurate and reliable MR sign for multinodular and vacuolating neuronal tumor (SID-118, p 183)
Dr SUH Sangil	High Density in Iodine map on Dual-Energy Computed Tomography is associated with Hemorrhagic Transformation After Mechanical Thrombectomy in Patients with Acute Stroke (SID-142, p 192)
Dr KHEOK Si Wei	Deep learning model prediction of optic neuropathy in thyroid eye disease patients on CT orbits (SID-157, p 53)
Dr CHIA Ghim Song	Comparative analysis of different stent retrievers used in the endovascular treatment of acute ischaemic stroke: Single centre experience (SID-136, p 93)
Dr Daniel LOH	FastStroke ColorViz in the detection of distal vessel occlusion on CT Angiography for Acute Ischaemic Stroke. (SID-318, p 256)

Oral Competition &
E-poster Presentation

AOCNR SCIENTIFIC ORAL POSTER PRESENTATION	
Judges: Professor Ann D King, Dr Wickly Lee, Dr Constantine Phatouros	
Dr Vineet GOROLAY	CT Perfusion for the Detection of Vasospasm and Delayed Cerebral Ischaemia in Aneurysmal Subarachnoid Hemorrhage: A Systematic Review and Meta-analysis (SID-60, p 156)
Dr CHUA Wei Ming	Short term BRAF and MEK inhibition in Redifferentiation of Radioiodine-Refractory Thyroid Cancer (RR-TC) (SID-93, p 266)
Dr Tetsuro SEKINE	4D Flow MRI blood flow quantification correlates with direct MCA blood pressure measurements in patients with EC-IC bypass (SID-97, p 173)
Dr Shea FOO	Imaging and detection of ectopic glands in the head and neck with neoplastic transformation (SID-117, p 182)
Prof OH Se Won	Evaluation of an Artificial Intelligence-Based Research Application for Acute Infarcts on Brain MRIs in the Emergency Room (SID-120, p 184)
Prof PARK Mina	Diffusion tensor image analysis along the perivascular space and its association with CSF volume (SID-151, p 199)
Dr Dewansh MISHRA	Cognitive Improvement Post-Endovascular Treatment of Intracranial Dural Arteriovenous Fistula: A Prospective Study (SID-161, p 94)
Dr HAN Miran	Brain stiffness change according to brain development using virtual MR elastography based on DWI (SID-176, p 211)
Dr MA Yingqiao	Social intelligence and the brain: Social intelligence mediates the impact of resting-state brain activity on social anxiety in late adolescence (SID-211, p 221)

SGCR-WIRES SCIENTIFIC ORAL POSTER PRESENTATION	
Judges: Associate Professor CHONG Bee Kiang, Professor PUA Uei, Dr WONG Kang Min	
Dr NGUYEN Ha Khuong	Diagnostic value of 3D T1-weighted gradient-echo and 2D T1-weighted in-phase and out-of-phase gradient-echo sequences for appendicitis diagnosis in pregnant women (SID-50, p 77)
Ms KIM Sunwoo Sunny	Application of a Deep Learning Algorithm in the Detection of Hip implant Cut-outs (SID-72, p 50)
Mr ANG Xu Kai	Leveraging Endeavour AI to eliminating redundant CT studies performed (SID-123, p 51)
Mr HO Hee Shen	Radiation Doses in Management of Abnormal Placentation with Preoperative Endovascular Internal Iliac Artery Balloon Occlusion (SID-203, p 96)
A. Prof Yassir Edrees ALMALKI	Biceps Pulley Lesions: Diagnostic Accuracy of Conventional Shoulder MRI and Value of Various Diagnostic Signs (SID-217, p 126)
A. Prof Yassir Edrees ALMALKI	Ovarian-Adnexal Imaging-Reporting and Data System (O-RADS) Ultrasound v2018: Prospective validation and comparison to updated classification (v2022) in pathologically confirmed adnexal masses (SID-237, p 85)
Dr MYUNG Jun Yi	Correlation between Clinical and Dual Energy Foot CT Findings in Patients with Gout (SID-279, p 130)
Dr SHEN Chao-Yu	Improving Transcatheter Embolization for Pulmonary Arteriovenous Malformations: Four Cases Report and Review of Literatures (SID-289, p 102)

Oral Competition & E-poster Presentation

AOCNR SGCR-WIRES COMPETITION PRIZES

AOCNR Oral (NEW)
- Gold: SGD $600
- Silver: SGD $300
- Bronze: SGD $150 (2 awards)

AOCNR Poster (NEW)
- Gold: SGD $500
- Silver: SGD $250
- Bronze: SGD $180 (2 awards)

SGCR-WIRES Oral
- Best SGCR: SGD $600
- Best WIRES: SGD $600

SGCR-WIRES Poster
- Best SGCR Scientific Poster: SGD $400
- Best WIRES Scientific Poster: SGD $400
- Best Educational Poster: SGD $400
- Merit Poster: SGD $100 + $500 travel vouchers (3 awards)

AOCNR SGCR-WIRES Young Investigator: SGD $400 + $500 travel vouchers*

* To be eligible for the selection of Young Investigator Award, the presenting author needs to be 40 years old or below and based in Singapore.

Artificial Intelligence

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Application of a Deep Learning Algorithm in the Detection of Hip Fractures

Dr Nicholas Soh[1], Ms Yan Gao[1], A. Prof Nan Liu[2], A. Prof Daniel Ting[2], Dr Kang Min Wong[1], Dr Charlene Liew[1], A. Prof Hong Choon Oh[1], Dr Jin Rong Tan[3], Prof Siang Hiong Goh[1], Dr Yet Yen Yan[1]

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Hip fractures are a major health problem and can increase patient mortality and morbidity. The aim is to evaluate the performance of a deep convolutional neural network (DCNN) in detecting and localising hip fractures on plain frontal pelvic radiographs (PXRs).

Materials and Methods

A DCNN was developed using 36442 PXRs between January 2016 and December 2020, of which 29153 PXRs and 7289 PXRs were allocated for training and validation sets respectively. The accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC) were evaluated on 3761 independent PXRs acquired from the emergency department from 2016 to 2020. PXRs with metallic implants, suboptimal positioning and poor image contrast were included to increase its clinical applicability and simulate real world situations. The authors also used the visualization algorithm gradient-weighted class activation mapping to assess the validity of the model.

Results

The algorithm achieved an accuracy of 96%, a sensitivity of 94%, a specificity of 96%, and an AUC of 0.990 for identifying hip fractures. The visualization algorithm showed an accuracy of 76.8% for fracture localisation.

Conclusion

A DCNN can detect hip fractures on PXRs with a high accuracy and might assist clinicians in the emergency department.

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Application of a Deep Learning Algorithm in the Detection of Hip implant Cut-outs

Ms Sunwoo Sunny Kim[1], Dr Jin Rong Tan[2], Dr Yan Gao[3], Dr Nicholas Soh[4], A. Prof Nan Liu[5], A. Prof Daniel Ting[6], Dr Kang Min Wong[4,7], Dr Hong Choon Oh[3], Prof Siang Hiong Goh[8], Dr Yet Yen Yan[4,7]

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Hip implant cut-outs are a commonly reported cause of fixation failure, which can increase patient morbidity. We aim to develop and evaluate the performance of a deep convolutional neural network (DCNN) to detect hip implant cut-out on frontal pelvic radiographs (PXRs).

Materials and Methods

A DCNN was developed using 32163 PXRs performed in the ambulatory, inpatient and emergency department settings between 2016 and 2020. The hip implants included proximal femoral nail antirotation, dynamic hip screws and cancellous screw fixations. Of these, 24122 and 8041 PXRs were allocated for training and validation sets respectively. PXRs with suboptimal quality, including images with poor image contrast and positioning were included to simulate real-world practice and thus increase clinical relevance. Subsequently, accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC) were evaluated on 8040 PXRs between 2016 and 2020 to test the model.

Results

The algorithm achieved an accuracy of 99.5%, and an AUC of 0.994. The sensitivity and specificity of the model were 84% and 99.6% respectively.

Conclusion

DCNN can accurately detect implant cut-outs from PXRs and may serve as a useful adjunct for clinicians in their routine evaluation of orthopaedic hardware.

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Leveraging Endeavour AI to eliminating redundant CT studies performed.

Dr Desmond Lim Shi Wei, Mr Xu Kai Ang, Dr Andrew Makmur

National University Hospital, Singapore, Singapore

Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Redundant CT examinations are an elephant in the room. An internal audit revealed 211 redundant examinations performed over a 20 month period. These redundant CTs not only result in unnecessary cost and radiation to the patient but also affect machine utilisation time and man-hours involved in performing and interpreting these scans.

A large contributor to the issue is the fragmented specialized care of our patients. Patients are often seen by multiple specialists who may order imaging studies with overlapping diagnostic ability.

To mitigate this, manpower is assigned to check and vet all incoming CT requests. This is time consuming and inefficient.

We aim for the Endeavour AI (EAI) platform to highlight requests which are potentially redundant during the vetting process.

Materials and Methods

EAI houses the TIBCO Spotfire software for real time data analytics. Data is streamed from the electronic health records, allowing the programming of a dashboard which highlights potential redundant CT examinations. Rule-based codes were written, to include matching of examination names, and applying a threshold of 1 to 3 months between the scheduled and previous examinations depending on scan type. The programmed dashboard instantaneously performs the rule-based identification of potential duplicate studies.

Results

Over 3 months, the dashboard prevented 24 cases of redundant CTs from a volume of 3643 examinations. 8 duplicates were missed with a myriad of reasons. This solution saves 3 hours per day of human time per imaging centre, a 75% reduction.

Conclusion

Redundant CT studies can be eliminated using the Endeavor AI system.

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Comprehensive Adipose Tissue/Muscle Segmentation and Quantification Tool for Sarcopenia Prediction

Mr Arvind Channarayapatna Srinivasa[1], Mrs Ling Yun Yeow[1], Dr Jordan Sim Zheng Ting[2], Mr Wen Xiang Chen[3], Ms Audrey JP Yeo[4], Dr Wee Shiong Lim[4,5], Dr Cher Heng Tan[3,5], Dr Bhanu KN Prakash[1]

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Projected to increase exponentially with population ageing and the obesity epidemic, sarcopenic obesity is associated with increased risk of adverse outcomes from sarcopenia and metabolic dysregulation in older persons. Manual fat/muscle segmentation and quantification from magnetic resonance (MR) scans are laborious and time-consuming. We sought to develop an end-to-end framework for automated abdominal and thigh fat/muscle segmentation for sarcopenia prediction.

Materials and Methods

We examined MR scans from 190 community-dwelling older adults (mainly Chinese, 69.5% females), with mean age: 67.85±7.90 years, and BMI: 23.75±3.65 kg/m2. Forty-one upper abdominal and fifty-three thigh datasets were semi-automatically segmented for ground-truth generation. Proposed framework includes: Brain Imaging Data Structure (BIDS) conversion, data augmentations, automatic L1 and thigh starting slice identification, multiple trained multiRes U-Net models for abdominal and thigh fat/muscle segmentation and spine-based fat distribution analysis. The generated fat/muscle statistics were used for construction of sarcopenia prediction model. Final deliverable is the integration of framework into a client-server cloud-based application for metabolic quantification and sarcopenia prediction.

Results

Abdominal fat segmentation: median Dice scores are 0.97 for superficial subcutaneous adipose tissue (SSAT) and Deep subcutaneous adipose tissue (DSAT), and 0.96 for Visceral adipose tissue (VAT). Mean Hausdorff distance is <5 mm for all the three fat compartments. Upper thigh: median Dice scores are 0.58 for intermuscular adipose tissue (IMAT), 0.92 for SSAT and 0.88 for muscle.

Conclusion

The deployment of end-to-end framework for automatic fat/muscle segmentation and quantification of different body parts for sarcopenia prediction serves as a AI tool for metabolic studies.

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Deep learning model prediction of optic neuropathy in thyroid eye disease patients on CT orbits

Dr Si Wei Kheok[1], Dr Hugo Lee[2], Dr Lei Zhu[3], Dr Steve Chen Pong Wong[1], Mr Guoyu Hu[3], Dr Kaiping Zheng[3], Prof Ling Ling Chan[1], Dr Alexander Sheng Ming Tan[1], Prof Beng Chin Ooi[3], A. Prof Lay Leng Seah[4]

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Optic neuropathy (ON) is a rare but severe complication of thyroid eye disease (TED) causing blindness. The aim of the study is to develop a CT orbital deep learning model to predict the presence of ON in patients clinically diagnosed with TED, to assist in clinical diagnosis and potentially expedite treatment.

Materials and Methods

Patients with TED and orbital CT from 2002-2017 were included. 2D and 3D CT labels, including the apex, medial and lateral walls were annotated to train the models. The dataset was split in the ratio 4:3:3 for training: validation: testing. The top 5 convolutional neural network (CNN) models achieving best class average accuracy on validation were used to evaluate the test set. Sensitivity, specificity, F1 score, accuracy and positive predictive value (PPV) were calculated. McNemar chi-square was used to compare the performances of the models against the medical specialists' assessment of the same test set.

Results

Of the 126 TED patients included, 27/252 orbits had clinically confirmed ON. Model 2 apex had the highest sensitivity=0.78 with specificity= 0.78, F1 score= 0.47 and accuracy=0.78. Model 4 apex had the highest specificity=0.95, with sensitivity=0.56, F1 score=0.59 and accuracy=0.90. Medical specialists performance was not significantly different to the CNN performances (p>0.05).

Conclusion

There is potential for Model 2 apex to be used for screening and Model 4 apex to be used as a diagnostic tool. The performances of the CNN models do not differ significantly from that of medical specialists. A higher recruitment number will improve the models' performances.

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Machine Learning Approach to Brain Age Prediction (BAP) for Local Population in Singapore

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Difference between predicted brain-age and chronological age is termed brain Predicted Age Difference (brainPAD), which is used as biomarker for overall brain health. Positive brainPAD reflects 'accelerated' ageing and is associated with neurodegenerative disorders/cognitive impairments. Being a rapidly ageing nation, Singapore (SG) is at increasing risk for neurodegenerative diseases. Currently, there is no brain-age prediction (BAP) model available in SG.

Materials and Methods

Retrospective T1W MPRAGE MRI brain data (n=360) gathered from Sengkang General Hospital. FastSurfer (v2.0.4) used for brain segmentation (21 regions – left and right combined). Volumes were normalized using total intracranial volume. Subjects with >2 outliers were removed while rest of outliers imputed with median (age-and-gender-matched). Stratified 10-Folds for train/test split, robust scaling with 10 repetitions for each regressor with GridSearchCV (stratified 5-folds): Gaussian process (GP), linear SVR, and SVR. MAE, RMSE, R and R-Squared values calculated.

Results

Mean MAE, RMSE, R and R-Squared (10 repetitions):

7.94, 9.97, 0.86, 0.72 (Linear SVR)

7.95, 9.97, 0.86, 0.72 (GP regression)

6.09, 8.34, 0.90, 0.80 (SVR)

SVR (10 repetitions) with stratified 10-folds for train/test split with GridSearchCV is the best regressor. MAE of 6.09 and RMSE of 8.34. Correlation between chronological and predicted brain-age is 0.90, and 80% of variation in brain-age explainable by the normalised structural brain volumes.

Conclusion

SVR is the best performing regressor and more regression models would be trained with additional normative data to improve robustness of BAP. Using brainPAD, BAP can differentiate normal from pathological brain ageing, enabling clinicians to monitor patient's disease progression and treatment response.

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Insights from implementation of a comprehensive AI solution for the assessment of NCCT brain scans in a national radiology network

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Inadequate generalisability of AI models may limit their adoption within clinical practice. We evaluated the real-world performance of a comprehensive AI solution for non-contrast brain CT studies during a controlled deployment.

Materials and Methods

A commercially available AI tool capable of detecting 130 findings (Annalise Enterprise CTB, Annalise.ai, Sydney, Australia), was deployed within the acute imaging division across a large national private radiology provider. A limited number of consultant radiologists (n=11) were provided access to the device for a period of 10 weeks. Users were asked to indicate at the point of use on a case level, their agreement / disagreement with the findings displayed, and findings they considered "valuable" during the clinical workflow.

Results

A total of 4,145 cases were evaluated, with 15,861 AI predictions made. During this period, 87 findings were added, 305 findings were rejected and 105 findings were considered valuable. Encephalomalacia was the most common finding added. Acute cerebral infarct was the most common finding rejected and sulcal effacement the most common finding flagged as valuable. The feedback was analysed by the vendor, and utilised to modify the product thresholds prior to network-wide deployment. High approval ratings were reflected by the participating user group whom declined having the product removed during the analysis/modification period.

Conclusion

Evaluation of algorithm performance within a prospective clinical setting is important to understanding its generalisability. This early evaluation data indicated that rates of added/rejected findings were low for the majority of findings when the AI device was implemented in a real-world clinical setting.

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Deep learning assistance for Cobb's angle assessment in the Singapore national scoliosis screening programme.

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Singapore's national scoliosis screening programme targets young adolescents at a population level. Annually, approximately 6000-8000 cases require radiographic analysis of the Cobb's angle. The current method of analysis is time-consuming and repetitive. This study assesses the speed and accuracy of Cobb's angle assessment with and without DL-assistance.

Materials and Methods

Retrospective study. DL model was developed to assist Cobb's angle interpretation on posteroanterior spine radiographs. Consecutive radiographs in patients 10—18 years with scoliosis from January 2018—January 2019 were included. Eight clinicians, four radiologists in-training(R1—R4,no experience) and four orthopedists in-training(O1—4,6-months-experience) performed assessment with and without DL-assistance with a 6-week washout. Interpretation time and angle differences were assessed with a spine surgeon (6-years-experience) as the reference standard.

Results

640 patients(mean±SD, 12.6 years±2;465 girls) were split into 580 patients for training(73%) and validation(81%), and 60(9%) for testing.

DL-assistance showed reduced or equivalent mean-angle differences compared with unassisted reads. A radiologist-in-training(R4) showed the largest reduction in mean-angle difference from -3.20°(95%CI:-4.21—-2.12°) unassisted to 1.03°(95%CI:-0.5—2.57°) with DL-assistance. No significant mean-angle differences between radiologists and orthopedists with and without DL-model assistance.

Comparing DL-assisted vs. unassisted interpretation, radiologists had a mean time-saving of 13.25 seconds(95%CI:-19.6—-6.91), vs. an increase of 3.85 seconds(95%CI:-2.94—10.63) for the orthopedists(p=0.005).

Conclusion

Interpreting scoliosis radiographs in a national screening programme is a resource-intense, time-consuming process. DL-assistance may improve the productivity and accuracy of scoliosis evaluation, saving manpower costs and reducing inappropriate tertiary referrals.

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Block-Wise Neural Network Architecture for Early Detection of Breast Cancer by BI-RADS

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

The continually rising percentage of breast cancer (BC) cases has created an alarming situation and increased research interest in the early detection and diagnosis of BC using deep-learning models. This study proposes a novel computer-aided design approach to categorize benign and malignant tumors on mammography images using BI-RADS classification.

Materials and Methods

The dataset was made up of 12476 two-dimensional mammographic images and was divided into three parts: training (70%), testing (15%), and validation (15%). The tuning process followed two steps: (i) data collection and preprocessing and (ii) feeding the dataset into a fine-tuned block-wise neural network. The dataset was categorized into five classes, BI-RADS 1 to BI-RADS 5, based on the BI-RADS classification. We used the confusion matrix (CM), accuracy, precision, and F1-score to assess model prediction.

Results

In the Block-Wise Visual Geometry Group19 (BW-VGG19) model with 5 epochs, the training accuracy increased from 0.4 to 1, while the validation accuracy increased from 0.2 to 0.99. The training loss started at 0.63 and decreased to 0.1, and the validation loss exhibited an aberrant behavior. The accuracy, precession, recall, and F1-score of this model were 99% for all parameters. The CM results showed that this model produced 163 accurate classifications in BI-RADS

1, and just three BI-RADS 1 were wrongly classified as BI-RADS 2.

Conclusion

Applying the BW-VGG19 model with 5 epochs showed the best results for the BI-RADS classification of breast masses on mammography, which could decrease human error in the diagnostic process.

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Deep Learning-Based Automated Detection of Space Occupying Lesions in Brain Scans

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

Develop a deep learning (DL) model for accurate and automated detection of space-occupying lesions in brain imaging scans. DL model detects SOL and assists radiologists in identifying lesions at an early stage. This early detection enables timely intervention and treatment planning, potentially leading to better patient outcomes.

Materials and Methods

During image acquisition, fluctuation of the magnetic filed coil noise is added in the input MRI slices. Due to this detection of the brain abnormalities is a difficult task. Therefore, denoise neural network is developed for noise reduction. After the noise reduction, MRI images are passed to the proposed quantum neural network for classification of the healthy/unhealthy MRI slices. After classification, un-healthy slices are fed to the proposed semantic segmentation model which consists of the 49 layers such as 14 convolutional, 9 batch-normalization, 9 activation, 8 drop-out, 4 concatenation, 4 max-pooling. The proposed semantic segmentation model is trained on the selected learning hyperparameters that provide accurate segmentation of the lesions.

Results

The presented model is tested on locally acquired images and BRATS-2020, BRTAS-2021 datasets which gives 0.88 dice scores with 95% diagnostic accuracy.

Conclusion

Overall, the proposed method performed better as compared to the existing research works that authenticate the novelty of this work. This can provide an ease to radiologists in their daily MRI brain reporting with more accurate diagnosis without interobserver bias.

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AI-Lung: A Deep Learning Approach for COVID-19 Lung Lobe Analysis and Grading

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Abstract Theme

Artificial Intelligence

Abstract Category

Scientific

Objective

This study involves grading COVID-19 based on combined percentages of infection present in all five lobes of both lungs. This helps in segregation of patients with healthy, mild, and severe disease more accurately and precisely as it involves information of all the five lobes.

Materials and Methods

We have used Radient dicom viewer to get the sagittal images that are further processed to segment out the lobes using UNET architecture. These Dicom images are converted into jpeg images and then are passed through UNET model. A colored mask is generated against each slice representing different lobes. As there are 2 lobes in the left lung and 3 lobes in the right lung, five RGB values are assigned. The RGB value (255, 0, 0)- red is given to lobe 1, (0, 0, 255)-blue is given to lobe 2, (0, 255, 255)-cyan is given to lobe 3, (128, 223, 0)-yellow is given to lobe 4 and (255, 0, 255)-magenta is given to lobe 5. These segmented lobes are then assessed on the grading module that grades all individual lobes of a sagittal slice and give 5 score values ranging from 0-1.

Results

The proposed grading model provides 100% diagnostic accuracy in segregating normal and diseased lungs. It also gives grading of mild and severe covid lung disease on HRCT lung.

Conclusion

This study helps radiologists in reporting CT scan of COVID lung disease with high dianostic accuracy and thus helps in better patient care.

Breast Radiology

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Preoperative Ultrasound (US) Perforator Localization in Surgical Planning for Deep Inferior Epigastric Perforator (DIEP) Flaps

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Abstract Theme

Breast Radiology

Abstract Category

Education

Teaching Points

CT DIEP angiography is first performed, to assess for and select suitable perforators. These are then identified on the patient's abdomen using grayscale US and colour Doppler. Perforators are visualized as hypoechoic interruptions in the linear echogenic rectus abdominis superficial fascia, and arterial waveform is confirmed using colour Doppler. Locations where the perforators exit the superficial fascia are skin-marked with an "X", while the intraperitoneal and intramuscular course of the deep inferior epigastric arteries are marked for the surgeon using solid and dotted solid lines respectively.

We recommend the use of linear probes (12 MHz). A 6 cm footprint is preferred as it allows for a wider field of view. Identification of the rectus abdominis is of utmost priority, as it can occasionally be misidentified as subcutaneous fat, especially in patients with muscle atrophy. US is also a useful technique for preoperative planning in patients with iodinated contrast allergies.

Background / Outline

DIEP flaps remain the gold standard of autologous breast reconstruction in patients undergoing mastectomy for breast cancer. Appropriate perforator selection and localization can greatly affect procedure outcomes. Typically, perforator assessment is done preoperatively using computed tomographic (CT) angiographic techniques, while physical localization and skin-marking of chosen perforators is performed using US by the surgeon during surgery.

The use of US can be highly operator dependent. At our institution, this is mitigated by performing perforator localization and skin-marking preoperatively at the Breast Imaging department by trained sonographers and radiologists. We describe our technique and discuss some learning points.

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"Deceptive Appearance: Metastatic Malignant Melanoma Presenting as a Benign-Looking Breast Mass"

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Abstract Theme

Breast Radiology

Abstract Category

Education

Teaching Points

1.   Metastatic melanoma may present atypically and resemble benign lesions on ultrasound.

2.   It's crucial to thoroughly examine and investigate any atypical lesions or complaints in patients with a history of melanoma, and to have regular follow-up appointments and report any new or concerning symptoms promptly.

Background / Outline

In our case, a 51-year-old woman presented to the triple breast assessment clinic with a new lump in her right breast that appeared benign during clinical examination (P2). She had a normal screening mammogram three months prior. However, she had a history of malignant melanoma excision from her forehead in 2012 and a similar lesion from her right lower back in 2017.

A focal ultrasound of the affected area in the upper outer quadrant of the right breast revealed a 12 mm well-defined isoechoic to hypoechoic lesion, which appeared benign and was likely a fibroadenoma, graded as U2. A subsequent core biopsy was performed as per standard protocol, and the histopathology results showed features consistent with metastatic malignant melanoma. A PET-CT was then performed to determine the extent of the disease, which revealed multiple sites of active disease in the chest, abdomen, pelvis, and subcutaneous tissue.

Cardiac Radiology

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Complete Aortic Arch Interruption in a teenager

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Abstract Theme

Cardiac Radiology

Abstract Category

Education

Teaching Points

Aortic congenital anomalies with epidemiology.

Presentation of various aortic congenital anomalies.

Presentation of aortic arch interruption with its classification system and related management.

Clinical scenario where the aortic arch interruption case can survive and lead on with a normal life with minimal morbidities.

Background / Outline

Interrupted aortic arch (IAA) is a rare congenital malformation of the aorta and is defined as a segment of the arcus aorta being atretic. We discuss here an 11 year old female patient of IAA not as an isolated anomaly but accompanied by polycystic kidney disease (PKD). In the literature, there is only 1 report showing that polycystic kidney disease and IAA occur together.

IAA is characterized by the congenital absence of the luminal continuity between the ascending and descending portions of the aorta and is found in 3 per million live births. Prognosis of this anomaly depends on the associated congenital anomalies like truncus arteriosus, transposition of the great arteries, double outlet right ventricle and functional single ventricle. It has a very poor prognosis unless surgical treatment is undertaken at an early age.

The main prognosis of IAA depends upon associated anomalies and collateral circulation perfusing the rest of the body. Echocardiography, cardiac catheterization, CT angiography, and contrast MRI are the mainstay in the diagnosis of the anomaly along with diagnosing other associations. The definitive management is surgery

VFSS plays a vital role in improving patient outcomes and enhancing their quality of life.

ENT Radiology

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Interpreting the Videofluoroscopic Swallow Study (VFSS); The gold standard for evaluating dysphagia

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Abstract Theme

ENT Radiology

Abstract Category

Education

Teaching Points

1. To highlight the importance of the Videofluoroscopic Swallow Study (VFSS) in the evaluation of patients with dysphagia.
2. To recognise the different components of normal swallow physiology.
3. To recognise common functional and anatomic abnormalities of swallowing, which will guide individualised rehabilitative management of patients with dysphagia.

Background / Outline

Dysphagia is a debilitating condition that can lead to severe complications such as malnutrition, dehydration, aspiration pneumonia, and even death. The prevalence of dysphagia increases with age and can occur due to a variety of medical conditions and their associated treatment complications.

The current gold standard investigation for diagnosing dysphagia is the Videofluoroscopic Swallow Study(VFSS), a dynamic fluoroscopic study often performed in collaboration between speech therapists and radiologists. The use of fluoroscopy makes it possible to visualise bolus flow through the aerodigestive tract in relation to structural changes, enabling real-time evaluation of the patient's swallowing physiology, .

This allows the clinician to detect the presence and timing of any aspiration, as well as the associated underlying functional and/or structural anomalies. Furthermore, the VFSS allows the clinician to directly observe the effects of different bolus consistencies and volumes on swallowing, as well as the effects of compensatory strategies. Depending on the identified pathophysiology, an appropriate individualised treatment plan can be devised. Hence, the

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Screening for nasopharyngeal carcinoma: association between plasma EBV-DNA levels and tumour volume

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

To evaluate the association between plasma Epstein-Barr virus (EBV)-DNA levels and tumour size in patients with nasopharyngeal carcinoma (NPC) detected by EBV-DNA screening.

Materials and Methods

A retrospective analysis was performed in 41 patients with NPC who had undergone MRI after a plasma EBV-DNA screening test was found to be elevated. The primary tumour volume (PTV), nodal volume (NV) and total volume (TV) were correlated with the level of plasma EBV-DNA using the Pearson correlation test. A $p < 0.05$ indicated statistical significance.

Results

Screening detected mostly early-NPCs, 33/41 (80.5%) were stage T1 and 3/41 (7.3%) were stage T2, 30/41 (73.2%) did not have nodal metastases and none had distant metastases. The level of EBV-DNA [median (interquartile): 24 (9, 49) ´ copies/ml] positively correlated with PTV [median (interquartile): 2.7 (1.7, 5.4) ´ cm3] (Pearson coefficient =0.78, $p < 0.01$) and TV [median (interquartile): 2.8 (1.7, 5.4) ´ cm3] (Pearson coefficient =0.77, $p < 0.01$), but not NV [median (interquartile): 1.6 (0.5, 7.4) ´ cm3] ($p = 0.09$).

Conclusion

Results showed that the level of plasma EBV-DNA positively correlated with PTV, therefore in NPC screening studies even when the plasma EBV-DNA levels are low the nasopharynx should be scrutinized to ensure small tumours are not missed.

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Role of Superb Microvascular Imaging for differentiation between Benign and Malignant Neck Lymph Nodes

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

In many patients, various types of conditions causing lumps in cervical lymph nodes are detected through ultrasound examinations. However, similar ultrasound findings can be seen in different types of diseases, and despite suggested criteria for distinguishing them, there are still limitations with grayscale ultrasound. Therefore, analyzing the vascular pattern using color or power Doppler ultrasound is being used. However, benign and malignant vascular patterns still overlap, so it appears that using the superb microvascular imaging(SMI) technique to detect microvasculature may be helpful in distinguishing between them.

Materials and Methods

All enrolled patients underwent US examinations of LNs consisting of grayscale US, PDUS and SMI. From January to April 25 2023, 91 consecutive patients who hade been referred for US-FNAB at out institution were enrolled in the preliminary study. Still images were evaluated by Two experienced head-neck radiologist who were blined to the patients' clinical information and evalution of grayscale, vscular pattern on PDUS and SMI on US.

Results

Out of 116 lymph nodes examined in 91 patients, 20 nodes were excluded due to nondiagnostic results. Of 96 nodes, 51 were classified as sonographic suspicious lymph node of which 33 were pathologically diagnosed as metastasis. 22 nodes were classified as indeterminate, and of these, two were diagnosed as metastasis.

Conclusion

From the above results, we can see that using a nodal classification based on a combination of sonographic features and SMI is effective in detecting and diagnosing metastatic lymphadenopathy, leading to improved treatment and prognosis for patients.

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The Hidden Culprit: Uncovering Nasopharyngeal Carcinoma in a Patient with Orbital Apex Syndrome

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Abstract Theme

ENT Radiology

Abstract Category

Education

Teaching Points

Nasopharyngeal carcinoma (NPC) typically originates from the lateral wall of the nasopharynx. Perineural spread is common in NPC and orbital invasion indicates a poor prognosis. This case demonstrates the significance of considering perineurial spread as a potential cause of orbital apex syndrome.

Background / Outline

A 67-year-old male presented in November 2022 with progressive right-sided visual impairment. There is ophthalmoplegia and ptosis of the right eye, dilated right pupil with no visual perception and reduced sensation over the right V1 and V2 dermatomes consistent with orbital apex syndrome.

MRI orbit revealed an orbital mass extending into the right optic canal, cavernous sinus and Meckel's cave with the mass encircling the right optic nerve. In view of subacute onset, an inflammatory condition such as Tolosa-Hunt syndrome is suggested. The mass was biopsied and showed non-specific chronic inflammatory changes. He was started on steroids for one month with minimal improvement neurologically.

Three months serial CT brain and orbit showed stable disease. A multidisciplinary meeting was conducted in view of lesion stability despite being on steroids. A retrospective review of the MRI (Figure 1) revealed an enhancing lesion in the right fossa of Rosenmuller with extension into the right foramen of ovale, vidian canal, pterygopalatine fossa, superior orbital fissure and optic canal. There is also enhancement of the adjacent prevertebral muscles and clivus. CT showed (Figure 2) sclerotic clivus and central skull base with widened skull base foramina. A revised diagnosis of a nasopharyngeal malignancy with extensive perineural spread was made and this was biopsy-proven.
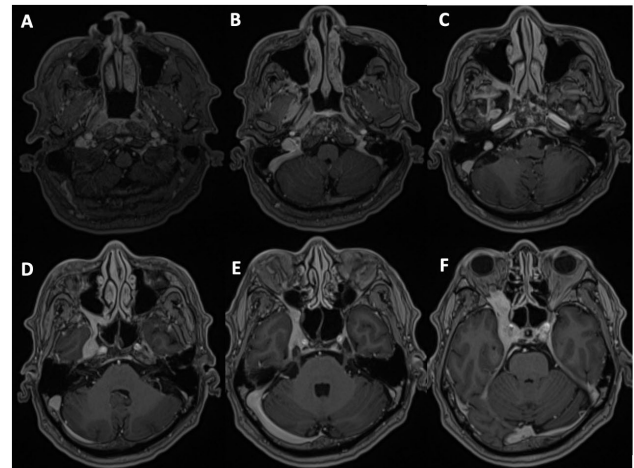
Figure 1. Axial MRI Brain in T1W fat-saturated post-Gadolinium sequence caudal cranially (A to F) showing an enhancing lesion in the right Fossa of Rosenmuller (A) with parapharyngeal and skull base involvement (B) and extensive perineural spread along foramen of ovale and vidian canal (C), foramen rotundum and pterygopalatine fossa (D), superior orbital fissure (F) and optic canal (E) causing orbital apex syndrome.
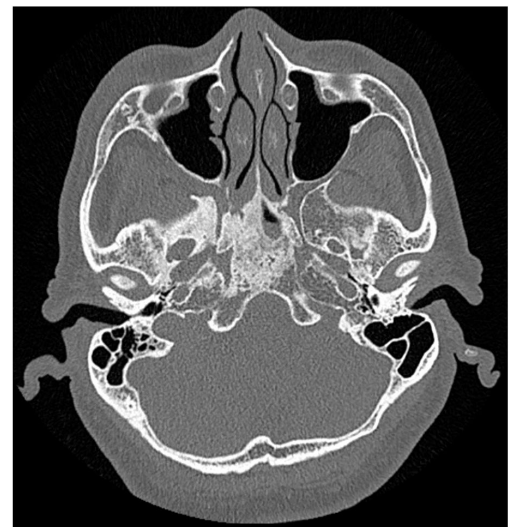
Figure 2. Axial CT of the skull base in bone window showing central skull bases sclerosis and widening of the right foramen ovale, foramen rotundum and pterygopalatine fossa.

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The Hoarse Whisperer: A Case of Cardiovocal Syndrome

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Abstract Theme

ENT Radiology

Abstract Category

Education

Teaching Points

Cardiovocal syndrome is characterized by vocal cord paralysis secondary to damage to the left RLN or vagus nerve along its course, extending from the jugular foramen until the aortopulmonary window. Due to its long meandering route and proximity to the major mediastinal vessels, esophagus, and lung apex, the left RLN is more susceptible to compression than its right-side counterpart.

Background / Outline

A 74-year-old male presented in May 2022 with one-month history of hoarseness. He denies upper respiratory tract infection symptoms, hemoptysis, dysphagia, chest pain, or shortness of breath. No constitutional symptoms. He is a chronic smoker with underlying hypertension and heart disease. No history of trauma or surgery to the neck, gastroesophageal reflux or underlying malignancy. Laryngoscope showed left vocal cord paralysis. No evidence of laryngeal inflammation or neoplasm.

CECT neck and thorax showed anteromedial rotation of the arytenoid cartilage and air distention of the left laryngeal ventricle demonstrating 'sail sign' compatible with left vocal cord paralysis (Figure 1). No lesion was seen at the glottic region to suggest laryngeal malignancy. An aortic arch saccular aneurysm was detected with peripheral mural thrombus, protruding into the aortopulmonary window and mildly compressing the left proximal main pulmonary artery (Figure 2). No signs of impending aneurysmal rupture. No mediastinal lymphadenopathy or lung malignancy.

This led us to conclude that the hoarseness the patient was experiencing was caused by cardiovocal syndrome, which is caused by saccular aneurysmal dilatation of the aortic arch compressing on the left recurrent laryngeal nerve (RLN). He opted for endovascular aortic repair.
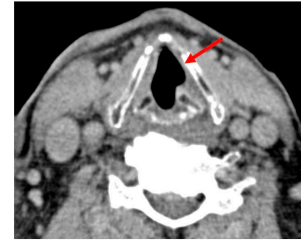

Figure 1. Axial image of CECT Neck at the level of the glottis shows paralysis of the left vocal cord evident by unilateral dilatation of the laryngeal ventricle demonstrating a 'sail sign'.

Figure 2. (A) Axial, (B) sagittal, and (C) coronal reformatted images of CTA Thorax showing a wide neck aortic arch saccular aneurysm with peripheral mural thrombus (solid arrow) and its dome pointing inferiorly protruding to the aortopulmonary window along the course of the left recurrent laryngeal nerve and compressing onto the left proximal main pulmonary artery (dotted arrow).

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Comparison study of ultrasonography features and the Korean-Thyroid Imaging Reporting and Data System of isthmic and lobar papillary thyroid carcinomas

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

To compare US features and K-TIRADS categories for diagnosing isthmic and lobar PTCs.

Materials and Methods

From January 2009 to December 2012, 163 patients who underwent thyroid surgery and were confirmed with a postoperative histopathological diagnosis of isthmic PTC were retrospectively included. Fifty-nine patients were excluded because their tumor size was < 0.5 cm or because of other reasons. Eventually, 104 patients with isthmic PTC (88 female and 16 male; age range, 25–75 years; mean ± SD, 46.9 ± 9.9 years) were included in the study group. The control group comprised of 145 patients (127 female and 18 male; age range, 29–86 years; mean ± SD, 48.4 ± 10.9 years) who underwent thyroid surgery from January to April 2013 for a classic type of PTC, with the largest diameter being ≥ 0.5 cm and located in the thyroid lobe. A single radiologist retrospectively reviewed the US features and K-TIRADS categories of each nodule using a picture archiving and communication system.

Results

Isthmic PTC showed a lower prevalence of non-parallel orientation than lobar PTC (23.1 and 71%). Nodule orientation was the only US feature statistically different between the two groups ($p < 0.0001$). However, there was no significant difference in patient age, sex, nodule size, composition, echogenicity, microcalcification, spiculated/microlobulated margin, and K-TIRADS category between the two groups ($p > 0.05$).

Conclusion

Most cases of isthmic and lobar PTC belong to K-TIRADS category 5, and only the nodule orientation parameter was different between isthmic and lobar PTC. Therefore, K-TIRADS may be useful in the diagnosis of both isthmic and lobar PTC.

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4D MR Parathyroids: A Review and Our Institutional Experience

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

Accurate localization of parathyroid adenomas is critical for the surgical management of primary hyperparathyroidism. Four-dimensional magnetic resonance imaging (4D-MR) exploits the hypervascular nature of adenomas, which show a greater wash-in, greater degree of max enhancement, faster time-to-peak (TTP) and greater wash-out than both normal thyroid tissue and cervical lymph nodes. This study aims to review our institution's experience with 4D-MR as a possible alternative for accurate adenoma localisation.

Materials and Methods

Retrospective analysis of 15 patients who underwent 4D-MR was performed. Unenhanced T1/T2 sequences were performed according to the department protocol, followed by DCE analysis of selected candidate lesions. Images were read by a subspecialty head and neck radiologist.

Results

Out of the 15 cases analysed, eight patients subsequently underwent a parathyroidectomy, of which the adenoma was localised to the correct quadrant in 7 out of the 8 cases (88%).

The nodule could be identified on the unenhanced T1/2 sequences in 4/7 (57%) patients, with the main limiting factor being motion artefact that hinders the detection of these small adenomas. 3/7 cases (43%) showed mild restricted diffusion.

Contrast enhancement improves detection of the lesions, due to a combination of increased contrast ratio (given the hypervascular nature of these lesions) and less motion sensitive sequences. All the adenomas were visible on the postcontrast sequences. 5/7 (71%) showed the classical hypervascular pattern of enhancement, while the other two showed a progressive enhancement pattern.

Conclusion

Our institutional experience is in keeping with the growing understanding that 4D-MR parathyroids is a valuable adjunct modality to localise parathyroid adenomas.

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Differential diagnoses of intensely enhancing cervical lymph nodes

Dr Jingli Chong[1], Dr Amit Karandikar[1], Dr Hau Wei Khoo[1], Dr Alvin Soon[1], Dr Tiong Yong Tan[2], Dr Julian Goh[1]

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Abstract Theme

ENT Radiology

Abstract Category

Education

Teaching Points

- Nodal pathologies enhance; however, only a small number of conditions cause intense enhancement.

- Intense enhancement is best assessed on computed tomography (CT) scan as it can be objectively quantified based on Hounsfield unit (HU) values

- Diseases that cause intensely enhancing cervical lymph nodes have characteristic clinical and radiological features that will help narrow the differential diagnoses and guide subsequent management

Background / Outline

Cervical lymphadenopathy is frequently encountered clinically, and can be evaluated using a variety of modalities. These include ultrasound (US), CT and magnetic resonance imaging (MRI), each with its own pros and cons. Enhancement after contrast administration can be seen. However, objectively, the degree of enhancement is best evaluated with CT as it allows an objective measurement based on HU values. On CT, intense enhancement is found in a small number of conditions, both benign and malignant. This poster aims to discuss the common causes of intensely enhancing cervical nodes, highlighting the imaging features and differentiating points in each condition to help radiologists approach these lesions and suggest a likely diagnosis. This in turn will help guide clinical management and avoid unnecessary intervention and treatment in conditions that are self-limiting.

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IgG4 related orbital disease: Six case series

Prof In Ho Lee

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

IgG4 orbital diseases involve the extra-ocular muscles, orbital fat, lacrimal gland or nerves.

This entity may overlap the other conditions such as thyroid orbitopathy or orbital pseudotumor.

Materials and Methods

We report six cases with pathologically proven or markedly elevated serum IgG4.

Results

All cases showed the enlarged lacrimal glands or extra-ocular muscles. Two of them showed the enlarged nerve involvement

Conclusion

Although IgG4 related orbital disease is not common, this commonly occurs as lacrimal gland enlargement with presentation of eyelid swelling.

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La Gioconda - Imaging of Peripheral Causes of Facial Nerve Palsy

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Abstract Theme

ENT Radiology

Abstract Category

Education

Teaching Points

- To review the radiologic anatomy of the facial nerve
- To show the classic imaging appearance of Bell's palsy
- Understand that various pathologies can cause facial nerve palsy and recognise their features

Background / Outline

Bell's palsy, a benign, commonly self- limiting, inflammatory condition, is the most common cause of facial nerve palsy. Although this does not require routine imaging, facial palsy that is unremitting, resolves partially, or occurs repeatedly require evaluation as they may be due to sinister pathologies.

Both peripheral and central causes of facial nerve palsy exist, ranging from benign to malignant. Peripheral causes of facial nerve palsy are many, and include infection (e.g. Ramsay-Hunt syndrome, necrotising external otitis); inflammation; trauma; and benign and malignant tumours and masses. Perineural spread is also an important cause of facial nerve palsy. However, knowledge of facial nerve anatomy is also crucial, which allows the radiologist to carefully study the facial nerve and identify possible causes of facial nerve palsy.

This exhibit aims to demonstrate the anatomy of the facial nerve, and to discuss the pertinent features of various pathologies that may cause peripheral facial nerve palsy.

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Evaluation of sample adequacy rates in thyroid FNAs using a liquid-based cytologic technique - a pilot study

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

Routine thyroid FNA in our department uses a fine needle aspiration technique. Smears are prepared and assessed for sample adequacy by an on-site cytotechnologist, with further passes as needed.

The final call on sample adequacy is made after a formal assessment by a pathologist. Currently, our adequacy rate ranges from 72 – 74%. A pilot study to determine if an addition of a fluid-based cytologic technique to the standard protocol would improve sample adequacy.

Materials and Methods

After literature review, a new protocol was proposed and a pilot study performed in 30 nodules. 2 smears were prepared from each pass, and 2 passes were performed per lesion. The procedurist could then take up to 4 additional passes. The needles were flushed with the ThinPrep cytology fluid. 1 ThinPrep slide was prepared from the cytology fluid, and compared against the smears for cellular adequacy. Diagnostic performance was also assessed.

Results

23% of nodules (n=7) were deemed inadequate on smears. Of these 7 nodules, the ThinPrep had sufficient cells to improve adequacy in 4 nodules. Overall, this improved the adequacy rate to 90% (n=27). 4 nodules were non-diagnostic on the smears. Their diagnostic category was upgraded to benign with the ThinPrep slides.

Conclusion

The pilot results suggest the use of a liquid-based preparation increases the adequacy rate of thyroid FNA samples and can be considered for use, particularly where cytotechnologist support is unavailable.

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A Rare Case of Otomastoiditis-Induced Skull Base Osteomyelitis Mimicking Nasopharyngeal Cancer

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Abstract Theme

ENT Radiology

Abstract Category

Scientific

Objective

Skull base osteomyelitis (SBO) is a rare and serious infection of the central cranial bones that is typically caused by infection from adjacent head and neck structures. Due to its non-specific clinical symptoms and radiological features, it is not uncommon to misdiagnose SBO as other entities, one of which is nasopharyngeal carcinoma (NPC).

Materials and Methods

A 55-year-old female presented with left ear pain and otorrhea. Initial mastoid CT showed a heterogeneously enhancing nasopharyngeal mass with concurrent left otomastoiditis and adjacent skull-base bone erosion. Subsequent nasopharyngeal MRI was performed and showed preserved nasopharyngeal mucosal lining despite a heterogeneously enhancing lesion at the skull base which extended to the retropharyngeal space at the oropharyngeal level, craniocervical junction, and anterior cervical epidural space at the C2-4 level, causing C2-C4 bone marrow edema. Lab findings showed leucocytosis and increased CRP levels, subsequent anatomical pathology sample taken from the nasopharynx suggested chronic nasopharyngitis.

Results

SBO and NPC are serious entities that require prompt and accurate diagnosis. It's not uncommon for SBO to mimic malignancies. As SBO is usually a complication of otogenic or sinonasal infection, radiologists should take into account the patient's prior history of related infection, and search for radiological signs of infection. Both CT and MRI are useful and complementary modalities in diagnosing SBO. Nevertheless, microbiologic tests and repeated biopsies should ultimately be the deciding diagnostic tools.

Conclusion

Radiological features of infection following a high index of clinical suspicion is crucial in diagnosing SBO. However, microbiologic tests and repeated biopsies should be the concluding diagnostic tools.

Gastrointestinal Radiology

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Deep infiltrative gastrointestinal endometriosis (DIGIE) – the role of MRI in pre-treatment assessment and surgical planning

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Education

Teaching Points

· DIGIE most commonly affects the rectosigmoid and anterior rectum (75-90%), often with concomitant disease elsewhere in the pelvis. Implants comprise fibromuscular hyperplasia surrounding sparse endometriotic glands, appearing T1w and T2w isointense to smooth muscle. Variable haemorrhage and inflammatory response result in T1w hyperintense foci and enhancement/ill-defined margins respectively.

· Imaging mimics include peristalsis, Crohn's disease, malignancy and carcinoid tumours.

· The 'mushroom cap' sign is characteristic for DIGIE and depicts a crescenteric implant invading the muscularis propria with associated T2w hypointense muscular hypertrophy, but preserved T2w hyperintense submucosa. Fibrosis may additionally result in the appearance of convergence at the serosal surfaces.

· Details important to the colorectal surgeon are location (including distance from the anal verge, if rectal), depth (in terms of bowel layers), length and circumference of bowel involved by the implant. All visualised implants (gastrointestinal or otherwise) should be described.

Background / Outline

The gastrointestinal tract is the most common location of extra-genital endometriosis; if treatment aims for removal of all implants, any bowel implants will also need removal. Hence, successful treatment of endometriosis requires accurate diagnosis and pre-treatment delineation. Surgical options for DIGIE include ablation, partial-thickness excision, discoid resection, and segmental bowel resection. MRI aids the surgeon's pre-operative counselling of the patient by allowing mapping of deep implants, as well as determining the likely surgical options and associated risks.

We present cases from our institution to illustrate MRI features and their implications on surgical treatment.

45

Rare Case:Pneumoscrotum And Pneumoperitoneum in a Neonate

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

This paper aimed to describe radiography on patient with pneumoscrotum and pneumoperitoneum.

Materials and Methods

Conducting a literature review and medical records.

Results

We present one case of pneumoscrotum and pneumoperitoneum in a neonate. The patient was a four day old male baby who showed pneumoscrotum and pneumoperitoneum. The scrotum and the abdomen were enlarge about 12 hours after delivery. The imaging showed gastric dilatation, extralumen free air form a football sign, continuous diaphragm sign, cupola sign, luscent liver sign, rigler sign, and there was a lucency on the right intrascrotal. At 20 hours in hospital, the baby was performed laparotomy procedure.

Conclusion

Although pneumoscrotum with pneumoperitoneum is rare condition, but can be life threatening if not treated immediately. Radiologic examination plays an important role in the diagnosis of pneumoperitoneum and pneumoscrotum

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Diagnostic value of 3D T1-weighted gradient-echo and 2D T1-weighted in-phase and out-of-phase gradient-echo sequences for appendicitis diagnosis in pregnant women.

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

This study compared the diagnostic value of 3D T1-weighted (T1W) gradient-echo (GRE) and 2D T1W in-phase and out-of-phase GRE sequences for appendicitis diagnosis in pregnant women.

Materials and Methods

This retrospective study included 25 pregnant patients with suspected appendicitis who underwent 1.5 Tesla abdominal magnetic resonance imaging and had definitive diagnoses. Four doctors approached four separate imaging groups: A (only T2-weighted image [T2WI] sequences), B (T2WI and 3D T1W GRE sequences), C (T2WI and T1W in-phase and out-of-phase GRE sequences), and D (T2WI, 3D T1W GRE, and T1W in-phase and out-of-phase GRE sequences). The kappa (κ) index was used to compare the appendicitis diagnostic results between groups. The diagnostic value of these sequences in the diagnosis of pregnancy appendicitis was also evaluated.

Results

Groups A and C had average consistency with definitive diagnosis ($\kappa = 0.6$), lower than Groups B and D ($\kappa = 0.865$), indicating a high definite diagnosis consistency. Groups B and D had similarly high sensitivity (80%), specificity (100%), positive predictive value (100%), negative predictive value (95.2%), and accuracy (ACC) (96%), higher than Groups A and C (60%, 95%, 75%, 90.5%, and 88%, respectively).

Conclusion

3D T1W-GRE sequences improve appendicitis diagnosis in pregnancy compared to T2W sequences alone. Adding in and out phase GRE sequences do not increase diagnostic ACC.

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MRI appearance of massive biloma formation due to bile duct injury during cholecystectomy

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

Imaging has important roles in non-invasive evaluation of bile duct injury as a post-cholecystectomy complication. This paper aims to present imaging appearance of two cases of massive biloma formations due to bile duct injury during cholecystectomy.

Materials and Methods

We performed database search using filters "bile duct injury" and "MRI" for the past year. We excluded patient without biloma formation, minimal biloma formation, and follow up imaging for previos history of bile duct injury.

Results

We found two cases of post-cholecystectomy patients with abdominal distension who were suspected of having a bile duct injury. MRI images in both cases showed multiple foci of complex fluid accumulation showing high signal intensity on T1. In one case, a biloma focus filled the entire abdominal cavity. MRI in both cases identified a ruptured portion of the bile duct, the common hepatic duct in both cases.

Conclusion

MRI and MRCP are valuable modality in evaluating the manifestations of bile duct injury and determining the location of the injury.

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The Role of Computed Tomography in the Assessment of Blunt Bowel and Mesenteric Injuries

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

The purpose of this research was to assess the diagnostic accuracy of 16-slice multidetector computed tomography (MDCT) findings in the diagnosis of bowel and mesenteric injuries accompanied by the association of these findings with the treatment strategy

Materials and Methods

A retrospective study was performed on 86 blunt-abdominal-trauma patients, hospitalized at the emergency department of our institution from June 2018 to July 2019 (75 men and 11 women aged 4–76 years old with a median age of 40.88), who had 16-slice MDCT diagnosis of blunt bowel and mesenteric injuries and were treated by nonsurgical and surgical treatment. Ethical clearance was taken from the institute ethics committee with waiver of consent

Results

The specificity of bowel-wall rupture, active extravasation, and reduced bowel-wall enhancement were 100%, 98.15%, and 100%, respectively. Pneumoperitoneum had the highest sensitivity of 83.33%. Bowel-wall rupture, Janus signs, pneumoperitoneum, and mesenteric stranding were significantly correlated with surgical results. The existence of these results improved the likelihood of 7-, 6-, 29- and 3-fold surgical treatment, respectively. Inter-observer consensus was very strong for bowel-wall rupture, active extravasation, bowel hematoma, and pneumoperitoneum

Conclusion

Bowel-wall rupture was the definite sign of bowel injury and its connection with surgical treatment was important. Pneumoperitoneum was not a specific indication of blunt bowel injury; but when this is detected, emergency intervention should be suggested

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Gas in the superior mesenteric artery and cardiac arrest during CT scan in a case of bowel ischaemia

Dr Xin Min Yong

National Cancer Institute, Putrajaya, Malaysia

Abstract Theme

Gastrointestinal Radiology

Abstract Category

Education

Teaching Points

1. Gas in the superior mesenteric artery is a rare finding for mesenteric ischaemia, in contrast to pneumatosis intestinalis and portal venous gas.

2. It is important to recognize the CT indicators of imminent cardiac arrest to help patients receive timely resuscitation. They include pooling and layering of contrast media in the major dependent parts of the venous system.

Background / Outline

The author presents a case of bowel ischaemia in a 73 year-old female with multiple co-morbidities, who had a three-day history of abdominal pain and no bowel opening. On arrival to the Emergency Department, her vital signs were not stable, requiring intubation and inotropic support. Venous blood gas showed lactic acidosis, raising concern for bowel ischaemia, hence CTA abdomen was performed. Her CT imaging findings would be discussed, focusing on the signs of cardiac arrest during CT scan, and the rare finding of gas in the superior mesenteric artery.

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A Rare Case Report: Intrathoracic Gaster, A Rare Type of Hiatal Hernia Diaphragm

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

Intrathoracic gaster is the end stage of a hiatal hernia diaphragm and it is rarely found, accounting 0.3% of all hiatal hernias characterized by abnormal rotation of herniated stomach around a fixed axis. This case report describes radiologic presentation of Intrathoracic Gaster from Contras-Enhanced Computed Tomography (CECT)

Materials and Methods

This is case report of 28 years old male admitted to emergency due to recurrent epigastric discomfort and feeling weak for 3 month. The chest radiography found opacity with air fluid level on the right paravertebra at the level of 7-12th thoracic vertebral bodies, suspicious of diaphragmatic hernia. CECT revealed herniation of the gastric structure, mesenterial fat, gastric vessel to the right hemithorax through the oesophageal hiatus without strangulation. Laboratory showed anemia with low ferritin and serum iron level.

Results

The diagnosis of an intrathoracic gaster should be considered in patients with a fluid level on a chest X-ray. CECT with sagittal, coronal and multiplanar reformation more clearly reveals loss of integrity of the diaphragm and herniated organs through the diaphragm and abnormal rotation of the herniated stomach around a fixed axis. Iron deficiency anemia could be a presenting clinical symptom due to mechanical irritation of the stomach leading to gastric erosions and ulcerations causing occult blood loss.

Conclusion

Contras-Enhanced Computed Tomography is the most effective imaging method due to its short acquisition time and easy application. It is a reliable tool in hiatal hernia diagnosis and has great advantages from other imaging modalities.

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Recurrence prediction for resected hepatocellular carcinoma by integrating radiomic-based surrogates of distinct vascular patterns

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

The distinct vascular patterns, including microvascular invasion (MVI) and vessels encapsulating tumor clusters (VETC), represent the biological aggressiveness of hepatocellular carcinoma (HCC). Imaging surrogates of these vascular patterns potentially helped predict recurrence after resection. Herein, we aim to build a prognostic model integrating imaging-based surrogates of these distinct vascular patterns for predicting postoperative recurrence-free survival (RFS) in HCC.

Materials and Methods

Clinic-radiologic data of 1,285 HCC patients undergoing surgical resection were retrospectively enrolled. A prognostic model using clinical data and imaging-based surrogates of MVI and VETC patterns was developed (n = 297) and externally validated (n = 373) for predicting RFS. The model-predicted RFS score was calculated individually. The imaging-based surrogates (i.e., MVI and VETC radiomics scores) were individually built from preoperative CT using radiomics analysis based on two independent sets (n = 360 and 255), respectively. K-adaptive partitioning algorithm with permutation test was used to divide patients into prognostically distinct subgroups according to the model-predicted RFS score.

Results

The MVI radiomics score and VETC radiomics score demonstrated effective performance in their respective training and independent validation sets (AUC: 0.841-0.892 for MVI and 0.830-0.851 for VETC). The prognostic model incorporating serum alpha-fetoprotein, tumor multiplicity, MVI radiomics score, and VETC radiomics score achieved a C-index of 0.734-0.766 for developing and external validation. Patients have been stratified into three prognostically distinct groups accordingly.

Conclusion

The proposed model integrating imaging-based surrogates of distinct vascular patterns enabled accurate prediction for RFS.

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Sister Mary Joseph Nodule Arising from Undiagnosed Endometrioma: A Case Report

Dr Rida Mumtaz[1], Dr Noreen Rasheed[1], Dr Hamza Rafique[1], Dr Fouzia Rani[1], Dr Muhammad Imran[2], Dr Ammara Saeed Malik[1], Dr Sami Khan[1], Dr Imran Syed[1]

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Education

Teaching Points

1. Clinicians should be mindful of underlying malignancy like Sister Mary Joseph Nodules when evaluating patients with a new or enlarging umbilical lump and should conduct thorough investigations like CT and MRI before opting for surgery.
2. Timely recognition and diagnosis are crucial to manage the underlying malignancy, and misdiagnosis can result in harm and prolonged hospital stay.

Background / Outline

The patient had an outpatient ultrasound scan which indicated a possible hernia or scar tissue in the abdominal wall, but it was unclear if it was a recurrent hernia. A CT scan was done to prepare for urgent surgery to repair the umbilical hernia with or without mesh, but it revealed a soft tissue density lesion in the umbilical region with no apparent abdominal wall defect. The scan also found a large cystic lesion in the left adnexa, believed to be an ovarian cyst, which required further assessment by the gynaecology team. Consequently, the surgical repair plan was cancelled, and an MRI was requested to better characterize both lesions. The MRI revealed a 3.6 cm cyst on the left ovary and a 10mm nodule with a low T2 and high STIR signal at the umbilicus, but the interpretation was limited by significant artifact. The differential diagnosis included a small hernia containing fat or a Sister Mary Joseph nodule. The lump was explored, biopsied, and the cells were confirmed to be consistent with an undiagnosed Endometrioma.

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Omental torsion to omental hernia.

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Abstract Theme

Gastrointestinal Radiology

Abstract Category

Scientific

Objective

The aim of this paper is to study the radiological features of omental torsion to omental hernia. Radiology plays an essential role in accurate preoperative diagnosis and proper management.

Materials and Methods

We describe the ultrasound (US) and computed tomography (CT) findings of this rare disease providing a radiological-pathological correlation of them.

Results

CT scan of the abdomen shows a hazy fat-density mass right side with whirling sign and fibrous tissue around a central vessel. These strands represent blood vessels twisted around a central vascular pedicle. Concentric linear strands and hyperdensity rim suggesting omental infarction. The mass also seen displacement of the bowel loops. Compatible with the histopathology.

US findings with panoramic imaging in omental hernia usually consistent with a hyperechoic, non-compressible, ovoid intra- abdominal mass adherent to the abdominal wall, which is located in the inguinal canal to the upper pole of scrotal.

Conclusion

Omental torsion is a rare cause of acute abdomen as a result of vascular ischemic and infarction of the greater omentum, minimal gastrointestinal symptoms and predisposing factors, such as an omental hernia.

Diagnosis of omental torsion is usually difficult without imaging.

CT scans and US would be helpful to rule out cholecystitis, appendicitis, diverticulitis and acute pancreatitis.

Abdominal CT scan is gold standard, with high accuracy. Surgery with omental resection is the treatment of choice.

Gynaecological Radiology

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Ovarian-Adnexal Imaging-Reporting and Data System (O-RADS) Ultrasound v2018: Prospective validation and comparison to updated classification (v2022) in pathologically confirmed adnexal masses

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Abstract Theme

Gynaecological Radiology

Abstract Category

Scientific

Objective

To evaluate diagnostic accuracy and reliability of the Ovarian-Adnexal Imaging-Reporting and Data System (O-RADS) ultrasound v2018 for the classification of adnexal masses (AMs) and compare the old version with the updated one (v2022).

Materials and Methods

This prospective multicenter study included 855 women with 869 AMs. Three experienced radiologists performed ultrasound examinations and categorized AMs into 4 categories according to the O-RADS v2018. We used histopathology as the reference standard to calculate the diagnostic accuracy of the O-RADS for predicting malignant AMs. The Fleiss kappa (κ) test was used to evaluate the interrater agreement (IRA) of the O-RADS scoring results. Furthermore, we retrospectively analyzed the images and gave the O-RADS v2022 classification.

Results

The final analysis included 188 (21.6%) malignant and 681 (78.4%) benign AMs. Of the 399 AMs categorized as OR-2, two were malignant; of the 227 AMs categorized as OR-3, eight were malignant; of the 103 AMs categorized as OR-4, 49 were malignant; of the 140 AMs categorized as OR-5, 129 were malignant. Considering AMs classified as OR-4 and OR-5 as predictors for malignancy, the sensitivity, specificity, and accuracy were 97.8% and 97.5%, 94.2% and 96.4%, and 96.6% and 97.3% for O-RADS v2018 and v2022, respectively. Overall IRA was good for O-RADS v2018 (κ=0.75) and was slightly lower than that of the version 2022 (κ=0.78).

Conclusion

The O-RADS v2018 has good diagnostic accuracy for predicting malignant AMs. O-RADS v2022 has slightly higher accuracy and specificity than O-RADS v2018. The IRA was good for both versions.

Hepatobiliary and Pancreatic Radiology

22

Give Me Neither Poverty Nor Riches: Contrasting Cases of Hypo- and Hyperdynamic Portal Circulation from Rare Congenital Hepatic Vascular Anomalies in Children

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National University Hospital, Singapore, Singapore

Abstract Theme

Hepatobiliary and Pancreatic Radiology

Abstract Category

Education

Teaching Points

Clinical manifestations, imaging features and management of presented congenital hepatic vascular anomalies - Abernethy malformation and extrahepatic arterioportal fistula.

Background / Outline

Altered flow in the portal circulation is not uncommon in adults, typically observed in the setting of cirrhosis or from myriad other acquired causes including thrombosis and malignancy. Abnormalities in portal flow are comparatively rare in the paediatric population, and cases caused by congenital vascular anomalies are even more so.

This pair of paediatric companion cases of congenital hepatic vascular anomalies resulting in hypo- and hyperdynamic portal circulation showcases contrasting clinical and imaging features between them. It also illustrates implications of altered portal flow for the developing body which differ from those in adults. The first case is a teenage patient with congenital absence of portal vein or Abernethy malformation, incidentally noted on CT and further imaged on MRI after initial presentation for unrelated complaints. The second is a neonatal patient with extrahepatic arterioportal fistula between the inferior epigastric artery and intrahepatic portal vein imaged on US, CT with 3D reconstructions and conventional angiography, who presented precipitously with frank gastrointestinal haemorrhage.

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Solid Pseudopapillary Tumour of Pancreas: A Case Report

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Abstract Theme

Hepatobiliary and Pancreatic Radiology

Abstract Category

Education

Teaching Points

1. Solid pseudopapillary tumours (SPTs) are a rare type of pancreatic tumour, mainly affecting young women and often discovered incidentally on imaging scans. Surgical removal of SPTs confined to the pancreas is highly effective, with over 95% cure rate. However, if the tumours spread beyond the pancreas, distant metastases can occur.

1. Diagnosis of SPTs can be challenging, and a multidisciplinary approach involving imaging, biopsy, and surgical management is necessary. Despite distant metastases, SPT patients generally have a favourable overall survival rate.

Background / Outline

A 46-year-old woman presented to her general practitioner with fatigue, high blood pressure, indigestion, and feeling full. An abdominal ultrasound revealed an 81 x 88 x 123mm solid cystic mass on the pancreas. A CT scan showed a 139mm exophytic cystic mass on the neck, body, and tail of the pancreas, contacting the SMV and portal vein, and a small 13mm subcapsular nodule on the liver.

The regional liver and hepatobiliary MDT recommended endoscopic ultrasound, which suggested a large pancreatic pseudocyst with high lipase, low CEA, and benign cytology. An MRI revealed a large exophytic mass of pancreatic origin, and a solid pseudopapillary neoplasm was suspected. The cyst is kept under surveillance unless new symptoms arise.

Interventional Radiology

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Iatrogenic Renal Injuries - an IR Standpoint

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Khoo Teck Puat Hospital, Singapore, Singapore

Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

Iatrogenic renal injuries could be easily missed and mismanagement may result in serious consequences.

Background knowledge of the renovascular anatomy and following meticulous safety standards are of paramount importance in avoiding injuries.

The poster highlights the importance of careful patient selection, proper technique, and close monitoring during and after procedures to minimize the risk of renal injury.

Background / Outline

Although polytrauma is the commonest cause of renal injuries, iatrogenic injuries are increasingly becoming common with the widened scope of genitourinary interventions in recent times. Unlike polytrauma where the blunt injury is a predominant pattern, most iatrogenic injuries are penetrating in nature. Other than biopsy, the commonest cause of iatrogenic injury, renal injuries are also encountered in the setting of ablations, percutaneous nephrostomy, ureteric stenting and angioplasty & stenting.

There is a wide spectrum of presentations that can be classified as vascular and nonvascular. The vascular presentations include arterial/venous bleeding, pseudoaneurysm, AV fistula and multifocal subcapsular bleed secondary to capsular separation. Nonvascular presentations include collecting system injury, urinoma, secondary infection, and reduced renal function from the mass effect associated with hematoma/urinoma.

The majority of iatrogenic injuries are largely managed conservatively. However, some of the cases may need endovascular and endourological procedures. Only rarely is open surgical management warranted. The educational poster is aimed at emphasising various manifestations of iatrogenic renal injuries using case examples. Interventional radiologists and clinicians should be familiar with the various presentation and should have a high index of suspicion for timely detection and proper management of these complications.

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Endovascular Salvage via Penile Arterial Embolization for High-Flow Priapism (HFP)

Dr Si Zhao Tang, A. Prof Anil Gopinathan

NUHS, Singapore, Singapore

Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

Review on endovascular treatment for high-flow priapism (HRP), followed by a case presentation of HRP which was treated successfully via penile artery embolization.

Materials and Methods

A systematic search using combinations of keywords: [PRIAPISM] AND [ENDOVASCULAR] between 1990 to 2023 in PubMed was performed. The studies were then screened based on title and abstract to be included for selected analysis. References from the included study were reviewed as well.

For our case report, patient consent for research participation was obtained prior to endovascular treatment.

Results

Total of 11 studies reported >5 treated patients were included. 117 cases with patient mean age of 30 years were reported. The average technical success rate was 99% (93-100%). Average 88% (56-100%) achieved clinical resolution. There were no reported periprocedural major adverse events. Recurrence rate of 21% was observed. 4 patients underwent surgery. 15% of patients developed erectile dysfunction (ED).

In our case, a 29-year-old patient presented with post-traumatic HRP which persisted for a few days despite conservative treatment. US and angiogram demonstrated arteriocavernosal fistula on the left. Selective microcatheter cannulation of the penile arterial feeding branch followed by retrograde coiling in from the point of feeding branch was performed. Final check angiogram was satisfactory and HRP was resolved with no recurrence. There was no periprocedural adverse event.

Conclusion

Penile arterial embolization with absorbable/non-absorbable agents is a safe and effective treatment for HRP.

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Safety and Clinical Outcomes in Endovascular Treatment for Symptomatic Cerebral Venous Thrombosis: Single-center Experience with Meta-analysis

Dr Mingxue Jing, Dr Si Zhao Tang, Dr Leonard Yeo, A. Prof Anil Gopinathan, Dr Cunli Yang, Dr Benjamin Tan

NUH, Singapore, Singapore

Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

The role of mechanical thrombectomy (MT) in cerebral venous sinus thrombosis (CVT) is ambiguous. This study aims to share our experience with MT in CVT, supplemented by a meta-analysis on this treatment.

Materials and Methods

We conducted a retrospective review of all the patients who underwent MT for CVT at our institution between 2016 and 2021. This case series was reviewed for the treatment indications, techniques employed, success and complication rates, as well as the clinical outcomes. A meta-analysis on the clinical and safety outcomes of MT in CVT was then performed including published studies with sample size larger than 10 patients.

Results

15 patients were included in this study. All had venous haemorrhage or clinical deterioration despite anticoagulation therapy. MT was performed using aspiration (with wide bore catheters) in 7 patients, aspiration with stentretriever in 5 and transjugular Fogarty-balloon thrombectomy in 3 patients. Adjunctive intra-sinus thrombolysis (IST) was used in 4 cases and venoplasty in 3. Technical success, defined as restoring antegrade venous flow on arterial injection was 100% with no procedure-related major complication. Direct transjugular approach was less costly and faster. At 3-month follow-up 86 % of patients had good outcomes (mRS <2). Meta-analysis of clinical and safety outcomes from 22 and 20 studies respectively, demonstrated a positive association between MT and good clinical outcomes without significant association with hazardous periprocedural events.

Conclusion

Based on our series and meta-analysis, MT for CVT is feasible and safe. In addition, our experience shows that trans-jugular Fogarty balloon embolectomy seems to be a potential cost-saving option.

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Ruptured intracranial mycotic aneurysm from *Streptococcus suis* endocarditis: A case report

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

- This is the rare presentation of cerebral mycotic aneurysm caused by *Streptococcus suis*.
- Endovascular treatment with parent artery occlusion is the mainstay therapeutic option among medication-unresponsive patients.

Background / Outline
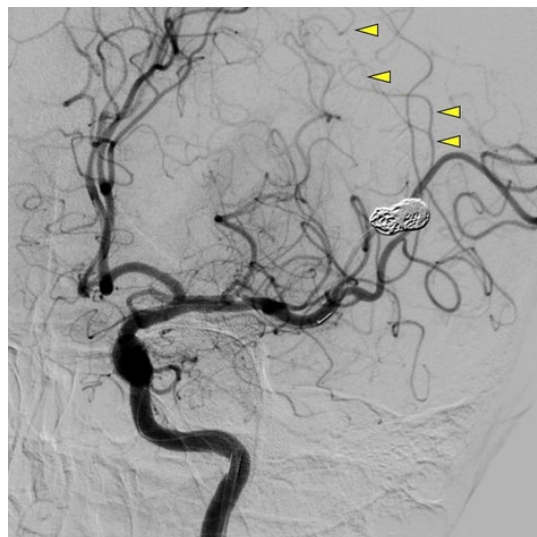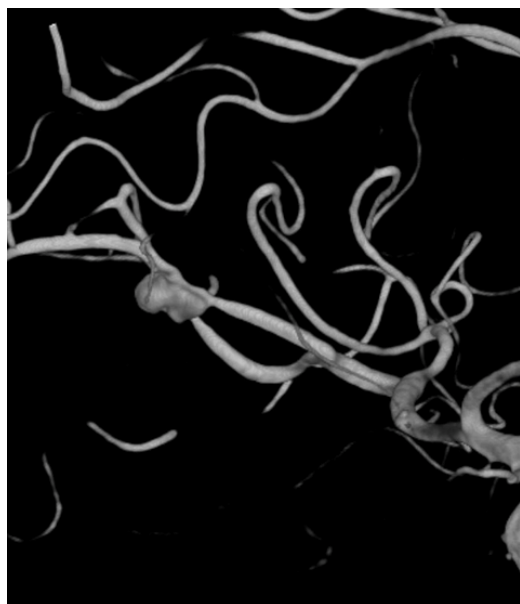
Reports of cerebral *Streptococcus suis* mycotic aneurysms are rare. This emerging zoonotic infection is transmitted from pigs. Clinical characteristics include meningitis, septicemia, and endocarditis. Infective endocarditis associated with septic emboli results in arteritis and subsequent mycotic aneurysm.

We report a case of a 38-year-old man diagnosed with *Streptococcus suis* endocarditis with a history of undercooked pork ingestion. The causative agent was isolated from blood and CSF cultures. After the patient received a combination of parenteral ampicillin and gentamicin for 2 weeks, he complained of a right frontal headache. Intracerebral and subarachnoid hemorrhage were demonstrated by CT scan. CT angiography showed a left M2 MCA aneurysm, which rapidly grew from 3 to 10 mm within 2 weeks despite susceptible antimicrobial treatment. He was referred for endovascular treatment after antibiotic failure.

Digital subtraction angiography revealed a multilobed left M2 superior division MCA aneurysm measuring 9.6 x 11 x 6 mm with a 1 mm neck and collateral supply to an anterior parietal branch. A 6Fr Guider catheter was positioned in the petrous left ICA, through which a 1.7Fr straight tip microcatheter was advanced over a 0.014" microguidewire across an aneurysmal neck, and then transarterial simple coil embolization was performed. Postprocedural angiography demonstrated occlusion of an aneurysm while preserving collateral circulation.

The patient's postoperative course partially improved his neurologic status without regrowth of an aneurysm.

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Stent-Assisted Coil-Jailing Technique on a Renal Transplant Recipient with Multiple Pseudoaneurysms

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

Pseudoaneurysm is a potential complication following kidney transplantation surgery. This case report presents a successful implementation of the stent-assisted coil-jailing technique on a renal transplant recipient with pseudoaneurysm post-surgery. Additionally, an analysis of the effectiveness of this treatment will be analyzed.

Materials and Methods

A 74-year-old male with chronic kidney disease had received routine hemodialysis since 2017. The identified underlying diseases were known to be hypertension and diabetes that were treated for approximately a decade. The patient was referred due to difficulty in micturition accompanied by pain in the inguinal region. Physical examination showed bruising on the right inguinal region near the surgical site. CT scan and CT-angiography revealed an active bleeding at the anastomosis of right external iliac and renal artery due to a ruptured multiloculated pseudoaneurysm. The patient underwent emergency coiling to stop the bleeding while preserving vascularization to the allograft kidney using a bilateral transfemoral approach using a 5 mm x 100 mm vascular stent and 12 coils with varying diameters ranging from 5 mm to 7 mm and lengths ranging from 10 cm – 20 cm.

Results

After the procedure, diagnostic angiography was performed, showing obliteration of the pseudoaneurysms with patent lumens of the allograft renal artery and right external iliac artery.

Conclusion

The stent-assisted coil-jailing technique can be an effective approach and viable treatment option for the management of multiple pseudoaneurysms' as a complication following kidney transplantation.

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Comparative analysis of different stent retrievers used in the endovascular treatment of acute ischaemic stroke: Single centre experience

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SGH, Singapore, Singapore

Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

Few studies have done direct comparison of different stent retrievers (Solitaire vs Trevo vs Embotrap) used in endovascular treatment for acute ischaemic stroke, especially in an Asian population. There is a significantly higher prevalence of intracranial atherosclerosis causing acute ischaemic stroke in Asian patients. This may impact on the efficacy and safety of the various stentrievers.

Materials and Methods

Our study includes all patient who underwent endovascular thrombectomy using either the Solitaire, Trevo or Embotrap stent retrievers for anterior circulation ischemic stroke. Primary endpoint measures of stent efficacy include first-pass effect (FPE), number of passes and final vessel recanalization grade. Safety of the devices were analyzed by hemorrhagic and device-related complications. Clinical outcomes of patients that have undergone endovascular treatment with stent retriever also analyzed by means of modified Rankin scale (mRS) during admission and at 90 days.

Results

Preliminary analysis includes 115 patients who underwent endovascular treatment with stent retrievers: Solitaire n=57, Trevo n=41, Embotrap n=17. Primary endpoint measures indicate highest FPE with Embotrap. Rest of the primary endpoints did not show statistical difference between the various stents. No significant difference in safety outcomes between the stents.

Conclusion

Preliminary conclusion - Embotrap has the highest FPE in our single centre dataset. No other significant difference in the other primary endpoints or safety outcomes between stents.

Clinical outcomes to be finalized before oral/poster presentation and included in the abstract.

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Cognitive Improvement Post-Endovascular Treatment of Intracranial Dural Arteriovenous Fistula: A Prospective Study

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SCTIMST, Thiruvananthapuram, India

Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

Dural arteriovenous fistulas (dAVFs) are abnormal communication of the meningeal arteries supplying the dura with venous sinuses, meningeal veins or cortical veins of the brain.(1)(2) It presents with variety of symptoms ranging from headache to dementia and intracranial hemorrhage. (1)

Although few case series have been published in the literature depicting the reversible nature of dementia post endovascular treatment, the sample sizes of these series were relatively small.(2,3,4,5,6)

This study aims to study the cognitive abnormality in patients with dural arteriovenous fistula and its change post treatment at a centre treating dAVFs.

Materials and Methods

Dural AVF patients who presented in the institute between 2016-2022 and underwent treatment were included in the study. All the patients underwent pretreatment cognitive assessment using MMSE and Addenbrooke's score followed by endovascular embolisation of the fistula. Post embolisation patients underwent cognitive assessment after 1 month and 1 year interval. All patients who either did not receive treatment were excluded from the study. Ethical approval was taken from the institute ethics committee.

Results

A total of 33 patients with 1 month follow up and 15 patients with 1 year follow up were included in the study. The mean 1 year pre and post treatment MMSE was 23.15 and 27.3 respectively. Mean change of MMSE and addenbrooke's score post embolisation were +3.333 (range 0-15, p= 0.0001) and +12.4 (range 2-42,p=0.0011) respectively.

Conclusion

We found significant improvement in MMSE and addenbrooke's score in intracranial dAVF patients after endovascular embolisation of the fistula site.

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**Contrast Enhanced Ultrasonography
(CEUS) transformed Liver Directed
Therapy in our Practice - How and Why?**

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

1. CEUS allows for reliable visualization and targeting of ablative therapy to HCC and non-HCC lesions in the liver.

2. CEUS can be a crucial problem solver to aid in the diagnosis and management of complex Liver Tumors.

3. CEUS is relatively easy, quick and inexpensive to implement into any Interventional Radiology practice.

Background / Outline

CEUS has become a critical tool for liver directed therapy in our practice at a non-academic tertiary community healthcare system. Major benefits include increased diagnostic confidence with improved spatial tracking, improved patient experience, faster access to treatment, reduced dependance on resource heavy modalities and reduced system costs.

Wide adoption of CEUS in Radiology has been challenging due to a steep learning curve and it's use has been limited to larger academic facilities. Yet, our experience has been that it is possible to flatten the curve and modify CEUS for use in interventional radiology in a relatively simple manner. Significantly improved outcomes have led our MDT to make a significant change to our patient management algorithm.

We share 5 of our recent cases of CEUS directed therapy, each illustrating one of the key benefits listed above along with a short summary of useful 'tips and tricks' that we were able to implement in our practice.

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Radiation Doses in Management of Abnormal Placentation with Preoperative Endovascular Internal Iliac Artery Balloon Occlusion

Mr Hee Shen Ho[1], Mr Yong Heng Tay[1], Ms Hui Qi Lai[1], Ms Hongfang Xiong[1], Dr Matthew William Lukies[1], Dr Sivanathan Chandramohan[2], Dr Luke Han Wei Toh[1]

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

The objective of this retrospective study is to evaluate the radiation dose received during the preoperative balloon placement procedure; and to check whether is it safe for both the mother and the foetus under international guideline.

Materials and Methods

We collated data from 60 patients with the preoperative diagnosis of placenta accreta and its variants who underwent preoperative placement of internal iliac occlusion balloons at our institutions over a period of 7 years, between June 2010 to September 2017.

Intermittent low dose x-ray fluoroscopy (3.75 frames per second) were only used to check placement of guidewires, catheters, Fogarty balloon catheters and appropriate balloon inflation volume throughout the procedure.

Results

All mothers received less than 100 mSv of radiation while 55 out of 60 foetuses received less than 100 mGy of radiation. Most foetuses and mothers received radiation doses less than the International Commission on Radiological Protection's (ICRP's) recommended safe dose level of 100 mGy.

For the 5 outliers, where the foetus dose is higher than the safe dose level, there was a few factors causing such results. One would be the usage of digital subtraction angiography (DSA) acquisition more frequently to check the pelvic vasculature. However, the high dose trend is mainly observed during the early years of the study phase, suggesting a possible learning curve effect.

Conclusion

Radiation dose for both the mother and baby is within the safe limits, as prescribed by the ICRP during the preoperative internal iliac artery occlusion balloon placement procedure.

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Cryoablation for recurrent pubic ramus metastasis complicated by delayed Cutibacterium avidum Infection: A case report

Dr Farhan Ishraq, Dr Alfred Bingchao Tan, Dr Nanda Venkatanarasimha, Dr Leong Sum

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

In eccrine gland-rich areas, we recommend cutaneous antisepsis using benzyl peroxide and prophylactic antibiotics with anaerobic coverage to reduce the incidence of C. avidum infections.

Background / Outline

We present a case of a 59-year-old male with hepatic haemangioendothelioma who underwent segmentectomy in August 2019. In October 2020, he presented with metastatic liver recurrence which was treated with microwave ablation. A year later, he was diagnosed with a biopsy-proven left superior pubic ramus metastasis, which was treated with cryoablation. However, six months after the initial cryoablation, local recurrence was observed in the left superior pubic ramus metastasis extending to the right pubic ramus. The patient underwent further multiprobe cryoablation under general anaesthesia.

Three months after the cryoablation, the patient presented with left-sided inguinal swelling and discharge from an underlying sinus. Computed tomography (CT) showed a soft tissue collection superficial to the pubic symphysis. This was subsequently targeted for aspiration. Cloudy fluid was aspirated. Cutibacterium avidum was isolated. The patient was initially treated with clindamycin due to penicillin allergy however this was poorly tolerated. Cephalexin and metronidazole were given instead. The discharge subsided and follow-up CT 2 months later showed resolving collection.

C. avidum is a common skin commensal. Up to 51% of the population is colonized by it in eccrine gland-rich areas such as the groin and axilla. Moreover, 20% remain viable after standard pre-operative cutaneous antisepsis using chlorhexidine and betadine. The standard antibiotic prophylaxis for musculoskeletal interventional radiology procedures, such as first-generation cephalosporin, is inadequate as C. avidum is an anaerobic organism.

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A Pictorial Review of Malpositioned Non-Vascular Interventional Devices in the Abdomen

Dr Mark Yee Meng Tang, Dr Alfred Bingchao Tan, Dr Mark Qi Wei Wang, Dr Chow Wei Too, Dr Richard Hoau Gong Lo, Dr Apoorva Gogna, Dr Nanda Kumar Venkatanarasimha, Dr Sivanathan Chandramohan

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

Describe the malpositioning of various intra-abdominal, non-vascular devices used in interventional radiology on multi-modality diagnostic imaging.

List potential acute and chronic complications related to these devices.

Accurate and early recognition of their abnormal presentations can prevent significant morbidity.

Background / Outline

Malposition of the below devices will be discussed and illustrated based on the lessons learned from quality assurance rounds.

1. Drainage catheters (e.g. biliary, nephrostomy, peritoneal)
2. Ureteric stents
3. Cholecystostomy
4. Percutaneous gastrostomy
5. Percutaneous transhepatic biliary drainage (PTBD)
6. Biliary and gastrointestinal stents (gastric outlet, duodenal, colorectal)

Retrospective review of patients who underwent interventional radiology procedures at the Department of Vascular and Interventional Radiology, Singapore General Hospital.

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Artificial Intelligence-Guided Segmentation and Path Planning Software for Transthoracic Lung Biopsy

Mr Khi Yung Fong[1], A. Prof Chow Wei Too[2,3,4], Dr Guanqi Hang[2], Dr Takafumi Sato[5], Ms Chiaw Qing Nyam[6], Dr Siang Huei Leong[6], Dr Ka Wei Ng[6], Dr Wei Lin Ng[7], Dr Tatsuya Kawai[8]

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

To evaluate the efficacy of lesion detection and optimal path planning for lung biopsies using a 3-Dimensional Convolution Neural Network (3D-CNN) artificial intelligence (AI) software.

Materials and Methods

Retrospective computed tomography (CT) scans from three hospitals were obtained for this study. This study consisted of two phases. In the lesion detection phase, 2147 nodules in 219 patient scans were used to develop and train the deep learning 3D-CNN to detect lesions. Performance of lesion detection was validated with 235 patient scans (containing 354 lesions) for sensitivity and specificity; area-under-the-curve (AUC) analysis of receiver operating characteristic curves was also performed. In the path planning phase, which involved 150 patients, the system utilized Bayesian optimization to propose needle trajectories for lesion biopsy, while avoiding vital structures (bone, lung fissures, airways, and vessels). Software-proposed needle trajectories compared against actual biopsy path trajectories obtained from intraoperative CT scans, with a match defined as angular deviation of <5 degrees between the two.

Results

The 3D-CNN achieved an overall AUC of 97.4% (95%CI=96.3-98.2%) for lesion detection, with a mean sensitivity of 93.5% and mean specificity of 93.2%. Software-proposed needle trajectories achieved an overall 82.0% match with actual biopsy needle trajectories, with similar performance between supine and prone/oblique patient orientations (p=0.311). Average angular deviation between matching trajectories was 2.30±1.22o; average path deviation was 2.94±1.60mm.

Conclusion

Segmentation, lesion detection and path-planning for CT-guided lung biopsy using an AI-guided software showed promising results. Future integration with automated robotic systems may pave the way towards fully automated biopsy procedures.

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Converting an interventional radiology outreach educational programme into a virtual platform during the COVID-19 pandemic: The APSCVIR Experience

Dr Joemel Francisco[1], Ms Deborah Halim[2], Dr Yasuaki Arai[3], Dr Andrew Holden[4], Dr Luke Toh[5], Dr Lik-fai Rickie Cheng[6], Dr Bien Soo Tan[1]

[1]Singapore General Hospital, Singapore, Singapore. [2]Asia Pacific Society of Interventional Radiology Secretariat, Singapore, Singapore. [3]National Cancer Center, Tokyo, Japan. [4]Auckland City Hospital, Auckland, New Zealand. [5]KK Women's and Children's Hospital, Singapore, Singapore. [6]Princess Margaret Hospital, Kowloon, Hong Kong

Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

To describe how an interventional radiology (IR) outreach educational programme was converted into a virtual platform and to analyse the viewership impact of the programme.

Materials and Methods

Prior to the COVID-19 pandemic, APSCVIR ran in-person IR workshops as part of its outreach initiative. During the pandemic, virtual workshops were organized from December 2020 onwards. After each virtual session, recordings of these sessions were posted online via a link from the APSCVIR website. Viewer attendances and viewing statistics of these live and online sessions were analysed to understand the impact of the virtual platform for IR education.

Results

From December 2020 to December 2022, a total of 10 virtual seminars were organized. Four of the sessions were in collaboration with the Japanese Society of Interventional Radiology. The other 6 were solely organized by APSCVIR.

Data from these 6 sessions were analysed. A total of 881 attendances were recorded during the live sessions (mean: 146.8, range: 116 - 188). Countries with most number of live participants were Indonesia and Pakistan. For seminars posted online, mean viewership was 258 (range: 130-461), with a mean viewership of 35.8 hours. Link access to these were mainly via WhatsApp, Facebook and Gmail.

Conclusion

Virtual platforms for education flourished during the pandemic. Organising these virtual sessions in IR entailed a steep learning curve. Our experience shows that IR educational programmes are feasible and are able to reach out to lower resourced communities where IR has potential to develop further.

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Deep learning-based auscultation models for diagnosing arteriovenous fistula/graft stenosis assessed by angiography in hemodialysis patients

Mr I-No Cheng[1,2], A. Prof Yao-Chia Shih[2], Dr Pen-Chih Liao[1], Dr Yen-Wen Wu[1]

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

This study aims to establish a deep auscultation model using digital acoustic features to detect arteriovenous fistula/graft (AVF/AVG) stenosis in the end-stage renal disease (ESRD) patients.

Materials and Methods

127 ESRD patients who underwent the long-term hemodialysis via AVF/AVG and required percutaneous transluminal angioplasty (PTA) were enrolled into this study. The patients were divided into AVF and AVG groups based on their vascular access types. Digital auscultation patches were placed at the stenotic site before and after PTA, and Mel Frequency Cepstral Coefficients (MFCC) were acoustic features of digital auscultation recordings. The ground truth is that the degree of AVF/AVG stenosis ≥ 50% was clinically assessed by angiography. Two deep learning models, convolutional neural network (CNN) and deep neural network (DNN), were trained using the MFCC features, which represent the time-frequency characteristics of bruits.

Results

The accuracies of both CNN- and DNN-based models for detecting AVF/AVG stenosis were over 70%. The DNN model outperformed the CNN model with 73% and 77% accuracy for detecting AVF and AVG stenosis, respectively. The DNN model also had the best sensitivity of 83% in the AVG group, and the best specificity and precision of 92% and 83% in the AVF group.

Conclusion

This study shows the feasibility of predicting AVF and/or AVG stenosis using deep learning models based on auscultation sounds. It sheds light on developing low-cost portable or wearable devices utilizing artificial-intelligent models that can benefit hemodialysis patients.

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Improving Transcatheter Embolization for Pulmonary Arteriovenous Malformations: Four Cases Report and Review of Literatures

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

Transcatheter embolization is documented as first-choice treatment for pulmonary arteriovenous malformations (PAVMs). In this cases report, we share our experience for consecutive 4 PAVMs embolization cases in recent 5 years.

Materials and Methods

Case 1 was a 17 y/o male with multiple bilateral PAVMs and two big PAVMs were embolized with detachable and pushable coils. During the procedure, a pushable coil was dislodged and migrated into mitral annulus of left heart and entrapped by tendinous chords. Case 2 was a 43 y/o male with bilateral PAVMs, which were embolized with detachable and pushable coils using double catheters technique for better coils tangling and preventing coil dislodge. Case 3 was a 56 y/o female with bilateral PAVMs was underwent two-staging embolization of her 4 PAVMs with type 4 Amplatzer vascular occlude, detachable and pushable coils. Case 4 was a 24 y/o female with multiple bilateral PAVMs and 4 big PAVMs were embolized with type 4 Amplatzer vascular occluder, detachable and pushable coils.

Results

Case 1 showed stable position of the dislodged coil and without associated clinical symptom/sign. All 4 cases showed gradually improvement of clinical symptoms and room air O2 saturation, and followed-up chest X-ray or CT showed no evidence of recurrent of the treated PAVMs.

Conclusion

With proper flush system setup, IV heparin used, embolizing devices selected and adequate dense packing of very distal feeding artery of PAVMs, transcatheter embolization can be safe, effective and with low recurrent rate for PAVMs treatment.

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Complications of totally implantable venous access device: NUH VIR single centre experience

Dr Chee Woei Yap, Dr Amos Tan, Dr Jimmy Tun Kyaw, Dr Shao Jin Ong, Dr Pavel Singh, Dr Cunli Yang, Dr Rahul Lohan, Dr Kamarjit Singh Mangat, A. Prof Anil Gopinathan, Dr Prapul Chander Rajendran

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

1. Knowledge of the normal radiographic appearance of the totally implantable venous access device is essential for day-to-day reporting.
2. Knowledge of various complications that can occur during and after placement of totally implantable venous access device.

Background / Outline

Totally implantable venous access device is commonly known as Chemo-port or Port-A-Cath in our local setting. It is an implantable close-system central venous catheter with an attached port chamber, which is implanted into the subcutaneous space, usually in the upper chest. It can be used for chemo drugs administration, parenteral nutrition and other intravenous drug infusions, blood transfusion as well as blood taking/ sampling.

Totally implantable venous access device improves patient's quality of life with a much lower infection rate compared to the non-totally implantable central venous catheter systems, for example, the tunnelled and non-tunnelled central venous catheter.

The complications can be categorized into immediate and delayed.

Examples of immediate complications are arterial injury, pneumothorax, hemothorax, and air embolism during the port implantation and malposition of the catheter which can happen during the procedure or later. Delayed complications are infection, wound dehiscence, catheter thrombosis, vessel thrombosis, catheter fracture, and migration of the catheter.

Most of the complications can be detected on imaging (radiograph and CT). A thorough assessment of the port chamber orientation, catheter continuity, and the tip position on the radiograph and CT is key for early detection of complications and plan for any intervention if necessary.

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Lessons Learnt From Management of Radiologically Inserted Gastrostomy Complications

Dr Sarah Neo[1], Dr Nanda Venkatanarasimha[2], Dr Sivanathan Chandramohan[2], Dr Alexander Sheng Ming Tan[2], Dr Tseng Hui Heng[2], Dr Gerald Zhi Xue Low[2], Prof Bien Soo Tan[2], A. Prof Farah Gillan Irani[2], Dr Zehao Tan[2], Dr Shaun Xavier Ju Min Chan[2], A. Prof Apoorva Gogna[2], Dr Alfred Bingchao Tan[2]

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

Recognising common and uncommon complications of radiologically inserted gastrostomy (RIG)

Delineate treatment options for RIG-related complications.

Sharing valuable lessons learnt from quality assurance rounds aimed at preventing RIG-related complications.

Background / Outline

RIG is usually performed on individuals who require support for feeding and nutritional needs. Complications associated with RIG can range from pain at the access site to life-threatening conditions such as perforation and bleeding, but overall complication rates are low and most are self-limiting. Mortality associated with RIG remains rare.

Common complications include pain, bleeding around tube site, and infection, while less commonly faced complications include pericatheter leakage, tube dislodgement, and injury to organs such as the posterior gastric wall, colon, diaphragm, and the gastroepiploic vessels. Radiographs and imaging techniques such as cone-beam CT and standard CT are beneficial in identifying most of these complications.

This educational review discusses the various clinical, medical, minimally invasive and surgical methods used at our institution to manage such cases. Also, lessons learnt from our quality assurance rounds for the prevention of these complications will be explored.

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Hybrid Endovascular-Surgical Management of Iliac Artery Injury in an ECMO Patient: A Unique Vascular Case.

Dr Sarah Neo[1], Dr Nanda Venkatanarasimha[2], Dr Alfred Bingchao Tan[2]

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[2]Singapore General Hospital, Singapore, Singapore

Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

To appreciate the appearances of arterial blood flow in an ECMO patient during catheter angiography

Radiological interpretation of vascular damage and vessel patency in a patient on ECMO support

Treatment approach to iliac artery injury in an ECMO patient.

Background / Outline

We described a rare case of a patient on ECMO support who was referred for endovascular treatment of a left common iliac artery injury.   This is a 63-year-old patient who developed new symptoms of left acute limb ischaemia following ventricular tachycardia ablation. The postulated reason for the limb occlusion was either due to iatrogenic arterial injury following removal of the intra-arterial blood pressure pump or from embolism secondary to recent ablation.

The initial duplex ultrasound shows extensive clot occlusion from the aorta down to the lower limb.

Following left groin cut down and surgical embolectomy, an intra-operative catheter angiogram was performed which revealed an intimal injury of the left common iliac artery.

In this educational case review, we describe our approach to performing the diagnostic angiogram and interpretation of flow direction and velocity whilst on ECMO support, including our decision on the choice of stenting to deal with the iliac vessel injury.

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Mechanical thrombectomy for septic cerebral embolism secondary to infective endocarditis.

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

Endovascular mechanical thrombectomy is a viable treatment for septic cerebral embolism resulting in acute ischaemic stroke. In the case we present, the patient had undergone mechanical thrombectomy under conscious sedation due to concern of haemodynamic stability in the setting of infective endocarditis bacteraemia. We also highlight the use of a catheter with larger lumen resulted in successful revascularisation of the occluded artery.

Background / Outline

Septic cerebral embolism is one of the most frequent non-cardiac complication in patients with infective endocarditis. Septic cerebral emboli could result in ischaemic strokes, brain abscess, haemorrhagic transformation and mycotic aneurysms. The use of thrombolytic therapy in patients with acute ischaemic stroke secondary to septic embolism is not recommended due to the increased risk of intracranial haemorrhage. Endovascular mechanical thrombectomy is a viable treatment as it has been shown to have good rates of recanalisation. We present a case of infective endocarditis complicated by septic cerebral embolism resulting in acute ischaemic stroke which was successfully treated with mechanical thrombectomy.

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Extended 5-Year Amputation and Survival Outcomes From SINGAPACLI: A Randomised Clinical Trial Comparing Drug-Coated Balloon to Conventional Balloon Angioplasty for Below-the-Knee Arteries in Critical Limb Ischemia

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

The Singapore Infra-Genicular Angioplasty with Paclitaxel-eluting Balloon for Critical Limb Ischemia (SINGA-PACLI) trial {1} is a randomised clinical trial comparing drug-coated balloon angioplasty (DCBA) to conventional (uncoated) percutaneous transluminal angioplasty (PTA) for below-the-knee (BTK) lesions in patients with chronic limb-threatening ischemia. We sought to assess the long-term safety outcomes of the SINGA-PACLI trial by analysing the 5-year freedom from major amputation, survival and amputation-free survival (no amputation or death) in trial participants.

Materials and Methods

The SINGA-PACLI trial recruited and randomised 138 participants across two centres in a 1:1 ratio to either DCBA or PTA treatment. After obtaining additional consent for study period extension to 5 years (beyond the original 1-year follow-up), 112 participants were analysed with Kaplan-Meier analysis.

Results

There was no significant difference between both groups for freedom from major amputation (DBCA vs PTA: 70.8% vs 79.7%, logrank $p = 0.43$; HR 1.39, 95% CI 0.61 – 3.16), survival (DBCA vs PTA: 37.5% vs 42.3%, log-rank $p = 0.69$; HR 1.11, 95% CI 0.65 – 1.91) and amputation-free survival (DBCA vs PTA: 32.9% vs 40.0%, log-rank $p = 0.29$; HR 1.31, 95% CI 0.79 – 2.17) at 5-year follow-up.

Conclusion

There was no significant difference in the risk of death and major amputation between the DCBA and PTA arms in the SINGA-PACLI trial at 5 years follow-up.

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Aggressive dural arteriovenous fistulas: Characteristic and treatment result in relation to craniospinal epidural venous anatomical bases and embryology consideration

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

The objective to evaluate the characteristics and treatment outcome of aggressive type dAVFs in each group of anatomical bases and germ cell layers bases classifications, and to assess the correlation between shunt multiplicity features in aggressive dAVFs

Materials and Methods

From 2017 to 2022, a retrospective study was conducted to review all patients diagnosed with dAVF. Data collection including patient characteristics, shunt characteristics, clinical presentation, treatment options, complication and result of treatment were analyzed. The dAVFs shunt was classified into ventral, dorsal and lateral epidural groups. Also, it was classified into neural crest and mesoderm group depending upon germ cell layers bases.

Results

There were 111 patients diagnosed with dAVFs. The dorsal group was the most common of anatomical shunt location for the aggressive dAVFs, demonstrated on 53 patients (67.9%) and 65 shunts (67.7%). The dorsal group exhibited the highest percentage of venous outflow restriction (90.7%). Out of the 35 patients who had multiple shunts, 36 of the shunts were of the aggressive type in the dorsal epidural group. The neural crest origin and mesoderm origin showed 95% and 59.2% rate of aggressive type dAVF respectively.

Conclusion

The majority of dAVF in dorsal epidural group was aggressive type with high incidence of VOR and shunt multiplicity. In the lateral epidural group, it is always of the aggressive type which correlate in neural crest group embryologically. Shunt multiplicity can be observed in different epidural venous groups and can coexist with benign shunts. However, there was no evidence of shunt multiplicity in the lateral epidural group.

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Awareness and perceptions of Interventional Radiology (IR) amongst final year medical students in Singapore

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

The increasing demand for Interventional Radiology (IR) services in Singapore highlights the importance of generating interest and recruitment amongst medical students at an early stage.

This nationwide survey aims to assess the exposure and awareness of interventional radiology amongst final year medical students in Singapore and their perceptions of IR as a career.

Materials and Methods

Data was collected through an online survey distributed to final-year medical students from medical schools in Singapore.

Results

79 responses were collected, out of approximately 500 final-year medical students. The majority of students (79.7%) claimed to have only brief knowledge on IR, while 8.9% reported having no knowledge at all. While many students (89.9%) were familiar with some IR procedures such as angioplasty, most (85.9%) gained this exposure from cardiologists or vascular surgeons. Although most students felt that IR offers good (43%) or excellent (39%) career prospects, almost half of respondents (46.8%) were unsure about considering a career in IR. The lack of interest (17.5%) and knowledge (10.1%) were the top reasons for not considering a career in IR, while the procedure-intensive nature of IR was the speciality's most attractive trait.

Conclusion

Medical students in Singapore have a basic understanding of IR's role in modern medicine, but most lack interest and in-depth knowledge due to a lack of exposure in medical school. Short of introducing examinable IR content into local medical school curricula, active efforts should be made to increase hands-on exposure of medical students to IR through clinical attachments.

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Treatment outcome of distal non-saccular intracranial aneurysms at Siriraj hospital, Thailand: a retrospective review of a single center

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

To evaluate the outcome of the treatment of distal non-saccular intracranial aneurysms (DNSIA) in different modalities at Siriraj hospital, Thailand.

Materials and Methods

A retrospective review of patients who were diagnosed DNSIA at Siriraj Hospital between July 2013 and June 2021was performed. The treatments were summarized into 4 groups, 1.) Endovascular treatment (EVT) with parent artery occlusion (PAO), 2.) EVT with parent artery preservation (PAP), 3.) surgery with aneurysmal clipping or trapping, 4.) conservative treatment. Patient outcomes were defined as clinical and imaging outcome. The complications were determined immediately after each treatment.

Results

46 patients with 49 DNSIAs. From 41 patients who underwent treatment, 90.2% had complete obliteration, 7.3% had aneurysmal recanalization, 2.4% had residual lesion. There was no re-rupture aneurysms during the follow up period (averaged 29.37 months). Procedural complications occurred in 7 cases (17.1%), 3/7 had hemorrhage during surgical clipping and 4/7 had infarction from EVT with PAO. Unfavorable outcome was documented in 5 patients (10.9%), 3/5 were not related to treatment procedures. The favorable outcome showed a significant correlation with initial low Hunt and Hess scale (p-value=0.018).

Conclusion

EVT with PAO was considered to be the initial treatment of choice due to its safe and efficiency. Surgical procedure with distal flow preservation should be the alternative procedure when territory infarction was in concern.

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Image-guided percutaneous methods for mediastinal lesions - an update on approaches

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Abstract Theme

Interventional Radiology

Abstract Category

Education

Teaching Points

Appreciation of the mediastinal anatomy as applied to biopsy of mediastinal lesion.

Safe effective methods to biopsy mediastinal lesions from various minimally invasive percutaneous approaches under CT or ultrasound guidance.

Background / Outline

Mediastinal lesions are one of the most commonly biopsied lesions. Image-guided percutaneous methods for mediastinal lesions has become the primary method to gather tissue for biopsy. This has enhanced the speed and safety of arriving at a histopathological diagnosis.

In this educational review, we describe our institutions experience with performing mediastinal biopsies through a series of clinical vignette, showcasing 8 different approaches to sample the tissue. We describe the relevant pathological findings in relation to the surrounding anatomy and our rationale for performing biopsy. The majority of our cases are performed via an anterior approach with trajectories occurring through a transmediastinal or transpleural approach. Some highlights include the use of hydrodissection for the displacement of vital structures to achieve a safe biopsy path, use of a trans-sternal approach to reach retrosternal lesions and a trans thyroidal approach.

333

Intracranial Stenting in Acute Ischaemic Stroke with Large Vessel Occlusion

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Abstract Theme

Interventional Radiology

Abstract Category

Scientific

Objective

To evaluate the outcomes of emergency intracranial stenting in acute ischaemic stroke with large vessel occlusion.

Materials and Methods

We performed retrospective analysis of all patients who underwent intracranial stenting as part of endovascular treatment (EVT) of acute stroke with intracranial large vessel occlusion (LVO) at our institute between 2018-2023. Epidemiological data, pre-treatment functional status, NIHSS/GCS, pretreatment imaging findings, details of the endovascular procedure, procedural complications and post-procedural clinical outcomes were reviewed.

Results

28/573 patients who underwent EVT for AIS had emergency intracranial stenting. Median age=66-year-old, median ASPECT=8 and median NIHSS=16. 23 cases had anterior and 6 cases had posterior circulation stroke. 23 were rescue stentings for underlying ICAD leading to failure of recanalization or almost immediate post-thrombectomy re-occlusion of the vessel; 3 had primary stenting (without attempting thrombectomy) and 3 had dissections. The stents used include 21 self-expanding neuro stents (Enterprise=15, Solitaire=4, Neuroform Atlas=1 & Wingspan=1) & 10 balloon-mounted coronary stents. Pre- and post-stenting angioplasty was performed in 16 and 9 patients respectively (5 had both). Technical success (post-procedure≥TICI-2B and no immediate re-occlusion) was achieved in all patients. Complications included: 2 haemorrhagic transformations (1=PH1,1=HI1) and 2 mild SAH. There were no procedural-related SICH or major haemorrhagic complications requiring additional invasive treatments. 2 patients had early stent re-occlusion. At 3 months/last available follow-up (4 lost to follow-up), 7 patients had good functional outcome (MRS≤2).

Conclusion

Despite emergency intracranial stenting being a safe treatment strategy in AIS, patient's premorbid status and stent choices might influence the outcomes.

Multisystem / Multidisciplinary

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Hamartomas in paediatric patients and young adults – Head to toe review of clinico-radiological features

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Education

Teaching Points

Knowledge of the wide imaging spectrum of hamartomas and their syndromic associations is essential in avoiding unnecessary and invasive interventions as well as in directing further work-up for syndromic associations.

Background / Outline

Hamartomas are benign tumour-like malformations comprising of architecturally disorganized mesenchymal components (e.g cartilage, fat, connective tissue, and smooth muscle) that are typically found in the organ of origin, virtually in any organ system. These can occur either sporadically or in conjunction with underlying syndromic conditions, some with a known hereditary basis. Hamartomas are usually discovered incidentally and can give rise to symptoms due to obstruction, compression, infection, infarction, haemorrhage and pathological bony fractures. Rarely, some hamartomas can undergo sarcomatous transformation, such as transformation of osteochondroma into a chondrosarcoma.

Characterisation, detection of associated complications, and management of hamartomas relies heavily on imaging. Although the imaging appearances of hamartomas can mimic malignancy and also varies depending on the organ from which they originate, the findings are usually distinctive and a diagnosis can often be made with certainty.

The imaging features of a wide variety of hamartomas will be illustrated in various organ systems from head to toe, i.e. nervous system (e.g. Hypothalamic lesions, hamartomas associated with neurofibromatosis-1 and tuberous sclerosis, fibrolipomatous hamartoma of the median nerve), thorax/breast, gastrointestinal tract (e.g. polyps) and musculoskeletal system (eg chest wall mesenchymal hamartoma, osteopoikilosis, osteochondroma, enchondroma, non-ossifying fibroma, fibrous dysplasia, bone haemangioma, macrodystrophia lipomatosa etc.). Associated underlying syndromes and neoplasms that may arise will be highlighted.

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Pictorial Review of Rare Cases of May Thurner Syndrome- Common Condition Nowadays

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Education

Teaching Points

to educate radiologists regarding not so uncommon cause of a common condition in May-Thurner syndrome (MTS).

Since MTS is treated by wide array of specialties, including interventional radiology, vascular surgery, cardiology, and vascular medicine. Need for established diagnostic criterion is imperative in order to reduce misdiagnosis and inappropriate treatment.

Background / Outline

May-Thurner syndrome is a rarely diagnosed condition in which patients develop iliofemoral deep venous thrombosis (DVT) due to anatomical variant in which the right common iliac artery overlies and compresses the left common iliac vein against the lumbar spine. It is rarely considered in the differential diagnosis of DVT, particularly in patients with other risk factors. Venous compression associated with intimal hyperplasia, which creates the potential for venous stasis and subsequent thrombosis.

We have encountered 8 patients of May-Thurner syndrome in the past 2 years in our centre. These are young women in their 2nd to 4th decades, with the risk factor usually after prolonged immobilisation or pregnancy.

Majority of patients presented with history of unilateral lower extremity oedema and pain, varicosities, deep vein thrombosis or venous ulcers. Initially, these patients are investigated for pulmonary embolism/deep vein thrombosis. CT scan abdomen subsequently demonstrates chronic compression of left common iliac vein (CIV) against lumbar vertebrae by overlying right common iliac artery (CIA).

Early follow up is necessary if patient is symptomatic from process. First-line treatment is with thrombolysis and stenting , which removes clot and relieves compression to prevent recurrence.

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A Case of Miliary Pulmonary Tuberculosis With Intracranial and Spinal Involvements

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Scientific

Objective

Patients with tuberculosis may have different forms of extrapulmonary involvement, including the central nervous system (CNS) and spinal tuberculosis. The incidence may be higher in patients with miliary tuberculosis, which is caused by the acute, diffused dissemination of Mycobacterium tuberculosis from the primary infection site. This poster is presented to discuss the role of magnetic resonance imaging (MRI) in detecting the co-existence of intracranial and spinal involvements in a patient with miliary pulmonary tuberculosis.

Materials and Methods

A 40-year-old female came to our emergency room with frequent seizures, back pain, and a history of untreated miliary pulmonary tuberculosis, which was confirmed by her chest x-ray. Brain MRI showed multiple tuberculomas at bilateral frontal lobes and spine MRI revealed oedema and compression fractures of 6-7th thoracal vertebras with gibbus deformity suggesting spondylitis.

Results

Brain MRI is superior in detecting four major patterns of CNS tuberculosis, including meningitis, tuberculomas, brain abscess, and encephalopathy. Tuberculosis spondylitis is the most common extrapulmonary involvement which mostly occurs in the thoracal region. Spine MRI enables anatomic localization and extent as well as detection for paraspinal involvement. The co-existing of several extrapulmonary involvements is possible in patients with miliary tuberculosis as a consequence of inadequate host defenses.

Conclusion

This case highlights the pivotal role of MRI in detecting and evaluating the extent of different forms of extrapulmonary involvement; as well as the need for looking for any CNS and spinal involvement among patients with miliary tuberculosis, especially those presenting with neurological deficits.

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How we communicate matters as much as what we communicate: The Power of Effective Communication in the radiology report.

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Education

Teaching Points

- Pearl 1: Not all is black and white, but it's alright.

1. Not all diagnoses lie in the radiological findings; advice for further clinical correlation may be crucial at times.

- Pearl 2: Even when it's grey, it's better that way.

1. Even when findings are inconclusive, Wording the report in a nuanced manner (while avoiding over-ambiguity) allows the clinician flexibility for further management.

- Pearl 3: When less is more, and more is less.

1. Over-reporting may lead to unnecessary investigations for patients.
2. Conversely, constructive and concise conclusions leads to effective clinical decisions.

- Pearl 4: Structure and language matters.

1. Clinicians may not always analyse the entire report in depth, hence clarity and succinctness matters.

- Pearl 5: Collaborative thinking goes a long way.

1. Providing referring clinicians with effective reports ultimately builds trust and fosters collaboration.

Background / Outline

- Effective communication in radiology reporting allows clinically-relevant information to be conveyed in a prompt and concise manner, ensuring that patients receive appropriate and timely clinical management.
- This is a topic commonly overlooked and not well-studied, but has far-reaching potential to influence the way report in any radiology subspecialty, hence optimize clinical management.
- What we choose to include (or omit) in the radiology report has medico-legal implications: balance is key, and this develops with experience.
- This educational abstract consolidates key principles in effective communication in radiology reporting from lessons learnt in both local and international contexts (e.g. ESR communication guidelines) to enhance communication in radiology reporting.

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Audit to determine diagnostic use of CT Chest Abdomen Pelvis in patients with non-specific symptoms to diagnose malignancy of undefined origin at Basildon and Thurrock University Hospital

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Scientific

Objective

This audit assessed the detection rate of CT Chest Abdomen Pelvis (CAP) for malignancy in patients with non-specific symptoms. Although there is no direct national guideline in the UK for what this detection rate should be, previous work [1] [2] has indicated a rate of 5-8%.

Materials and Methods

Our audit analysed requests from October 2022 to March 2023 which were requested to rule out malignancy. We excluded any patients with abnormal preliminary imaging, raised tumour markers, abnormal clinical findings and any known or previous malignancy. From the pool of suitable scans, 100 were randomised and the outcome reviewed. If A report suggested further investigations this was labelled equivocal.

Results

From 100 scans, 7 showed an abnormality with 2 being reported as malignancy and 5 being equivocal. The average age was 67 years old with 46 of the scans being requested from primary care and 54 from secondary care. The most common symptom described was weight loss

Conclusion

Our audit demonstrates poorer detection rates when compared to other studies [1][2]. The NICE guidance [3] on two week wait referrals for malignancy have been in place for several years and previous work has shown the positive difference they have made in the early detection of cancers [4][7]. However, the UK still lacks behind other OECD nations in cancer survival rates [5][6] and some of this is put down to late detection [7]. Our results imply that CT CAPs for non-specific symptoms may not improve detection rates without more thorough pre-workup [8][9].

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Craniotabes on Rickets of a Triplet Baby: A Radiologic Imaging of Maternal Vitamin D Deficiency

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Education

Teaching Points

Presenting a radiological review from a case of incidental craniotabes findings on rickets of a triplet baby suggested a relation of maternal vitamin D deficiency.

Background / Outline

Craniotabes is a softening of the skull bone found in several conditions, from a normal newborn until a Rickets baby. Studies debate the relationship between maternal vitamin D deficiency and this finding, but a case from our institution revealed a strong relationship between them. A 6-month-old baby was prematurely born triplet from an IVF program. She has the lowest birth weight, 1100 grams, than 2 other siblings. She also has the most complicated problems because she suffers from an atrial septal defect. A bowing deformity suggested a fracture of the distal left tibia and mid-left fibula was found due to the observed deformity of the lower leg without any trauma history. A 25-OH-vit D examination revealed 19,6 ng/ml. A head MSCT was performed to find a cause of the sudden convulsion without fever and revealed normal brain parenchyma with incidentally found craniotabes. The findings of rickets of the tibial and fibula bone, craniotabes of the skull, and low 25-OH vitamin D suggested a strong relationship related to the pregnancy history of this patient.

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Contrast material in Imaging world- A recent update

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Abstract Theme

Multisystem/Multidisciplinary

Abstract Category

Education

Teaching Points

Classification of contrast according to the modality.

Changes in the contrast used in today's time.

Updates in the contrast and machine relation.

A brief about the anaphylactic reactions associated with contrasts and management.

What's new in the pipeline for the upcoming years in contrasts from around the world.

Background / Outline

Contrast media are commonly used for imaging to enhance the differences of structures or fluids within the body tissue. As we all know they are divided according to the modalities that they can be used with and further according to the molecular structure. We will delve into the facts how and why certain molecular structures can be used for a particular modality and why not other with a brief about the complications and management associated with them.

And then passing on to the newer contrast media which have drastically reduced the rate of complications, are more organ specific and how are they going to change the dynamics of the radiology in coming time specially with the AI coming into play more by each passing day.

Musculoskeletal Radiology

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Acquired deformities of the foot and ankle

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

Acquired deformities of the foot and ankle are commonly encountered in imaging. As radiologists, we serve an important role in the diagnosis and management of these conditions. We should thus be familiar with the imaging features, diagnostic criteria and commonly used classification systems. This poster aims to provide a concise review of the topic at hand.

Background / Outline

This poster aims to present a systematic outline of acquired soft tissue and structural deformities of the ankle and foot, including conditions such as Achilles tendinopathy, pes planus, hindfoot valgus, hindfoot varus, hindfoot equinus, neuropathic arthropathy, hallux valgus, hallux rigidus and sesamoid pathology.

This poster is organised by anatomical location of the hindfoot, midfoot and forefoot. We aim to showcase a variety of conditions with clearly annotated images of various modalities, as well as a brief discussion of the aetiology, risk factors and pathophysiology.

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Entrapment Neuropathy of the Shoulder: MR Features and Differential Considerations

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

1. Identify MR features of entrapment neuropathy as a cause of shoulder pain.

2. Demonstrate common causes of muscle denervation around the shoulder girdle.

Background / Outline

Nerve injury of the shoulder is an unusual cause of shoulder pain and painful instability. While clinical findings and electrophysiologic studies are the mainstay of diagnosis, they do not determine the exact etiology or anatomic site of muscle denervation. MRI could offer information about the location of injury depending on the muscle groups involved, allows an estimation of the duration of denervation, and search for a cause.

The MRI features of neuropathy include direct signs, such as signal changes in the involved nerve, and indirect signs related to muscle denervation in a neural distribution pattern. The pattern of muscle denervation provides information about the duration of entrapment; acute denervation depicts features of muscular oedema, whereas chronic compression shows features of muscular atrophy and fatty degeneration. The etiology may include masses impinging on a regional nerve or osseous abnormalities, such as fracture fragments or bone spurs.

This education exhibit describes the characteristic MR findings of entrapment neuropathy and demonstrates common conditions that can cause muscle denervation around the shoulder girdle.

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Sarcopenia - Do radiologists need to know?

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

Sarcopenia is associated with increased incidence of adverse patient outcomes, such as falls, fractures, morbidity, and mortality; higher risk of post surgical complications and relatively poor prognosis in cancer patients. More recently, its presence was associated with higher ICU admission rates and increased mortality in hospitalized COVID-19 pneumonia patients.

Clinical questionnaires, anthropometry and physical performance tests are some non-imaging methods used to assess sarcopenia. However, these tests very often have confabulated results due to factors other than sarcopenia. Eg, certain neurological conditions (such as depression or altered mental status) may affect outcome and lead to false positive results.

Radiologists with imaging techniques such as DEXA, Sonography, CT and MRI at their disposal, are playing an increasingly important role in identifying and quantifying sarcopenia.

This educational exhibit highlights the impact of radiologist's familiarity with sarcopenia, its detection and assessment, and early intervention in patients at risk for sarcopenia related complications, on quality of patient care and management.

Background / Outline

"Sarcopenia" (Greek 'sarx' or flesh + 'penia' or loss) is a term used to describe significant loss of skeletal muscle mass and function. Traditionally, it was used to describe the skeletal muscle loss related to ageing. However, nowadays a broader definition is used which includes other causes of muscle wasting such as disuse, malnutrition, chronic diseases (eg, stroke, cancer) etc.

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Pictorial Essay: Patterns of Muscle Denervation and Their Anatomical Basis

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

This pictorial essay will illustrate the MRI features of muscle denervation and highlight the anatomy of culprit nerve through several cases seen at our institution, and to provide a guided search pattern to localise the culprit lesion when denervation injuries are suspected.

Background / Outline

Denervation injury is a common condition that can present with pain, weakness, sensory deficit or a combination of these. The key radiographic feature in the early stage is muscle edema in a myotomal distribution, and progressive fatty atrophy over time. The inciting factor may not always be apparent on imaging. When the anatomical cause is not apparent, signal changes in muscles innervated by the abnormal nerve and key understanding of the anatomical landmarks of the culprit nerve would help to better diagnose the presence of nerve damage and localise the level of pathology.

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MRI Features of Fatty Tumors: How to Differentiate Characterization of Lipoma and Liposarcoma

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Scientific

Objective

To describe magnetic resonance (MR) imaging features in differentiating lipoma and liposarcoma.

Materials and Methods

Magnetic resonance (MR) imaging of 10 patients with histologically proven fatty tumors (4 lipomas and 6 liposarcomas) was collected retrospectively from Saiful Anwar Hospital's medical record. Images were assessed for adipose tissue content, nonfatty components (thin and/or thick septa and nodular and/or globular components), and signal intensity of the lesions.

Results

Ten patients (7 males and 3 females, aged 40-60 years old) came to Saiful Anwar Hospital with soft tissue mass, most commonly in the extremities. All patients were referred for plain radiograph examination followed by MRI. Imaging features that represent liposarcoma (in 6 patients) included lesion size larger than 10 cm, presence of thick septa (thickness >2 mm), presence of globular and/or nodular non-adipose areas or mass, less than 75% fatty component of the lesion. Also, there was the poor definition of adjacent structures and increasing inhomogeneous signal intensity in lesion after adding contrast injection. Imaging features of lipoma (in 4 patients) included lesion size is less than 10 cm, more than 75% fatty component, presence of thin septa, and no visible globular or nodular component in the lesion. And the diagnosis was confirmed histologically by biopsy examination.

Conclusion

Features that suggest malignancy of fatty tumors include large lesion size, presence of thick septa, nodular and/or globular non-adipose area in the lesion, and decrease in fat composition.

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Revisiting the Role of Conventional Magnetic Resonance Imaging in Differentiating Osteoporotic From Malignant Vertebra Compression Fractures

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Scientific

Objective

Vertebral compression fractures (VCFs) can have a variety of etiologies, including osteoporosis, trauma, or neoplastic infiltration. Among elderly patients, differentiating osteoporotic and malignant VCFs can present a diagnostic dilemma with considerable management and prognostic implications. This poster aims to revisit the role of conventional magnetic resonance imaging (MRI) in distinguishing the two natures of fractures.

Materials and Methods

Two elderly patients presented to our emergency room with back pain and deformity as well as reduced sensation in their lower limbs. The initial diagnoses for both cases were confusing as access to their medical history was limited. MRI of both patients' spine showed compression fractures with different types of characteristics which help the clinician in determining the osteoporotic and malignant fractures for each patient.

Results

Conventional MRI has been widely in detecting and analyzing vertebral fractures with findings that are helpful in the discrimination between osteoporotic and malignant VCFs. Features strongly predictive of malignancy include expansion of the fractured vertebral body, an epidural and/or paraspinal soft tissue mass, discrete lesions within the bone, and replaced signal of the vertebral body, especially extending into the pedicles or posterior elements. Features strongly predictive of osteoporosis include lack of malignant features and at least partial preservation of normal marrow signal, visible fluid- and/or air-filled fracture lines/clefts, and retropulsion of the cortex.

Conclusion

MRI is the established modality of choice, with strong evidence for multiple distinguishing imaging features, which can allow confident characterization of the VCFs etiology.

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Biceps Pulley Lesions: Diagnostic Accuracy of Conventional Shoulder MRI and Value of Various Diagnostic Signs

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Scientific

Objective

There is limited literature data on the role of conventional MRI in detecting biceps pulley (PB) lesions. This study aimed to assess accuracy of conventional MRI in detecting PB lesions and to evaluate diagnostic value of various MRI signs in detecting such lesions.

Materials and Methods

This retrospective study included patients who underwent conventional shoulder MRI with subsequent arthroscopy. Two radiologists independently reviewed all MRI images for the presence of BP lesions defined by superior glenohumeral ligament (SGHL) discontinuity/non-visibility, long head of biceps (LHB) displacement sign or subluxation/dislocation, and LHB, supraspinatus and subscapularis tendon lesions. MRI signs and final MRI diagnoses were tested for accuracy in detecting BP lesions using arthroscopy results as a reference standard. Interreviewer agreement (IRA) was determined using kappa statistics.

Results

The final analysis included 84 patients (32 in BP-lesion group and 52 in BP-intact group). Using consensus data, the sensitivity, specificity, and accuracy of conventional MRI in detecting BP lesions were 78.1%, 92.3%, and 86.9%, respectively. The highest accuracy was noticed with LHB displacement sign (86.9%), the highest sensitivity was noticed with LHB tendon lesion (87.5%), and the highest specificity was noticed with LHB displacement sign and LHB subluxation/dislocation sign (100%). The IRA regarding final MRI diagnosis and various MRI signs of BP lesions was moderate to very good (κ=0.78).

Conclusion

Conventional shoulder MRI showed good diagnostic accuracy in detecting BP lesions. The LHB displacement sign was the most accurate and specific sign for diagnosis.

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Missing the Obvious? Reviewing the Blind Spots in Spine MRI.

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

- Demand and volume of MRI spine imaging is ever increasing.

- Need for sustained attention to perform level-by-level imaging interpretation of the spine on MRI creates a risk for the reporting Radiologist to inadvertently miss significant extraspinal, edge-of-film, and scout / localiser findings.

- Systematic review of the blind spots on spine MRI is important so as to provide optimal patient care and avoid potential medicolegal implications.

Background / Outline

The demand and volume of medical imaging which includes Magnetic Resonance Imaging (MRI) of the spine is ever increasing. The need for sustained attention to perform a level-by-level imaging interpretation of the spine on MRI creates a unique risk for significant extraspinal, edge-of-film, and scout / localiser findings to go undetected - such risk may be further amplified by the complexity of the imaging study, presence of multiple abnormalities, and the heavy workload of the reporting Radiologist. This education presentation aims to provide a systematic review of the blind spots of spine MRI, which are important for both residents and seasoned Radiologists so as to provide optimal patient care and avoid potential medicolegal implications.

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Angioimmunoblastic T-cell lymphoma manifesting after Covid mRNA booster

Dr Kenneth Sheah[1], Dr Daryl Tan[2], Dr Chian Yong Low[3], Dr Gerrard Teoh[4]

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

- Persistent lymphadenopathy is observed in patients after SARS-CoV-2 mRNA vaccination.
- Other lymphoproliferative or infective causes should also be considered
- Linkage between SARS-CoV-2 mRNA vaccines and lymphoproliferative is not established, but anecdotal reports exist in the literature.

Background / Outline

The efficiency of SARS-CoV-2 mRNA vaccines has been related to their ability to stimulate T follicular helper (TFH) cells, resulting in persistent germinal center B cell responses.

This may result in reactive lymphoadenopathy which sometimes may raise a differential diagnosis with a lymphoproliferative disorder.

The patient in the case report is a 51-year old male who presents with enlarged lymph nodes after SARS-CoV-2 mRNA vaccine booster. The first core biopsy of lymph node showed necrotizing lymphadenopathy consistent with a drug hypersensitivity reaction. Inflammation and autoimmune markers all negative.

He presents again 6 months later, with painful swelling in the left subpectoral region and left frozen shoulder like symptoms. He had his 4th SARS-CoV-2 mRNA vaccine booster prior to symptoms. QFTB as well as TB PCR (blood) were negative. There was no paraproteinemia, light chain restriction or elevation in LDH. Full Body FDG-PET-CT Scan showed high SUVmax lesions in several areas. A second ultrasound-guided left axillary lymph node biopsy revealed angioimmunoblastic T-cell lymphoma.

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MR and CT findings of pediatric spine disease

Prof Jeong Hyun Yoo

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Education

Teaching Points

To illustrate various CT and MR images of the wide disease spectrum in pediatric spine.

Background / Outline

Retrospective review of CT and MR images of various spine diseases experienced at the tertiary hospital during last several years and case collections with literature review and teaching points

Spine diseases were classified into spinal tumor, intra medullary, intradural extramedullary, extradural location including primary and secondary benign and malignant tumor, hematologic malignancy, tumor like lesions, tumor mimicking cystic lesion, vascular disease, infection and inflammatory disease, trauma related disease, and normal variation.

Diseases included astrocytoma, ependymoma, ganglioneuroma, myxopapillary ependymoma, paraganglioma, metastasis (neuroblastoma, germinoma, Ewing sarcoma, medulloblastoma), lymphoma and leukemia, Langerhans cell histiocytosis, neurofibromatosis, myofibroma, epidural lipomatosis, arachnoid cyst and meningocele, hemorrhage and cord infarction, acute transverse myelitis, metabolic deficiency, Guillain-Barre disease, multiple sclerosis, ADEM, SLE, abscess.

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Correlation between Clinical and Dual Energy Foot CT Findings in Patients with Gout

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Abstract Theme

Musculoskeletal Radiology

Abstract Category

Scientific

Objective

To evaluate the frequency of monosodium urate (MSU) crystal deposition in foot and ankle joints of gout patients using dual energy CT (DECT) and to analyze the correlation between clinical and DECT findings.

Materials and Methods

DECT scans of both feet in 69 patients with gout without apparent clinical tophi were evaluated for the sites and volume of MSU crystal deposition. Clinical data included age, sex, duration of disease, BMI, history of smoking and alcohol intake, DM, hypertension, cardiovascular disease, dyslipidemia, chronic renal disease and laboratory findings. The associations between clinical data and number and volume of MSU crystals with DECT were statistically analyzed.

Results

All patients had MSU crystal deposition at least one site. Forty-nine patients (71.0%) had MSU deposits in Achilles tendon. The total number of sites of MSU crystal deposition was in 779 (43.4%) joints. The number of MSU crystal deposits was correlated with history of hypertension and cardiovascular disease. The volume of MSU crystal deposits was correlated with the number of sites and history of DM.

The number and volume of MSU crystal were not correlated with patient's age, duration of disease, serum uric acid level, history of smoking, alcohol intake, dyslipidemia, and chronic renal disease.

Conclusion

MSU crystal deposition frequently occurs in gout patients despite absence of clinical tophi and easily detected by DECT. The number and volume of MSU crystal deposition in DECT are correlated with clinical co-morbidities such as DM, hypertension, and cardiovascular disease, but not correlated with age, duration of disease, or serum uric acid level.

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EOS Full-Spine Imaging at KK Women's and Children's Hospital (KKH) – improving patient safety and patient experience.

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KK Women's and Children's Hospital, Singapore, Singapore

Abstract Theme

Musculoskeletal Radiology

Abstract Category

Scientific

Objective

To minimise radiation dosage to children and adolescents with scoliosis, and improve their patient experience.

Materials and Methods

The Musculoskeletal Centre at KKH runs a busy scoliosis service, serving more than 100 patients a week. Each day, about an average of 15-20 x-rays are done on patients aged 10-18 years.

The main concern among parents and their child is the radiation they are subjected to during X-rays every few months when they come for review.

KKH DDII started with Film-cassette imaging, Computed Radiography (CR), then Digital Radiography (DR) for long spine imaging. With MOH funding to renovate our specialist clinics 8 years ago, KKH acquired the EOS Low Dose Imaging system for spinal imaging.

Results

EOS low-dose imaging provides a 50% reduction in radiation dose compared to DR imaging. It is equipped with a "microdose" setting for follow-up X-rays when a lower resolution is sufficient, resulting in a radiation dosage of 5-10% of the DR. A biplanar, orthogonal X-ray can be obtained with the EOS by standing in one position with two X-ray tubes. This feature allows spinal X-rays to be obtained more quickly.

Furthermore, the site of the EOS in the Musculoskeletal Center enhances the productivity, efficiency, and treatment experience of patients.

Conclusion

The EOS Low Dose imaging system offers an important advancement in minimizing ionizing radiation to children and adolescents with scoliosis.

The patients benefit from the convenience and time savings that are achieved by having their consultations and X-rays performed at the same location.

Neuroradiology

7

A Retrospective Study on the Cranial CT Imaging Findings in Patients Presenting with First-onset Seizure in a Tertiary Hospital in Makati City from January 2018 to January 2020

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

General Objective: To evaluate cranial CT imaging findings of patients presenting with first-onset seizure in a tertiary hospital in Makati City

Specific Objectives:
- To describe the baseline demographic and clinical characterisitcs of patients presenting with first-onset seizure

- To compare the cranial CT findings in patients with first onset seizure with and without associated focal neurologic signs, symptoms and neurologic deficits

- To determine the association between neurologic signs, symptoms, and focal neurologic deficit with cranial CT scan findings among patients presenting with first episode seizure

Materials and Methods

Materials: Medical Records

Methods: Retrospective, cross-sectional study design

Results

A total of 118 patients presenting with first onset seizure who underwent plain cranial CT scan were included in the study. 9% of these patients had a history of head trauma within one week, 9% had a history of stroke, and 8% had a history of malignancy. 74% of patients had normal imaging findings, the rest had acute intracranial hemorrhage (n=12, 10%), tumor with severe secondary findings (n=9, 8%), and acute ischemia (n=9 8%). Logistic regression was used to assess the associated neurologic signs, symptoms, and neurologic deficit with abnormal CT scan findings. Focal motor sign, weakness, and altered mental state were significantly associated with an abnormal cranial CT findings.

Conclusion

Patients presenting in the emergency department for first onset seizure with post-ictal neurologic signs and symptoms of focal motor signs, altered mental state, and weakness significantly increase the chances of a diagnostic yield. A good physical examination will help health care institutions and patients conserve limited resources.

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Imaging Findings in Central Nervous System Listeriosis on Computed Tomography and Magnetic Resonance Imaging

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To describe the imaging findings and determine the incidence of a characteristic worm-like pattern along the white matter tracts in neurolisteriosis on CT/MRI.

Materials and Methods

An IRB-approved retrospective study in 21 consecutive neurolisteriosis cases during January 2002-July 2020. At least one of the following is required; 1) Positive Listeria Monocytogenes (LM) in blood with clinical signs of meningeal irritation and/or abnormal CSF profile, 2) Positive LM in blood with signs of encephalitis, 3) Positive LM in CSF, 4) Positive LM from brain biopsy/aspiration. Six cases were excluded due to the lack of contrast-enhanced images, leaving a total of 15 cases for analysis. Imaging studies were independently reviewed by two blinded readers. The demographic data, imaging findings, and incidence of the worm-like pattern was reported. Cohen's kappa was used to calculate interrater reproducibility.

Results

Of the twelve patients with relevant imaging findings, nine cases (75%) had parenchymal lesions (8 cases in the supratentorial and 1 case in the infratentorial compartment), 4 cases (33.3%) had leptomeningeal enhancement and 2 cases (16.7%) had hydrocephalus. Brain abscesses were found in 8 cases and nodules evocative of abscess in 1 case. Restricted diffusion in the central area and hemosiderin deposition were observed in all cases. The involvement of the white matter tract in a worm-like pattern was demonstrated in 8 of 9 patients with parenchymal lesions (88.9%).

Conclusion

Abnormal findings on brain CT/MRI are common in neurolisteriosis. The incidence of worm-like spread along the white matter tracts is high and may help diagnose suspicious patients.

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Comparison of the mathematical ellipsoid formula technique against computer-assisted volumetric analysis to estimate subdural hematoma volume in a tertiary hospital

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The study aimed to evaluate if the mathematical ellipsoid formula, $(\pi/6)\cdot(XYZ)$, is reliable in estimating subdural hematoma volumes compared to computer-assisted volumetric analysis.

Materials and Methods

A comparative cross-sectional study with 89 subdural hematoma cases who underwent non-contrast cranial computer tomography scans in 2020 in a tertiary hospital in the Philippines. The subdural hematoma volumes were calculated using two techniques: (1) manual computation using the mathematical ellipsoid formula and (2) computer-assisted volumetric analysis. Non-parametric Wilcoxon signed-rank test and a scatter-plot graph were done to analyze these two groups. This study was approved by an ethical committee.

Results

Non-parametric paired test showed that subdural hematoma volumes calculated using computer-assisted volumetric analysis were statistically significantly lower than the volumes calculated using the ellipsoid formula. The scatter-plot graph demonstrated that using the ellipsoid formula most commonly overestimated the subdural hematoma volumes compared to computer-assisted volumetric analysis. Deviations of more than 10% of equivalence were observed in 68 over 89 cases.

Conclusion

Contrary to several previous studies, calculating subdural hematoma volume through manual computation using the ellipsoid formula was shown to be inaccurate and imprecise as compared to computer-assisted volumetric analysis. Subdural hematomas do not naturally assume the ellipsoid geometrical shape and may have contributed to the overestimation of volumes calculated through manual computation. Further research with sensitivity and specificity studies may provide better understanding to the differing conclusions regarding calculating volumes for subdural hematoma.

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Mechanical Thrombectomy with Coaxial Angioplasty Technique in Patients of Acute Ischemic Stroke with Tandem Carotid Occlusions

Dr Pao-Sheng Yen

Kuang Tien General Hospital, Taichung City, Taiwan

Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The recanalization of acute ischemic stroke (AIS) with tandem occlusion (TO) is technically challenging due to the involvement of two large vessel occlusions (LVO) in the same vascular territory. During revascularization, balloon guiding catheters (BCGs) and angioplasty catheters should be applied sequentially to prevent thrombus migration to a new vascular territory. This study describes our experience using the combination of BCG and angioplasty catheters in stroke patients treated with mechanical thrombectomy with or without a stent retriever.

Materials and Methods

Retrospective evaluation of our institutional databases from 2020 to 2022 revealed 6 patients with TO who underwent mechanical recanalization with the coaxial-balloon technique. Neurological statuses were evaluated by National Institutes of Health Stroke Scale (NIHSS). Outcomes analyzed included technical success rate, procedure time, and short-term clinical outcomes. Favorable clinical outcome was defined as modified Rankin Scale (mRS) score ≤ 2 at 90 days.

Results

All 6 patients are male, the mean age was 68 years (57 - 84), mean NIHSS at presentation was 14.5 (9 -20). Successful revascularization with subsequent carotid artery treatment was feasible in all 6 patients. Overall, successful reperfusion (modified Thrombolysis in Cerebral Infarction [mTICI] ≥2b) was achieved in all patients and 5/6 (83%) individuals completely reperfused (mTICI 3). The median procedure time is 61min (IQR 52-90). The mean NIHSS at discharge was 3.5 (2-8) with favorable clinical outcome at 90 days in 3 out of 6 patients (50%).

Conclusion

The coaxial-balloon technique is safe and effective in the endovascular revascularization of acute symptomatic TO patients with underlying atherosclerotic lesion of the extracranial ICA.

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Interstitial fluid dynamics in the cases of whole brain radiation by diffusion weighted image analysis along the perivascular space (DWI-ALPS) method.

Prof Toshiaki Taoka, Dr Rintaro Ito, Dr Rei Nakamichi, Dr Toshiki Nakane, Dr Mariko Kawamura, Prof Shunichi Ishihara, Prof Shinji Naganawa

Nagoya University, Nagoya, Japan

Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To assess changes in glymphatic function in response to whole brain radiotherapy by using "Diffusion Weighted Image-Analysis aLong the Perivascular Space (DWI-ALPS)" method.

Materials and Methods

This retrospective study included 47 image sets from 22 patients after whole-brain radiotherapy. The data for the normal control group consist of 105 imaging sets from 105 subjects with no pathological changes. DWI were obtained with the three MPGs applied in an orthogonal direction to the imaging plane, and apparent diffusion coefficient images in the x-, y-, and z-axes were generated and ALPS-index was calculated to quantify the interstitial fluid dynamics. The independent t-test was used to compare ALPS-index between control subjects and patients after whole-brain radiotherapy. Comparison for three age groups were made. The correlation between the biologically equivalent doses (BED) and the ALPS index was also examined.

Results

In the comparison of all age groups, ALPS-index was significantly lower ($p<.001$) in post radiation group (1.32 ± 0.16) than in normal control group (1.44 ± 0.17), suggesting alteration in interstitial fluid dynamics in the patients after whole brain radiotherapy. There were also significant differences in the individual age groups (40-59 y.o.: $p<0.01$, 60-84 y.o.: $p<0.001$). There was slight negative correlation between the BED and the ALPS index ($r=-0.19$).

Conclusion

Alteration in the interstitial fluid dynamics was suggested in patients after whole-brain radiotherapy by using ALPS method using DWI with orthogonal MPG. Especially, in the older populations, the ALPS-index was significantly lower suggesting that abnormal interstitial fluid dynamics in whole-brain radiation cases were related to age.

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Multimodality Imaging and Role of Interventional Radiology in Cerebral Septic Emboli Secondary to Infective Endocarditis: A Pictorial Review

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Cerebral septic emboli secondary to infective endocarditis require prompt recognition of its typical presentation and imaging manifestations to facilitate early treatment and possible radiological intervention.

This pictorial review aims to discuss the spectrum of presentation and multimodality imaging to increase awareness of the classic diagnostic imaging findings of cerebral septic emboli secondary to infective endocarditis, and to illustrate the role of interventional radiology in such cases which was sparsely described in literature.

Background / Outline

Neurological complications are the most common and severe extracardiac complications of infective endocarditis, of which cerebral septic embolism is one of the important and treatable causes to be recognized. Imaging findings have been shown to influence diagnostic classification and clinical decisions, including modification of medical or surgical treatment plans. However, there is often underdetection of these lesions, leading to delayed diagnosis and management. Therefore it is important to be familiar with the wide spectrum of imaging manifestations. Proven cases of cerebral septic emboli secondary to infective endocarditis from a regional hospital in Hong Kong from 2019 to 2022 are included. Various intracranial manifestations of cerebral septic emboli secondary to infective endocarditis are reviewed, including ischemic stroke, cerebral haemorrhage, mycotic aneurysm, cerebral abscess and meningitis. Illustrative figures including computed tomography (CT), magnetic resonance imaging (MRI) and digital subtraction angiography (DSA), and management with interventional radiological input will be discussed.

28

Case Series: Clinical and Radiological Spectrum of Acute Leukoencephalopathy with Restricted Diffusion in Three Indonesian Children with Positive Anti SARS-CoV-2

Mr Robby Hermawan, Ms Meilia Muliati Suriadi, Mrs Sheila Febrina, Mr Tan Siauw-Koan, Mrs Reggy Panggabean, Mr Chandra Mulyono

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Acute leukoencephalopathies with restricted diffusion (ALERD) were reported earlier in several case series in Japan and India, with the predominantly reported etiologies of Human herpes virus 6, Influenza A and Dengue virus. In February 2023, Japan also made a publication that acute encephalopathy syndromes related to SARS-CoV-2 could also show restricted diffusion lesions.

The spectrum of ALERD in Indonesia has not been published. This case series reported three children with ALERD that were found in Indonesia, and all showed positive Anti-SARS-CoV-2. This case series aims to add insight into the spectrum of ALERD that varies between populations and etiologies and could also be related to SARS-CoV-2.

Materials and Methods

This study is a case series of three children managed at St. Borromeus Hospital, Bandung, Indonesia. All of the patients in these cases were presented to the hospital in March 2023. All children presented initially with fever, followed by seizures and some level of decreased consciousness. All patients were examined using MRI 1.5 Tesla.

Results

The hallmark of the MRI findings in all three cases are restricted diffusion lesions on DWI-ADC that predominantly involving subcortical white matter. Some lesions were slightly hyper-intense on T2WI or T2 FLAIR, but most lesions were most conspicuous on DWI-ADC, which is different from neuroimaging findings of acute disseminated encephalomyelitis (ADEM) or encephalitis.

Conclusion

This case series shows that neuroimaging findings of ALERD can be found in several children with positive anti SARS-CoV-2 and may be required to be mentioned separately from ADEM or encephalitis findings.

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Depicting facial nerve branches with a tale of two Magnetic Resonance Neurogram Techniques – Preliminary results

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The facial nerve branches are difficult to be visualized in conventional salivary gland magnetic resonance (MR) imaging protocol. Novel imaging techniques such as dual-echo steady state (DESS) and contrast-enhanced constructive interference in steady state (CISS) potentially provide better anatomical resolution for facial nerve mapping and to mitigate risk of nerve injury during parotidectomy.

Materials and Methods

This is a prospective cohort, institutional review board-approved study. Consecutive patients undergoing parotid surgery were recruited for magnetic resonance imaging including CISS and DESS sequences. The sections of facial nerve (main trunk, superior and inferior divisions; temporal, zygomatic, buccal, marginal mandibular and cervical branches) are graded in a three-point scale, with the sum of scores in each parotid gland calculated on each sequence. Statistical analysis performed with Wilcoxon signed rank test.

Results

Of the ten patients (twenty parotid glands) recruited and scanned, including ten normal glands and ten diseased glands (4 benign and 6 malignant lesions), contrast-enhanced CISS sequence shows better overall facial nerve visualization score than DESS ($p<0.001$); while both CISS and DESS show superiority to contrast-enhanced T1-weighted axial sequence (both $p<0.001$). There is no significant difference between nerve visualization between the diseased and normal sides of each patient, on the CISS ($p=0.18$) or DESS ($p=0.59$).

Conclusion

Both CISS and DESS are superior to conventional imaging sequences for intra-parotid facial nerve visualization. While CISS shows better performance than DESS in facial nerve visualization, the latter may still be advantageous in some circumstances as it does not require gadolinium contrast and allow visualization above the stylomastoid foramen.

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Audit of Appropriateness and Outcome of Computed Tomography Brain Scanning for Headaches in Paediatric Age Group.

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Hayatabad Medical Complex, Peshawar, Pakistan

Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To assess the appropriateness and outcomes of computed tomography brain scanning for headaches in pediatrics age group.

Materials and Methods

This Descriptive study was conducted at the Radiology Department Hayatabad Medical Complex, Peshawar over a period of 1 year i.e. from 9-07-16 to 9-07-17. Patients of both genders between the ages of 4-18 years presenting with headache either isolated or common/ classic migraine were included in this study. These variants of headache were allocated an appropriateness rating of 2 for CT scan by the American College of Radiology Appropriateness Criteria (ACRAC) for children with headaches.

Results

Out of the 100 patients only 4% patients showed abnormal findings on CT scan while the remaining 96% of the scans were absolutely normal. The four patients with abnormal findings all had sinusitis.

Conclusion

This audit suggests that a proportion of the computed tomography studies performed for children with isolated headaches or common/classic migraine may have been inappropriate.
The development of a local guideline for imaging referral is indicated.

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Effects of Magnetic Resonance-Guided Focused Ultrasound Thalamotomy on Gray Matter Volume in Patients with Essential Tremor

Ms Haoxuan Lu[1], Ms Yongqin Xiong[1], Ms Xiaoyu Wang[1], Mr Jiayu Huang[1], Mr Dekang Zhang[1], Mr Xiangbing Bian[1], Mr Jiayou Zhou[2], Prof Longsheng Pan[2], Prof Xin Lou[1]

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Magnetic resonance-guided focused ultrasound thalamotomy of the ventral intermediate nucleus (VIM-MRgFUS) is an emerging and minimally invasive neuromodulation technique used to treat medication-resistant essential tremor (ET). This study aims to investigate changes in brain gray matter volume in ET patients after VIM-MRgFUS treatment.

Materials and Methods

Thirty-two ET patients who underwent unilateral VIM-MRgFUS treatment were followed up for 6 months. Changes in gray matter volume were assessed using longitudinal segmentation in Computational Anatomy Toolbox12 and paired t-tests. Tremor severity was assessed using the Clinical Rating Scale for Tremor, and Pearson correlation analysis was used to assess the relationship between changes in gray matter volume and tremor improvement.

Results

At 6 months post-treatment, ET patients showed a decrease in gray matter volume in the left fusiform gyrus, left temporal transverse gyrus, and left thalamus (voxel-level $P < 0.001$, cluster-level PFWE < 0.05). The reduction in left thalamus volume was negatively correlated with the tremor scale score change rate at 6 months after treatment ($P < 0.05$).

Conclusion

VIM-MRgFUS treatment resulted in a reduction in gray matter volume in the left thalamus and left audiovisual-related brain regions in ET patients. The reduction in left thalamus volume correlated with tremor improvement, suggesting it can serve as a valid neuroimaging index to assess clinical outcomes.

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Widespread changes in white matter microstructure following MR-guided focused ultrasound thalamotomy in patients with essential tremor

Ms Haoxuan Lu[1], Ms Yongqin Xiong[1], Ms Xiaoyu Wang[1], Mr Jiayu Huang[1], Mr Dekang Zhang[1], Mr Xiangbing Bian[1], Mr Jiayou Zhou[2], Prof Longsheng Pan[2], Prof Xin Lou[1]

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Magnetic resonance-guided focused ultrasound thalamotomy of the ventral intermediate nucleus (VIM-MRgFUS) is a promising non-invasive treatment option for medication-resistant essential tremor. This study aimed to investigate changes in white matter integrity in ET patients who underwent unilateral VIM-MRgFUS.

Materials and Methods

Thirty-two medication-resistant ET patients underwent pre- and post-operative imaging and Clinical Rating Scale for Tremor. ROI-based diffusion tensor imaging analysis and paired t-tests were used to assess changes in white matter integrity. Pearson correlation analysis was used to evaluate the relationship between changes in white matter integrity and tremor improvement.

Results

Fractional anisotropy decreased 6 months postoperatively in genu of the corpus callosum (GCC), left posterior limb of the internal capsule (LPIC), left superior cerebellar peduncle, and right superior cerebellar peduncle, while the mean diffusivity and lateral diffusivity increased in GCC, fornix, left anterior and posterior limb of the internal capsule, left anterior and superior corona radiata, left external capsule ($P < 0.05$). Axial diffusion increased with more extensive changes ($P < 0.05$). All white matter integrity indexes in GCC and LPIC changed significantly and were correlated with the tremor scale score change rate ($P < 0.05$).

Conclusion

VIM-MRgFUS has remote neuromodulatory effects on white matter integrity in medication-resistant ET patients, not only affecting the fiber tracts around the ablation lesion but also impacting the integrity of white matter fiber tracts in remote areas. The findings provide insights into the mechanism of action of VIM-MRgFUS and suggest that it may be a promising non-invasive treatment option for ET.

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Unusual Brain Patterns in Patients with Positive CSF anti-SARS-CoV-2 IgG Antibody Index

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Recent studies showed that CSF-PCR examination was mostly negative in COVID patients with neurological involvement and positive-nasopharyngeal-PCR. The sensitivity and specificity of increased CSF protein and anti-SARS-CoV2 IgG-antibody index positivity were higher. The positive antibody index measured from CSF in our case series has enriched the data of many case series showing COVID-19 and complications.

Materials and Methods

Fifty-four of 89 patients had a high CSF antiSARS-CoV2 Spike protein index. Twenty-nine patients had CNS and 25 had peripheral nervous system involvement. Neuroimagings of those 29 patients were evaluated retrospectively.

Results

MRI showed different pathological findings such as herpes encephalitis, transverse myelitis, ischemic stroke and hemorrhagic transformation, demyelinating lesions (MOGAD, NMO-SD, MS), pseudotumor cerebri, cranial neuropathy with nuclear involvement and leptomeningal involvement. Nine(33.3%) patients with CNS involvement and positive CSF antiSARS-CoV2 index had a history of vaccination or COVID infection in the last month. The mean CSF-antiSARS-CoV2 index of those patients was 5.71+/-2.40. The mean index of patients with an infection or vaccination history in the last month was higher compared to those without(p=0.053). Of the 23 patients whose CSF was examined for oligoclonal band (OCB), type 2 OCB was detected in 5.

Conclusion

Whether these antibodies are formed by intrathecal synthesis or passed by passive diffusion due to blood-brain-barrier destruction is still controversial. A specific neuroradiologic imaging feature for COVID infection was not considered. CSF-antiSARS-CoV2 antibody index positivity can be a significant indicator of neuronal damage due to COVID infection or vaccination in the last 1 month.

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The clinical utility of a deep learning-based software for the detection of intracranial hemorrhage on brain CT in real-world settings

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Computer-aided detection (CAD) software trained by deep learning algorithm have been on commercially available and beginning to apply clinically.

The purpose of this study is to evaluate a diagnostic accuracy of commercially available AI software for all brain CT examination in an university hospital.

Materials and Methods

All 1127 brain non-contrast CT taken in our facility during May to August in 2021 were applied to AI software. The AI results were compared to the findings of board-certificated radiologist's reports.

Results

The diagnostic performance for hemorrhage detection were as follows:

Sensitivity : 210/234=0.897, Specificity : 800/893=0.896, Accuracy : 1010/1127=0.896

93 false positive cases are artifact (32), tumor (30), Falx or tentorium (20), paranasal sinuses (5), calcification (4) and aneurysm (2). And 24 false negative cases are subdural hematoma (19), hemorrhagic infaction (2), intracerebral hemorrhage (2), and post operative hemorrhage (1).

Conclusion

the diagnostic accuracy of commercial software for ICH detection was almost 90% in clinical setting. There were a certain number of false positive and false negative cases, and improvement of the software is needed.

36

Differentiation in ADC Values of Peritumoral Edema in Malignant Primary Brain Tumors and Metastatic Brain Tumors. A Study of Cases in Saiful Anwar General Hospital, Malang

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study was conducted to differentiate the peritumoral edema ADC values of malignant primary and metastatic brain tumors.

Materials and Methods

This is a cross-sectional, retrospective, analytic observational study conducted on ten patients (5 males and five females diagnosed with malignant primary brain tumors) and 22 patients (7 males and 15 females diagnosed with metastatic brain tumors) using DWI examinations. With each tumor, three regions of interest (ROI) were placed manually on the proximal and distal side of the peritumoral edema and contralateral side. The ADC values of those regions were subsequently assessed.

Results

The ratio of proximal peritumoral edema to contralateral ADC values in malignant primary brain tumors was lower than in metastases tumors ($p = 0.001$). The mean proximal peritumoral edema ADC values of malignant primary brain tumors were lower than in metastases tumors ($p = 0.004$). Both findings suggest that infiltrative cells in proximal peritumoral edema of malignant primary brain tumors are absent in metastatic brain tumors. The ratio of proximal to distal peritumoral edema ADC values in malignant primary brain tumors was lower than in metastases tumors ($p = 0.000$). The finding suggests a gradient of malignant cell infiltration in regions adjacent to primary brain tumors not found in the metastases brain tumors.

Conclusion

The differentiation of ADC values of peritumoral edema in primary brain tumors and metastatic brain tumors may portray the infiltrative nature of malignant primary brain tumors that are not found in metastases brain tumors.

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Transradial Versus Transfemoral Approach to Neurointervention In the Singapore General Hospital

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The increased safety profile of transradial approach (TRA) versus transfemoral approach (TFA) for neurointervention procedures is well established in the Western population. Periprocedural complication and TRA to TFA crossover rates before and after adoption of TRA in our local Asian population is not well established. This clinical audit aims to compare the clinical outcomes of TFA and TRA for neurointervention procedures at the Singapore General Hospital (SGH).

Materials and Methods

Patients who underwent TFA or TRA for neurointervention procedures from 1 January 2022 to 1 August 2022 at SGH were reviewed retrospectively. Patient characteristics, procedural techniques, and outcomes were recorded. TRA versus TFA cohorts were compared with respect to the periprocedural complication rates, access site conversion rates, and vascular sheath size used.

Results

A total of 193 TFA and 65 TRA neurointervention procedures were performed. Overall, access-site-related (ASR) complication rates were 20 (10.36%) versus 6 (9.23%) for TFA and TRA respectively. TFA had a similar ASR minor complication rate compared with TRA (8.81% vs 9.23%). ASR major complications were noted in 3 (1.66%) TFA versus none (0.00%) in TRA (p = 0.57). A total of 4 (6.15%) TRA cases required conversion to TFA.

Conclusion

Overall ASR complication rates for TFA and TRA are similar. However, there were no ASR major complications recorded in the TRA group.

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Multilayer Analysis of Dynamic Network Reconfiguration in Pediatric Posttraumatic Stress Disorder

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Neuroimage studies have reported functional connectome abnormalities in posttraumatic stress disorder (PTSD), especially in adults. However, these studies often treated the brain as a static network, and the time-variance of connectome topology in pediatric PTSD remain unclear.

Materials and Methods

To explore case-control differences in dynamic connectome topology, resting-state functional magnetic resonance imaging data were acquired from 24 treatment-naïve non-comorbid pediatric PTSD patients and 24 demographically matched trauma-exposed non-PTSD (TENP) controls. A graph-theoretic analysis was applied to construct time-varying modular structure of the whole-brain networks by maximizing the multilayer modularity. Network switching rate at the global, subnetwork and nodal levels were calculated and compared between PTSD and TENP groups, and their associations with PTSD symptom severity and sex interactions were explored.

Results

At the global level, PTSD patients showed significantly lower network switching rates than TENP, mainly in the default-mode and dorsal attention networks at the subnetwork level, and in the inferior temporal and parietal regions at the nodal level. PTSD symptom severity was negatively correlated with switching rate in the global network and the default mode network. There were no significant differences in diagnosis-by-sex interaction.

Conclusion

Pediatric PTSD is associated with dynamic reconfiguration of brain networks mainly involving the default mode and dorsal attention networks. This may provide insights into the biological basis of this disorder.

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Comparison of single-and multi-echo susceptibility weighted imaging in detecting cerebral arteriovenous shunts

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare the sensitivities of T2WI and SWI in detecting cerebral arteriovenous fistula, cerebral arteriovenous malformation, and to qualitatively evaluate single-echo SWI(s-SWI) and multi-echo SWI(m-SWI) in characterizing vascular lesions

Materials and Methods

From January 2016 to December 2021, cerebral angiography-proven lesions were recruited. The sensitivities of T2WI and SWI in detecting vascular lesions were compared using McNemar's test. Qualitative evaluations of s-SWI and m-SWI were categorized to be of poor, average, or good quality and compared using Fisher's exact test.

Results

A total of 24 patients(mean age :61 yrs, 12 female, and 12 male) were enrolled. 20 patients underwent s-SWI or m-SWI, and 4 patients underwent both. AVF, AVM, and CCF were diagnosed in 10, 11, and 3 patients, respectively. SWI demonstrated higher sensitivity compared to that of T2WI(82.1% vs.53.6%, p=0.013). m-SWI showed better image quality compared to that of s-SWI (good quality, 83.3% vs 25%, p=0.009)

Conclusion

SWI demonstrated a higher sensitivity for detecting cerebral arteriovenous shunts compared to that of T2WI. m-SWI exhibited better image quality compared to that of s-SWI in characterizing vascular lesions.

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Rare Case: CT and MRI Presentation of Dyke-Davidoff-Masson Syndrome in Adulthood – Systematic Approach

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This paper aimed to describe brain CT and MRI on patient with symptoms characterized in Dyke-Davidoff Masson syndrome

Materials and Methods

Conducting a literature review and medical records

Results

A 49 -year- old female patient had seizure, contralateral hemiparesis, and intellectual disability with history of prolonged febrile seizure when she was a child. When finding a neurological disorder such as seizure, it is necessary to do brain CT and MRI. From MR imaging, there is left cerebral hemisphere atrophy with widening left lateral ventricle and anterior falx cerebri deviation to the left. Then it is very important to determine its assymetrical cause whether it results from oedema or atrophy. Secondly it is also crucial to see its pathological condition of the brain to exclude the other differential diagnose. In this patient, from CT imaging, there is left frontal bone thickening, left petrous ridge elevation, and left frontal sinus hyperpneumatization. The CT and MR imaging finding of this patient were suggestive of Dyke-Davidoff-Masson Syndrome.

Conclusion

Although Dyke-Davidoff-Masson syndrome is rare, it possibly occurrs in adult. Holistic and comprehensive approach is needed to get the child's history information in adult patient. If the symptom is suitable, brain CT and MR imaging are important, because these are gold standards to diagnose Dyke-Davidoff-Masson syndrome. The hallmark imaging features of Dyke-Davidoff-Masson syndrome are cerebral hemiatrophy or hypoplasia, widening of lateral ventricle in the affected side, hyperpenumatization of the paranasal sinuses, and ipsilateral compensatory osseous hypertrophy.

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Diagnostic performance of MRI perfusion and spectroscopy for brainstem glioma grading

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study investigated the roles of dynamic susceptibility contrast (DSC) perfusion and multivoxel magnetic resonance spectroscopy (MRS) in grading brainstem glioma (BSG).

Materials and Methods

Our retrospective study comprised 12 patients, including 6 with pathology verified low-grade BSGs and 6 with high-grade BSGs. We examined differences in age, relative cerebral blood volume (rCBV), regional cerebral blood flow (rCBF), and the metabolite ratios of choline (Cho)/N-acetyl aspartate (NAA) and Cho/creatine (Cr) between these two groups using the Mann-Whitney U test and Chi-square test. Receiver operating characteristic (ROC) curve analysis was used to establish cutoff values and assess their usefulness in grading BSG.

Results

The Cho/NAA metabolite ratio had the strongest preoperative predictive performance for identifying the correct histological grade among BSGs, with an area under the ROC curve (AUC) value of 0.944 (cutoff: 3.88, sensitivity [Se]: 83.3%; specificity [Sp]: 100%), followed by the Cho/Cr ratio (cutoff: 3.08; AUC: 0.917; Se: 83.3%; Sp: 100%), rCBF (cutoff: 3.56, AUC: 0.917; Se: 83.3%; Sp: 100%), rCBV (cutoff: 3.16, AUC: 0.889; Se: 100%; Sp: 66.7%), and age (cutoff: 9.5 years, AUC: 0.889; Se: 100%; Sp: 83.3%).

Conclusion

rCBF and rCBV values comparing solid tumors with the normal brain parenchyma and the metabolite ratios for Cho/NAA and Cho/Cre may serve as useful indices for establishing BSG grading and provide important information when determining treatment planning and prognosis in patients with BSG.

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Diagnostic performance of quantitative signal intensity measurements on magnetic resonance imaging for distinguishing cerebellopontine angle meningioma from acoustic schwannoma

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Our study investigated magnetic resonance imaging measurements for differentiating cerebellopontine angle (CPA) meningioma from vestibular schwannoma (VS).

Materials and Methods

This retrospective study compared 36 meningioma and 36 VS patients. The tumor volume (Vtumor) and peritumor edema index (EI) relationship was analyzed. T2-weighted three-dimensional gradient-echo image signal intensity (T23D) and apparent diffusion coefficient (ADC) differentiation cutoff values were defined. Mann-Whitney U test, independent-samples t-test, receiver operating characteristic curve, and Spearman's correlation analyses were applied.

Results

Meningioma had higher Vtumor (p=0.009) and EI (p=0.031) values than VS. Meningioma had significantly (p<0.001) lower values than VS for mean ADC (ADCmean: 0.841±0.083×10-3 vs.1.173±0.190×10-3 mm2/s), minimum ADC (ADCmin: 0.716±0.078×10-3 vs.1.045±0.178×10-3 mm2/s), tumor:white matter ADC ratio (rADC: 1.198±0.19 vs. 1.59±0.30), mean T23D (T23Dmean: 142.91±19.9 vs. 218.72±84.73), and tumor:adipose T23D ratio (rT23d: 0.19±0.06 vs. 0.30±0.28) Cutoff, sensitivity (Se), and specificity (Sp) values were ADCmin, 0.856×10-3 mm2/s (Se: 96.6%, Sp: 100%); ADCmean, 0.963×10-3 mm2/s (Se: 96.6%, Sp: 95.5%); rADC, 1.3189 (Se: 93.1%, Sp: 81.8%), T23Dmean (Se: 96.6%, Sp: 100%); rT23D, 0.1951 (Se: 89.7%, Sp: 100%), Vtumor, 14828.65 mm3 (Se: 75.0%, Sp: 66.7%), and EI, 1.1025 (Se: 47.2%, Sp: 100%).

Conclusion

ADCmin, ADCmean, rADC, T23Dmean, rT23D, Vtumor, and EI, effectively discriminated meningioma from VS.

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Predictive value of preoperative diffusion tensor imaging for evaluating postoperative outcomes of supratentorial glioma in the motor function area

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study aimed to assess the predictive value of preoperative diffusion tensor imaging (DTI) data for surgical outcomes of patients with supratentorial glioma in the motor function area

Materials and Methods

This is a retrospective study of 43 patients receiving navigation-guided surgery for histopathologically demonstrated supratentorial glioma in the motor function area. All patients underwent preoperative 3 Tesla magnetic resonance imaging examinations with conventional and DTI sequences. Data on preoperative imaging and pre- and postoperative clinical characteristics of patients were retrospectively collected. Univariate and multivariate linear regressions were applied to analyze the relationships between preoperative parameters and pre- and postoperative muscle strength and the Karnofsky Performance Status (KPS) score.

Results

Fourteen patients had low-grade gliomas and 29 had high-grade gliomas. Although the corticospinal tract (CST) score did not differ significantly between tumor grades, edema and deviation were common in low-grade gliomas (64.3%), while destroyed and infiltrated lesions were common in high-grade gliomas (58.6%). Muscle strength improved after surgery in the deviated tract group (40%) more than in the infiltrated tract group (33.3%). Two independent indices, preoperative muscle strength ($p = 0.000$) and glioma-to-CST distance ($p = 0.001$), were linearly related to postoperative muscle strength. The preoperative KPS score was the only indicator that affected the postoperative KPS score ($p = 0.000$).

Conclusion

DTI should be considered in surgical management of supratentorial gliomas in the motor function area to determine the appropriate surgical strategy and predict the nature of the tumor and postoperative motor function

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The Value of Quantitative Magnetic Resonance Imaging Signal Intensity in Distinguishing Between Spinal Meningiomas and Schwannomas

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Prior studies have suggested a number of the subjective visual characteristics that help distinguish between spinal meningiomas and schwannomas on magnetic resonance imaging (MRI) and computed tomography; however, objective quantification of the signal intensity (SI) can be useful information. This study assessed whether quantitative MRI SI measurements could distinguish intradural-extramedullary schwannomas from meningiomas.

Materials and Methods

From July 2019 to June 2022, 103 patients with intradural-extramedullary tumors (31 meningiomas and 72 schwannomas) underwent surgery, and tumors were verified pathologically. Defined regions of interest were used to quantify SI values on T1- (T1W) and T2-weighted images (T2W). Receiver operating characteristic curve analysis was used to obtain cutoff values and calculate the area under the curve (AUC), sensitivity (SE), specificity (SP), positive predictive value (PPV), and negative predictive value (NPV).

Results

To differentiate schwannomas from meningiomas on MRI, both maximum (T2max), mean (T2mean) T2W SI values and T2W tumor/fat SI ratio (rTF) demonstrated excellent abilities (AUC: 0.801, 0.802, 0.827, respectively), minimum T2W SI values (T2min) demonstrated acceptable abilities (AUC: 0.703), and maximum SI value on contrast-enhanced T1W (T1CEmax) demonstrated poor abilities (AUC: 0.662), with SE, SP, PPV, and NPV values of 77.8%, 67.7%, 84.8%, 56.8% for T2max; 76.4%, 71%, 85.9%, 56.4% for T2mean; 79.2%, 83.9%, 91.9%, 63.4% for rTF; 76.4%, 61.3%, 82.1% 52.8% for T2min; and 65.3%, 71%, 83.9% and 46.8% for T1CEmax, respectively.

Conclusion

The quantitative evaluation of SI values on MRI can be effective for differentiating between spinal schwannomas and meningiomas, with T2max, T2mean and rTF serving as the most valuable parameters.

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Routine vs. ultrafast protocol paediatric MRI brain examinations performed for headaches - Are the ACR guidelines followed?

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To review if paediatric MRI brain examinations performed for headaches comply with the American College of Radiology (ACR) guidelines at our institution.

Materials and Methods

Headaches are one of the commonest imaging indications for paediatric MRI brain examinations. At our institution, these studies are performed either on a 3-Tesla or 1.5-Tesla MRI scanner, with submitted imaging orders triaged according to ACR guidelines for appropriate MRI utilisation using a locally developed artificial intelligence based text classifier. If guidelines are met, patients are scanned on regular MR imaging protocols with optional additional sequences based on clinical need. Low-risk cases (e.g. migraine) are scanned on the 3-Tesla scanner with a recently implemented 5-minute ultrafast protocol.

Clinical and imaging data of paediatric patients who underwent MRI brain examination at KK Women's and Children's Hospital from January to December 2022 were reviewed.

Results

A total of 647 and 277 MRI brain examinations were completed on the 3-T and 1.5-T MRI scanners respectively, with 250 (38.6%) studies utilising the ultrafast protocol. Sixty-nine (53 on 1.5-T) of the 674 (397 on 3-T, 277 on 1.5-T) non-ultrafast protocol studies were also performed for headache indications, with 15 studies administered intravenous contrast. Of the 69 non-ultrafast protocol studies, 58 (84.0%, 47 on 1.5-T) did not meet the ACR criteria for routine imaging.

Conclusion

Most of the non-ultrafast protocol studies performed for headache did not fulfill the ACR criteria and could be scanned with the 3-Tesla ultrafast protocol instead, potentially saving time and costs. However, logistical and patient-related reasons may be causing non-compliance.

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Differentiation Between Glioblastoma and Solitary Brain Metastasis: The Role of Diffusion Tensor Imaging and the Quantitative Analysis Based on Flair Signal Intensity

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study determined the diagnostic utility of diffusion tensor imaging (DTI) and fluid-attenuated inversion recovery (FLAIR) signal intensity (SI) for discriminating between glioblastoma (GBM) and solitary brain metastasis (SBM).

Materials and Methods

A retrospective study was conducted, including fifty patients who underwent biopsy or surgery and received a histological diagnosis of GBM or SBM between August 2020 and June 2022. All preoperative examinations were performed on 3 Tesla MRI using conventional and DTI sequences. Three regions of interest were placed in the enhancement region of the tumor, the peritumoral edema, and the opposite normal white matter to measure FA, MD value and FLAIR SI. The diagnostic value of the significant difference parameters between the two tumors was analyzed by using the receiver operating characteristic curve.

Results

In the peritumoral region, FA value (pFA) of GBM was significantly greater but the FLAIR SI (pFLAIR) was significantly lower than that of SBM ($p<0.05$). The FA, MD value, FLAIR SI in the enhancing region (eFA, eMD, eFLAIR), and the ratio of eFA, eFLAIR values to the FA and FLAIR SI of the opposite normal white matter (e/nFA, e/nFLAIR, respectively) in GBM were all significantly greater than those of SBM. Combining the pFA, eFA, eMD, eFLAIR, e/nFA, and e/nFLAIR values provided the highest area under the curve of 0.975, with a sensitivity of 88.6% and a specificity 100% for distinguishing GBM and SBM.

Conclusion

The combination of pFA, eFA, eMD, eFLAIR, e/nFA, and e/nFLAIR parameters may increase the discrimination of GBM and SBM.

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CT Perfusion for the Detection of Vasospasm and Delayed Cerebral Ischaemia in Aneurysmal Subarachnoid Hemorrhage: A Systematic Review and Meta-analysis

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This systematic review and meta-analysis investigated the diagnostic performance of computed tomography perfusion (CTP) for detection of delayed cerebral ischemia (DCI) and vasospasm in the setting of aneurysmal subarachnoid hemorrhage (aSAH).

Materials and Methods

A systematic review was performed to December 2022 of studies that compared diagnostic accuracy of CTP to a reference standard (clinical or radiologic DCI, angiographic spasm) for the detection of vasospasm or DCI in aSAH patients. Bivariate random effects models were used to pool outcomes for sensitivity, specificity, positive likelihood ratio (LR) and negative LR. Subgroup analyses for individual CTP parameters and study timing was performed. Bias and applicability were assessed using modified QUADAS-2.

Results

Twenty-eight studies were included, with 1514 patients and 2044 CTP studies. For assessment of DCI, CTP demonstrated a pooled sensitivity of 81.2% (95% CI 74.4-86.5%), specificity of 77.7% (95% CI 70.9-83.30), positive LR of 3.64 (95% CI 2.72-4.89), and negative LR of 0.24 (95% CI 0.17-0.34). The most sensitive parameter for DCI detection was time to peak (TTP), in 8 studies with a pooled sensitivity of 82.4% (95% CI 73.40-88.70) and specificity of 72.3% (95% CI 62.80-80.20). For assessment of vasospasm, CTP showed a pooled sensitivity of 81.7% (95% CI 70.20-89.50), specificity of 92.1 (95% CI 80.50-94.20), positive LR of 7.51 (95% CI 4.02-14.03), and negative LR of 0.21 (95% CI 0.12-0.35).

Conclusion

CTP has a high sensitivity, moderate negative LR and reasonable specificity for the detection of DCI. For detection of vasospasm, CTP demonstrates high specificity and reasonable sensitivity.

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Sixth nerve palsy- just the tip of the iceberg?

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

While isolated 6th nerve palsy can be due to underlying vasculopathy (such as poorly controlled diabetes); often times MRI demonstrates a causative lesion, not initially suspected.

Due to its superior contrast resolution; MRI can localize the pathology to the segment of abducent nerve involved. It can often characterize the abnormality and is useful for further treatment planning.

Hence MRI must be performed in all patients with persistent 6th nerve palsy and is specially indicated in patients without risk factors or evidence of significant vasculopathy.

Good knowledge of the anatomy and the intracranial course of 6th nerve on MRI and systemic approach is imperative to pick up these abnormalities.

Background / Outline

Abducens nerve innervates the lateral rectus muscle and is responsible for horizontal eye movement.

Due to its longest intracranial course; it is often the first cranial nerve to be affected by a wide variety of CNS pathologies. Lesions can affect the nerve directly such as central lesions (infarct, demyelination or tumour) or indirectly leading to stretching or displacement or infiltration of the nerve along its course.

MRI offers the best opportunity to identify the cause and extent of the underlying abnormality and aids further management.

In this pictorial review we illustrate the key anatomy of the nerve along with a number of conditions that can masquerade under this blanket diagnosis.

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A posterior inferior cerebellar artery of C2 transverse foramen level origin that entered the spinal canal via the C1/2 intervertebral space demonstrated by computed tomography angiography

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To describe a case of a posterior inferior cerebellar artery (PICA) of C2 transverse foramen level vertebral artery (VA) origin that entered the spinal canal via the C1/2 intervertebral space.

Materials and Methods

A 48-year-old man with posterior neck pain underwent computed tomography (CT) angiography and selective left vertebral angiography.

Results

Arterial dissection was found at the distal V2 segment of the left VA on subtracted CT angiography. The left PICA arising from the VA at the level of C2 transverse foramen was identified on CT angiography with bone imaging. This PICA of extracranial origin entered the spinal canal via the C1/2 intervertebral space, just like a PICA of C1/2 level origin.

Conclusion

The origins of PICAs show several variations. PICAs originating at the extracranial C1/2 level VA are relatively rare, with a reported prevalence of approximately 1%. Our patient had a left PICA arising from the VA at the level of the C2 transverse foramen. No similar cases have been reported in the relevant English-language literature. We speculated that the proximal short segment of the PICA arising from the C1/2 level VA regressed incidentally and that the distal segment of the PICA was supplied by the muscular branch of the VA arising from the level of the C2 transverse foramen.

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Multiple Rim-Enhancing Lesions in Brain CT and MRI of a Patient with HIV/AIDS

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- Tuberculomas represent 10%-30% of intracranial masses in tuberculosis endemic areas with clinical presentations are seizure, headache, hemiplegia and signs of raised intracranial pressure

- CT scan was reported to have a sensitivity of 100% and specificity of 85.7% in CNS tuberculoma detection and was more sensitive in calcification

- MRI was more sensitive in a larger number of lesions, infarcts, vasogenic edema, meningeal enhancement and also can characterized different forms of tuberculoma

Background / Outline

Tuberculosis, an infectious disease caused by the Mycobacterium tuberculosis, typically affects the lungs (pulmonary TB) and spread to other sites (extrapulmonary TB) through lymphatic or hematogenous dissemination. Central nerve system (CNS) tuberculosis occurs in 2-5% of patients with tuberculous infections and up to 15% of cases of AIDS-related tuberculosis. CNS tuberculosis mainly manifests as tuberculous meningitis, tuberculomas or tuberculous abscesses. Tuberculomas represent 10%-30% of intracranial masses in tuberculosis endemic areas with clinical presentations are seizure, headache, hemiplegia and signs of raised intracranial pressure. CT scan was reported to have a sensitivity of 100% and specificity of 85.7% in CNS tuberculoma detection, but different forms of tuberculoma can be characterized based on MRI findings. Therefore, the most commonly used modality of choice is contrast-enhanced magnetic resonance imaging (MRI). CT scan was more sensitive in calcification, whereas MRI was more sensitive in a larger number of lesions, infarcts, vasogenic edema, and meningeal enhancement. Here, we present the case of multiple intracranial tuberculoma in a 31-years old men with headaches, seizure, stiffness on the left extremity and history of HIV/AIDS.

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Pituitary Adenoma : What Radiologist should Know

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Magnetic Resonance Imaging (MRI) is the first imaging used to diagnose pituitary adenoma. Pituitary gland imaging using MRI requires special protocol because of its small size, its proximity to bone and sinusoidal air, and the proximity of the internal carotid artery. It provides an extremely powerful tool to identify pituitary adenoma, distinguish between micro- and macro-adenoma and assess their extension. Though MRI can be used to diagnose microadenoma and macroadenoma, there are some limitations and MRI can be non-conclusive. The development of additional imaging modalities like nuclear medicine explorations may help to confirm diagnosis, guide management and follow up. Radiopharmaceuticals products target specific cellular elements which allow exploration of several biological pathways. Nuclear medicine may also be used for therapeutic purposes and recent developments of approach based on Peptide Receptor Radionuclide Therapy for treatment of aggressive pituitary adenoma.

Background / Outline

Pituitary adenomas originate from the endocrine tissue of the adenohypophysis. They comprise up to 80% of sellar tumors and 10–15% of intracranial tumors and are classified by size and clinical function. By size, there are microadenoma and macroadenoma; while clinically, there are endocrinologically functional and non-functional adenoma. The functional adenoma causes hormonal disturbance, thus the type of pituitary adenoma also classified by hormonal produced by the tumors. Since the WHO Classification of Endocrine Tumors 4th edition till the new 5th edition, the histological type is now defined not only by the anterior pituitary hormones, but also by the transcription factors involved in the differentiation of anterior pituitary cells.

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Same Same but Different!

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Dementia is the loss of cognitive functioning — thinking, remembering, and reasoning — to such an extent that it interferes with a person's daily life and activities. It is a global problem and affects about 47.5 million people worldwide and about one-third of all people aged 85 or older may have some form of dementia. Signs and symptoms of dementia result when once-healthy neurons in the brain stop working, lose connections with other brain cells, and die. It can be a very challenging diagnosis as patients with neurodegenerative disorder can present with similar symptoms. It requires a combination of detailed clinical assessment and MR imaging. Although a PET scan is a useful tool, it is rather expensive. In this article we illustrate MR imaging features of a number of clinical syndromes presenting with similar problems but with different underlying pathologies. It highlights the importance of MR imaging which problem-solves and helps the clinician in making a diagnosis.

Background / Outline

This is a case-based MR imaging review of patients clinically diagnosed with dementia and presenting with a similar set of problems but with different underlying pathologies. We have divided them into three main subsets: 1. Memory deficits 2. Speech and language deficits 3. Personality and behavioural change. Dementia can be very challenging to diagnose, with the final diagnosis being primarily clinical after consideration of imaging findings.

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Vallue of MRI in differential diagnosis of parkinsonism - from swallow tail sign to nigrosome-1 imaging

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Understanding the anatomical relationship between swallow tail sign and nigrosome-1 imaging, and their value in differential diagnosis of parkinsonism.

Background / Outline

Since the first report of swallow tail sign by Schwarz ST et al in 2014, the diagnosis of Parkinson's disease (PD) becomes possible using MRI. The negative predictive value was 100% for PD according to the original publication, and 89% for Lewy body dementia according to Shams S et al in 2017. It was believed that the hyperintensity between the hypointense swallow tails was the nigrosome-1 (N-1). However, Brammerloh M et al in 2022 reported that the nigrosome-1 was only partly overlapped with the hyperintense part of swallow tail sign, and nigrosome-1 was significantly thinner and longer than the swallow tail sign. Therefore, it is necessary to understand the difference and value in the differential diagnosis of different causes of parkinsonism for clinical application. Outline of this report will include the following and will be modified according to length allowed for this presentation:

- General introduction to parkinsonism including PD
- Dopamine transporter (DaT, DAT) scan
- Swallow tail sign / absent swallow tail sign
- Locations of five nigrosomes including N-1 on MRI
- Swallow tail sign: revisited
- Clinical application of N-1 imaging in differential diagnosis of parkinsonism.
- Recognition of normal and abnormal N-1 (PD) on MRI
- Atypical parkinsonism (Parkinson's plus syndrome): CBD, DLB, MSA-P, MSA-C, PSP
- Secondary parkinsonism: drug induced, vascular
- Familial: Fahr disease

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Traversing the Maze of the Common but Confounding Intrinsic Spinal Cord Signal Abnormality

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Cultivate a systematic approach to tackle the abnormal cord signal.

Familiarize with the imaging features of various causes of abnormal cord signal.

Co-relate the imaging features with the clinical presentation and other relevant investigations.

Be aware of pitfalls and mimics.

Background / Outline

Abnormal cord signal intensity is a commonly encountered but non-specific feature on MR imaging of the spine. It presents a diagnostic dilemma to the radiologists, as the causes include a wide range of conditions.

Evaluation of the imaging features in the backdrop of the clinical details, which include presentation, symptoms, signs, and relevant laboratory investigations, facilitates in narrowing the differential diagnosis. The most important of these is whether the presentation is acute or chronic.

Developing a systematic approach in analyzing the imaging features assists in arriving at a diagnosis.

The first step is to exclude extrinsic compression, as it is a common cause and the abnormality is evident. The next step is to exclude whether the abnormal signal is due to an artifact.

The abnormal cord signal should also be evaluated for

• Short or long segment involvement
• Anterior or posterior cord involvement
• Expansile or non-expansile
• Presence or absence of cord oedema
• Presence or absence of enhancement

We present a pictorial assay of intrinsic cord signal abnormalities with a systematic approach to evaluation and diagnosis.

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Endovascular treatment for spontaneous intracranial hypotension (SIH) secondary to spinal cerebrospinal fluid (CSF)-venous fistula.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Review on endovascular treatment for spontaneous intracranial hypotension (SIH) secondary to spinal cerebrospinal fluid (CSF)-venous fistula (VF), followed by a case presentation and treatment outcome.

Materials and Methods

A systematic search using combinations of keywords: [SPINAL] AND [CSF-VENOUS FISTULA] AND [ENDOVASCULAR] from inception to 1 April 2023 in PubMed was performed.

For our case report, patient consent for research participation was obtained prior to endovascular treatment.

Results

5 studies reported endovascular treatment in patients with SIH secondary to spinal CSF-VF. Note there is a significant disparity in case volume – 2 studies (an author's name was included in both studies) recruited 5 and 60 patients, whereas the remaining 3 studies were single case reports. Clinical resolution/improvement was achieved in all cases with no reported periprocedural major adverse events or recurrence.

In our case, a 56-year-old lady presented with intermittent postural headaches for 6 months. MRI brain demonstrated SIH with no measurable opening pressure on lumbar puncture. Epidural blood patch was performed with clinical improvement. However, her SIH recurred after 1 month. Digital subtraction myelography (DSM) and decubitus CT myelogram (CTM) demonstrated CSF-VF at the right T9-10 neural exit foramen. Onyx embolization was performed with good penetration and desirable cast distribution. No periprocedural complication was encountered. Complete radiological and clinical resolution of SIH was achieved with no recurrence.

Conclusion

SIH from spinal CSF-VF is an emerging entity that is increasingly recognized, which endovascular venous embolization is an effective and safe treatment option for this disease.

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Deep Learning-based synTOF-MRA Generation Using Time-resolved MRA in Fast Stroke Imaging

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Time-resolved magnetic resonance angiography (TR-MRA) enables collateral evaluation in late-window acute ischemic stroke (AIS) with large vessel occlusion (LVO); however, a low signal-to-noise ratio (SNR) and spatial resolution impede the diagnosis of vascular occlusion. We developed a CycleGAN-based deep learning model to generate high-resolution synthetic time-of-flight (TOF) MRA images using TR-MRA and evaluated its image quality and clinical efficacy.

Materials and Methods

This retrospective, single-center study included 397 patients who underwent both TOF- and TR-MRA between April 2021 and January 2022. Patients were divided into two groups for model development and image quality validation. Image quality was evaluated qualitatively and quantitatively with three sequences [TR-MRA, synthetic TOF (synTOF), and TOF]; a multi-reader diagnostic optimality evaluation was performed by 16 radiologists. For clinical validation, we evaluated 123 patients who underwent fast-stroke magnetic resonance imaging to assess AIS. Diagnostic confidence level and decision time for LVO were also evaluated.

Results

Median values of overall image quality, noise, sharpness, and venous contamination were significantly better with synTOF than with TR-MRA. There was no significant difference in SNRs of middle cerebral arteries between synTOF and TOF. During the multi-reader evaluation, radiologists could not discriminate synTOF images from TOF images when selecting the real TOF images. During clinical validation, both readers demonstrated significant increases in diagnostic confidence levels and decreases in decision time.

Conclusion

A CycleGAN-based deep learning model was developed to generate synTOF images with high resolution and SNR. SynTOF could potentially mitigate limitations of TR-MRA, which excels in collateral imaging.

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Susceptibility weighted imaging findings for various intracranial conditions; smoking gun in tricky case

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- SWI is a high resolution 3D gradient echo MR imaging technique that is sensitive to substances that induce local magnetic fields inhomogeneity, such as blood products.
- Resulted from these characteristics, additional SWI-specific findings may appear in various intracranial pathologies.
- If you are familiar with these SWI-specific findings, you can receive decisive help in diagnosing a tricky case.

Background / Outline

- Vascular disease
    - Dissection
    - Venous sinus thrombosis
    - Dural AVF
    - Cerebral amyloid angiopathy
- Trauma
    - Cerebral fat embolism syndrome
- Inflammatory disease
    - Multiple sclerosis, central vein
    - Abscess, dual rim sign
- Neurodegenerative
    - MSA-P type
- Miscellaneous
    - Remote cerebellar hemorrhage
    - Pulmonary embolism
    - Chronic encapsulating hematoma
    - Critical illness associated microbleeds 735682

Oral Competition &
E-poster Presentation

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Preballoon-Navigation Technique: Distal Emboli Protection During Stent Retriever Thrombectomy

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

During stent retriever thrombectomy, a balloon guide catheter reduces distal emboli and consequently improves clinical outcomes. Because balloons are usually used before stent retrieval, these can affect the thrombus including the distal emboli while performing microcatheter navigation. This study aimed to evaluate the usefulness and safety of the preballoon navigation technique during microcatheter and microwire navigation.

Materials and Methods

Patients who underwent stent retriever thrombectomy secondary to an anterior circulation large-artery occlusion were retrospectively evaluated. The preballoon-navigation technique was used, and the number of retrievals, procedure time, final recanalization, presence of distal emboli, first-pass effect (FPE), symptomatic intracranial hemorrhage including procedure-related complications, and clinical outcomes at 3 months were evaluated.

Results

In total 123 patients were analyzed, and occurrence of distal emboli was lesser in the preballoon navigation than in the non-balloon navigation group (4.4% vs. 11.5%, p=0.02). No statistical difference was found in successful recanalization, mortality, and procedure-related complications. Moreover, the preballoon group had a higher FPE than the non-balloon navigation group (37.8% vs. 20.5%, p=0.004). Although no statistical difference was found in the preballoon group, a trend toward a higher rate of good clinical outcomes was observed (mRS 0–2 at 3 months, 55.6% vs. 48.7%, p=0.09). In the multivariate analysis, lesser distal embolism (0.91 [0.80–1.00], p=0.02), higher successful recanalization (3.52 [1.11–7.03], p=0.016), and higher FPE (3.17 [1.83–7.37], p=0.001)

Conclusion

The preballoon-navigation technique significantly reduced occurrence of distal embolism and increased the FPE.

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Congenital external carotid-internal carotid artery anastomosis: A report of three cases and literature review

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Congenital external carotid-internal carotid artery (EC-ICA) anastomosis is a cervical arterial variation that was initially reported in 2011. The carotid bifurcation and EC-ICA anastomosis form a large arterial ring. The purpose of this presentation is to show the characteristic findings of this extremely rare cervical arterial variation.

Materials and Methods

We analyzed eight cases, including five previously reported cases and three cases that we recently experienced. Three of the five previously reported cases were from Korea, and the remaining two cases were from Japan. MR angiography (4), CT angiography (2) and catheter angiography (2) were used as diagnostic modalities.

Results

The study population included seven men and one woman. Anastomosis was seen on the left side in seven cases and the right side in one case, and it was located at the level of C2-C2/3 cervical vertebrae. In all cases, ECA was larger than ICA at the level of their origins. In four cases, the ICA was extremely small in caliber. In one case, the ICA may have been occluded postnatally.

Conclusion

EC-ICA anastomosis can be regarded as a variant of the nonbifurcating cervical carotid artery (CCA) because if a proximal segment of the small ICA is occluded prenatally or postnatally, nonbifurcating CCA may form. EC-ICA anastomosis may be formed by remnants of the proatlantal artery, which normally remains as the occipital artery.

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Altered hippocampal intra-networks in mild cognitive impairment: a structural MRI study in a general elderly Japanese population

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Although altered networks inside the hippocampus (hippocampal intra-networks) have been observed in dementia, the evaluation of hippocampal intra-networks using MRI is challenging. We employed conventional structural imaging and incident component analysis (ICA) to investigate the structural covariance of the hippocampal intra-networks. We aimed to assess altered hippocampal intra-networks in patients with mild cognitive impairment (MCI).

Materials and Methods

This was a cross-sectional study of 2122 participants with 3T MRI (median age 69 years, 60.9% female) who were divided into 218 patients with MCI and 1904 cognitively normal older adults (CNOA). By employing 3D T1-weighted imaging and ICA, we extracted the structural covariance intra-networks in the hippocampus.

Results

The ICA extracted 16 intra-networks from the hippocampal structural images, which were divided into two bilateral networks and 14 ipsilateral networks. Of the 16 intra-networks, four (one bilateral network and three ipsilateral networks) were significant predictors of MCI from the CNOA after adjusting for age, sex, education, disease history, and hippocampal volume/total intracranial volume ratio.

Conclusion

We found that the relationship between hippocampal intra-networks and MCI was independent from the hippocampal volume. Our results suggest that altered hippocampal intra-networks may reflect a different pathology in MCI from that of brain atrophy.

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Postoperative Complications related to Neurosurgical Implants

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- Identifying the various neurosurgical implants on imaging
- Knowing the common complications to look out for in post-operative implant insertion, including the interval at which to expect such findings.
- Knowledge of the appropriate subsequent management of such complications

Background / Outline

There are a wide range of neurosurgical implants, cranioplasty materials and catheters used to treat a variety of intracranial disorders, including those related to neurotrauma, hydrocephalus, neurovascular diseases, infections and movement disorders such intractable Parkinsonism. Interpretation of postoperative imaging can be challenging and complicated by postoperative changes and potential implant-related complications. Some examples of complication with illustrations: (1) post-cranioplasty infection and tension pneumocephalus; (2) Deep brain stimulator with infection and dislodgement; (3) Post-EVD and VP shunts with ventriculitis and dysfunction, resulting in recurrent hydrocephalus; (4) Brain hemorrhage related to ICP monitoring probe; (5) Dislodgement of aneurysm clip/flow diverter/cochlear implant.

If these complications were not addressed appropriately in a timely manner, it may cause delay in patient's treatment with subsequent prolongation of hospital stay. It is therefore paramount for clinicians and radiologists to be aware of these implant-related complications during postoperative surveillance. Early detection and appropriate management of these neurosurgical implants related complications is essential to prevent delays in treatment and prolonged hospital stays.

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Diagnostic algorithm for grading high-grade glioma and low-grade glioma using 3T-MRI with dynamic susceptibility contrast-enhanced (DSCE), proton magnetic resonance spectroscopy (1H-MRS) and diffusion tensorimaging (DTI).

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This retrospective study was designed to investigate the diagnostic capacity and construct a diagnostic algorithm of DSCE-MRI, 1H-MRS and DTI in grading low-grade glioma (LGG) and high-grade glioma (HGG)

Materials and Methods

57 patients enrolled in this retrospective study comprised 14 LGG and 43 HGG (5 WHO grade 1, 9 grade 2, 20 grade 3, and 23 grade 4). All research subjects underwent a standard 3T MRI brain tumour protocol with conventional magnetic resonance imaging (cMRI) and advanced technique, including DSCE-MRI, 1H-MRS and DTI. We review the connection between grade categorize and parameters of tumour and peritumor regions in (1) DSCE-MRI: signal intensity in relative cerebral blood volume map and regional cerebral blood flow map and ratio to normal white matter (TrCBV, TrCBF, PrCBV, PrCBF); (2) 1H-MRS: ratio of metabolites Choline to N- acetyl aspartate and Creatinin (TCho/NAA, TCho/Cr, PCho/N AA, PCho/Cr); (3) DTI: signal intensity in fractional anisotropy and mean diffusivity and ratio to normal white matter (T-FA, P-FA, T-MD, P-MD, rFA t/n, rFA p/n, rMD t/n, rMD p/n). Comparison using Mann-Whitney U test, Chi–square test, and receiver operating characteristic (ROC) curve analysis. Utilized decision tree analysis to establish an algorithm using the specified cut-off of significant parameters.

Results

PrCBF had the highest performance in preoperative prediction of histological glioma grading, followed by TrCBV, PrCBF, TrCBV, PCho/NAA, PCho/Cr, TCho/NAA, TCho/Cr, rFA p/n, and P-FA. Algorithm using TrCBV, PrCBF, and rFA p/n with a diagnostic accuracy of 100% LGG and 90.7% HGG, risk estimate of 7%. The cut-off (sensitivity and specificity) value of TrCBV 2.48 (86, 100), PrCBF 1.26, (83.7, 100), and rFA p/n 0.43 (50, 88.4).

Conclusion

The parameters and ratios in DSCE-MRI, 1H-MRS and DTI represent functional indices in glioma grading and bring important information for treatment planning and the prognosis of patients. Taking advantage of the algorithm using TrCBV, PrCBF, and rFA p/n might increase the overall diagnostic ability to 100% with LGG and 90.7% with HGG.

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Hyperpolarized ^{129}Xe Magnetic Resonance Spectroscopy Imaging in Patients with Gliomas

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study aimed to investigate the feasibility of imaging hyperpolarized (HP) ^{129}Xe magnetic resonance spectroscopy (MRS) in patients with glioma.

Materials and Methods

A prospective study was conducted with one healthy volunteer and three glioma patients. HP ^{129}Xe MRS was performed in the brain. After inhaling 900ml of HP ^{129}Xe gas, the HP ^{129}Xe gas got through the alveoli and blood vessel. The gas dissolved into the brain by the systemic blood circulation. HP ^{129}Xe dissolved in brain was used for imaging. chemical shift calibration was performed by ^{129}Xe gas phase resonance. The HP ^{129}Xe MRS images of the brain in healthy volunteers and glioma patients were observed.

Results

The HP ^{129}Xe MRS of the healthy volunteer showed three obvious nuclear magnetic resonance peaks at 195.3ppm, 192.5ppm and 189.1ppm. The HP ^{129}Xe MRS of three glioma patients showed obvious nuclear magnetic resonance peaks at 195ppm~196ppm, 192ppm~193ppm and 189ppm~190ppm. Compared with the healthy volunteer, two patients showed a decrease peak at 192ppm~193ppm, and two patients showed an increase peak at 189ppm~190ppm.

Conclusion

HP ^{129}Xe MRS technology can detect in healthy volunteers and glioma patients safely and stably, and good image quality can be obtained. Three nuclear magnetic resonance peaks with different shapes and chemical shifts can be observed. The imaging technology has potential for detecting glioma patients and has potential for clinical development in detecting glioma molecular phenotypes in the future.

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4D Flow MRI blood flow quantification correlates with direct MCA blood pressure measurements in patients with EC-IC bypass

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The purpose of this study was to clarify the intracranial hemodynamics before and after STA-MCA bypass surgery by comparing the flow parameters obtained by time-resolved 3-dimensional phase-contrast (4D Flow) magnetic resonance imaging (MRI) and intraoperative MCA pressure measurement.

Materials and Methods

We recruited 23 patients who underwent STA-MCA bypass surgery for internal carotid artery (ICA) or MCA stenosis. We monitored intraoperative MCA pressure, STA pressure, and radial artery (RA) pressure. All patients underwent 4D Flow MRI preoperatively and 3 weeks after surgery to quantify the blood flow volume (BFV) of the bilateral ICA, basilar artery (BA), and bilateral STA. The sum of intracranial BFV was defined as BFVtotal. We compared BFV parameters and intraoperative pressure.

Results

BFViSTA significantly increased after surgery (p < 0.001). While, BFViICA and BFVBA significantly decreased after surgery (BFViICA p = 0.005; BFVBA p = 0.02). No significant difference was observed in BFVcICA between before and after surgery (p = 0.07). As a result, BFVtotal postoperatively increased by 6.8%, however, no significant difference was observed (p = 0.07). Intraoperative MCA pressure and MCA/RA pressure ratio significantly increased after surgery (p<0.001). We found a stronger positive correlation between MCA pressure increase ratio and BFVtotal increase ratio in patients with lower pre-MCA pressure (r = 0.907, p <0.001).

Conclusion

The quantitative assessment of 4D Flow MRI revealed that the intracranial blood flow changes complementarily after STA-MCA bypass surgery. The sum of intracranial BFV can be used for the evaluation of treatment outcome after the surgery.

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Imaging Features of High Resolution Vessel Wall MR in Uncommon Neuroradiological Conditions

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

We aim to highlight and discuss the high resolution vessel wall imaging (HR-VWI) specific features of the conditions below:

1. Intravascular lymphoma
2. Vertebro-basilar dolichoectasia
3. Giant cell arteritis
4. Systemic lupus erythematosus
5. Intracranial Takaysu
6. Intracranial arterial dissection treated with endovascular clot retrieval. Co-existing imaging features of arterial dissection and post thrombectomy findings.

Background / Outline

The use of high resolution vessel wall MR imaging (HR-VWI) has rapidly increased in neuroradiology. Commonly imaged pathologies include intracranial vasculitis, atherosclerosis, Moyamoya and cerebral aneurysms.

In this abstract we would like to showcase HR-VWI features of uncommon intracranial pathologies and rare sub-variants of more common neurovascular conditions. We hope that this will help to improve confidence in the interpretation of HR-VWI studies.

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Efficacy of pre-MRI interactive videos in children in the clinical setting

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare the efficacy of pre-MRI interactive videos in children in the clinical versus the research setting.

Materials and Methods

A previous 2018 research study showed that videos can improve the cooperativeness of children undergoing MRIs, with less repeated MRI sequences required.

Interactive videos were implemented into clinical practice and this is a post-implementation study on children undergoing MRIs in 2021–2022. Their confidence in keeping still and the requirement for repeat MRI sequences were compared against the data from previous research.

Results

Results were separately analysed for two groups of children undergoing brain MRIs – those undergoing the Ultra-fast brain MRI protocol, which has a greatly reduced average acquisition time of 6 minutes (4–13 minutes) and other MRI brain protocols, lasting on average 36 minutes (12–112 minutes).

For the ultra-fast brain MRI protocols (n=55), 20 (36.4%) children were confident of keeping still for a minimum of 30 minutes, and 12 (21.8%) needed repeat sequences. Their average age was 12.1 ± 3.0 years.

For the other MRI brain protocols (n=91), 63 (69.2%) children were confident of keeping still for a minimum of 30 minutes, and 28 (30.8%) needed repeat sequences. Their average age was 11.1 ± 3.0 years.

This compares favourably to the 31.5% confidence and 37.8% repeats from the research study which had children with an average age of 11.0 ± 3.3 years.

Conclusion

The efficacy of interactive videos is maintained in the clinical setting. The requirement for repeat sequences appears significantly lower for the Ultra-fast brain MRI protocol, although statistical significance was not reached (p=0.087).

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Diagnostic Findings in Creutzfeldt-Jakob Disease

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Creutzfeldt-Jakob Disease (CJD) is a rare and fatal degenerative disease that belongs to the Prion family. It is often misdiagnosed as its clinical manifestations can mimic other conditions, so further diagnostic tools were required.

Materials and Methods

We report a 64-years-old female with rapid progressive dementia, multifocal seizures, akinetic mutism, upper and lower extremities spasticity as well as postural tremor, who underwent brain MRI and Electroencephalography (EEG) examination.

Results

MRI findings showed bilateral thalamus and basal ganglia enlargement. Restricted diffusion was found in bilateral caudate nuclei, along the cortex of bilateral superior frontal gyrus, left medial frontal gyrus, left inferior frontal gyrus, and right occipital cortex. FLAIR sequence showed hyperintense signal involving the pulvinar and dorsomedial thalamus, also known as the Hockey Stick sign. Serial EEG examination demonstrated Generalized Periodic Discharge (GPD) in both cerebral hemispheres.

Conclusion

The clinical symptoms, along with brain MRI and EEG findings, well correspond to the diagnostic criteria of probable sporadic Creutzfeldt-Jakob Disease.

Keywords: Creutzfeldt-Jakob Disease, Caudate Nuclei and Cortical Restricted Diffusion, Pulvinar and Dorsomedial thalamus FLAIR hyperintensities, Generalized Periodic Discharge.

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Broad spectrum of central nervous system manifestations in patients with hematologic malignancy

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

The spectrum of CNS manifestations is very wide in patients with hematologic malignancy. Radiologists should know each hematologic malignancy related CNS manifestations. Myeloid sarcoma frequently occur in acute myeloid leukemia, and previously known as chloroma and granulocytic sarcoma. It can manifest as a enhancing solid extramedullary mass. Lymphoma demonstrates high attenuation on unenhanced CT images, periventricular location, strong enhancement, and restricted diffusion on diffusion weighted image (DWI). In patients with multiple myeloma, common manifestations include extraaxial dura-based masses, parenchymal and cranial nerve involvement. With regard to the infection, progressive multifocal leukoencephalopathy can be suspected when DWI shows peripheral restricted diffusion with or without enhancement on T1 enhancement scan. And toxoplasmosis should be included as a differential diagnosis when T1 contrast enhancement shows target apperarance and rim enhancing lesion.

In the Methotrexate (MTX) induced encephalopathy can show unilateral or bilateral diffusion restriction in the white matter, sparing the subcortex. It can be confused with the ischemic stroke. Clinical features often include a subacute encephalopathy with a fluctuating course followed by frequent improvement of symptoms. And also, symmetrical involvement of the basal ganglia may occur.

Background / Outline

Outline

1. Tumor

1) Lymphoma

1.1) Primary CNS lymphoma

1.2) Secondary CNS lymphoma

2) Myeloid lineage - myeloid sarcoma

3) Lymphoid lineage- leukemia involvement

4) Multiple myeloma and plasmacytoma/ extramedullary myeloma

2. Infection

1) Progressive multifocal leukoencephalopathy (PML)

2) Toxoplasmosis

3) CMV infection

4) Listerial encephalitis

3. Toxic or metabolic encephalopathy

1) MTX-induced encephalopathy

2) Posterior reversible encephalopathy (PRES)

3) Wernicke encephalopathy

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Case of Reversible Cerebral Vasoconstriction Syndrome - Clinically and Radiologically proven.

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Imaging findings in RCVS: Characteristic imaging finding on angiography is described as giving a "sausage-on-a-string appearance" OR "beaded appearance" of medium-to-large cerebral arteries, where multifocal areas of smooth tapering narrowing are interspersed with segments of normal-caliber. These findings typically resolve within three months.

Clinical and imaging differentials: Important clinical differentials for thunderclap headache include aneurysmal subarachnoid hemorrhage, intracerebral hemorrhage, cerebral venous thrombosis, cervical arterial or cerebral arterial dissection, and pituitary apoplexy. However, the most important imaging and clinical mimics of RCVS are other large/ medium vessel intracranial arteriopathies such as Primary angiitis of the central nervous system (PACNS). The RCVS2 score is a useful aid in differentiating RCVS from these vasculopathies.

Differentiating RCVS from other intracranial arteriopathies is particularly important as management and outcomes are different. RCVS is managed conservatively and is a self limiting condition with complete long - term resolution of symptoms in most cases, while other intracranial arteriopathies usually require more elaborate management. Also, the use of corticosteroids in RCVS is associated with worse clinical outcomes.

This educational exhibit demonstrates one such clinically and radiologically proven case of RCVS, with imaging findings on CT and DSA.

Background / Outline

Reversible Cerebral Vasoconstriction Syndrome (RCVS) is a clinical and radiologic syndrome characterised by thunderclap headache and reversible vasoconstriction of cerebral arteries. This may be spontaneous or precipitated by a trigger such as drugs, post-partum state, trauma and strenuous activity. The pathophysiology of RCVS is unknown and is postulated to be due to alterations in cerebral vascular tone.

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Distinct Amygdala Connectivity Changes in Youth at High-Risk for Bipolar Disorder with and without Antidepressant-induced Hyperarousal

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Antidepressants are commonly used to treat moderate to severe depression and anxiety in youth including those with a family history of bipolar disorder (BD). However, in some youth, antidepressants induce emotional hyperarousal (e.g., irritability, agitation, aggression, elevated mood), particularly in youth with a family history of BD. Thus, it is important to examine the neurobiological mechanism underlying antidepressant-induced hyperarousal and examine its pretreatment predictors.

Materials and Methods

Twenty-two youth with a family history of BD and current depressive and/or anxiety disorder who received escitalopram were analyzed here, half of them had hyperarousal and the other demographically-comparable half did not have hyperarousal after treatment initiation. Resting-state functional images were collected at baseline and the time of a hyperarousal event. CONN was used to preprocess data and generate amygdala connectivity maps. Group-by-time interaction was evaluated using a full-factorial analysis with thresholds of voxel-level $p<0.005$ and cluster-level FDR-corrected $p<0.05$.

Results

Significant group-by-time interactions were found in connectivity of right amygdala-right ventrolateral prefrontal cortex (VLPFC), right amygdala-left VLPFC, and right amygdala-right striatum. Post-hoc analyses showed youth with hyperarousal compared to those without had lower amygdala-VLPFC connectivity at baseline, and escitalopram increased amygdala connectivity in youth with hyperarousal but decreased amygdala connectivity in those without hyperarousal. Moreover, lower baseline connectivity in right amygdala-right VLPFC and right amygdala-left VLPFC were associated with greater increase in mania symptoms.

Conclusion

Our findings suggest antidepressant-induced hyperarousal may be associated with increased connectivity in prefrontal-amygdala-striatal circuitry, and baseline disruption in this circuitry is a promising predictor of antidepressant-induced hyperarousal in high-risk youth for BD.

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The Temporal Relationship between BBB Permeability and Cognitive Function in Mild Traumatic Injury: Preliminary Results of a Longitudinal DCE-MRI Study

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

We aimed to evaluate the temporal changes and relationships between BBB permeability, brain volume and cognitive function, using dynamic contrast-enhanced (DCE) MRI and volumetric analysis in mild TBI.

Materials and Methods

This prospective longitudinal study included nineteen patients (mean age, 59 ± 12 years; 6 women) with mild TBI (GCS>13). All patients underwent DCE imaging with a 3T at three-time points; 1 week (W), 1 month (M), and 3 months (M) after the injury. Brain volumes were segmented using 3D T1; Ktrans was determined using DCE MRI and the Patlak model approach. MMSE and MoCA were assessed for cognitive function measures.

Results

BBB permeabilities in the cortical gray matter (GM) and white matter (WM) were negatively correlated with MMSE score, irrespective of time points ($p<0.05$). Notably, The Ktrans value of GM in the left cingulate and WM in the left insular exhibited a significant negative correlation with MMSE scores at 1W and a a trend towards an inverse relationship with MMSE at 1M and 3M. In a linear mixed model, reduced left insular ($p=0.041$) and right parietal ($p=0.042$) cortex volume were the imaging predictor of lower MMSE, while the volume of the left temporal cortex was a predictor of MoCA scores ($p=0.028$) after adjusting age, sex, and education year.

Conclusion

These data suggest that elevated BBB permeability is associated with cognitive dysfunction in the early stage following mild TBI. In conjuction with permeability change, decreased volumes of insular, parietal, and temporal cortex may serve as useful predictors of long-term cognitive impairment in mild TBI patients.

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Claustrophobia During MRI Examination of Brain and Neck.

Prof Muhammad Nawaz

Prof Dr Mahreen Samad, Peshawar, Pakistan

Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To determine the incidence of MRI related claustrophobia.

Materials and Methods

The study was conducted in the Diagnostic Radiology Department of Hayatabad Medical Complex Peshawar Pakistan over the period of one year i-e 9-10-16 to 9-10-17.

Patients of both genders above ten years of age referred to the Radiology Department for MRI examinations were included. Patients below ten years were excluded. MRI examinations were done using 1.5 Tesla Machine with a bore length of 180cm, width and height of 60cm with flared at both ends.

Results

A total of 2630 patients underwent MRI examinations.

Out of them 58 patients (2.2%) experienced Claustrophobia which include 41 males (1.5%) and 17 females (0.64%). 27 Patients undergoing Brain MRI showed the highest incidence of Claustrophobia—-(1.02%) followed by 18 cases of spine examination—-(0.68%) while those undergoing Pelvis and extremities examinations were lowest.

Conclusion

All measures should be taken into account to markedly reduce the incidence of Claustrophobia to avoid incomplete and inconclusive MRI examinations.

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Imaging and detection of ectopic glands in the head and neck with neoplastic transformation

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Identify characteristic imaging features and location of ectopic glands with neoplastic or malignant transformation in the head and neck.

Materials and Methods

Retrospective review of patients who underwent head and neck imaging on CT and MRI at Sengkang General Hospital in Singapore from 1 Jan. 2018 to 31 December 2022. Patients with head and neck neoplasms arising from ectopic salivary and thyroid glands were recruited.

Results

Majority of ectopic salivary tissues are located in the oral cavity, palate, nose/nasal cavity and upper respiratory tract. Tumors arising from minor salivary glands are either benign or mixed benign entities including pleomorphic adenoma, carcinoma ex-pleomorphic adenoma and lesser known, eccrine spiradenoma while malignant entities include mucoepidermoid carcinoma, adenoid cystic carcinoma and lymphoma.

Although ectopic thyroid tissues can be found anywhere between the tongue and the diaphragm, they are common along the path of the thyroglossal duct. Similar to the native thyroid gland, these have great tendency for malignant transformation.

In this pictorial review, we highlight imaging features of these neoplasms on ultrasound, CT and MRI including the locoregional extension of the lesions. Distal metastases through hematogenous and lymphogenous spread are better evaluated and detected on PET-CT and nuclear scintigraphy. A brief review of surgical and non-surgical treatment strategies is also given.

Conclusion

Ectopic thyroid and salivary glands in the head and neck have tendency for malignant transformation. Multimodality imaging is essential for detection and diagnosing those with malignant transformation. Clinicians and radiologists should be familiar with their abnormal location and imaging features.

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Bright diffusion sign: Accurate and reliable MR sign for multinodular and vacuolating neuronal tumor

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To establish an accurate radiological diagnostic approach to distinguish multinodular and vacuolating neuronal tumor (MVNT) from dysembryoplastic neuroepithelial tumor (DNET).

Materials and Methods

Analysis of brain MRI of a MVNT (n=32) and DNET (n=19) patients were performed using T2WI and DWI. A qualitative assessment was based on; bubble appearance (BA), cortical involvement (CI), T2 hyperintensity, diffusion restriction, bright diffusion sign (BDS, DWI signal intensity higher than gray matter (GM)), and bright ADC sign (BAS, ADC value higher than GM). A quantitative analysis was conducted using normalized values within the tumors on the DWI and ADC maps, nDWI and nADC, respectively.

Results

In the qualitative analysis, BA was higher in MVNT (91% [31/34], p=0.025). CI was more common in DNET (95% [18/19], p<0.001). BDS was predominantly observed in MVNT (88% [30/34], p<0.001). BAS was more frequently positive in DNET (95% [18/19], p<0.001). Partial enhancement (11% [2/18], p<0.001), FLAIR peripheral hyperintense rim (50% [8/19], p<0.001) was observed in some DNET patients.

In the quantitative analysis, nDWI was higher in MVNT than DNET (1.51±0.29 vs. 1.14±0.95, p<0.001), whereas nADC was higher in DNET than in MVNT (2.48±0.67 vs. 1.22±0.19, p<0.001). The interobserver agreement was excellent for the qualitative analysis (p=1.000), while it was suboptimal for the quantitative analysis (ICC=0.202–0.789).

In the diagnosis of MVNT, BDS and negative CI demonstrated high specificity (89.47%, 94.74%), sensitivity (88.24%, 91.18%), and positive predictive value (99.38%, 99.69%), respectively.

Conclusion

Utilization of visual MRI assessment based on BDS could serve as an accurate and reliable diagnostic method for MVNT.

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Evaluation of an Artificial Intelligence-Based Research Application for Acute Infarcts on Brain MRIs in the Emergency Room

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To determine efficacy of the artificial intelligence-based research application (AIRA) in multi-parametric brain MRI utilizing a 3D neural network system, NeuroTriage, in triaging acute infarcts in an emergency room.

Materials and Methods

Brain MRI exams performed in the emergency department of our institution from April to October 2021 were retrospectively analyzed by three neuroradiologists and the AIRA. 831 cases (mean age, 64 years ± 16 [SD]; 399 men, 432 women) met the criteria for image analysis of the application. Baseline characteristics were compared between acute infarct positive and negative groups using the Student's t-test. F1max score, sensitivity, specificity, accuracy, positive predictive value, precision, and negative predictive value were analyzed to calculate the performance of the AIRA. Interobserver agreement of the neuroradiologists was measured by interobserver correlation coefficient (ICC).

Results

The AIRA showed that the sensitivity was 79.15% and the specificity was 92.26%. The area under receiver operating characteristic curve and area under precision recall curve values showed 0.90 and 0.86 respectively with average processing time of 60.87 seconds ± 31.21 [SD]. ICC for diagnosing acute infarct were 0.980, indicating statistically significant and excellent agreement. Sub-analysis revealed that the detection performance of acute lacunar infarcts was 64.10%, compared to 87.97% for larger infarcts.

Conclusion

NeuroTriage is an AIRA that can be used in the emergency room to rapidly triage acute infarct in MRI scans.

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Comparing the Performance of an Artificial Intelligence-Based Research Application and Variable Readers for Detecting Acute Infarcts on Brain MRIs in the Emergency Room

Prof Jimin Kim[1], Prof Se Won Oh[1], Prof Jee Young Kim[1], Prof Sheen-Woo Lee[1], Dr Minsun Koo[1], Dr Joo Yeon Kim[1], Mr Heiko Meyer[2], Mr Stefan Huwer[2], Mr Gengyan Zhao[3], Mr Dongyeob Han[4]

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare the performance of the artificial intelligence-based research application (AIRA) in multi-parametric brain MRI using a 3D neural network system, NeuroTriage, with that of the readers including musculoskeletal radiologist, senior and junior in-training residents for acute infarcts in the emergency room.

Materials and Methods

Three neuroradiologists retrospectively analyzed brain MRI exams conducted in the emergency department of our institution between April and July of 2021. 411 cases (mean age, 65 years 15 [SD]; 202 men, 209 women) met the eligibility for image analysis of the application (mean age, 65 years 15 [SD]). Using the Student's t-test, the baseline characteristics of the acute infarct positive and negative groups were compared. Utilizing the area under the receiver operating characteristic curve (AUROC), precision-recall curve (AUPRC), F1max score, sensitivity, specificity, and accuracy, the performance of the readers including AIRA was calculated. The interobserver correlation coefficient (ICC) was used to evaluate the three neuroradiologists' interobserver agreement.

Results
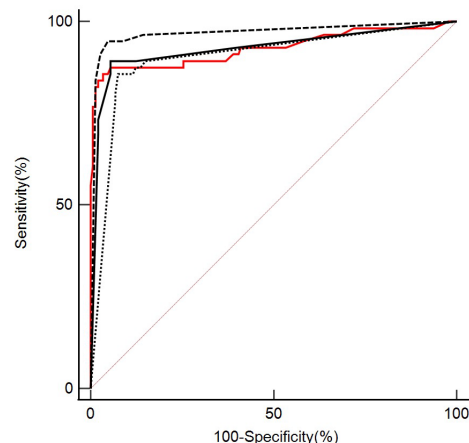
Age and proportion of each gender were statistically different. AUROC, AUPRC, F1max score, sensitivity, specificity, and accuracy for each reader were as follows: 0.914, 0.899, 0.866, 85.9%, 94.9%, and 96.6% for AIRA; 0.890, 0.760, 0.788, 78.9%, 93.3%, 88.3% for musculoskeletal radiologist; 0.978, 0.935, 0.925, 92.9%, 97.4%, 95.3% for senior in-training resident; 0.932, 0.875, 0.869, 86.9%, 95.8%, 95.9% for junior resident. Three neuroradiologists' ICC for acute infarct diagnosis was 0.98, indicating excellent agreement.

Conclusion

AIRA's performance in detecting acute infarction is comparable to that of a junior resident in radiology and superior to that of subspecialty radiologists other than neuroradiology.

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Case Report: Non-FDG-Avid Glioblastoma in a Patient With Known Double Primary Malignancy

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- Rim enhancing brain lesions in a patient with history of primary malignancies may bring about a diagnostic dilemma that may be addressed by multi step imaging including CT/MR and PET imaging.
- PET imaging findings may be confounded by false negativity in large necrotic tumors.
- MRP and MRS may provide additional information that may help narrow the differential diagnosis, but must be interpreted in the context of conventional MR findings.

Background / Outline

INTRODUCTION

Glioblastoma is a common aggressive primary malignancy of the central nervous system. These neuroglial tumors have a peak incidence at age 65-75 years with a slight male preponderance, and poor prognostic outcomes.

CASE PRESENTATION

This is a case of a 76 year old male with a history of squamous cell carcinoma of the ear and prostate carcinoma, who presented with an 8-month history of holocranial headaches.

Upon work-up, PET-CT was done which showed a large non-FDG-avid rim-enhancing necrotic mass lesion in the right parieto-temporal lobe. Discordant imaging findings prompted a contrast MRI, with MR spectroscopy and perfusion, which then showed large rim-enhancing mass lesion, with tumor spectra on MRS, and increased permeability with elevated relative cerebral blood volume and signal recovery to just below baseline on the signal intensity curve on MR Perfusion – findings which favor a glioblastoma. An excision biopsy was done, with histopathologic and immunologic findings consistent with a Glioblastoma, IDH-WILD Type, CNS WHO Grade 4.

CONCLUSION

IN addition to conventional MRI, MR spectroscopy and MR perfusion may prove useful in the problem-solving of oncologic diagnostic dilemmas.

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Neuro-oncological emergencies: A pictorial review of neurology critical alerts from a tertiary oncology center.

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1. *To review the pathophysiology and clinical features of neuro-oncological emergencies.*
2. *To describe the imaging features of neurological emergencies using case scenarios.*
3. *To emphasize the role of on-call radiologists in prompt diagnosis and management of neurology critical findings.*

Background / Outline

An imaging finding is considered as critical and warrants informing the treating physician if it is acute in onset, potentially life-threatening and has a reasonable chance that the treating physician was unaware of the abnormal finding when the test was ordered. Neuro-oncological emergencies may be primary when they arise from tumors of brain and spinal cord or secondary when they are derived from metastases to the neural axis from other systemic malignancies. A reportable emergent complication develops in an oncology patient either as a direct effect of tumor on the adjacent neural tissues or indirect effects and autoimmune paraneoplastic effects due to systemic or regional therapy. Although the most common complications occur due to severe vasogenic edema from primary or metastatic neuro-parenchymal lesions, other etiologies such as thromboembolic vascular events and CNS infections may also be commonly encountered. Awareness of these complications along with a knowledge of cancer treatment history that may be known to have neurological side effects is important in order to identify patients at risk. Neurological complications result in significant morbidity and mortality thus requiring early diagnosis and prompt management in order to improve patient outcome.

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Perineural Spread in Head and Neck malignancies: A pictorial review and reporting checklist for easy navigation.

Dr Anisha Gehani

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1. To understand the anatomy and pathology of perineural spread (PNS) and describe the most common histological subtypes associated with PNS.

2. To review direct and indirect radiological features of PNS and imaging pitfalls.

3. To provide a reporting checklist of key areas for identification of affected cranial nerves

Background / Outline

Perineural spread (PNS) is the ability of neoplastic cells to travel along the neural sheath and be found in a site distant from the primary tumor site. Much confusion exists in literature about the precise definition of PNS and its difference from microscopic perineural invasion (PNI) resulting in both terms being used interchangeably. Due to the rich and complex neural network in the head and neck region and multiple interconnecting branches of trigeminal and facial nerves, it is common for head/neck cancers to spread from one nerve to another. Perineural spread is known to occur at sites that may not be amenable to biopsy, thus imaging plays a critical role in accurate detection of affected sites. Certain histological subtypes have a higher propensity for perineural spread due to increased expression of neural cell adhesion molecules that are responsible for complex signaling and interaction between neoplastic cells and stromal components of the nerve resulting in formation of low resistance pathway for spread of tumors. Since it is associated with increased loco-regional and distant recurrences, it is considered a poor prognostic factor in head and neck cancers making its identification crucial for treatment planning.

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Unexpected extrathyroid lesions detected on routine thyroid ultrasound studies

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Thyroid ultrasound is a useful imaging modality for the assessment and management of thyroid diseases. Although the ultrasound is mainly targeted at the thyroid gland, extrathyroid structures should not be neglected because sometimes unexpected findings on the ultrasound may need further evaluation with dedicated imaging. The aim of this study is to highlight the various unexpected extrathyroid findings that were subsequently found to have clinical importance on follow-up investigations.

Materials and Methods

As part of an audit process, we retrospectively reviewed 800 thyroid ultrasound studies performed from 1 Jan 2018 to 1 May 2021 at the department of Radiology of the Sengkang General Hospital, a tertiary teaching hospital in Singapore.

Results

The unexpected extrathyroid findings illustrated in this report include peripheral nerve sheath tumors (e.g. Schwannoma, plexiform neurofibromatosis), thyroglossal duct cyst, Zenker's diverticulum, parathyroid adenoma, intramuscular lipoma, thyroid lymphoma, thyroid carcinoma, internal jugular vein thrombus, and Zuckerkandl tubercle. Most of the aforementioned cases underwent further examination, some with advanced cross sectional imaging, and some even underwent further medical and surgical treatment. It is essential to communicate these unexpected findings to the patient's primary physicians to ensure that prompt and appropriate clinical care is provided.

Conclusion

It is important to note that extrathyroid structures should also be evaluated during the thyroid ultrasound, as unexpected findings may require further investigation and subsequent medical treatment. This study provides valuable insights for radiologists and clinicians in the diagnosis and management of associated extrathyroid abnormalities found on routine thyroid ultrasound.

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MRI features of Pure epidural spinal cavernous hemangiomas

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To summarize the MRI features of Pure epidural spinal cavernous hemangiomas (SCH), so as to improve the accuracy of preoperative diagnosis.

Materials and Methods

The clinical and MRI data of 7 cases of Pure epidural SCH confirmed by surgery and pathology were retrospectively analyzed.

Results

7 cases of intraspinal pure epidural cavernous hemangiomas were located in thoracic spinal canal in 4 cases and lumbar spinal canal in 3 cases. The tumors appeared in the dorsal spinal cord (n=4), lateral (n=1), dorsal and lateral (n= 2), and all accumulated corresponding segmental foramina, which were divided into bilateral foraminal enlargement (n= 3) and unilateral foraminal enlargement (n=4). Some lesions were accompanied by adjacent bony remodeling/extension (n=1). In all 7 patients, cavernous hemangiomas were mostly lobed, and 3 of them showed "T" shape sign. The lesions showed isointense on T1WI images, hyperintense on T2WI images, obvious homogeneous enhancement with internal linear low enhancement areas after contrast medium injection.

Conclusion

pure epidural SCH has typical signs in MRI: lobular contour (most lesions are "T" shape), occupying the posterior spinal canal or foraminal area, foraminal involvement is common. The dural sac compression or wrapped, half wrapped. The lesions showed isointense on T1WI and hyperintense on T2WI. After enhancement, most of the lesions showed obvious uniform enhancement with that linear low enhancement areas were observed inside. All these signs suggested that the lesions were pure epidural SCH.

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Unusual Cases of Acute Ischemic Stroke for Endovascular Thrombectomy

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To illustrate several unusual cases of acute ischemic stroke (AIS) for endovascular thrombectomy (EVT).

Materials and Methods

From 2015 to now, we review AIS patients for EVT about the medical records, peri-procedural images, EVT procedures and patient outcome. We selected several unusual and interesting cases to illustrate.

Results

Case 1: CTA showed only stenosis of P1 of right PCA. DSA showed a filling defect at superior wall of right P1. After EVT, a Percheron artery arose from right P1 with visualization of bilateral thalamoperforating arteries. Patient got much improvement of her consciousness. Case 2: CTA showed right M1 occlusion and complete occlusion of bilateral proximal CCA with reconstitution of distal CCA. Takayasu's arteritis is impressed. Emergent direct puncture of right distal CCA for right M1 thrombectomy was successfully performed. Case 3: CTA revealed complete occlusion of right cervical ICA with patent intracranial arteries. DSA revealed right cervical ICA dissection after catheterization of right M1 through the occluded ICA. After carotid stenting, right ICA was well recanalized. Case 4: CTA showed hypoplasia of right VA terminated to PICA and left VA orifice occlusion but reconstitution at middle neck. Intracranial arteries are patent when at ER. But symptoms progressed at the second day after admission. Repeated CTA showed basilar artery occlusion. Emergent EVT of basilar artery was successfully performed after opening of left VA orifice with angioplasty.

Conclusion

Optimal diagnosis and procedure for unusual cases are mandatory for good outcome of AIS.

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High Density in Iodine map on Dual-Energy Computed Tomography is associated with Hemorrhagic Transformation After Mechanical Thrombectomy in Patients with Acute Stroke.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To evaluate the relationship between abnormal high density in iodine map or hemorrhage map of Dual-Energy Computed Tomography (DECT) and the occurrence of hemorrhagic transformation (HT) after mechanical thrombectomy (MT).

Materials and Methods

Total 98 acute stroke patients, treated by MT, underwent DECT within 6 hrs and Gradient Echo (GRE) or Susceptibility Weighted Imaging (SWI) within 24 hrs after procedure for detection of HT, were evaluated. The presence of high density and region of interest (ROI) values in each map on DECT were assessed. Multivariable logistic regression analysis was used to search for independent risk factors for HT.

Results

The median time from MT finish to DECT and DECT to GRE or SWI was 20 (15-46) minutes and 13 (9-21) hours, respectively. The presence of high density was significantly more frequent in HT confirmed group in both hemorrhage (5.0% vs. 26.5%, p=0.01) and iodine map (45.0% vs. 81.6%, p<0.01). ROI value was significantly higher in HT confirmed group (21±15 vs. 41±35, p<0.01). Among possible confounders, the confirmation of HT in GRE or SWI after MT was independently associated with the presence of high intensity in iodine map (adjusted Odds Ratio [aOR], 40.1; 95% Confidence Interval [CI], 2.9-551.6) and higher ipsilateral ROI value in iodine map (aOR, 1.07; 95% CI, 1.01-1.13). Nevertheless, the presence of high intensity in hemorrhage map was not independently associated with HT.

Conclusion

High density at iodine map images in DECT performed within a few hours after MT was found to be significantly associated with HT detection within 24 hours.

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Acute hemianopia associated with nonketotic hyperglycemia: a case report

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

We present a case of nonketotic hyperglycemia complicated by acute hemianopia with subcortical T2 hypointensity in the left occipital lobe.

We report the usefulness of MR imaging, including T2*, perfusion, and MR spectroscopy, for diagnosing hemianopia associated with nonketotic hyperglycemia.

Background / Outline

Background: Nonketotic hyperglycemia (NKH) is a metabolic complication of diabetes, a disease with severe hyperglycemia and high plasma osmolality. NKH has been associated with neurological manifestations such as seizures, hemichorea-hemiballism, and hemianopia.

Case presentation: A 53-year-old female complained of right homonymous hemianopia. No other neurological abnormalities were noted. Her blood glucose level was 608mg/dl, HbA1c was 15.9 %, and serum osmolarity was 301mOsm/L. No ketones were detected. MRI scan showed subcortical T2 hypointensity in the left occipital lobe. ASL and SPECT showed increased blood flow in the same area. MR spectroscopy showed decreased NAA. After the patient's blood glucose level was corrected, neurological symptoms and abnormal signals on MRI scans were improved and a diagnosis of hemianopia associated with NKH was made. It is little known about the MRS findings of NKH, and our case suggests the usefulness of MRS for diagnosing this disease.

Conclusion: It is useful to diagnose hemianopia associated with NKH using MRI, including ALS and MR spectroscopy.

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Topological disorganization of brain functional connectome in social anxiety disorder

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Previous MRI-based studies seeking to identify neuroimaging biomarkers for social anxiety disorder (SAD) have mainly focused on regional brain abnormalities, while the brain is increasingly seen as a system of interacting information-sharing networks. Herein, we aimed to investigate the topological organizations of brain functional networks using a graph-theoretical approach in a relatively large and homogenous sample of SAD patients, and assess their pathophysiological relevance and potential diagnostic value.

Materials and Methods

Neuropsychological assessments and resting-state functional MRI images were obtained from 49 non-comorbid patients with SAD and 53 demography-matched healthy controls (HC). We constructed functional networks via a model-driven approach, and performed network-based statistic and graph-theoretical analyses to estimate the network properties. Furthermore, we explored the associations of networks abnormalities with clinical characteristics, and assessed their ability to discriminate SAD from HC using support vector machine analyses.

Results

At the global level, SAD patients showed reduced clustering coefficient and local efficiency than HC. The network-based statistic analyses revealed two connected patterns of abnormal circuitry including increased connectivity mainly involving default mode network (DMN), subcortical network and perceptual system, and decreased connections mainly covering DMN, salience network and perceptual system. Aspects of aberrant networks features were associated with clinical characteristics. Furthermore, network metrics anomalies allowed individual classification of SAD versus HC with significant accuracy.

Conclusion

These findings highlight the topological disorganization of brain functional connectome in SAD in a way that suggests weaker segregation of information processing with a topology shift toward randomized configurations, which may extend neurobiological understandings of a brain network-level disruption in SAD.

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MRI findings of hypoglycemic encephalopathy due to excessive diet program in systemic lupus erythematosus patient, a case report

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Hypoglycaemic encephalopathy is defined as metabolic encephalopathy due to extremely low levels of blood glucose in the body. Its clinical manifestation can be varied in severity and mimic other conditions. Imaging has an important role in evaluating this condition.

Materials and Methods

We report a 36-year-old female with a history of systemic lupus erythematosus and excessive diet program, who was found unconscious by her family at home. Initial assessment showed severely low blood glucose levels. Intravenous dextrose was administered, and the patient starts having seizures and hospitalized for one month because of deterioration of consciousness. Further laboratory and imaging examination was then performed.

Results

Laboratory examination showed normal blood gas examination, negative Anti-N-methyl D-aspartate (NMDA), normal cerebrospinal fluid analysis, and normal serial blood glucose. Further brain MRI findings showed bilateral T2 and FLAIR signal hyperintensity in basal ganglia and cerebral cortex, notably the insular and frontal-temporal-parietal-occipital. Restricted diffusion and contrast enhancement was found along the cerebral cortex, relative sparing of the thalamus, brain stem, and cerebellum.

Conclusion

The clinical symptoms along with MRI findings well correspond to the diagnosis of hypoglycemic encephalopathy.

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Ectopic calcifying epithelial odontogenic (Pindborg) tumor of the maxillary sinus.

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Calcifying epithelial odontogenic tumor (CEOT) was first described by Pindborg in 1958. It accounts for less than 1% of odontogenic tumors, commonly occurs in the third to sixth decades and is located in the premolar and molar regions of the mandible. About 60% of CEOTs are associated with unerupted tooth.

Calcifications clustered around a tooth with a 'driven snow' appearance are characteristic of CEOT. It should be distinguished from ameloblastoma which is biologically more aggressive. In this case, the histopathology was straightforward with typical morphological features, presence of amyloid, and calcifications in the forms of Liesegang rings.

Background / Outline

A 73-year-old woman presented with a one-year history of left nasal obstruction and rhinorrhea in 2022, followed by progressive left cheek swelling and hypoesthesia. On clinical examination, there is a hard bony mass at the left maxillary region.

CT paranasal sinuses (Figure 1) showed a large expansile calcified soft tissue mass occupying the entire left maxillary antrum resulting in adjacent maxillary sinus bony remodeling and some parts showing cortical destruction. An ectopic molar tooth is centered within the mass with surrounding hyperdense flecks showing 'driven-snow' appearance.

An endoscopic left medial maxillectomy and tumor debulking were performed. Histopathological examination is indicative of a calcifying epithelial odontogenic tumor. The tumor was arranged in sheets composed of polyhedral, eosinophilic cells with concentric calcifications forming Liesegang rings (Figure 2a). It displays mild to moderate nuclear pleomorphism, inconspicuous nucleoli and moderate eosinophilic cytoplasm. Figure 2b). Abundant amyloid bodies were demonstrated by Congo red special stain (Figure 2c).
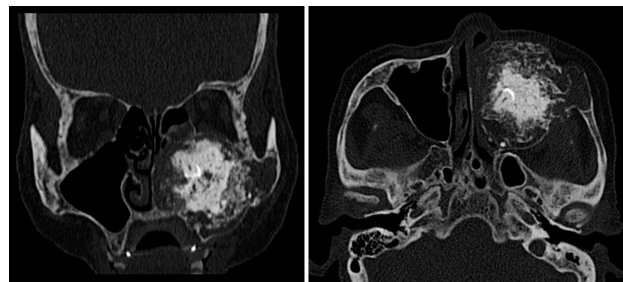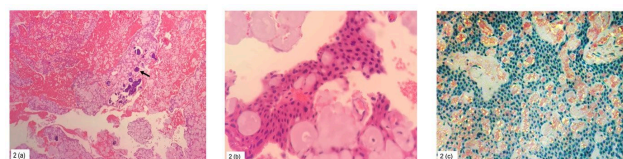

Figure 1

Figure 2a   Figure 2b   Figure 2c

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Abnormal large-scale brain functional network dynamics in social anxiety disorder

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Although static brain network abnormalities are reported in social anxiety disorder (SAD), little is known about resting-state functional connectivity dynamics at the macroscale network level. Herein, we aimed to identify dynamic functional network connectivity (dFNC) alterations using a multivariate data-driven method in a relatively large and homogenous sample of SAD patients.

Materials and Methods

Based on the power analysis, 49 SAD patients and 53 demographically-matched healthy controls (HC) were recruited to undergo clinical evaluation and resting-state functional MRI scanning. Spatial independent component analysis and sliding-window approach with a k-means clustering algorithm were conducted to characterize the recurring states of brain resting-state networks (RSNs). Then, state transition metrics and FNC strength were compared between the two groups. Furthermore, the relationships between dFNC properties and clinical characteristics were explored in SAD cohort.

Results

Four different recurring states were identified, namely, State III representing widely lower FNC with highest frequency (52.42%). Compared with HC, SAD patients showed higher fractional windows and mean dwelling time in State III, but lower ones in States II and IV representing locally/widely stronger FNC respectively. In State I representing widely moderate FNC, SAD patients demonstrated decreased FNC mainly between default mode network with attention and perceptual networks. Some aberrant dFNC signatures were correlated to illness severity and duration, suggesting pathophysiological relevance.

Conclusion

SAD patients showed distinct patterns of dynamic functional synchronization abnormalities across large-scale RSNs, reflecting or causing network imbalance of bottom-up response and top-down regulation in cognitive, emotional and sensory domains, which may offer insights into the neurofunctional substrates of SAD.

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Comparison of High-Frequency Conductivity in the Brains of Alzheimer's Disease Patients and Cognitively Normal Elderly Controls

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

This study aimed to explore the potential of high-frequency conductivity (HFC) mapping using a clinical 3T MRI system as an imaging biomarker to evaluate the differentiation of Alzheimer's disease (AD) from amnestic mild cognitive impairment (MCI) and cognitively normal (CN) elderly people.

Materials and Methods

The study included 74 participants, 23 AD patients, 27 amnestic MCI patients, and 24 CN elderly people. The researchers used a multi-echo turbo spin-echo pulse sequence to obtain MREPT images and a homemade software to map the HFC at the Larmor frequency of 128 MHz at 3T. Statistical analyses using both voxel-based and region-of-interest (ROI) methods were performed to compare HFC maps between the participant groups, to evaluate the association of HFC maps with Mini-Mental State Examination (MMSE) scores, and to evaluate the differentiation between the participant groups for HFC values in specific brain areas.

Results

The results showed that the HFC value was higher in the AD group than in the CN and MCI groups, and MMSE scores were negatively associated with HFC values, but age was positively associated with HFC values. The HFC values in the insula, precuneus, and posterior cingulate gyrus showed significant differences between the participant groups.

Conclusion

The study suggests that HFC mapping using a clinical 3T MRI system may be a potential imaging biomarker to evaluate the differentiation of AD from MCI and CN and to assess cognitive decline.

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Diffusion tensor image analysis along the perivascular space and its association with CSF volume

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Diffusion tensor image analysis along the perivascular space (DTI-ALPS) index has been suggested as a marker to measure the glymphatic system. The relationship between the DTI-ALPS index and CSF volume has yet to be ascertained. We aimed to clarify the relationship between the DTI-ALPS index and CSF volume in patients with mild cognitive impairment (MCI) or subjective memory impairment (SMI).

Materials and Methods

DTI images of 85 patients with either SMCI or MCI were analyzed in this study. DTI-ALPS index was calculated in the bilateral cerebral hemispheres. The association between DTI-ALPS index and CSF volume was evaluated with a linear correlation. Multivariate regression analysis was performed to evaluate the association between DTI-ALPS index and CSF volume with adjustment for age, amyloid status, and diagnosis.

Results

There were 53 MCI patients and 32 SMI patients. The mean DTI-ALPS index were 1.4480 ± 0.1727 and there was no significant difference in mean DTI-ALPS index between SCI and MCI patients (1.4948 ± 0.1773 vs. 1.4198 ± 0.1651, P = 0.052). Amyloid (+) patients had lower ALPS index (1.3853 ± 0.1561) than amyloid (-) patients (1.4963 ± 0.1707, P = 0.003). Age and CSF volume were independently correlated with mean DTI-ALPS index (β=-0.009, P < 0.001 and β=-0.001, P < 0.001). Multivariable analysis revealed that the CSF volume (β = -0.001 [95% CI -0.001–0.000], p = 0.032) was associated with mean DTI-ALPS index, after adjustment of age, amyloid status, and diagnosis.

Conclusion

DTI-ALPS index was negatively associated with CSF volume and this finding suggests that glymphatic dysfuction may lead to CSF resorption disturbance in cognitively declined patients.

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Usefulness of pituitary high-resolution 3D MRI using deep-learning-based reconstruction for pre- and postoperative evaluations in patients with pituitary adenoma/ pituitary neuroendocrine tumor

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The recently developed deep-learning-based reconstruction (DLR) technique enables image denoising while maintaining sharp edges, which improves the image quality of 3D MRI. Therefore, for contrast-enhanced (CE) MRI, we assessed the diagnostic value of T1-weighted 3D fast spin-echo sequence (CUBE) with DLR for evaluating pituitary adenoma.

Materials and Methods

We assessed 24 patients with pituitary or residual adenoma who underwent CUBE with and without DLR (5 min, 7 s), 1-mm-slice-thickness 2D T1WI (1-mm T1WI) with DLR, and 3D spoiled gradient echo sequence (SPGR) as CE-T1WI. For these MRI sequences, the depiction of the pituitary adenoma and parasellar region was scored by two neuroradiologists, and the contrast-to-noise ratio (CNR) between the pituitary adenoma and the brain parenchyma was calculated.

Results

Scores for the depictions of pituitary or residual adenoma were significantly higher with CUBE with DLR than with CUBE without DLR, 1-mm T1WI with DLR, and SPGR (P < .001). The score for the depiction of the boundary between the adenoma and the cavernous sinus was higher with CUBE with DLRthan with 1-mm T1WI with DLR and SPGR. The CNR increased by a factor of 3.6 (mean CNR:13.7, CUBE with DRL vs 3.8, CUBE without DRL, <0.01). For the CNR, the CUBE with DLR was significantly higher than that with SPGR, but not the 1-mm T1WI with DLR.

Conclusion

Using the DLR technique, CUBE may replace 1-mm T1WI for evaluating the pituitary and parasellar regions.

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The value of three-dimensional pseudo-continuous arterial spin labeling at 7T in predicting glioma grade prior to surgery

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The signal-to-noise ratio and the longitudinal relaxation time have increased with the increase in magnetic field, thus benefiting high-resolution three-dimensional pseudo-continuous arterial spin labeling (3D pCASL) imaging. 3D pCASL MRI is a noninvasive perfusion technique that does not require administration of exogenous contrast agents. The aim of the study is to assess the diagnostic performance of 3D pCASL at 7T MRI in predicting histologic grades of cerebral gliomas.

Materials and Methods

Twenty-eight patients with gliomas (age 49.3 ± 13.3 years, 14 males) confirmed by pathology underwent preoperative 3D pCASL MR imaging at 7T. The maximum cerebral blood flow (CBFmax) values were calculated in the tumor and normalized to the contralateral normal appearing white matter (NAWM) (nCBFmax). These measurements were compared between the grade 3/4 group (n = 19) and the grade 2 group (n = 9). The receiver operating characteristics (ROC) curve was used to determine the diagnostic efficiency for grading gliomas.

Results

Both CBFmax and nCBFmax ($P < 0.05$) were higher in the grade 3/4 group. The areas under the ROC curve, sensitivity, and specificity were 0.807 ($P < 0.01$), 84.2% (16/19), and 77.8% (2/9) for CBFmax, and 0.819 ($P < 0.01$), 89.5% (17/19), and 77.8% (2/9) for nCBFmax in the discrimination between grade 2 and high-grade (grade 3 and grade 4) tumors, respectively.

Conclusion

7T 3D pCASL imaging is a feasible method for assessing glioma perfusion and predicting grade.

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Pre-COVID brain network topology prospectively predict social anxiety alterations during the COVID-19 pandemic: A Resting-State fMRI Study

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Social anxiety (SA) is a negative emotional response that can lead to mental health issues, which some people have experienced during the coronavirus disease 2019 (COVID-19) pandemic. However, less attention has been given to the neurobiopsychological mechanisms underlying interindividual differences in SA alterations. This study aims to identify neurofunctional markers of COVID-specific SA development.

Materials and Methods

One hundred and ten healthy participants underwent resting-state magnetic resonance imaging and behavioral tests before the pandemic (T1, October 2019 to January 2020) and completed follow-up behavioral measurements during the pandemic (T2, February to May 2020). We constructed individual functional networks and estimated global and regional topological properties of these constructed networks using graph theoretical analysis. This research has been approved by an ethical committee.

Results

Partial correlations revealed that SA alterations (T2-T1) were negatively related to pre-pandemic small-worldness and normalized clustering coefficient. Partial least squares correlations indicated that SA alterations were positively linked to a pronounced degree centrality pattern, encompassing both the high-level cognitive networks (dorsal attention network, cingulo-opercular task control network, default mode network, memory retrieval network, fronto-parietal task control network, and subcortical network) and low-level perceptual networks (sensory/somatomotor network, auditory network, and visual network). These findings remained consistent even after controlling for pre-pandemic general anxiety, other stressful life events, and family socioeconomic status.

Conclusion

Our results provide evidence for topological characteristics of the functional networks associated with SA alterations, shedding light on the neurobiological basis of COVID-related SA changes. This may have potential clinical implications in targeting therapies for individuals susceptible to SA.

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Chameleons in Emergency Head Computed Tomography (CT)

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

We present a collection of cases with CT head scans that are misdiagnosed at the emergency department due to either perception or interpretation errors of so-called 'chameleon' lesions. These errors can pose the risks of delayed patient treatment or even litigation if not detected timely by radiologists or clinicians. Our study aims to increase awareness and improve detection of 'chameleons' in CT head scans.

Background / Outline

We emphasize the importance of review areas in emergency CT head scans. The following cases are part of our larger collection of cases.

'Chameleons' hidden in the middle of the scan include cavernous-sinus and orbital-apex-syndrome e.g. invasive fungal sinusitis. The sellar/suprasellar region should be reviewed to exclude pituitary apoplexy and the presence of SATCHMO which is mnemonic for Sarcoidosis, Aneurysm/vascular malformations, Teratoma, Craniopharyngioma, Hypothalamic hamartoma and hypophysitis, and Optic glioma/lesions.

'Chameleons' hidden at the edges of the scan can be missed due to partial imaging including neoplasms in the naso-and-oro-pharynx, inflammatory changes in Ludwig-angina and craniocervical-junction abscesses. Additionally, bony review areas including the temporomandibular joints and the mandibular condyles should not be overlooked, particularly fractures and dislocation in the setting of trauma.

Finally, 'Chameleons' may mimic/masquerade as pseudoSAH (subarachnoid hemorrhage) in hypoxic-ischemic-injury; or as acute SAH in a case of white-epidermoid tumor; or inflammation/neoplastic processes with pachymeningeal thickening (meningitis) in craniospinal hypotension.

CONCLUSION

A checklist for systematic assessment of the CT head scans is provided, emphasizing review areas to ensure thorough evaluation of these scans in emergency settings.

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High extracellular fluid content is associated with white matter fiber degeneration in patients with cerebral small vessel disease: a longitudinal study

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Increasing evidence suggests that excessive extracellular fluid is associated with cerebral white matter (WM) fiber degeneration. In this study, we aim to demonstrate their associations through longitudinal analyses in patients with cerebral small vessel disease (CSVD).

Materials and Methods

Eighty-seven CSVD subjects (mean age 66.1) were retrospectively included in this study. All subjects had at least two complete multi-modality MRI data (baseline and follow-up data within 1-3 years from baseline). White matter hyperintensities (WMH) presented at all time points were classified as stable WMH, and WM that contained no WMH at all time points was classified as stable normal-appearing WM (NAWM). Furthermore, each subject's stable WMH was divided into three subregions based on baseline FW values (low: 0.2-0.4; medium: 0.4-0.6; high: 0.6-0.8). A bi-tensor diffusion imaging model was used to calculate free water (FW, representing extracellular fluid) and tissue fractional anisotropy (FA-t, representing intracellular microstructural integrity). We performed cross-sectional and longitudinal statistical analyses to explore the relationship between FW and FA-t in each brain region (stable WMH, stable NAWM, and subregions with different levels of FW).

Results

At baseline, FW was negatively associated with FA-t in NAWM($r = -0.619$, $p < 0.001$), but not in stable WMH. Longitudinally, FW significantly increased in all regions ($p < 0.001$), while FA-t only decreased in the high-FW subregion ($p < 0.001$).

Conclusion

High extracellular fluid content may accelerate white matter fiber degeneration in CSVD.

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Cavernous sinus mass, thrombosis or aneurysm. Which one is it?

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

This case highlights that a cavernous ICA aneurysm can be erroneously diagnosed as a mass and cavernous sinus thrombosis in the background of ongoing intracranial infection. The points supportive of an aneurysm are the blood signal depicted on T1W and T2W, peripheral susceptibility artefact on SWI, avid contrast enhancement and irregularity of the cavernous ICA on MRA. Enhancement in meningioma is usually less avid and there is no adjacent bony hyperostosis in this case. Hemangioma and cystic schwannoma are rare cavernous sinus masses.

Background / Outline

A 47-year-old male, presented in July 2022 with fever, lower toothache and left neck swelling for two weeks.

CECT neck and brain revealed left deep neck muscle abscesses, left subdural collection and left bulky cavernous sinus suggestive of cavernous sinus thrombosis. Antibiotic was started and left craniectomy and subdural collection washout were performed. Serial plain CT Brain in July showed resolving subdural collection and MRI Brain in August 2022 (Figure 1) reported a stable left cavernous sinus mass mildly compressing the left cavernous internal carotid artery (ICA) suggestive of a meningioma or schwannoma.

Despite the report, he was treated as cavernous sinus thrombosis and started on an anti-coagulant for 6 months. MRI brain on February 2023 (Figure 2) revealed a larger mass with a change of the provisional diagnosis to cavernous hemangioma or cystic schwannoma with intra-tumoral hemorrhage.

In view of larger cavernous sinus mass/thrombosis, a multi-disciplinary meeting was conducted and a cavernous ICA aneurysm was suspected. This was confirmed by diagnostic cerebral angiography (Figure 3).
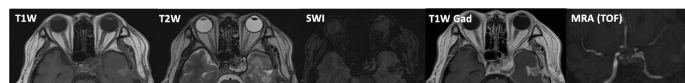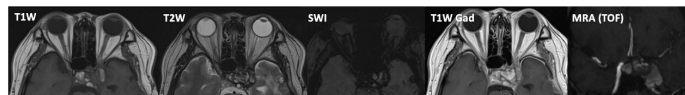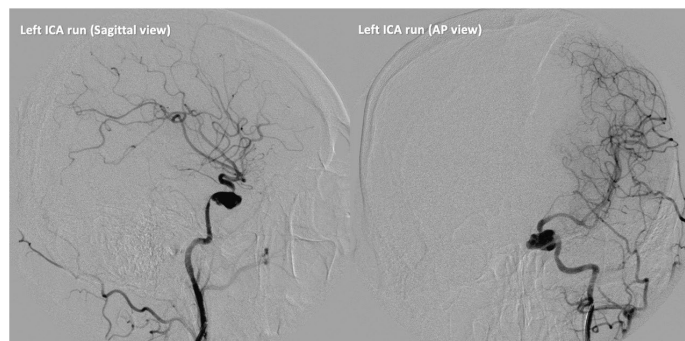

Figure 1

Figure 2

Figure 3

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Interactions between connectome gradient dysfunction in thalamus and striatum in drug-naïve first-episode major depressive disorder and its relationship to memory impairment

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

By introducing a novel gradient-based approach, which identifies hierarchical organization by capturing the similarity of the functional connectivity patterns among brain voxels, we aimed to evaluate subcortical gradients of patients with major depressive disorder (MDD) and their association with cognitive features.

Materials and Methods

Resting-state fMRI studies were performed with 145 never-treated first-episode MDD patients and 145 healthy controls (HCs). Voxel-wise distributions of the principal gradient were mapped and group-averaged gradient values were compared between groups across all subcortical voxels (global), three main systems (limbic, thalamic, and basal ganglia), structural subregions, and functional subregions related to specific cortical functional networks. Last, we assessed the associations between the significant gradient alterations and neuropsychological functioning.

Results

The principal gradient values were organized along a gradual anterior-posterior axis across the subcortical structures in MDD patients but a medial-lateral axis in HCs at the global level. MDD patients exhibited lower gradient values in the limbic and thalamic regions but higher values in the basal ganglia than HCs. Specifically, the antagonistic gradient alterations between the thalamus and putamen were associated with memory impairments of MDD while the synergistic gradient reductions of the thalamus and caudate was related to the functional connectivity disturbance in MDD.

Conclusion

Multiscale principal gradient alterations of the subcortical-cortical connectome reflected the hierarchical disorganizations underpinning the functional segregation in MDD. The interactive associations of thalamic and striatal gradient alterations were implicated in subcortical functional connectivity disturbance and episodic memory impairments in MDD patients, revealing an internally differentiated and clinically relevant pattern of subcortical gradient dysfunction in MDD.

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Utility of Magnetic Resonance Vessel Wall Imaging (MRVWI) in Identifying Atherosclerotic Plaque Characteristics in Extra-Cranial Carotids: Comparing High Resolution Vessel Imaging to Conventional Imaging Modalities.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare the utility of high resolution MRVWI in delineating extra-cranial carotid atherosclerotic plaques, in particular high risk features (intra-plaque haemorrhage, fibrin cap, lipid rich necrotic core, ulcerations) which may guide therapy, compared to conventional Doppler ultrasound (US) and computed tomographic angiography (CT).

Materials and Methods

A series of 5 patients with extra-cranial carotid stenosis underwent imaging of the plaque with MRVWI, US and CT. All studies were independently evaluated by two neuroradiologists with varying years of experience, to assess for the presence of high risk plaque features, namely intra-plaque haemorrhage (IPH), fibrin cap (FC), lipid rich necrotic core (LRNC) and ulcerations (UC). Calcifications, although not a high risk feature, was also assessed. Any of these features identified on the different imaging modalities is independently recorded by the two radiologists. Tabulated findings were analysed using Cohen's Kappa Coefficient of inter-rater reliability (K value).

Results

MRVWI has the largest number of high K values ranging from 0.714 to 1.00, indicating the highest concordance between radiologists in identifying plaque features, followed by US and then CTA ranging at 0.667 to 1.00 and 0.385 to 1.00 respectively. All modalities fall under the "almost perfect" category.

Conclusion

MRVWI is superior in distinguishing various extra-cranial carotid plaque high risk features compared to US and CT. It may emerge as a valuable imaging tool for detecting and monitoring of high risk plaque features in patients who are symptomatic yet with non-severe stenoses, allowing for more aggressive medical therapy or even early endovascular or surgical intervention to reduce stroke risk.

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Tuberculous myelitis, a rare cause of longitudinally extensive transverse myelitis

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Mycobacterium Tuberculosis is a rare cause of transverse myelitis. Diagnosis is achieved through MRI, CSF analysis and bacteriological confirmation of tuberculous infection.

Background / Outline

A 66-year-old male with underlying hypertension and Diabetes, presented in April 2023 with fever, encephalopathy and bilateral lower limb weakness for five days and loss of weight and appetite for three months. On examination, he was paraplegic with absent reflexes and anal tone.

The laboratory studies on admission revealed leucocytosis, raised erythrocyte sedimentation rate and C-reactive protein.

MRI brain (Figure 1) showed features suggestive of intracranial tuberculosis evidenced by multiple ring enhancing tuberculomas and extensive pachy- and leptomeningitis complicated with multifocal lacunar infarctions, likely secondary to Tuberculous arteritis.

MRI whole spine (Figure 2) showed a long segment intramedullary hyperintensity of the thoracic cord with patchy enhancement and associated cord expansion. There is also extensive enhancing exudates coating the entire spinal-dural arachnoid sheath extending from the craniovertebral junction until the conus medullaris. These exudates extend along the nerve sheaths of multiple dorsal nerve roots and along the cauda equina nerve roots with features of cauda equina arachnoiditis. Overall features are suggestive of spinal Tuberculous myelitis with extensive dura-arachnoiditis.

Lumbar puncture revealed xanthocromic cerebral spinal fluid (CSF) with raised protein level of 1.57 g/L and normal glucose level of 2.7 mmol/L. Sputum acid-fast bacilli (AFB) test revealed scanty AFB and the Xpert MTB/RIF assay detected trace Mycobacterium Tuberculosis.

He had marked clinical improvement and neurologic recovery after anti-tuberculous treatment and steroid, though still unable to function independently.
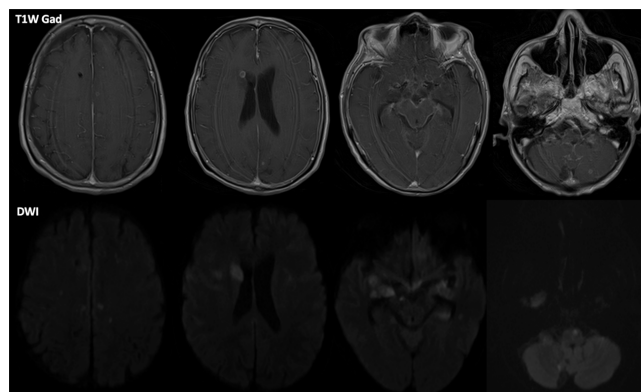

Figure 1

Figure 2

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MR manifestations of brain injury due to treatment-related disorders

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1、Recognizing imaging changes in brain injury from radiotherapy and chemotherapy is beneficial to further promote and improve the standardized diagnosis and treatment of treatment-related disorders.

Treatment-related disorders refer to the damage to the body caused during the treatment of diseases (1) Radiation therapy and chemotherapy are important tools in the treatment of tumors. (2) Radiation brain injury: (3) Chemotherapeutic

2、Factors influencing radiotherapy

3、Mechanism of radiotherapy occurrence

4、Pathology

5、Clinical

6、Clinical Staging

(1) Acute type: (2) Early late-onset reaction type: (3) Late late-response type:

7、Clinical - Imaging

8、Acute radiation brain injury

9、Early delayed radiation brain injury

10、Late stage delayed radiation brain injury

11、Radiation brain necrosis

12、Differential Diagnosis – Glioma, Lymphoma, brain abscess, cerebral infarction, viral encephalitis

13、Advances in radiotherapy injury imaging studies

(1) DWI/DTI

(2) DKI

(3) PWI

(4) MRS

14、Chemotherapy injury

15、Clinical and Pathology

16、Chemotherapeutic brain injury

(1) Cerebrovascular lesions.

(2) Cerebral white matter lesions (3) Brain atrophy

17、Chemotherapeutic brain injury

18、Advances in chemotherapy injury imaging studies

Background / Outline

Treatment - related disorders (TRDs) are injuries to the body caused during the treatment of a disease. Recognizing imaging changes in brain injury from radiation and chemotherapy is beneficial to further promote and improve the standardized diagnosis and treatment of treatment-related disorders.

This section enables us to deepen our understanding of the diagnostic imaging of brain injury due to radiotherapy and chemotherapy, the differential diagnosis of brain injury-related brain diseases and the progress of scientific research.

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Effect of Deep Learning image reconstruction algorithm on brain FLAIR images for detection of white matter lesions

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To assess whether there was no difference between a pair of FLAIR image sets generated by a deep learning (DL) reconstruction (recon) algorithm and by an original recon method, in detecting brain white matter (WM) abnormalities.

Materials and Methods

96 pairs of FLAIR image sets generated by a DL recon algorithm (DLFL) and by an original recon method (OrgFL) (> 59 years; mean age, 73 years) were compared. The images were acquired by 3 clinical scanners (3.0T x 2 and 1.5T). We used a commercially available DL based image analysis tool to determine a grade of WM abnormal high intensity (WMgrade) on OrgFL (WMgradeOrg) and that on DLFL (WMgradeDL). The grade was scored (from grade 0 to 4) according to a guideline from The Japan Brain Dock Society. We statistically evaluated differences of mean SSIMs (a structural similarity index measure: a combination index of luminance, contrast, and structural factors; SSIM_index plugin; ImageJ 1.53c) between two groups that the DL based analysis tool judged WMgradeOrg and WMgradeDL matched or unmatched, with Mann–Whitney U test.

Results

The DL based analysis tool determined 17 pairs WMgrade 3 or 4 and judged the WMgrade of 4 pairs of them unmatched. Mean SSIMs of the group with matching WMgrade and that with unmatching WMgrade were 0.99975 and 0.99979 (p = 0.486), respectively.

Conclusion

We showed there was no difference between mean SSIM of OrgFL and that of DLFL even though in case DL based analysis tool showed discrepancy in WM grading between OrgFL and DLFL.

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Brain stiffness change according to brain development using virtual MR elastography based on DWI

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To estimate the change of brain stiffness according to brain development in children and young adults using the virtual magnetic resonance elastography (vMRE) which is non-invasive and novel technique based on diffusion weighted imaging (DWI)

Materials and Methods

With ethical committee approval, 247 children and young adults (6 months~30 years, 119 females, 128 males) without structural brain abnormality were retrospectively reviewed. Shifted apparent diffusion coefficient was calculated from DWI (b=200 and 1500sec/mm2) and converted to DWI-based virtual shear modulus (μ). Brain stiffness was measured in whole brain and thirteen brain regions; cerebrum, cerebral gray/white matter, basal ganglia, thalamus, frontal/ parietal/temporal/occipital lobe, cerebellum, middle cerebellar peduncle, hippocampus, amygdala. Multiple comparison test and linear regression were conducted to investigate changes in brain stiffness according to development.

Results

Sexual dimorphism was not observed in any brain region. The virtual shear modulus (μ) of whole brain increased until the age of 16 years and then reached plateau. The elasticity of whole brain was increased 1.15% per year (R^2=0.642, $P <$ 0.001) until 16-year-old. The change of brain stiffness according to brain development showed regional differences. Changes of brain stiffness showed the earliest plateau (8-year-old) in cerebral gray matter and continued to increase in the basal ganglia until 30-year-old. Although steepest increase in occipital lobe (1.85% increase/year, R^2=0.659, $P < 0.001$), there was no significant difference in pattern of stiffness change according to brain lobar area.

Conclusion

DWI-based brain stiffness parameters increased with brain development in pediatrics period with differences by region.

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Comparative analysis of normative brain structures and volumes between SG and Caucasian population

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Volume of brain structures vary according to differences in age, gender [males(M), females (F)], geographical location and ethnicity. Currently MNI is most widely used brain template but is limited to young/healthy Western population and not representative of other populations. We aim to compare differences between SG Chinese and Caucasian (Cau) brain volumes to address the need for age, gender-and-ethicity-specific brain templates besides accurate stereotactic standardization of the templates. Moreover, we aim to build a brain volumetry database for SG Chinese population, which is currently lacking in Singapore.

Materials and Methods

Retrospective T1W MPRAGE MRI brain Cau data (N:248) was gathered from PPMI database while SG data (N:360) obtained from Sengkang General Hospital. FastSurfer (v2.0.4) for brain segmentation into 21 regions; brain volumes were normalized using total intracranial volume. Subjects divided into 5 age-groups: 31-40, 41-50, 51-60, 61-70, 71-80 years. If > 2 outliers, subjects removed while the rest of outliers imputed with median (age-and-gender-matched); comparison performed with Wilcoxon tests (Bonferroni corrected).

Results

SG(M) have significantly greater cerebral white-matter than Cau in 41-50 age-group, while SG(F) have greater thalamus than Cau males but the reversed is true for lateral ventricular volumes. SG(M+F) 51-60 age-group have significantly greater 3rd ventricle while SG(M) 71-80 age-group have greater inferolateral ventricles and CSF compared to Cau.

Conclusion

There are differences in brain structure/volumes between SG and Cau across ages and gender. Building an age, gender-and-population-specific brain volumetry database is paramount to ensure accurate comparison and greater accuracy during brain registration in AI/DL.

184

Review Neuroimaging of Hypoxic Ischemic Encephalopathy (HIE) in Adults

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

To describe and recognise the radiolological findings of hypoxic ischemic encephalopathy (HIE) in daily practice.

Background / Outline

HIE is caused by circulatory or respiratory failure, leading to global hypoxia/anoxia. It is one of the most common causes of cerebral palsy and other severe neurologic deficits in children.

Prompt recognition of these imaging findings can help exclude other causes of encephalopathy, affect prognosis and facilitate earlier supportive treatment.

Imaging findings are highly variable and depend on factors, including brain maturity, severity and duration of insult and type and timing of imaging studies.

Early imaging findings can be subtle and are always overlooked. It's important to be familiar with the many patterns of injury that may be observed and to pay attention on areas that are most likely to be injured.

Severe global HIE primarily affects the grey matter structures:

1. basal ganglia

2. thalami

3. cerebral cortex

4. cerebellum

5. hippocampi

We have encountered multiple cases for neuroprognostications in daily practises.

CT :

- diffuse cerebral edema with sulci and gyri effacement
- decreased cortical grey matter attenuation, loss of normal grey-white differentiation
- decreased bilateral basal ganglia attenuation reversal sign
- white cerebellum sign
- cortical laminar necrosis :
- pseudosubarachnoid hemorrhage: cerebral edema, decrease in parenchymal attenuation ,swelling & engorgement and dilatation of superficial venous structures

MRI :

- DWI- earliest imaging modality to become positive, demonstrated restricted diffusion in the regions mentioned above.
- T1 hyperintensities indicating cortical laminar necrosis become evident after two weeks.
- Both the reversal sign and white cerebellum sign indicate severe injury and a poor neurologic outcome.

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Age-specific MRI brain templates/atlases for healthy Chinese population in Singapore

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Currently, the most widely used brain template is MNI which is limited to the young/healthy Western population and not representative of others. The brain volumes can vary according to differences in age, gender, geographical location, ethnicity and neurological conditions. It is thus important to construct brain templates specific to age, gender and ethnicity for accurate registration and analysis. These templates are however not available in Singapore.

Materials and Methods

Retrospective review of T1W MPRAGE MRI scans obtained from Sengkang General Hospital (SKH) with preliminary data of 209 subjects with wide-ranging age from 12-98 years. They are classified according to respective age-groups i.e. adolescence (12–18 years), young adulthood (19–25 years), adulthood (26–40 years), late adulthood (41–64 years), early (65 to 74 years) and late elderly (≥ 75 years). For template creation, symmetric image normalization (SyN) diffeomorphic registration method, incorporated into Advanced Normalization Tools (ANTs); averaging of pre-processed images for initial template generation followed-by 4 iterations: rigid registration, affine registration and SyN with similarity metric with cross-correlation.

Results

With increasing age, the SG-brain progressively becomes smaller in volumes particularly caudate nucleus, putamen, genu and splenium of corpus callosum as well as the grey-and-white matter, while the ventricles become bigger. These changes are significant compared to the MNI template. Additional data allows for continual improvement of brain templates with inclusion of gender-split and creation of maximum probability atlas for more accurate quantification of the template.

Conclusion

Age-and-population-specific normative brain templates provides a more nuanced understanding of the brain structures in our population.

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Pituitary Magnetic Resonance Imaging: A Practical Approach for Differential Diagnosis

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

The two lobes of the pituitary gland are embryologically distinct. Anterior lobe (adenohypophysis) derives from an invagination of the oral ectoderm known as Rathke's pouch, and posterior lobe (neurohypophysis) forms from a protrusion of the neural ectoderm of the diencephalon.

Dynamic contrast-enhanced imaging is an essential protocol constituting pituitary MRI. Pituitary adenomas usually demonstrate delayed enhancement and washout compared to normal glands on dynamic contrast-enhanced imaging.

Background / Outline

The tumors of the pituitary gland are the second most common tumors of CNS, and pituitary lesions are frequently encountered in routine practice. Dedicated pituitary MRI is widely used to diagnose the sellar lesions by providing a detailed information on the pituitary anatomy and its relationship with adjacent structures. Above all, it is important to understand the developmental background of the pituitary gland structures, because the anatomical location of the tumors can help in the differential diagnosis of the lesions. In addition, it is necessary to know dynamic contrast enhancement pattern of the pituitary gland and tumors according to the blood supplying system. Small sellar lesions, such as pituitary microadenomas, may be distinguished only on DCE by showing a time-signal intensity curve different from that of the normal pituitary tissue.

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Value of susceptibility-weighted image in patients with chronic stage of the intracranial arterial dissection

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Despite taking vessel wall image(VWI), it is often difficult to differentiate dissection from other vascular pathology in the chronic stage of intracranial arterial stenosis or occlusion. We purposed to evaluate the value of susceptibility-weighted image(SWI) in patients with chronic dissection.

Materials and Methods

We searched for "dissection" in the reports of VWI taken from January 2018 to December 2022 in our institution. Forty-two patients with definite diagnosis of acute intracranial dissection and with SWI scans taken in the acute phase and chronic phase in 6 months or later since the symptom onset were included. Upon a retrospective review of the images, definite diagnosis of dissection was made if there are typical findings on angiography, demonstration of an intramural hematoma or a dissection flap, or a rapid imaging appearance change upon a follow-up. We retrospectively reviewed SWI of intracranial artery dissection and evaluated the value of SWI for dissection in chronic phase.

Results

The median time from onset to follow-up scan was 252 days(range,178-962 days). The most commonly involved site is vertebral artery(n=30(71%)), followed by PICA(n=11(26%)) and MCA-M1(n=2(5%)). Thirty-six(86%) showed hemorrhage signal on SWI at their first MRI scan, which persisted on the follow-up in twenty-nine(69%), although the extent decreased in 24. The extent of hemorrhage signal increased in two patients.

Conclusion

SWI maybe helpful in diagnosing dissection in patients with chronic stenosis in the intracranial arteries; however, hemosiderin deposition may not be seen on SWI in about a one-third of patients with chronic dissection.

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Could the choroid plexus volume be the imaging biomarker of mild cognitive impairment?

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Recent studies suggested choroid plexus volume (CPV) may be an imaging marker for Alzheimer's disease. On the disease continuum, mild cognitive impairment (MCI) is the pre-dementia stage with cognitive symptoms. The early detection is crucial for timely intervention and management of MCI. In this study, we aimed to investigate whether CPV can serve a potential biomarker for diagnosing MCI in elderly individuals in a rural area.

Materials and Methods

This study has been approved by an ethical committee. MRI scans of 71 participants (14 MCI and 54 cognitively normal), were analyzed to measure the CPV, defined as the ratio to intracranial volume (ICV) given the individual ICV variation. CPV was segmented using 3D T1-weighted sequences and FreeSurfer. Logistic regressions analysis was performed to determine the status of cognitive impairment after adjusting age, sex, education and hippocampal volume.

Results

MCI patients had a significantly larger CPV compared to healthy controls (p =0.029), while hippocampal volume tended to be large in MCI without statistical significance (p=0.080). Furthermore, after correcting covariates (age, sex, education, hippocampus volume, white matter hyperintensity volume), normalized CPV was the only significant predictor for the presence of MCI (B 4.492 SE 2.177, Odd ratio = 89.3; 95% C.I=1.51-6369.50 p=0.039).

Conclusion

These findings support that CPV may serve as a reliable imaging marker of MCI early detection in elderly individuals in a rural area. However, large multi-center studies are needed to confirm these results and investigate the underlying relationship between CPV and MCI.

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Swallow Tail Sign (STS) Evaluation in Susceptibility Weighted Imaging (SWI) for Diagnosis of Parkinson's Disease: Is it worth it?

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Aims to describe the role of evaluation swallow tail sign of substansia nigra in susceptibility-weighted imaging (SWI) in patients clinically diagnosed with Parkinson's Disease compared with normal population.

Materials and Methods

Magnetic Resonance (MR) imaging of 42 patients was collected retrospectively from Saiful Anwar Hospital's medical record. Twenty-one patients were clinically diagnosed with Parkinson's Disease and 21 patients were without any neurological complaint. The presence or absence of swallow tail sign of substansia nigra was assessed on axial 3D SWI images. The absence of swallow tail sign (bilateral, unilateral) was suggested as Parkinson's Disease, and the bilateral presence of swallow tail sign was not assessed as Parkinson's Disease, but still according to clinical diagnosis as the gold standard.

Results

Forty-two patients performed MR imaging in Saiful Anwar Hospital and the radiologist evaluate the results in SWI images. It showed the absence of STS in 21 patients clinically diagnosed as Parkinson's Disease and showed the presence of bilateral STS in 21 patients without any neurological complaint.

Conclusion

The absence of swallow tail sign in substantia nigra can be a useful sign and highly suggesting of Parkinson's Disease, with keeping the clinical presentation in patients.

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The Essential Clinical & Radiological Points of Neurovascular Compression Syndrome

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Neurovascular compression syndrome (NVCS) results from the compression of cranial nerve at the transition zone between the central myelin by oligodendroglia and the peripheral myelin by Schwann cell. The radiological diagnosis of NVCS is challenging, because asymptomatic neurovascular contact is common. Exact knowledge of the characteristic clinical symptoms and the specific MRI findings of each cranial nerves can be related to the exact diagnosis and symptom relieve after microvascular compression surgery.

Background / Outline

NVCS of trigeminal nerve (CN V) is the most common cause of trigeminal neuralgia. Midcisternal segment as well as proximal root entry zone of compression point of CN V can cause NVCS of CN V. Superior petrosal vein is also related to NVCS of CN V.

NVCS of facial nerve (CN VII) cause hemifacial spasm, which is the most common clinical manifestation of NVCS.

NVCS of vestibulocochlear nerve (CN VIII) can make vertigo (vestibular nerve) or pulsatile tinnitus (acoustic nerve). If the contact site is more than 1cm from the brain stem, NVCS of CN VIII can happen because the demyelinated transition zone of CN III can reach up to 1.4 cm.

Glossopharyngeal Neuralgia is the characteristic symptom of NVCS of glossopharyngeal nerve (IX) and can be easily overlooked. It is a paroxysmal pain attack lasting in 2 minutes in the posterior tongue, throat and jaw angle. The pain is triggered by coughing, speaking, swallowing or yawning. NVCS of IX. The nerve contact point is less than 3mm from the brain stem.

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Non-motor Correlates of Pedunculopontine Nucleus (PPN) Projection Denervation with Sleep Disturbances in Parkinson's Disease

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To establish non-motor correlates of the PPN projection denervation correlated to sleep disturbances as a potential clinical markers in characterizing the PD spectrum.

Materials and Methods

Eighty PD patients and 110 healthy controls(HC) underwent brain MRI using diffusion spectrum imaging on a 3T scanner. The clinical non-motor assessments evaluating sleep disturbances, i.e. REM Sleep Behavior Disorder Screening Questionnaire(RBDSQ), Pittsburgh Sleep Quality Index(PSQI), and Epworth Sleepiness Scale(ESS) were conducted for all participants. The whole brain correlational tractography was performed using DSI studio with PPN as a seed to map the PPN projections exhibiting significant correlations with sleep disturbances. The restricted(RDI) and non-restricted(NRDI) diffusion imaging metrics were investigated along the PPN projection establishing significant correlations with sleep disturbances to quantify the intracellular and extracellular diffusivity of the projections.

Results

Our findings demonstrated significant positive correlations between RDI (r=0.06-0.14, FDR<0.05) with ESS, PSQI, and RBD; and NRDI (r=0.09-0.13, FDR<0.05) with ESS and RBD in the PPN projections. Decreased RDI and NRDI were observed in PPN projections that were correlated with RBD (mean RDI_PD: 0.55, mean RDI_HC:0.57, p= 0.038 and mean NRDI_PD: 0.56, mean NRDI_HC:0.58, p= 0.04) and ESS (mean RDI_PD: 0.57, mean RDI_HC: 0.59, p= 0.038 and mean NRDI_PD: 0.55, mean NRDI_HC: 0.57, p= 0.032) in PD compared to HC. Reduced RDI was apparent in PPN projection correlated with PSQI (mean RDI_PD: 0.53,mean RDI_HC: 0.55, p= 0.04).

Conclusion

The loss of integrity of PPN projections correlated to sleep disturbances was apparent in PD.

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Social intelligence and the brain: Social intelligence mediates the impact of resting-state brain activity on social anxiety in late adolescence

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Extensive research has shown that social intelligence plays a crucial role in various mental health outcomes, particularly in social anxiety. However, the neural mechanisms underlying social intelligence and how they can mitigate social anxiety remain largely unknown. Here, we aimed to use resting-state functional magnetic resonance imaging (RS-fMRI) to investigate the neural substrates that underlie individual differences in social intelligence and how social intelligence can mitigate social anxiety.

Materials and Methods

We recruited 244 students aged 16–20 years (52% female) and administered both RS-fMRI scans and behavioral assessments, including the Tromsø Social Intelligence Scale and Liebowitz Social Anxiety Scale. Whole-brain correlation analyses, prediction analyses, and mediation analyses were conducted to explore the neural mechanisms of social intelligence and the mediating role of social intelligence in the relationship between spontaneous brain activity and social anxiety.

Results

Behaviorally, we found a significant negative correlation between social intelligence and social anxiety. Neurally, we found that social intelligence was negatively associated with spontaneous activity in the left superior frontal gyrus (SFG) and positively correlated with spontaneous activity in the right middle temporal gyrus (MTG). Furthermore, mediation analysis revealed that social intelligence mediated the link between SFG spontaneous activity and social anxiety.

Conclusion

Our findings suggest that specific brain regions play a vital role in influencing the level of social intelligence. Furthermore, our study provides novel behavioral and neurological evidence that high levels of social intelligence can alleviate social anxiety in adolescents.

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Correlation between the degree of middle cerebral artery stenosis and cerebral small vessel disease imaging markers

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To investigate the correlation between the degree of unilateral middle cerebral artery (MCA) stenosis and the cerebral small vascular disease (CSVD) total burden and the imaging markers of SVD.

Materials and Methods

A retrospective analysis was performed on patients with chronic unilateral middle cerebral artery stenosis who underwent multimodal MRI at the First Medical Center of the PLA General Hospital from 2015 to 2019. According to the degree of MCA stenosis, the patients were divided into two groups: severe stenosis -occlusion (stenosis ≥70%) and mild to moderate stenosis (stenosis < 70%). The differences of CSVD total burden score and CSVD imaging markers between the two groups were compared.

Results

A total of 261 patients were included, among which 159 were mild to moderate stenosis and 102 patients with severe stenosis-occlusion.. There was statistical difference between two groups (P=0.043). There were significant differences in centrum semiovale perivascular space (P < 0.001) and chronic lacunes (P=0.001) between the two groups . Binary logistics regression analysis showed that the CSVD total burden score (OR=1.3; 95% confidence interval(CI): 1.047–1.613 , P=0.017), centrum semiovale perivascular space (OR=2.099; 95%CI 1.54–2.86, P < 0.001)) and chronic lacunes (OR, 2.609; 95%CI 1.294–5.261, P=0.007) was associated with severe stenosis-occlusion.

Conclusion

The degree of middle cerebral artery stenosis is correlated with CSVD burden. Patients with severe stenosis-occlusion of MCA may have higher CSVD total burden, more centrum semiovale perivascular spaces, and more chronic lacunes.

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Application of Dual Energy Computed Tomography in Acute Stroke Patients Post Endovascular Thrombectomy- A Single Centre Review

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

This article aims to share our center experience in setting up a 512 slice dual-energy CT scanner to perform DECT for acute stroke patients post EVT procedure. The scanner uses 1 x-ray tube with a row of detector, utilizing a high and low kV switching method to produce the CT images. We will be sharing our DECT Brain technical profile which include kV and mA mode, scan type, coverage speed and reconstruction of images. Post processing of the DECT images and case studies will be shared in the paper as well.

Background / Outline

Acute stroke is a life threatening condition that requires prompt diagnosis and treatment. Endovascular treatment (EVT) is the standard of care for patient with acute stroke with a large vessel occlusion. However, EVT patients are at risk of developing post-procedural complications such as hemorrhagic conversion, which can worsen their prognosis. Hemorrhagic conversion of brain often mimics the appearance of contrast spillage post EVT. Therefore, there is a need for accurate modalities to monitor EVT patients for hemorrhagic conversion. Dual-energy CT (DECT) appear to be an imaging method that could provide valuable information for EVT patients. DECT works by using two different x-ray energy levels to create images of the same area of the body. This allows for the discrimination of different material densities within the brain, such as bleed and contrast spillage for acute stroke patients that underwent EVT procedure.

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Imaging Features and Treatment Strategies in Middle Cerebral Artery Dissection (MCAD)

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Middle Cerebral Artery Dissection (MCAD) is uncommon and is often diagnosed as intracranial Atherosclerosis when presenting as large vessel occlusion (LVO) stroke.

The majority (70%) of patients with MCAD present with Ischaemic symptoms, with 30% presenting as intracranial haemorrahge.

Suspect Ischaemic MCAD in younger patients presenting with LVO stroke if there are none or few co-morbidities; headache is a common accompanying symptom.

 Imaging may reveal :

Aneurysmal dilatation

Segmental stenosis (filliform or pearl and string)

Vessel occlusion (tapered)

Intramural Haematoma

Intimal flap

Double lumen

Rapid change in appearance

Normal non -involved vessels

During thrombectomy: besides the above features, there is rapid re-occlusion of the revascularized vessel.

We adopted a "less is more approach" with temporary stentplasty, followed by administration of Eptifibatid to minimize permanent stent deployment, this strategy was successful in the majority of cases. Stents were deployed in resistant cases.

In cases of haemorrhagic presentation deconstructive or reconstructive approaches may be adopted

Background / Outline

MCAD is thought to occur less often than dissections of the vertebral artery.

However, with the establishment of Endovascular Mechanical Thrombectomy (EVT) as a front-line treatment of acute stroke from LVO there has been an increase in the recognition of this condition in our practice.

We review the Clinical clues and Imaging features, including High resolution MR vessel wall Imaging that are seen in this condition.

Treatment strategies and modifications that can be applied for MCAD presenting with ischaemic symptoms include the use of a "stentplasty" technique to tack down the dissection flap will be presented.

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The Signs and Reminiscence of Wildlife in Brain Imaging

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

The characteristic CT and/or MRI features and signs of certain neurological conditions can be arbitrarily divided into 'the good, the bad and the ugly' according to the aggressivity of the disease. Examples of 'the good' signs are 'Texas longhorn or moose head' (dysgenesis of the corpus callosum with elongated frontal horns) and Leontiasis ossea (fibrous dysplasia of facial bones). Examples of 'the bad' signs are 'Eye-of-Tiger' (abnormal iron accumulation or pantothenate kinase II-associated neurodegeneration) and 'Bat's wing 4th ventricle (in Joubert syndrome). Examples of 'the ugly' signs are butterfly glioma and lamb's wool appearance in glioblastoma and lymphoma, respectively.

There is a paradox in that the more aggressive the wildlife imagery, the milder are the neurological conditions depicted while the more aggressive or malignant conditions are represented by the meeker animal imagery.

Background / Outline

Familiarity with the characteristic imaging features of neurological diseases can facilitate the disease diagnosis and differential diagnosis. Reminiscence of wildlife and animal imageries in brain imaging remind, invoke and add confidence to the diagnosis of certain neurological conditions. Here, we provide illustrations of various animal-related imageries/signs and discuss the pertinent imaging features, cause and appearance of these signs in addition to the differential diagnoses considered when they are encountered in radiological practice.

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Non-vascular posterior fossa lesions masquerading as acute stroke in Emergency settings

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

There are a variety of posterior fossa stroke mimics, including neoplastic and malignant processes (e.g. glioblastoma, hemangioblastoma, lymphoma, metastases, angiosarcoma), infective processes (e.g. bacterial, fungal and tuberculous abscesses, and subdural empyema), inflammatory processes (e.g. tumefactive demyelination) as well as congenital/benign lesions (e.g. ecchordosis physaliphora, epidermoid cyst). As these lesions often share similar imaging characteristics on CT scans, further evaluation with MRI is imperative. Besides imaging, some of the above-mentioned lesions require histologic and/or microbiologic correlation to differentiate between them.

Background / Outline

Posterior fossa hemorrhage and ischemic stroke are commonly encountered on computed tomography (CT) scans at the Emergency Department (ED). Other non-vascular lesions may mimic acute stroke in the posterior fossa. Differentiating between these aetiologies can be challenging as the clinical presentations and CT scan findings often share overlapping features. Here we highlight several interesting cases of non-vascular lesions masquerading as either ischemic or hemorrhagic stroke in the posterior fossa on initial CT scans. Subsequent magnetic resonance imaging (MRI) scans were required to distinguish between them.

Conclusion

ED physicians need to be aware of the various non-vascular lesions mimicking acute stroke in the posterior fossa on emergency CT scans, and further evaluation with MRI is often necessary. Any incorrect or delayed diagnosis may increase patients' risk of exposure to unnecessary procedures/interventions, and delay proper treatment when time is of essence in the ED.

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Advanced Technique and Novel Devices for Endovascular Embolisation of Challenging Intracranial Aneurysms - Case Illustration

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- Balloon-assisted coiling is to inflate a non-detachable balloon across the neck of aneurysm during coil placement. It can help to avoid coil protrusion into the parent artery and improves aneurysm neck coverage.
- The stent/ flow diverters forms a scaffold across aneurysm neck and prevent protrusion of coil into the parent artery. It allows better coil packing in the aneurysm. Flow diverters can cause flow stagnation within the aneurysm and allow subsequent endothelization, which further improves aneurysm occlusion rate.
- 'Y-configuration stenting' is a special stent-assisted coiling technique used in bifurcation aneurysm. With usage of two stents, it creates a new bifurcation point that provides a scaffold to prevent coil protrusion.
- The Comaneci device is a retrievable stent deployed across aneurysm neck during coiling of aneurysm.
- pCONUS device is an intraluminal device designed to support the coil mass at the aneurysm neck to prevent collapsing of coil mass.
- With 'double-catheter' technique coil embolisation, the aneurysm is cannulated with two microcatheters and coils are introduced to aneurysm from two microcatheters simultaneously. It helps to form a stable coil frame as two coils braces each other within the aneurysm.

Background / Outline

Embolisation of wide-neck intracranial aneurysms are technically challenging and adjunctive devices are often required.

Retrospective review of embolisation for intracranial aneurysm performed in a tertiary center in Hong Kong was performed. The following techniques for coil embolisation of intracranial aneurysm would be illustrated with case examples:

- Balloon-assisted coiling
- Stent-assisted/ flow diverter-assisted coiling
- 'Y-configuration stenting' technique
- Comaneci device
- pCONUS device
- Coil embolisation with 'double-catheter' technique

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Intra-individual comparison between gadopiclenol (0.05 mmol/kg)- and gadobutrol (0.1 mmol/kg)-enhanced MRI in terms of brain metastases visualization

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare contrast-enhanced MRI with gadopiclenol (Elucirem™, Guerbet) at 0.05 mmol/kg and gadobutrol at 0.1 mmol/kg in terms of visualization of brain metastases.

Materials and Methods

This is a post-hoc analysis of the phase III PICTURE (gadoPIClenol for cenTral nervoUs system magnetic REsonance) study. A subpopulation of patients with brain metastases (N=46) who underwent two separate MRIs with gadopiclenol and gadobutrol was analyzed. Lesion visualization parameters (border delineation, internal morphology and contrast enhancement) were assessed by 3 off-site blinded readers. Percentage of enhancement (E%), lesion to background ratio (LBR) and contrast to noise ratio (CNR) were measured. Overall diagnostic preference was assessed in a global matched-pairs fashion by 3 additional blinded readers.

Results

For all readers, and all visualization parameters, the difference in mean of scores showed the non-inferiority of gadopiclenol to gadobutrol (lower limit of 95% CI between -0.04 and -0.30 depending on the reader, above the non-inferiority margin [-0.35]).

There was no significant difference between the two GBCAs in terms of CNR, while a higher E% was observed with gadopiclenol for 2 of 3 readers ($p \leq 0.0097$), and a higher LBR for the 3 readers ($p \leq 0.0036$).

Readers preferred images with gadopiclenol in 54% to 59% of evaluations, reported no preference for 13% to 24% of evaluations, and preferred images with gadobutrol in 22% to 30% of evaluations.

Conclusion

MRI with gadopiclenol at 0.05 mmol/kg is non-inferior to gadobutrol at 0.1 mmol/kg for brain metastases visualization.

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Beyond the Skin: Uncovering Sturge-Weber Syndrome without Facial Angiomatosis

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Sturge-Weber syndrome (SWS) is a sporadic neurocutaneous disorder which affects approximately 1 in 20,000 to 50,000 persons. It usually presents with seizures, facial port-wine stain (PWS) and leptomeningeal angiomatosis on neuroimaging. Five percent of patients present with leptomeningeal angiomatosis alone, without a PWS; this is known as type 3 SWS as seen in our patient. Genetic testing is not commonly performed on those with SWS as mutations are only present in the affected tissue.

Background / Outline

A 16-year-old, male presented in February 2023 with a right-sided partial seizure preceded by a left-sided throbbing headache. No fever, signs of sepsis or meningoencephalitis. He has no previous medical illness and had normal developmental milestones. Unfortunately, his poor academic performance compelled him to withdraw out of elementary school. On general examination, he was disorientated to place and had a right homonymous hemianopia. His routine blood tests were normal and serum meningitis panel was negative. Non-contrasted CT Brain (Figure 1) showed no acute changes but demonstrate left parietal cortical and subcortical calcification with a 'tram-track' appearance. MRI Brain (Figure 2) showed features suggestive of Sturge-Weber syndrome with left parietal pial angiomatosis without focal ischemia, demyelination or microhemorrhages and ipsilateral frontal sinus and lateral ventricle choroid plexus enlargement. The left parietal tram-track calcifications showed no abnormal signals on T1-weighted, T2-weighted or gradient-echo (GRE) sequences. Electroencephalography showed left parietal periodic spikes suggestive of ongoing non-convulsive seizure, corresponding to the area of angiomatosis. He was started on sodium valproate levetiracetam and his confusion and visual field defect subsequently resolved.
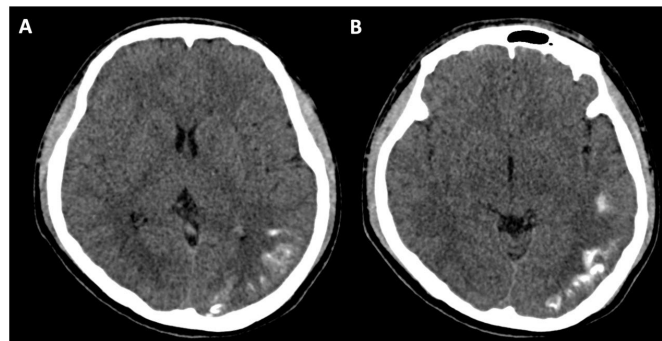
Figure 1. Non-contrasted CT Brain at the level of (A) lateral ventricles and (B) midbrain showing left parietal cortical and subcortical calcification with a 'tram-track' appearance.
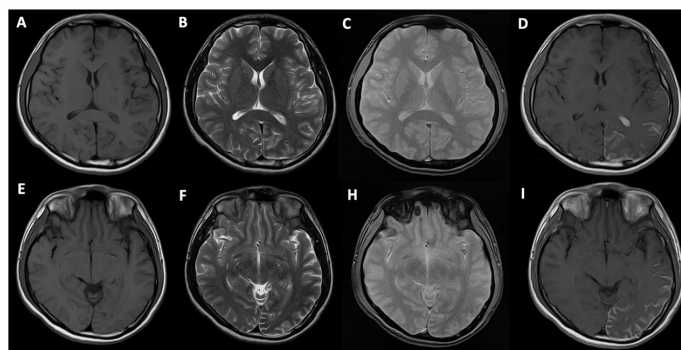
Figure 2. MRI Brain at the level of (A-D) lateral ventricles and (E-I) midbrain in T1-weighted (A, E), T2-weighted (B, F), gradient echo (C, H) and T1-weighted post-contrast sequences showing left parietal pial angiomatosis with no abnormal signals on T1-weighted, T2-weighted and gradient-echo (GRE) sequences corresponding to the tram-track calcifications seen on initial CT.

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Atrophic Changes of the Brain in Multiple Sclerosis Assessed by AI-Based MR Imaging Morphometry

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Patients with multiple sclerosis (MS) manifest varying degrees of brain atrophy resulting in cognitive deterioration. At a previous local meeting, we presented our initial experience of AI-based morphometry using MR imaging data obtained at 3T in atrophy quantification in MS. In the present study, we performed a similar assessment at 1.5T including serial examinations in some cases.

Materials and Methods

Our study group was composed of 13 patients with MS (10 with relapsing-remitting MS [RRMS] and 1 with secondary progressive MS [SPMS], and 2 with unknown type) with varying duration of illness. All patients underwent MR examination including the MPRAGE sequence at 1.5T followed by analysis using "Brain Morphometry" equipped in "syngo.via" (Siemens Healthineers).

Results

Significant atrophy, compared with an age-matched normal group, was most frequently detected in the frontal (6/13) lobe. Atrophy of the temporal (3/13) and occipital (2/13) lobes alone was also noted. Corpus callosal atrophy, probably associated with these changes, was often found (6/13). The frequency of thalamic atrophy was high at a single site (8/13). There were also changes in the brain stem and/or cerebellum (4/13). In two cases examined repeatedly with an interval of one year, mild volume increases and decreases were observed depending on the site.

Conclusion

AI-based morphometry using scan data by MPRAGE seems to work well for assessing brain atrophy in MS at 1.5T. Like in our first report, there seem to be several patterns of atrophy.

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Preoperative Diffusion Tensor Imaging of Frontal Lobe Language Tracts: How Do We Do It? A Case with Intraoperative Language Mapping Correlation

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Diffusion tensor imaging(DTI) is one of the most validated MR imaging technique to visualise the white matter tracts of the brain. It makes use of the anisotropic diffusion of water molecules along the axons, i.e. preferential movement of the water molecules along the axons rather than crossing them, to estimate the pathway of the important white matter tracts.

Background / Outline

Here we present a case making use of pre-operative DTI to predict the location of the frontal lobe language tracts, including the superior longitudinal fasciculus(SLF), in relation to the location of the tumor recurrence. The pre-operative DTI findings was compared with the intra-operative subcortical language mapping results in the subsequent awake craniotomy.

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Intracranial Perivascular Spread of Pneumococcal Meningitis in an Infant.

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

The rarity of disease spread by pneumococcal meningitis to the perivascular spaces of the cerebral convexities may suggest that this sign is fairly specific for this disease, as there is only 1 reported case of similar pattern of spread in literature.

Background / Outline

A 5-month-old boy was presented with 3 days history of fever, vomiting, loose stool, and an episode of complex seizure. On presentation, he has reduced consciousness with equal and reactive pupils. The anterior fontanelle was soft, limbs were hypertonic and reflexes were brisk.

Septic parameters were raised with leukocytosis, thrombocytosis and high C-reactive protein, 3.53 mg/dL. Cerebrospinal fluid analysis (CSF) showed raised total protein, low glucose level and presence of pus cells, namely polymorphs and lymphocytes. CSF latex agglutination for *Streptococcus pneumoniae* antigen was detected. Contrast-enhanced computed tomography (CT) brain revealed mild communicating hydrocephalus with multiple non-enhancing well-defined linear hypodensities arranged perpendicular and radial to the body and frontal horns of the lateral ventricles. On magnetic resonance imaging (MRI), these lesions demonstrated hypointense signal on T1-weighted image (T1WI), hyperintense signal on T2-weighted image (T2WI) with signal suppression on fluid-attenuated inversion recovery (FLAIR) sequence, which are suggestive of Virchow-Robins spaces. It also demonstrated restricted diffusion on diffusion weighted imaging/apparent diffusion coefficient (DWI/ADC) mapping with thin peripheral enhancement, some of which with incomplete ring, on post contrast T1WI.

He completed 6 weeks course intravenous C Penicillin and Ceftriaxone. CSF analysis post treatment showed normalised CSF glucose and protein with non-detection of S. pneumoniae antigen. Child recovered well.

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Keeping an Eye Out: A Review of CT Head Lens Exclusion Compliance

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To assess compliance with the Royal College of Radiologists (RCR) guidelines which state that all CT head scans should be performed with the base line set to exclude the lens of the eye.

Materials and Methods

We obtained a randomised list of CT head scans performed between 1/9/22 – 14/9/22 at Basildon University Hospital. The inclusion criteria was: all outpatient non-contrast CT-head scans requested by GPs. Our intervention was to discuss the results of our audit with the radiographers and provide teaching on the importance of excluding the lens and how to adhere to this. Post-intervention, we applied the same inclusion criteria for CT scans performed between 1/10/22 – 14/10/22.

Results

For cycle 1 of the audit, we had a total of 36 eligible plain CT head scans. Of these 36 scans, 0% excluded the lens of the eye. Post-intervention, we had a total of 40 eligible plain CT head scans. Of these 40 scans, 10% excluded the lens of the eye – showing an improvement in compliance by 10%.

Conclusion

The results of our audit shows an improved compliance but still significantly short of the recommended RCR target of 100%. To ensure a greater compliance, we recommend the following steps:

1. Presentation of the findings at local radiology audit meetings.
2. Development of a CT Head protocol which includes guidance on "Chin-Tuck" positioning.
3. Discuss procurement of eye shields for patient populations where protocol is unable to be followed.
4. Re-audit post second intervention.

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Dynamic Prediction of Ischemic Lesion with Computed Tomography by Deep Learning

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The ischemic lesion varies in the evolving process of acute ischemic stroke (AIS) and it is difficult to actually acquire the follow-up images at multiple time points in the clinical practice. This study aimed to develop a novel deep learning (DL) model which could dynamically predict the ischemic lesion at multiple time points from baseline images in AIS.

Materials and Methods

A DL model was trained, tested, and validated on 340 AIS patients from a prospective multicenter study. The baseline none-contrast computed tomography (CT) and CT perfusion maps were used as the inputs of the model, and the manually delineated lesions on the true follow-up images were used as the labels. The model outputted ischemic lesions with 4 predefined time intervals from 24 hours to 30 days simultaneously. Model performance was reported.

Results

In the testing group, the mean Dice similarity coefficient between the ischemic lesions estimated using the DL model and the follow-up infarcts was 67.7% (standard deviation, 19.0%). The predicted lesion volumes and the true follow-up lesion volumes showed no significant differences (median 44.7 ml vs median 46.3 ml, respectively; P = 0.839) and strong correlation (r = 0.853, P < 0.0001). The mean volumetric difference was 0.30 ml. The dynamic model correctly classified the types of lesion evolution with a total accuracy of 82.4%. Similar results were achieved in the validation group.

Conclusion

The proposed DL model shows high spatial and volumetric agreement with the true infarct lesions and could capture the lesion changes over time.

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Spontaneous formation of an arteriovenous fistula produced by ruptured aneurysm

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Carotid cavernous fistulas have been reported when an intercavernous aneurysm rupture and aortocaval fistulas have been reported, this case represents the first in literature of a parenchymal fistulous connection.

Background / Outline

An 86-year-old patient presented to the Emergency Department with sudden onset of severe headache. A CT scan revealed a subarachnoid haemorrhage. The distribution of the haemorrhage was consistent with rupture of the patient's previously diagnosed anterior communicating artery (ACoA) aneurysm that had been managed conservatively. Digital subtraction angiogram (DSA) showed a low flow arteriovenous (AV) fistula at the dome of the aneurysm draining into an adjacent vein. The low-flow fistula and lack of involvement of other veins were consistent with recent development of the fistula as a result of rupture of the aneurysm.

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An interesting presentation of a steal phenomenon from an arteriovenous fistula

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

A dural arteriovenous fistula (DAVF) refers to an abnormal direct blood connection between an intracranial artery and the dural venous sinus, and accounts for 10–15% of all intracranial vascular malformations1. They usually present as a spectrum of benign symptoms, including headache, murmur, pulsatile tinnitus and eye symptoms, though they may occasionally present with increased intracranial pressure or even fatal haemorrhage, this case highlights the early recognition and intervention with involvement of neurology, neurosurgery and interventional neuroradiology leading to a great functional outcome for the patient.

Background / Outline

We present an interesting case of a 68m who presented with acute confusion, speech deficit and left frontal headache. He was noted to have a conduction dysphasia with receptive greater than expressive deficits and alexia. His MRI imaging was noted to have significant temporal lobe oedema without infarction and prominent vasculature. Catheter angiography showed a Type 3 Borden DAVF of the left transverse-sigmoid sinus from occipital, MHT, pharyngeal and meningeal arteries.He was transferred l for definitive coil embolization of feeding arteries and occlusion of sinus and was noted to have progressive improvement of his speech and confusion to be almost at his pre-insult baseline.

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How to Approach the Dural-Based Lesion in a systemic way

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1. To review the normal imaging anatomy of the scalp and meninges. 2. To understand the different imaging modalities capabilities in diagnosis of dural-based lesions. 3. To use a practical systemic approach for the evaluation of dural-based lesions.

Background / Outline

1. Review of the normal gross anatomy and imaging appearance of scalp and meninges will be presented with illustration.

2. Case demonstrations will include:

A) Vascular - AVM with hemorrhage;

B) Tumors - metastasis, osteosarcoma, Ewing sarcoma, mesenchymal chondrosarcoma, lymphoma, leukemia, hemangioblastoma, hemangiopericytoma, melanoma, solitary fibrous tumor, meningioma, neuroblastoma, NF-2, PNET, malignant sweat gland tumor, myeloma.

C) Inflammatory/infectious - neurosarcoidosis, tuberculosis, Rosai Dorfman disease, epidural abscess, Erdheim-Chester disease, Langerhans Cell histiocytosis.

D) Trauma- epidural hematoma.

E) Others- extramedullary hematopoiesis.

A summary table focusing on the key findings to differential diagnosis of dural-based lesions.

3. The major teaching points of this exhibit are:

(A) to review the anatomy of scalp and meninges facilitating further approach to dural-based lesion

(B) to understand many pathologic conditions can lead to dural-based appearances

(C) to teach the radiologists be familiar with these key imaging findings for further differential diagnosis in a systemic approaching way.

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Sacral Paraganglioma With Intraspinal Metastasis and Hydrocephalus.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Spinal paraganglioma is an uncommon condition which arises from the filum terminale and displaces nerve roots peripherally as it grows. We present an infiltrative intraspinal paraganglioma involving sacral region manifested with hydrocephalus.

Materials and Methods

Ten year-old girl admitted for the nausea, vomiting and headache. She had papilledema on physical examination. Brain MR showed hydrocephalus with a small transependymal CSF spread from raised intracranial pressure. Lumbar spine MR showed collection of CSF intensity in the lower thecal sac, dorsal to the S1 measured at least 1.8x1.6x3.8cm. This collection demonstrated no significant internal enhancement but showed a thick rim of peripheral enhancement. There were displaced nerve roots dorsally and laterally. There was enhancement at the more proximal roots of the cauda equina as well as along the surface of the conus. Final pathologic report was infiltrated paraganglioma. Arachnoid biopsy also showed infiltrating tumor with similar histologic features.

Results

Although paraganglioma is known as benign neoplasm, it rarely can metastasize into the intracranial and intraspinal spread. Spinal paraganglioma can present with symptoms of hydrocephalus rather than symptoms directly relating to involvement of the spinal cord structure. Our case is the 2nd reported case of a paraganglioma associated with papilledema and hydrocephalus. The mechanisms are not defined for papilledema in association with paraganglioma in particular. The elevation of CSF protein and secondary prevention of CSF flow and/or subarachnoid bleeding may have resulted in increased intracranial pressure and papilledema.

Conclusion

Paraganglioma can arise from the spinal canal and be rarely associated with intraspinal metastasis and hydrocephalus and papilledema.

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Ultrasonographic findings of superficial palpable masses in head and neck

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

to demonstrate many various diseases of superficial located small palpable masses, and to learn the characteristic ultrasonographic findings and disease spectrums of the superficial palpable face and scalp masses with the review of literatures.

Background / Outline

Small palpable masses are very common in face and scalp. High resolution ultrasound is very useful for the characterization of the masses and adjacent soft tissue evaluation. In addition, ultrasound is very helpful for the differential diagnosis

Materials were retrograde collected in the university hospital for recent 5years using the PACS sorting system, and finally, cases were chosen among the all pathologic proven cases.

Most cases were located face and scalp area. Categories of Cases are as follows ; Lipoma, dermoid, epidermoid, complicated or rupture of epidermoid, osteoma cutis, Pilometricoma (calcifying epithelioma of Malherbe), Trichilemmal cyst (=pilar cyst), Proliferating trichilemmal cyst, Sola elastosis, Palpable hard mass such as osteoma, calcified granuloma, Fibrovascular tissue with calcification(calcinosis cutis), Calcified foreign body, Vascular mass and malformation (Hemangioma, lymphatic malformation, Venous lake (capillary aneurysm) with thrombosis), neurofibroma, schwannoma, Malignant mass such as melanoma, lymphoma, skin cancer (SCC) Inflammatory mass such as Chronic inflammatory mass, Acute suppurative and granulomatous inflammatory mass, fat necrosis, Fibrofatty mass, Lipogranulomatous inflammatory mass, Chalazion, Scleroderma, Cosmetic foreign body injection related mass : Foreign body granuloma(filler), cyst, granuloma. Multiple injection droplet, Inflammatory mass, abscess. Trauma related hematoma, Superficial lymph node, parotid mass,

Conclusively, ultrasonography is very helpful for the evaluation of characteristic findings of superficial masses and for the differential diagnosis.

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Investigating CT Head and CT Intracranial Angiogram Requests for Acute Stroke at a Large Tertiary UK Stroke and Thrombectomy Centre.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

CT brain imaging is performed prior to acute stroke thrombectomy to identify established infarction, haemorrhage and demonstrate a large vessel occlusion target.

In this retrospective study we aim to assess the appropriateness of emergency request for CT stroke imaging and intervention in accordance with local clinical guidelines at a tertiary stroke centre.

Materials and Methods

Imaging request forms were reviewed to assess whether symptom onset, premorbid disability (modified Rankin Score, mRS) and stroke severity (National Institute for Health Stroke Severity Score, NIHSS) were provided and within eligibility criteria for thrombectomy. Non-contrast CT head (NCCTH) imaging was reviewed for established infarction, haemorrhage and a large vessel occlusion target.

Results

100 consecutive adult patients with CT head /CT intracranial angiogram for stroke obtained within a 1 month period were reviewed with a median age of 72. 34/100 had a large vessel occlusion and 16/34 proceeded to mechanical thrombectomy.

Review of documented clinical information provided revealed 48/100 imaging request forms provided symptom onset time, and 80/100 provided symptom laterality. No form stated an mRS and 10/100 provided an NIHSS.

Conclusion

The study showed high proportion of poorly documented clinical information that was insufficient to meet guidelines to justify imaging in this series.

Prompt improvements in requesting history is necessary to optimise the stroke thrombectomy imaging service and preserve non-stroke related diagnostic clinical needs.

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Peer Assisted Learning Strategy (PALS) for understanding Diagnostic Neuroradiology: A pre- and post-learning survey.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Our neuroradiology training consists of in and out of hours reporting sessions, multiple MDT attendances with presentation and regional academy teaching.

We recently introduced a departmental neuroradiology educational programme with the content aiming for trainees entering subspeciality neuroradiology training from years 4-6.

The purpose of this study was to assess the impact of this on the specialty radiology trainees from year 1 to 6 (ST1 to ST6).

Materials and Methods

A mutually agreed curriculum in alignment with national training curriculum, customised to local needs was designed. It is made flexible to include new topics as and when the educational needs arise. The rota for presentation on a monthly basis to accommodate on calls and leave arrangements.

The details are made available in a departmental shared electronic folder as an Excel spreadsheet including dates, topics, presenters, attendance and also the power point presentations.

A total of 9 sessions were carried out over a four-month period so far. Participants were invited to an anonymous voluntary online survey pre and post attendance. The questions consisted of rating the level of confidence in reporting neuro scans, level of attraction towards neuroradiology career, and overall quality of neuroradiology educational program on a 5-point Likert scale.

Results

Majority of the participants reported strong interest in learning neuroradiology. The quality of neuroradiology education prior to the programme were felt to be varied. All the participants found this activity to be effective.

Conclusion

This study illustrates the feasibility and effectiveness of a peer-assisted educational programme for the learning of neuroradiology.

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Analysis of Frontal Lobe Volume in Alzheimer's disease and Mild Cognitive Impairment.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The aims of this study are to compare the frontal lobe gray matter volume and its subregions between healthy control (HC), AD, and MCI groups and to study the correlations between the frontal lobe gray matter volume and clinical scores.

Materials and Methods

A retrospective study in 84 patients which is categorized into 3 groups of HC, MCI and AD whom were evaluated with neuropsychiatric tests and underwent 3D-T1 sequence of MRI. Automated frontal lobe gray matter volumetric segmentation was analyzed by using FreeSurfer and was calculated using FSL software.

Results

The AD group shows significant decreases in gray matter volumes compared to the HC group in several regions, including the lateral orbitofrontal, pars opercularis, precentral, rostral middle frontal, and the entire frontal lobe. Differences are also observed between the AD and MCI groups in the precentral and superior frontal regions. No significant differences are observed between HC and MCI groups. Additionally, significant weak correlations between frontal lobe gray matter volume and TMSE clinical score are noted across multiple regions including lateral orbitofrontal (r = 0.34), medial orbitofrontal (r = 0.289), pars opercularis (r = 0.236), pars orbitalis (r = 0.216), pars triangularis (r = 0.285), precentral (r = 0.246), rostral middle frontal (r = 0.286), superior frontal (r = 0.378), and whole frontal lobe (r = 0.365).

Conclusion

Frontal lobe and its subregions GM volumes are associated with AD patients while comparing to HC and MCI patients. Furthermore, Frontal lobe and its subregions GM volumes also correlate with TMSE scores in almost every subregion.

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Pitfalls and mimics of leptomeningeal disease in routine MRI examinations

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

We emphasize the importance of recognizing pitfalls and mimics of LMD in routine imaging. The following cases are part of our larger collection of cases.

MRI Brain

1) Hereditary malformation e.g. Sturge Weber (gyriform enhancement with or without calcification.

2) Acute-subacute ischemic stroke with vascular congestion with FLAIR and post-contrast changes mimicking LMD

3) Non-hyperdense subarachnoid hemorrhage on CT with FLAIR and SWI changes.

4) Inflammatory conditions e.g. MOG antibody associated inflammatory demyelination

5) Limbic/autoimmune encephalitis vs Creutzfeldt-Jakob disease (CJD) with gyriform FLAIR hyperintensity and enhancement

6) Pachymeningeal disease mimicking LMD in Behcet

7) Bloomy rind sign (FLAIR hyperintensity around the brainstem due to chemotherapy treatment related changes in pulmonary carcinoma)

MRI Spine

Scans with apparent leptomeningeal enhancement with or without FLAIR hyperintensities including multiple sclerosis, neurosarcoidosis, neurosyphilis, Guillain Bare Syndrome, neurolupus with chronic inflammatory polyneuropathy and even lipomatosis.

Background / Outline

Leptomeningeal diseases (LMD) are often related to metastases and meningoencephalitis. There are some conditions that may masquerade as metastases and meningoencephalitis. In this review, we present a collection of cases with imaging changes on MRI brain and spine that are often misdiagnosed due to either perception or interpretation errors. The aim of our study is to increase awareness of radiologists of such pitfalls and mimics in routine neuroimaging examinations.

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The Role of Susceptibility-Weighted Imaging in the Diagnosis of Multiple Cavernoma Mimicking Intracerebral Hemorrhage

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Cerebral cavernous venous malformation, or cavernoma, is the third most common cerebral malformation with an incidence rate of 0.4–0.8% and accounts for 10–25% of all vascular malformations. Cavernomas are commonly found incidentally but can also be found during the evaluation of patients with headaches, seizures, focal neurological deficits, and intracerebral hemorrhage. Computed tomography (CT), which is often used as the initial modality, often fails to depict the lesion unless it is large. Magnetic Resonance Imaging (MRI) is the modality of choice for diagnosing cerebral cavernous venous malformations.

Materials and Methods

A 71-year-old female with a worsening headache was evaluated with a brain CT scan and brain MRI. CT scan was performed on a Revolution ACT 5 (General Electronic) CT scanner, while MRI was performed on a 3 Tesla Magnetom Skyra (Siemens) using a standard head coil.

Results

Cavernomas are formed by clusters of abnormal and hyalinized capillaries without intervening brain tissue. Sporadic cases tend to present with a solitary lesion, while familial cases tend to be multiple. In this case, the brain CT scan revealed a well-circumscribed hyperdense lesion in the right temporal lobe, which was diagnosed as an intracerebral hemorrhage. The patient has shown mild improvement. A brain MRI was done to evaluate the lesion and showed multiple "berry" appearance characteristics for multiple cavernomas.

Conclusion

MRI with SWI sequence plays an important role in establishing the diagnosis of cavernomas, showing a characteristic "berry" or "popcorn" appearance with a rim of signal loss and prominent blooming on SWI sequence.

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Specific DWI Lesion Patterns Can Predict Prognosis of Acute Posterior Circulation Ischemic Stroke

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Diffusion weighted imaging (DWI) lesion patterns is an useful prognostic indicator in acute anterior circulation ischemic stroke, but in posterior circulation ischemic stroke (PCIS) is yet to be fully investigated. We aimed to identify specific DWI lesion patterns in acute PCIS that can predict outcome at day 90.

Materials and Methods

Consecutive patients who confirmed PCIS within 24 hours from symptom onset from a prospective registry study were analyzed. The lesion patterns were divided into four classification: small perforating arterial infarction, large perforating arterial infarction, cortical infarction, and perforating arterial with cortical infarctions, based on the infarction lesion distribution and volume. The 90-days modified Rankin Scale (mRS) above 2 was used to define the adverse outcome.

Results

A total of 184 patients (138 males, mean age 61.10 years) were included. Lesion patterns was statistically significant (p=0.001) between patients with favorable and adverse outcome. Patients with favorable outcome had a higher proportion of small perforating arterial infarcts (57% versus 23%), and lower proportion of large perforating arterial infarction (16% versus 33%) and cortical infarction (17% versus 33%). In binary logistic regression analysis, the results indicated that large perforating arterial infarction (OR, 4.56 [95% CI, 1.61-12.91], p=0.004), diabetes (OR, 3.17 [95% CI, 1.39-7.26], p=0.006) and NIHSS score (OR, 1.22 [95% CI, 1.10-1.35], p<0.001) are associated with adverse functional outcome after adjusted for infarction volume.

Conclusion

Specific DWI lesion patterns can predict 90-day prognosis in acute PCIS, and large perforating arterial infarction predicted unfavorable functional outcome, the finding may be useful for clinical treatment decision.

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Highly accelerated 7T susceptibility-weighted imaging with deep learning for identifying swallow tail sign and diagnosing Parkinson's Disease

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To fast and accurately reconstruct highly accelerated 7T Susceptibility-weighted imaging (SWI) using deep learning, and evaluate the diagnostic performance of this approach for identifying swallow tail sign and diagnosing Parkinson's Disease.

Materials and Methods

A deep learning model based on complex-valued convolutional neural network (ComplexNet) was developed to reconstruct 6 and 8-fold accelerated 7T SWI data. The training data were acquired from 91 participants, including healthy participants and patients with various brain diseases, between January 2022 to November 2022. The diagnostic performances of the ComplexNet reconstructed images for identifying swallow tail sign (STS) and distinguishing Parkinson's disease (PD) patients from healthy controls was evaluated on an independent PD cohort.

Results

Average reconstruction time was 0.58 seconds per slice (46.4 seconds per participant). The PD cohort included 36 PD patients (mean age, 66 years ± 9; 19 men) and 28 healthy controls (mean age, 66 years ± 9; 7 men). Substantial to excellent agreement was observed between fully sampled and ComplexNet approaches for STS rating, with κ values of 0.661 to 1.000. Furthermore, accelerated SWI with ComplexNet reconstruction showed comparable diagnostic performance to the fully sampled 7T SWI for discriminating PD from healthy controls using the bilateral STS evaluation score, with no significant difference in area under the receiver operating characteristic curve ($P > 0.05$).

Conclusion

Highly accelerated 7T SWI with deep learning can offer comparable diagnostic performance to the fully sampled reference in terms of identifying STS and diagnosing PD.

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The outcome prediction of intracranial stenting by vessel wall imaging within 24 hours

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To evaluate the imaging characteristics in the early 24 hour after intracranial stenting with high-resolution vessel wall imaging (HR-VWI).

Materials and Methods

The study included 24 severe intracranial artery stenosis patients undergoing PTAS with Wingspan Stent between 2018 and 2020 and had a 1-year follow-up. Three HR-VWI sessions (preprocedural, early [within 24 h], and delayed postprocedural [134.7 ± 27.1 days)]) in each subject were performed with 3-Tesla MRI. We evaluated periprocedural HR-VWI
changes in patients with and without recurrent cerebral ischemic symptoms (RCIS) within 1-year follow-up

Results

On CE-T1WI of the patients without RCIS, a significant decrease in enhanced area was observed on early postprocedural (0.04 ± 0.02 cm2, p = 0.001) and delayed postprocedural (0.04 ± 0.02 cm2; p = 0.001)) and delayed postprocedural (0.04 ± 0.02 cm2; p = 0.001) HR-VWI compared to preprocedural (0.07± 0.02 cm2) HR-VWI. Patients with RCIS demonstrated no significant loss of enhanced area on CE-T1WI of early postprocedural HR-VWI (p = 0.180).

Conclusion

The postprocedural HR-VWI within 24 hours after the procedure may predict patient outcomes after intracranial stenting.

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An Indonesia's Endemic Disease: Tuberculosis, Clinical Overview and its Features in Neuroradiology

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Teaching points :

1. To explains the course of tuberculosis infection from lung to central nervous system

2. Showing various CT and MR imaging finding of tuberculosis at central nervous system

3. Correlate those imaging finding with patient clinical manifestation

4. Laboratorium finding supporting the diagnosis of tuberculosis

Background / Outline

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis bacteria. Although tuberculosis often affects the lungs, it can also affect other bodily regions such as brain, meninges and spinal cord. In developing nation, TB of the central nervous system (CNS) is still a major issue. The rising prevalence of acquired immunodeficiency syndrome has made this condition need significant attention. 10% of individuals with primary tuberculosis who are immunocompetent experience tuberculosis of the central nervous system. In Indonesia, imaging findings of CNS tuberculosis are very diverse and also imaging plays a significant part in making the diagnosis because clinical diagnosis only might be challenging. Hence, deeper understanding of its various features of CNS tuberculosis infection is an urge especially for radiologist.

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Radiology Assessment of Non-traumatic Spontaneous Spinal Subdural Hematoma without Coagulopathy: Rare Neurological Emergency

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1. Etiology of Spontaneous Spinal Subdural Hematoma
2. Prevalence of Spontaneous Spinal Subdural Hematoma
3. Imaging Characteristics of Spontaneous Spinal Subdural Hematoma
4. Prognosis of Spontaneous Spinal Subdural Hematoma
5. Clinical Grading of Subdural Hematoma Correlated to Radiology Features
6. Case Report and Literature Review

Background / Outline

Spontaneous spinal subdural hematoma (SSDH) is reported rare at incidence rate, only accounts for 4.1% among all spinal hematomas. Several factors that might be the cause of SSDH are cortical artery bleeding, vascular lesions, coagulopathy, neoplasms, spontaneous intracranial hypertension, cocaine, and arachnoid cyst. The incidence of spinal subdural hematoma is rare because spine has been protected by the vertebrae, broad paravertebral muscles and the passage of blood vessels through the subdural space. The spontaneous development of spinal subdural hemorrhage is an emergency situation including the risk of radiculopathy and spinal cord compression syndrome. Therefore, early diagnosis is essential and comes to prior with radiology imaging support. The appearance of the bleeding may vary on magnetic resonance imaging (MRI). MRI is the investigation of choice for diagnosis as well as for planning surgery. This research discussed a rare case of patient with spontaneous spinal subdural hematoma without prior to trauma and coagulopathy before. The patient had sensory complaints before paraplegia signs appeared.

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Joint structural and functional alterations underlying cognitive function in first-episode major depressive disorder

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Neuroimaging studies have shown widespread abnormalities in brain structure and function in individuals with major depressive disorder (MDD). However, it is unclear if integrating multimodal data can improve our understanding and diagnostic capabilities for MDD.

Materials and Methods

We employed multiset canonical correlation and joint independent component analysis (mCCA+jICA) to combine gray matter (GM) and amplitude of frequency fluctuations (ALFF) features in medication-naïve MDD patients (N=43) and healthy controls (HCs, N=43). We compared shared and specific joint independent components (ICs) incorporating both structural and functional modalities between MDD and HCs. Additionally, we conducted correlation and mediation analyses to examine the relationships between multimodal imaging features, clinical ratings, and cognitive test performance.

Results

We identified two pairs of shared ICs in both GM and ALFF, as well as three modality-specific ICs in GM that significantly differentiated MDD patients from HCs. The joint alterations in both GM and ALFF were primarily observed in the right dorsal lateral prefrontal cortex, bilateral superior and inferior parietal lobules, and bilateral calcarine cortex. Notably, we found significant associations between GM alterations in these regions and age-related cognitive performance in attention and executive functioning tests, with GM alterations acting as a partial mediating factor.

Conclusion

The structural-functional covariation in the right dorsal lateral prefrontal cortex, bilateral superior and inferior parietal lobules, and bilateral calcarine cortex may aid in identifying MDD and contribute to age-related cognitive impairments in MDD. These findings enhance our understanding of multimodal brain alterations in depression and provide evidence for their associations with age-related neurocognitive changes.

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Anticoagulation in traumatic intracranial haemorrhage -

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To compare the presence and nature of anticoagulation and other risk factors against the likelihood of intracranial haemorrhage in patients with head injury

Materials and Methods

An exploratory retrospective cohort analysis of CT head requests for head injuries using NICE guidelines from October 2021 to January 2022. Patients on anticoagulation were identified and subdivided based on class of anticoagulation. Patients on multiple anticoagulants were excluded. Imaging findings were analysed to identify presence of extracranial or intracranial abnormalities, and compared to nature and dose of anticoagulation and other risk factors to identify trends linking various factors.

Results

1514 CT heads were carried out for suspected intracranial injury. 646 (47%) had anticoagulation as a risk factor. Six were excluded due to multiple forms of anticoagulation. Direct-acting oral anticoagulants were the most commonly used, followed by Warfarin, antiplatelets and low molecular weight heparin in descending order. There was no statistically significant association between anticoagulation or any subtype thereof and the presence of abnormal CT findings.

Reduced Glasgow coma scale score, haemotympanum and post-traumatic seizure were associated with increased incidence of abnormal findings.

Conclusion

An aging population alongside increased prevalence of anticoagulation presents a growing burden on acute medical departments and imaging services. Despite its importance in UK national guidelines, our findings suggest anticoagulation therapy alone should not be a determinant of patient management. A comprehensive clinical assessment of all risk factors should be used to triage the need for and urgency of CT head imaging in patients presenting with suspected head injury to optimise patient care

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A Rare Case of Recurrent Giant Multicompartmental Trigeminal Schwannoma

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Trigeminal schwannomas (TS) are rare, accounting for 0.8%–5% of intracranial schwannomas. They are benign, encapsulated, slow-growing tumors composed of Schwann cells that can be confined to one or more compartments of the trigeminal nerve. Complete surgical resection is the treatment of choice, but it may not be possible in all cases. The recurrence rates of trigeminal schwannomas ranged from 0–17% and were higher in large schwannomas. Here we present a rare case of recurrent giant multicompartment trigeminal schwannoma and the role of magnetic resonance imaging (MRI) in the diagnosis.

Materials and Methods

A 29-year-old woman with a previous history of intracranial tumor removal and a biopsy result of schwannoma was evaluated with brain MRI performed on a 3 Tesla Magnetom Skyra (Siemens) using a standard head coil, brain standard sequence, and additional three-dimensional Constructive Interference in Steady State (3D CISS) axial sequence and spectroscopy.

Results

Multicompartmental TS is a rare entity and has higher reccurency. The most common clinical symptoms are facial pain and numbness. MRI with an additional thin T2-weighted 3D CISS axial sequence is the modality of choice for the evaluation of trigeminal schwannomas due to its higher tissue sensitivity and detailed depiction of the cranial nerves. Multicompartmental TS presents as a dumbbell or trilobular-shaped mass confined to Meckel's cave and preganglionic or postganglionic compartment and rarely confined to all three compartments.

Conclusion

MRI plays a crucial role in the diagnosis and presurgical planning of trigeminal schwannomas, as well as the evaluation of postsurgical and recurrency.

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Navigating asymmetries in pediatric brain

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1. Asymmetry in pediatric brain can be a clue to underlying diagnosis. However differentiating normal variations in brain asymmetries can be difficult from pathologic or abnormal asymmetries. A good bank of normal control datasets can help an early leaner navigate these differences.

2. Asymmetric myelin signal can be the only early sign of an occult focal cortical dysplasia. This may present with either hypo or hypermyelination.

3. Focally asymmetric ventricular contour may reflect a small focus of periventricular venous infarct which may not have associated gliosis.

Background / Outline

Pediatric brain imaging often treads the narrow zone of trying to differentiate normal brain from "subtle" abnormal findings. Asymmetric appearance of sulcation, gyration, ventricular caliber or myelin signal can be a common finding when reading pediatric neuroimaging studies. This exhibit aims to show a wide spectrum of asymmetries in pediatric brain- both normal and abnormal examples.

The learner will gain perspective for examples of

Early asymmetric myelin signal in a setting of focal cortical dysplasias in infancy

Asymmetric ventricular caliber signifying surrounding white matter volume loss due to periventricular venous infarct.

Asymmetric deep sulcation which may harbor underlying focal cortical dysplasias.

Asymmetric hemispheric size signifying examples of focal hemimegaloencephalies.

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Parathyroid Gland Imaging

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Seong Nam Shi, Seong Nam Shi, Korea, Republic of

Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

1.Normal Parathyroid Gland

2.Radiologic Evaluation indication and Imaging Modalities

3.Imaging features

•Parathyroid hyperplasia

•Parathyroid adenoma

•Parathyroid carcinoma

•Parathyroid cyst

4.Non-invasive treatment

Background / Outline

Generally, parathyroid glands are not usually identified by most imaging modalities such as CT, MRI, or sestamibi scintigraphy. Recently, many authors have reported that normal parathyroid glands showed homogeneously oval and hyperechoic features on ultrasound imaging. The cause of hyperechogenicity is based on its pathologic backgrounds such as rich lipocytes and loose connective tissue.

Primary hyperparathyroidism is an indication of parathyroid gland imaging. The mainstays of imaging are 99mTc Sestamibi scintigraphy for parathyroid localization and ectopia and ultrasound for anatomic relationship. Although fine-needle aspiration with washout PTH is a very sensitive and specific modality for the identification of parathyroid adenoma, it has a limited value because fine needle aspiration and biopsy can induce lesion disruption, seeding along the needle tract, and fibrotic reaction that causes recurrent laryngeal nerve injury. Four-dimensional CT can provide detailed anatomic information and can help differentiate adenoma from other mimickers.

Because of the rarity of parathyroid carcinoma, there were few reports focused on the differentiation between parathyroid adenoma and parathyroid carcinoma. Indistinct and infiltrative borders and heterogeneous echotexture are significantly different between the two disease entities. Sex (male predominance), PTH level, size, depth/width ratio, shape, cystic change, calcification, and combined suspicious lymph node showed overlapping results.

Ethanol ablation and radiofrequency ablation have been suggested alternative treatments. They have shown some efficacy in controlling serum levels of calcium and PTH in hyperparathyroidism patients.

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Advance of diffusion MRI and its application to neuro degenerative diseases

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

Advanced diffusion MRI: new diffusion tensor imaging (DTI) methods

1. Visualization: whole brain/atlas based analysis, probabilistic tractography
2. Quantification: non-Gaussian model, multi compartments model

Background / Outline

Though DTI created from diffusion MRI has made a great contribution to visualization and quantification of nerve fiber tracts, there were some limitations in traditional methods. To overcome them, new DTI methods have been developed.

In terms of visualization, traditional tract-specific analysis (TSA) has been used for evaluation of selected fiber tracts (ex: evaluation of pyramidal tracts in amyotrophic lateral sclerosis or pre-surgery). However, whole-brain analysis can be used for broad brain change (ex: development, aging), and atlas-based analysis can be used for anatomical evaluation (brain segmentation analysis) instead of TSA. Traditional streamline tractography had difficulty in visualization of neural connection like crossing fibers, but probabilistic tractography such as Q-ball imaging can improve it.

In terms of quantification, Gaussian model of water diffusion was not suitable for in-vivo use, and non-specific to the factors of metrics change. Non-Gaussian model based methods like diffusional kurtosis imaging (DKI) are more appropriate for analysis of the brain in vivo. Multi compartments model based methods including neurite orientation dispersion and density imaging (NODDI) and free water elimination (FWE) can estimate several specific aspects of neural tissue at each voxel. NODDI is sensitive to orientation of nerve fibers. FWE decreases partial volume effect which can be useful for exclusion of intracranial water or neural edema.

Understanding advance of diffusion MRI enable its appropriate application to neuro degenerative diseases.

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FastStroke ColorViz in the detection of distal vessel occlusion on CT Angiography for Acute Ischaemic Stroke.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The multiphasic CT angiogram (mCTA) is the mainstay in acute ischaemic stroke imaging, being more readily available than MRI. The mCTA identifies large vessel occlusions (LVO) and provides information on collateral circulation. The FastStroke software auto-registers the multiphasic CTA dataset. The ColorViz application provides colour-coded images based on temporal distribution of maximum contrast opacification. The arterial, venous and delayed phases are coded red, green and blue respectively, providing a quick assessment of collateral circulation. Unlike infarcts due to LVO, small infarcts due to distal vessel occlusions (DVO) are often not discernible on CT. This abstract presents 3 clinical cases to demonstrate the novel utility of Colorviz to detect small acute infarcts on CT.

Materials and Methods

All 3 patients had mCTA at initial presentation for acute stroke, with MRI the following day as per institution protocol. The CT was performed on a GE Revolution Apex CT scanner with FastStroke ColorViz application.

Results

In each patient, the ColorViz images identified delayed arrival (blue) in a distal vessel suggesting a DVO, beyond the resolution of conventional CTA. Next day MRI with diffusion-weighted imaging revealed acute infarcts in the corresponding regions.

Conclusion

These 3 cases demonstrate the ColorViz detection of small acute infarcts due to DVO. This potential for the expanded application of ColorViz is promising. Further studies are needed for validation.

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A Rare Case of Supratentorial Ependymoma in an Adult: The Role of Magnetic Resonance Imaging in the Diagnosis.

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Ependymomas are neuroepithelial tumors of the central nervous system which commonly occur in the pediatric population. Ependymoma in adults is rare and only a small percentage of them is found in the brain parenchyma. Diagnosing brain ependymoma remains a challenge due to various brain tumors with a similar appearance. This poster is to present a rare case of supratentorial ependymoma in an adult patient and the role of Magnetic Resonance Imaging (MRI) in the diagnosis.

Materials and Methods

Data were collected from medical record, PACS, and histopathology lab. A 38-year-old female came with neurological deficits and her brain CT scan revealed an isodense mass at temporoparietal lobe with surrounding edema. Further brain MRI showed a heterogenous mass at temporoparietal lobe which compressed the surrounding areas with heterogenous enhancement after contrast administration. Biopsy examination revealed ependymoma.

Results

Intracranial ependymomas in adults are rare and commonly found infratentorially. For those rare cases arising in the supratentorial, the majority are extra-ventricular. MRI plays an important role in identifying the mass location as well as evaluating its characterization and extent, for narrowed differential diagnoses and better presurgical planning. Intracranial ependymomas generally demonstrate high T2 and FLAIR signal intensity due to high intracellular myxoid accumulation and cyst formation. Compared to infratentorial ones, supratentorial ependymomas are usually more heterogenous due to a higher tendency for cyst formation, calcifications, and hemorrhage.

Conclusion

This case highlights the possibility of supratentorial ependymomas occurring in adults and the role of MRI in its diagnosis and assessment.

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Aceruloplasminemia in a Patient with Neurodegenerative Condition: a Case Report

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

- Raise awareness of an abnormal local iron accumulation in neurodegenerative diseases.

- Enrich knowledge about the genotype, epidemiology and clinical features of aceruloplasminemia.

- Arouse awareness among subspecialties for prompt diagnosis to prevent irreversible neurological complications.

Background / Outline

Aceruloplasminemia is a very rare adult-onset disorder with systemic iron overload due to production of dysfunctional ceruloplasmin jeopardizing the normal cellular iron transportation, resulting in iron accumulation and sequelae of organ damage. In January 2023, a 67-year-old woman with history of diabetes mellitus and iron-deficiency anemia since 2010 was admitted to Eastern Hospital presenting with disorientation, gait instability and history of fall. From the history, the patient showed rapid deterioration in mobility since December 2022, being poorly motivated and homebound. She was found with repetitive behavior for more than 10 years.

On admission, dementia workup was done with Montreal Cognitive Assessment (MoCA) test being 2/30, suspicious of dementia. Computed tomography (CT) of the brain was essentially unremarkable apart from known prominent ventricles. Subsequent magnetic resonance imaging (MRI) of the brain was performed with significant blooming artefacts at multiple deep grey-matter structures, including bilateral caudate nuclei, lentiform nuclei, thalami, red nuclei, substantia nigra and bilateral dentate nuclei, signifying mineral deposition. Diffuse gyriform blooming artefact is also noted outlining the cerebrum and cerebellum. Overall features raise the concern about aceruloplasminemia in the current clinical context. Subsequent blood tests showed

significant low ceruloplasmin with hyperferritinemia and genetic test confirmed the diagnosis with pathogenic variants on the ceruloplasmin gene detected. Further MRI for liver and cardiac iron overload are scheduled.

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Using Apparent Diffusion Coefficient value to distinguish between benign and malignant brain tumours: A diagnostic assessment.

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[2]Neurosurgery department CMH, Kharian, Pakistan

Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

The purpose of our study was to find the diagnostic efficacy of Apparent Diffusion Coefficient (ADC) values in diagnosing benign and malignant brain tumors using histopathology as the gold standard.

Materials and Methods

This was a cross sectional observational study conducted in Radiology department POF Hospital Wah Cantt Pakistan. MRI brain studies were done by 1.5 Tesla widebore Seimens machine. Data collection was done from December 12, 2020 to June 9, 2021.

Total 140 patients were included in the study. The slice thickness of MRI images was 3mm with an interval of 10 mm. .Tissue cellularity and diffusion properties of water molecules within tissues is assessed by The apparent diffusion coefficient (ADC) sequence.

Results

The mean age of patients was 46.5±14.0 years. There were 85 males (60.7%) and 55 females (39.3%). The mean BMI was 26.8±5.5 kg/m2. Duration of symptoms in all patients was 1 to 4 months with the mean 2.0±1.4 months. Chronic headache was found in 100 patients (71.4%), seizures in 20 (14.3%), and focal deficit was present in 111 patients (79.3%). Apparent diffusion coefficient (ADC) value in differentiating benign and malignant brain lesions showed sensitivity 77.5%, specificity 91.6%, PPV 92.5%, NPV 75.3% and diagnostic accuracy 83.5%.

Conclusion

Malignant brain lesions display lower ADC values than benign ones. Apparent diffusion coefficient (ADC) values improved our abilities to differentiate benign from malignant brain lesions. ADC helps in Identification of tumour core for biopsy site thus necrotic part of tumor may be avoided. Grading of gliomas may be done by ADC.

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MRI Features of Chemotherapy Related Central Neurotoxicity

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

With the rising incidence of cancer and advancements in cancer treatment, the prevalence of chemotherapy-related neurotoxicity has also seen an increasing trend. Chemotherapy-related neurotoxicity is a well-recognized complication in oncologic patients, with an estimated 19% to more than 85% of patients receiving chemotherapeutic agents experiencing symptoms of neurotoxicity.[1] This may present with a wide range of neurological manifestations, which often pose diagnostic challenges particularly in distinguishing it from tumor progression and paraneoplastic syndrome. Therefore, imaging plays a crucial role in the management of these patients.

There are various imaging patterns of chemotherapy-induced neurotoxicity on MRI, including acute-subacute leukoencephalopathy with reversible DWI pattern, commonly observed with methotrexate use, as well as acute cerebellar syndrome and reversible acute cerebellar toxicity patterns, most often induced by high-dose cytarabine. Other imaging patterns include posterior reversible encephalopathy syndrome, neurovascular complications pattern, progressive multifocal leukoencephalopathy pattern and spinal cord toxicity. [2]

In this pictorial review, we will highlight the MRI characteristics and patterns related to chemotherapy-induced neurotoxicity, as well as provide case-based examples to better illustrate these features.

Background / Outline

1. Introduction

2. Types of chemotherapeutic agents and mechanism of action

3. Characteristics MRI features of chemotherapy-induced central neurotoxicity

4. Conclusion

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Value of MRI Findings for Survival Prediction in Thalamic Tumor Patients: A Single Center Retrospective Study

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

Thalamic tumors are rare brain tumors that present challenges in gathering sufficient radiological data due to their low incidence. This has resulted in a lack of studies in the literature that comprehensively define both conventional and advanced MRI findings in a large patient population. However, MRI plays an essential role in the management of thalamic tumors, such as diagnosis, shaping surgery, improving the extent of resection. In this study, we aimed to gather conventional and advanced MRI findings of various thalamus tumors and analyze their association with patient survival.

Materials and Methods

81 patients with primary thalamic tumors who underwent surgery at Yeditepe University Hospital were selected from archives. Demographic, clinical, and pathologic data were retrospectively collected. MRI findings, including T1, T2, DWI, SWI, DTI sequences, pattern of contrast enhancement, perfusion status, presence of edema, cystic, necrotic, vascular component, and contours, were assessed in a blinded manner. We investigated the correlation between MRI findings and patient survival, using Kaplan-Meier analysis.

Results

The mean age of the study population was 32,62 years, and glioblastoma multiforme was found to be the most common tumor across all age groups (43,2%). In the pediatric age group, pilocytic astrocytoma was the most frequently occurring tumor (23,8%). MRI findings, such as the presence of necrosis, shift, edema, enhancement, vascular compartment, susceptibility sign, increased perfusion, diffusion restriction, axonal deviation-edema were found to be significantly associated with shorter survival ($p < 0.05$).

Conclusion

These results suggest that certain MRI findings may be useful in predicting survival for patients with primary thalamus tumors.

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The MRI Disparities between CADASIL and Multiple Sclerosis in Middle-aged Subjects: a Semiquantitative Analysis

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To evaluate the imaging difference between the two important white matter diseases: cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) and multiple sclerosis (MS) in the middle-aged subjects.

Materials and Methods

This retrospective study utilized the National Taiwan University Hospital database from January 2018 to March 2023. The CADASIL and MS patients who were aged 40-60 y/o and who underwent the study imaging protocol (including 3D T1WI, 3D FLAIR, DTI, SWI) were included. The patients with history of intracerebral hemorrhages or without detectable white matter lesions on MRI were excluded.

Results

A total of 29 CADASIL patients and 27 MS patients were analyzed. The CADASIL group exhibited a higher periventricular grade (2 vs. 1.85; P = 0.02), a greater involvement of the external capsule (55.2% vs. 18.5%; P = 0.006) and more microbleeds. The MS group showed a higher incidence of lesions at the body of the corpus callosum (44.8% vs. 81.5%; P = 0.005), brainstem (44.8% vs. 74.1%; P = 0.026), and upper cervical cord (0% vs. 48.1%; P < 0.001). In quantitative analysis, CADASIL patients exhibited a significantly higher mean diffusivity and lower fractional anisotropy in the splenium of the corpus callosum.

Conclusion

In the age range of 40 to 60, CADASIL patients exhibit more periventricular white matter grading and greater tissue alterations in the splenium of the corpus callosum. Factors that distinguish CADASIL from MS include the presence of microbleeds, T2 lesions involving the external capsule, and sparing the body of corpus callosum, brainstem and upper cervical cord.

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"Air bubble artefact" on CT brain images

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Abstract Theme

Neuroradiology

Abstract Category

Education

Teaching Points

"Air bubble artefact" is an uncommon artefact however, it is important to recognise it's presence to ensure appropriate clinical management of patients.

Background / Outline

The X-ray tube within a CT scanner is surrounded by an oil coolant system. In normal circumstances, the oil coolant has a uniform attenuation of photons. The "air bubble artefact' is caused by the presence of an air bubble in the oil coolant resulting in reduced attenuation of the photons and producing a hypodense artefact on the detector. The position of the air bubble may vary over time therefore the presence, position and severity of the artefact also varies. It is crucial to be aware of and recognise this artefact as it may alter the clinical management of patients.

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Challenging the Advanced Magnetic Resonance Imaging on Differentiation of Brain and Spinal Infections from Metastatic Lesions

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

To explain various signs of infection cases on brain and spine seen through Magnetic Resonance Imaging and differentiate them with metastases using Advanced Magnetic Resonance Imaging (MRI). The role of advanced MRI is to sharpen the diagnosis and help the clinicians for the next evaluation of the patients.

Materials and Methods

A retrospective study of 5 patient records and MRI scans who had specific infection features with histopathology and laboratory confirmations, and 1 sample of brain metastatic cancer as a comparative lesion.

Results

Infection and malignancy could show the same features on imaging. The Gadolinium contrast was injected to enhance specific infection features such as peridiscal enhancement, abscess in various places (paravertebral soft tissue, epidural, psoas muscle, and intraosseus), and gibbus formations which specifically lead the infection to tuberculosis process. Two of the sample showed multiple lesions mimicking metastatic lesion with necrotic areas inside that enhanced after Gadolinium injection, hypo to isointense on T1W1, hyperintense on T2W1, and unrestricted area of DWI. The metastatic lesion was differentiated by MR Spectroscopy showing increasing of Cho/Cre ratio and Cho/NAA ratio on peri-lesion.

Conclusion

Magnetic Resonance Imaging remains a powerful radiology tool in the detection and characterization of infection lesions, due to high anatomical resolutions and sensitivity to contrast enhancement. Various types of brain and spinal infections were seen on MRI, but it became less specific when facing the malignant mimicking lesions. The advanced MR such as MR Spectroscopy may improve the specificity of MRI by analyzing choline creatinine and N-acetyl aspartate ratio.

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FLAIR vascular hyperintensity-DWI mismatch and DWI-FLAIR mismatch ASPECTS for prediction of good outcome after recanalization in anterior circulation stroke; multicenter observational study

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Abstract Theme

Neuroradiology

Abstract Category

Scientific

Objective

the value of FVH-DWI mismatch, DWI-FLAIR mismatch, and a DWI-FLAIR MISMATCH ASPECTS scoring system for predicting revascularization

Materials and Methods

110 patients diagnosed as acute ischemic stroke with evidence of large vessel occlusion in anterior circulation and received endovascular thrombectomy were recruited. FVH-DWI mismatch was considered present when FVH extended beyond the boundaries of the cortical DWI lesion. DWI-FLAIR mismatch was diagnosed when a visible acute ischemic lesion was present on DWI with no traceable hyperintensity in the corresponding region on FLAIR imaging. The DWI-FLAIR MISMATCH ASPECTS was calculated from mismatched DWI-FLAIR area using a 10-point scoring system following the anatomical region distributed for MCA territory. DWI-FLAIR MISMATCH ASPECTS, which is higher than grade 6, was used to interpret comparing between present and absent FVH-DWI mismatch.

Results

FVH-DWI mismatch was present in 71 patients (89.9%) with complete revascularization and present in 8 patients (10.1%) with no/partial revascularization, which had no significant difference (p = 0.12), and there was no significant difference between good functional outcome and poor functional outcome. Moreover, in 76 patients with DWI-FLAIR mismatch ASPECTS of >6 point-group, present FVH-DWI mismatch in 57 patients (83.8%) with complete revascularization had a significant difference as compared to

11 patients (16.2%) with absent FVH-DWI mismatch (p < 0.05). The clinical outcome in complete revascularization is better than no/partial revascularization, and complete revascularization is independently associated with good functional outcomes (p < 0.05).

Conclusion

FVH-DWI mismatch paired with DWI-FLAIR mismatch ASPECTS >6 points may be possible to predict revascularization in patients with anterior circulation LVO

Nuclear Medicine

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Short term BRAF and MEK inhibition in Redifferentiation of Radioiodine-Refractory Thyroid Cancer (RR-TC)

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Abstract Theme

Nuclear Medicine

Abstract Category

Scientific

Objective

To assess the safety and efficacy of short-term MAPK and MEK inhibition in radioiodine uptake restoration in RR-TC.

Materials and Methods

Patients with unresectable RR-TC harbouring MAPK signalling pathway mutations were enrolled. Radioiodine uptake was assessed using I-124 PET-CT at baseline and two weeks after dabrafenib and trametinib combination therapy. Therapeutic dose of I-131 was administered if the target lesional dosimetry was predicted to be ≥ 2000cGy. Otherwise, redifferentiation therapy was continued for another two weeks before another I-124 PET-CT was performed to determine adequacy of iodide uptake restoration. Primary outcome was redifferentiation rate. Secondary outcomes were overall survival (OS), progression-free survival (PFS), best tumour response by RECIST 1.1, thyroglobulin (Tg) tumour marker response, and safety. This research has been approved by an ethical committee.

Results

Nine patients were recruited till date. Successful redifferentiation was achieved in six patients (66.7%); three within two weeks and the other three after four weeks of combination therapy. Of the six patients treated with radioiodine, best tumour and Tg response were evaluated in five patients at the time of writing. Three patients had partial response (60%) and two patients had stable disease (40%). All five patients had decline in Tg. OS and PFS are still under investigation. Grade 1/2 adverse events were seen in eight patients (88.9%) and grade 3 events were observed in two patients (22.2%).

Conclusion

Combined inhibition of BRAF and MEK was safe and achieved redifferentiation in two-thirds of patients. Shorter course of redifferentiation therapy is possible with 50% of successful redifferentiation requiring only two-week course.

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Concordance Between Contrast-Enhanced H&N PET-CT and MRI in the Local Assessment of Nasopharyngeal Carcinoma

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Abstract Theme

Nuclear Medicine

Abstract Category

Scientific

Objective

Nasopharyngeal carcinoma (NPC) is the 4th most prevalent cancer in Malaysia. And accurate staging is crucial in determining appropriate treatment. MRI is currently the primary tool for local staging, while CT TAP with bone scan assesses for distant metastasis. 18F-FDG-PET/CT is a new potential tool for staging, providing metabolic information on disease activity and distant metastasis. This study aimed to evaluate the concordance between dedicated contrast-enhanced H&N 18F-FDG-CE-PET/CT and H&N MRI in the local assessment of NPC.

Materials and Methods

A retrospective study of 31 patients with NPC was conducted from January 2017 to January 2023. Two radiologists independently interpreted the MRI and CE-PET/CT using checklists adapted from the 8th AJCC Cancer staging manual. The concordance in the extent of primary tumour and sensitivity and specificity of nodal metastasis were evaluated using MRI as the gold standard.

Results

After exclusion criteria, the study included 22 patients, predominantly male (63.6%) and Chinese (95%). The mean duration between CE-PET/CT and MRI was 18.3 days. CE-PET/CT was able to stage 68.2% of patients accurately for T and N staging respectively. For overall staging, CE-PET/CT and MRI were concordant in 55% of patients.

Conclusion

Modified 18F-FDG-CE-PET/CT has a comparative concordance rate in local and nodal staging of NPC compared to the gold standard MRI. This suggests that 18F-FDG-CE-PET/CT may serve as a potential alternative for staging, but further studies are necessary to confirm its efficacy.

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18F-FDG PET/CT Manifestations of Desmoplastic Small Round Cell Tumor in a Young Asian Male.

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Abstract Theme

Nuclear Medicine

Abstract Category

Scientific

Objective

Desmoplastic small round cell tumor (DSRCT) is an extremely rare form of primary peritoneal neoplasm in adolescence, which has an aggressive course and carries a dismal prognosis despite treatment.

Our study aims to share a case of a 19 year-old male who was diagnosed with DSRCT, to provide further insight into the evaluation of such cases in the Asian population with FDG PET/CT.

Materials and Methods

This report presents a single young Asian male who was initially evaluated for abdominal bloating and distention for a month. Initial contrasted computed tomography revealed scattered peritoneal/mesenteric masses occupying almost the entire abdomen and pelvis, with bilobar hepatic lesions suspicious for metastases. Subsequent biopsy of the involved liver tissue revealed histopathological features in keeping with DSRCT. An 18F-FDG PET/CT examination was thereafter performed, which further delineated the extent of disease and metastatic involvement.

Results

The PET/CT scan in this patient revealed multiple intensely FDG-avid large conglomerate abdominopelvic masses seen encasing most of the bowel loops, with FDG-avid nodal, liver and pleural metastases.

18F-FDG PET/CT has demonstrated to be an important imaging modality for initial staging for this disease entity and potentially for evaluation of treatment response in view of the aggressive nature and high metabolic activity of the tumour.

Conclusion

Our study serves to remind fellow Nuclear Medicine physician colleagues that DSCRT should be considered in young patients presenting with bulky abdominopelvic peritoneal masses.18F-FDG PET/CT can serve as a useful imaging modality in the evaluation of the morphology and extent of this disease.

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Radiosynoviorthesis (RSO) of debilitating haemophiliac and rheumatoid arthropathy - Singapore General Hospital experience

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Abstract Theme

Nuclear Medicine

Abstract Category

Scientific

Objective

To demonstrate the efficacy of radiosynoviorthesis of debilitating haemophiliac and rheumatoid arthropathy in a local hospital

Materials and Methods

The Department of Nuclear Medicine and Molecular Imaging, SGH has been treating patients with RSO since 2013. To assess treatment response, clinical assessment of joint swelling, synovial thickening and symptomatology by way of pain score using VAS was used.

Results

Steadily increasing procedure numbers are possibly due to increased clinician and patient awareness. Since then, an annual average of 3-4 RSO procedures are performed.

Radiopharmaceutical	2013-2017	2018-2022
Rhenium-186 sulfide	3	12
Yttrium-90 colloid	9	11
Total	12	23

From 2018 to 2023, 24 RSO have been performed (11 knee, 11 ankles, 1 elbow and 1 wrist joint).

Almost all patients reported an improvement of joint swelling/stiffness and/or pain reduction as early as 2-4 weeks following RSO of target joint. The duration of symptom control was from 6 to 20 months. Several patients reported symptom improvement allowing resumption of daily activities or work. Interestingly, it was noted that 2 patients experienced good response to initial target joint injections and returned to the clinic requesting for RSO of other affected joints.

Conclusion

RSO is an uncommon well-tolerated and effective intraarticular nuclear medicine procedure for haemophilia and rheumatoid arthritis with debilitating symptoms. An increasing number of patients with debilitating joints were treated within the last 5 years from 2018 to 2022. RSO in these patients has been noted to improve patients' symptoms and, in some patients, allowed them to return to previous functional status and regain employment.

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Using Yttrium-90 Glass Microspheres for Selective Internal Radiation Therapy in Hepatocellular Carcinoma: A Local Experience in Singapore

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Abstract Theme

Nuclear Medicine

Abstract Category

Scientific

Objective

There is limited data on the safety and efficacy of Y-90 SIRT using glass microspheres (Theraspheres^{TM}) in the Asian population. This case series highlights the initial safety of performing Y-90 SIRT using glass microspheres to deliver high tumour absorbed doses in our local patient population within a single institution in Singapore.

Materials and Methods

This retrospective study describes our initial 11 consecutive patients referred for Y-90 SIRT with the intent of radiation segmentectomy for surgically unresectable HCC in the Department of Nuclear Medicine and Molecular Imaging, Singapore General Hospital from December 2021 to October 2022. All patients had pathologically proven HCC or met the diagnostic imaging criteria for HCC (LI-RADS 5). Post SIRT Y-90 bremsstrahlung SPECT/CT or Y-90 PET/CT imaging was used to confirm microsphere deposition. Patients were followed up for at least 6 months post SIRT to assess for adverse effects and complications.

Results

None required hospitalization for complications due directly to Y90-SIRT. Half of the treated patients showed a reduction in serum AFP levels. One patient had residual tumour after Y-90 SIRT noted in interval CT scan, while one patient died five months post treatment due to metastatic HCC. In interval CT scans performed up to 6 months later, there were 4 CR, 1 PR, 3 SD and 2 PD when analysed according to mRECIST criteria.

Conclusion

Y-90 SIRT is a promising locoregional treatment option for Asian patients with unresectable HCC. Further large scale studies should be undertaken to demonstrate efficacy/responses in Asian patients as seen in the LEGACY study.

Radiography and Physics

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**Safety begins with ME! An MRI
Education & Safety Tool**

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Abstract Theme

Radiography and Physics

Abstract Category

Education

Teaching Points

With this education App, safety screening processes has
become more effective and efficient. Language barrier and
hearing difficulties no longer pose communication issues
during safety screening of MRI patients. This App has also
helped to boost the morale of the radiographers as they are
able to carry out their tasks confidently, as possible safety
lapses are greatly averted. This has resulted in a friendlier,
patient-centric environment that contributes to the caring
environment that CGH prides itself.

Background / Outline

The importance of communication cannot be undermined for
any effective interaction to take place; failure of which could
result in disastrous consequences that cannot be reverted in
many cases. With reference to radiography, inability of both
patient and radiographer to clearly communicate could result
in failure to declare if a patient has a cardiac pacemaker or
brain aneurysm clips, which in turn could lead to life
threatening incidents if accidentally brought into the MRI
scanner.

Our team has thus developed a user-friendly App to assist in
overcoming these communication barriers. A simple yet
effective PowerPoint App was designed with the four main
languages commonly used in Singapore, i.e. English, Malay,
Chinese and Tamil. This interactive App comprises a set of
specific MRI safety questions that could help patients in
declaring their medical history. Clear and colorful pictures
enhance patients' understanding including those who can't
read well. To cater to those with hearing difficulties or using
hearing aids, voice recordings of the screening questions are
also included into each translated questions.

Radiology Informatics

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Prediction of pineal region tumor using radiomic features from multi-parameter MRI with classical machine learning.

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Abstract Theme

Radiology Informatics

Abstract Category

Scientific

Objective

Pineal region tumors are most commonly germ cell tumors followed by pineal parenchymal tumors. Primary management for pineal region tumors with different cell origins are not the same. For germ cell tumor, tissue biopsy with or without chemoradiation therapy is the treatment of choice. While, other types of tumors, surgical removal may be required. Various radiographic findings are helpful for differentiating between each type of tumor. We aimed to develop machine learning models for predicting pineal region tumor using radiomic features with classical machine learning.

To evaluate detection of radiomic features from multi-parameter MRI using deep learning combined with clinical parameters predict molecular subgroups in patients with pineal region tumors.

Materials and Methods

Patients with pineal region tumor who underwent preoperative MRI in our institution Were included. Tumor segmentation, image preprocessing, feature extraction were performed. Classical machine learning models including Support Vector machine (SVM), multilayer perceptron (MLP) and Random Forest (RF) were used for classifying between germ cell tumor and other types of tumors.

Results

Sixty-seven patients were included. About 65.7% were germ cell tumors. The accuracy of radiomic features using support vector machine (SVM), multilayer perceptron (MLP) and Random Forest (RF) for classifying between germ cell tumor and other types of tumor were 61.5, 61.5 and 76.9%. RF achieved a predictor performance with AUC = 0.7. Most features that had high important indexes were texture features and on T2WI.

Conclusion

Machine learning techniques have the capacity to anticipate the diagnosis of pineal region tumor which would be helpful for preoperative diagnosis and management planning.

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Characterization of illness deficit and remission status in neuroanatomical subtypes of schizophrenia

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Abstract Theme

Radiology Informatics

Abstract Category

Scientific

Objective

Given recent research regarding heterogeneity within schizophrenia, we aimed to investigate neuroanatomical subtypes within schizophrenia as well as their manifestation in relation to illness presentations such as deficit and illness remission status.

Materials and Methods

Retrospective data from IMH, Singapore consisting of MRI scans (T1 MPRAGE), PANSS (Positive and Negative Syndrome Scale) and GAF (Global Assessment of Functioning) scores was collected for 158 Schizophrenia patients (58.5 ∓ 23.33 years). Brain features were extracted from images for clustering using ML methods for subtyping. GLM based group analysis was carried on these subtypes using illness presentations (deficit status/illness remission status) to evaluate differences.

Results

Two neuroanatomical subtypes were found within schizophrenia with significant differences in brain volume, mean curvature and surface area measures. While group analysis carried out only on illness presentations independent of subtypes revealed no significant differences, accounting for subtyping revealed significant differences between patients with these illness presentations in subtype 1 and subtype 2. Volume of insula and left inferior parietal region, surface area of right rostral anterior cingulate seemed to play a key role in differentiating subtypes, in patients with deficit status as well as in patients under remission. Such an overlap was not found between patients without deficit status or unremitted patients.

Conclusion

In addition to establishing presence of subtypes within patient cohort, we also found significant neuroanatomical changes in relation to deficit status and remission status. Our results further strengthen existence of heterogeneity and neuroanatomical variability within the disease and could help in evaluating individual response to treatment.

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Utilisation patterns of 3-Tesla and 1.5-Tesla MRI Scanners for Paediatric Brain Examinations: Single Centre Retrospective Review

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Abstract Theme

Radiology Informatics

Abstract Category

Scientific

Objective

To review the utilisation of 3-Tesla (T) and 1.5T MRI scanners for paediatric brain examinations performed at KKWCH, Singapore.

Materials and Methods

Paediatric MRI brain examinations are the commonest MRI study performed on two scanners at our institution, with common imaging indications including headache, giddiness, and seizures. An ultrafast 3T-MRI screening protocol was recently implemented for headache cases triaged to have low risk of significant intracranial pathology. Scans requiring general anaesthesia (GA) were mainly performed on 3T-MRI whilst those with metallic implants e.g. dental braces, were scanned on 1.5T-MRI. Clinical and magnetic resonance imaging data obtained from 3T and 1.5T MRI scanners between January to December 2022 were reviewed.

Results

Of 924 MRI brain examinations (including 4 MRI pituitary/internal-auditory-meatus and 47 MRA/MRV studies) performed, 647 and 277 studies were scanned on the 3T and 1.5T-MRI scanners respectively, with 219 of 358 studies with intravenous contrast, 169 of 176 studies performed under GA and 320 of 443 inpatient studies performed on 3T-MRI. 'Headache' was the commonest MRI indication, accounting for 319 (266 on 3T, and 53 on 1.5T) studies, with 250 (38.6%) 3T-MRI studies utilising the ultrafast protocol. Intracranial oncology comprised of the second commonest MRI indication, accounting for 141(71 on 3T, 70 on 1.5T) studies.

Conclusion

The 3T-MRI scanner was predominantly used for paediatric MRI brain studies, including scans for headaches, inpatient, contrasted and GA scans, possibly due to logistical and patient factors. Low-risk headache cases scanned on 1.5T-MRI may instead be scanned with the ultrafast protocol, potentially saving time and cost.

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Reproducibility of Parotid Gland Tumor MRI Radiomic Features Across Different MRI Scanners

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Abstract Theme

Radiology Informatics

Abstract Category

Scientific

Objective

Magnetic resonance imaging (MRI) radiomics has emerged as a technique to characterize tumours. A potential application of radiomics is in the characterisation of parotid gland tumours (PGTs) which have a diverse range of benign and malignant histologies. However, reproducibility of radiomics remains a major hurdle to widespread application. Therefore, in this preliminary study, we aimed to address a fundamental reproducibility question: are radiomic features of PGTs reproducible across MRI scanners?

Materials and Methods

We prospectively enrolled 6 patients with 7 PGTs including malignant (n=4), pleomorphic (n=2) and Warthin (n=1) tumours. Patients underwent T2-weighted axial scans on two MRI scanners manufactured by two vendors, scans performed approximately 15 minutes apart. A total of 443 features, comprising first-order and texture features, were extracted from each contoured tumour using the well-established PyRadiomics package, and the reproducibility was evaluated by comparing features between the two scanners using the two-way mixed intra-class correlation (ICC). Features with ICC p-value >0.05 were excluded from further analysis. ICC medians of features derived from various imaging features were evaluated.

Results

Majority of imaging features derived from original, exponential, gradient and wavelet filters exhibited good reproducibility with ICC median of 0.92[0.84-0.95], 0.92[0.89-0.96], 0.90[0.85-0.95], 0.92[0.87-0.97]. However, wavelet features showed inferior reliability, with as many as 35.3% of the features excluded (p>0.05), compared to 20.7%, 5.2% and 27.6% in original, exponential and gradient features, respectively.

Conclusion

The majority of PGT radiomics features were reproducible across different MRI scanners on T2-weighted images, but wavelet features should be used with caution.

Thoracic Radiology

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Rare Case: CT and MRI Presentation of Lymphangioleiomyomatosis – Systematic Approach

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Abstract Theme

Thoracic Radiology

Abstract Category

Scientific

Objective

This paper aimed to describe CT and MRI on a patient with Lymphangioleiomyomatosis (LAM) symptoms.

Materials and Methods

Conducting a literature review and medical records.

Results

A 28-year-old woman was referred from Marsudi Waluyo Hospital came to the Emergency Unit of the Malang Saiful Anwar Hospital complaining of sudden shortness of breath one day ago. The patient had a history of Pulmonary Tuberculosis treatment six years ago and completed treatment for eight months. The chest X-ray showed a spontaneous bilateral closed pneumothorax, and a chest tube was inserted. A CXR Follow-up six days after chest tube insertion showed bilateral pneumothorax. The thoracic CT scan concluded a bilateral cysts lung disease with discontinuity of the peripheral cavity walls accompanied by bilateral pulmonary fibrosis and bronchiectasis of the right lung, suspected pulmonary tuberculosis with a differential diagnosis of pulmonary LAM.

Conclusion

LAM is a rare disease encountered in clinical practice, and considering pulmonary symptoms and findings in LAM is common to another lung disease, such as primary spontaneous pneumothorax, asthma, and emphysema, the diagnosis of LAM is often ruled out. Pulmonary LAM can be confidently diagnosed in most cases by pulmonary HRCT. Classic CT findings obviate the need for open lung biopsy if accompanied by a retroperitoneal or definite cystic mass or possibly TSC. In this case, a CT scan of the lungs showed the classic appearance of LAM, and an abdominal MRI showed a suspicious diagnosis of another manifestation of LAM, adrenal angiomyolipoma.

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Diagnostic and imaging challenges of patients presenting with unusual massive hemoptysis at the Emergency Department

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Abstract Theme

Thoracic Radiology

Abstract Category

Education

Teaching Points

Unusual causes of massive hemoptysis require timely appropriate management, and often pose diagnostic and imaging challenges. CT pulmonary angiography (CTPA) is the preferred imaging modality for diagnosis and surveillance. Endovascular treatment is mostly preferred given its technical advantages over surgery. Adequate treatment of the underlying conditions is crucial.

Background / Outline

Massive hemoptysis is a potentially life-threatening condition that poses diagnostic and imaging challenges at the Emergency Department (ED). Causes of hemoptysis are wide-ranging and can include pulmonary vascular malformations, infections, neoplasms, and trauma.

This retrospective study analyzed the medical records of patients who presented with massive hemoptysis at the EDs of Singapore General Hospital and Sengkang General Hospital between 1st January 2008 and 1st March 2023. The study was approved by the institutional review board.

Preliminary results included 24 patients (13 males, 11 females) with a mean age of 54 years (age range: 10-82). Identified etiologies for hemoptysis included pulmonary pseudoaneurysms (secondary to aspergillosis, tuberculosis, or bacterial infection), arteriovenous malformations and fistulation, neoplasms with hypertrophied bronchial arteries (e.g. adenocarcinoma, non-small cell lung carcinoma, cystic teratoma, squamous cell carcinoma), and bronchopulmonary fistulation (post-infective or post-traumatic).

Underdiagnosis or delayed diagnosis and treatment is frequent. Radiography and conventional CT may not always reveal these entities. Further imaging with CTPA or aortogram is often necessary. Most patients underwent conventional catheter angiography and endovascular embolization. Patients with bacterial infections received antibiotics, while those with active pulmonary TB and fungal infections received long-term antituberculosis and antifungal medications respectively. Inadequate management of these entities may cause potentially life-threatening complications.

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Baseline competency and influence of pathology location on medical students interpretation of paediatric chest radiographs

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Abstract Theme

Thoracic Radiology

Abstract Category

Scientific

Objective

Radiology training in the medical school curriculum is often limited to incidental exposure during clinical rotations which may lead to a lower skill and confidence level in basic imaging interpretation. This study aims to evaluate baseline competency of and influence of pathology location on paediatric chest radiograph interpretation amongst medical students during their clinical paediatric posting.

Materials and Methods

The test was administered on the institution's e-learning platform. Ten paediatric chest radiographs were selected with a distribution of 3 normal and 7 abnormal radiographs featuring consolidations (3 were right-sided and 4 were left-sided, including 1 left retrocardiac consolidation). Other types of abnormalities were excluded. Participants were asked to classify each radiograph as normal or abnormal. A correct response scored 1 point while an incorrect response was awarded 0 points.

Results

From January 2023 to April 2023, 38 medical students completed the test with an average score of 7.9 (S.D 1.15). Normal radiographs were significantly less frequently correctly classified (50.3%) compared to abnormal radiographs (88.7%, $p<0.01$). Laterality of consolidation had no significant difference on the frequency of correctly classified abnormal radiographs ($p>0.05$). Retrocardiac consolidation was significantly less frequently correctly classified (71.1%) compared to other left-sided consolidations (97.4%, $p=0.01$).

Conclusion

Medical students show a good overall baseline competency in the interpretation of paediatric chest radiographs for their level of training. However, they are less competent in identifying normal radiographs compared to abnormal radiographs. The discrepancy may be attributed to regret and framing bias. Superimposed anatomic structures are likely the cause of more frequently missed retrocardiac consolidations.

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Spontaneous pneumomediastinum, pneumothorax and subcutaneous emphysema in COVID 19 patients

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Abstract Theme

Thoracic Radiology

Abstract Category

Education

Teaching Points

New emerging complications of a new pandemic.

Complications related to the treatment of the disease itself and associated comorbidities.

Prevention and management of these complications and role of radiology in doing so.

Role of radiology-based classification system in assessing the prognosis and management.

Background / Outline

While subcutaneous emphysema and spontaneous pneumomediastinum have been observed in patients with a variety of viral pneumonia as a complication of mechanical ventilation, the development of these conditions in non-intubated patients suggests an alternative aetiology.

There has been an increase in the patients presenting with pneumomediastinum and subcutaneous emphysema, with confirmed COVID 19 status more so in those who were intubated, raising the question if it is more so because of the viral disease or the complication of the emergent procedure.

Pneumomediastinum and pneumothorax are an uncommon finding associated with COVID 19, can be seen as a poor prognosis for the patient.

Pneumomediastinum, pneumothorax and subcutaneous emphysema can be noted as a complication of COVID 19 itself as well as the complication of management of COVID 19.

A susceptible trachea in combination with altered immune status, emergency intubation, frequent proning and high positive end-expiratory pressure (PEEP) can lead to an increase in the occurrence of pneumomediastinum and subcutaneous emphysema.