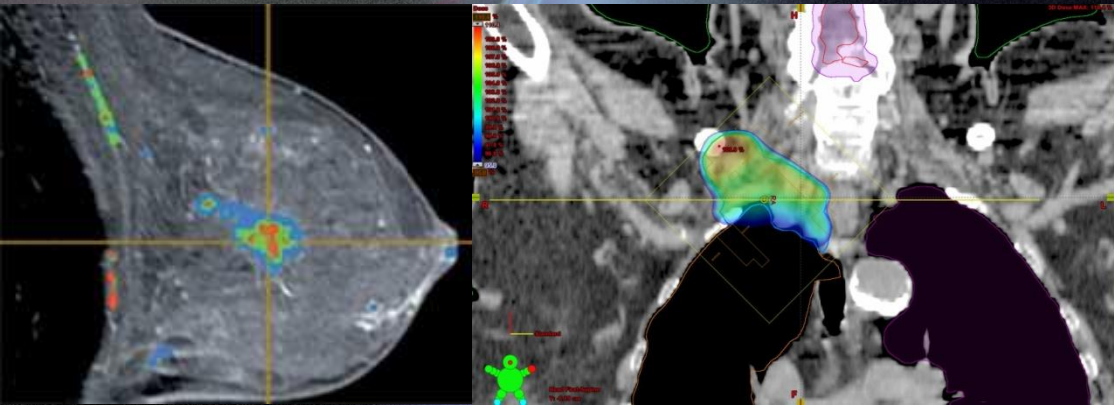


21st Annual Scientific Meeting of the Singapore Radiological Society & the College of Radiologists, Singapore

Breast and Thoracic Imaging: Where do we go from here?

11th – 12th February 2012
Tan Tock Seng Hospital



Organised by:





Welcome Message

Dear friends,

Thank you for being part of the 21st Annual Scientific Meeting of the Singapore Radiological Society and the College of Radiologists, Singapore. Our meeting will be hosted by Tan Tock Seng hospital from the 11th to 12th of February 2012.

Turning 21 has always been a significant milestone in life. It represents the transition between the bold exuberance of yesteryear and the reflections of a maturing mind. We would like to engage you along these lines to reflect on how far radiology has come. With advances in technology, comes earlier and more accurate detection, diagnosis and treatment. Has this made life simpler or more difficult for us?

The committee has lined up an exciting programme over the 2 days with wide ranging topics. These include a pre-congress workshop on residency education, breast and thoracic categorical courses and a dinner forum on the controversies of mammographic screening. Our radiation oncologists will have a full day symposium on lung SBRT and our nurses and radiographers will have their exclusive programmes too.

Its never too late to sign up if you haven't already! Don't forget to send your abstracts in for the Young Investigators Award and the Best Scientific or Educational Paper/Poster.

See you soon!

Richard, Gervais and the rest of the committee

SRS/CRS ASM 2012



Organising Committee

Chairman:

Dr Richard Yeo

Vice Chairman:

Dr Gervais Wansaicheong

Hon Treasurer:

Dr Wong Fuh Yong

Scientific Committee:

Dr Lester Leong Dr Kelvin Loke

Trade Exhibition:

Dr Eugene Ong Dr Teo Sze Yiun

Social:

Dr Ng Keng Sin

Publicity/IT :

Dr Koh Wee Yao

Radiographers/Technologists Programme:

Mr. Francis Ngoi

Nursing Programme:

NM Agnes Wong

College of Radiologists Ex-Officio:

Dr Anthony Goh

Singapore Radiological Society Ex-Officio:

Dr Michael Wang

SRS/ CRS ASM 2013 Chairman:

Dr David Ng

Secretariat

Ms. Tan Chiew Har Ms. Jesamin Lee



Invited Faculty

International

Dr Mark Alan Gittleman
Pennsylvania State University, USA

Dr Evelyn Ho
Sime Darby Medical Centre, Malaysia

Dr Daniel Makes
Department of Radiology, Universitas Indonesia, Indonesia

Dr Demetris Patsios
Joint Department of Medical Imaging, Toronto, Canada

Prof Robert Ryu
Northwestern Radiology, Chicago, USA

Prof Suresh Senan
Clinical Experimental Radiotherapy, VU University Medical Centre, Netherlands

Prof Ben Slotman
Chairman Department of Radiation Oncology, VU University Medical Centre, Netherlands

Dr Wilko Verbakel
Medical Physicist, VU University Medical Centre, Netherlands

Prof Shih-Chang (Ming) Wang
Parker Hughes Professor of Diagnostic Radiology, Sydney University, Australia

Local

Dr Tan Bien Soo
Snr Consultant, Diagnostic Radiology, SGH

Dr Mikael Hartman
Consultant, Breast & Trauma Surgery, NCIS

Prof Tan Puay Hoon
Head & Snr Consultant, Pathology, SGH

Prof Lee Pyng
Snr Consultant, Respiratory & Critical Care Medicine, NUHS

Dr Gregory Kaw
Snr Consultant, Diagnostic Radiology, TTSH

Dr Teh Hui Seong
Snr Consultant, Diagnostic Radiology, KTPH

Dr Thng Choon Hua
Snr Consultant, Cancer Imaging, NCCS

Dr Sim Shao-Jen, Llewellyn
Snr Consultant, Diagnostic Radiology, SGH

Dr Seet Ju Ee
Snr Consultant, Pathology, NUHS

Dr Sundeep Punamiya
Snr Consultant, Diagnostic Radiology, TTSH

Ms Mak Wei Munn
Partner, Allen and Gledhill

Dr Angeline Poh
Consultant, Diagnostic Radiology, CGH

Dr Esther Chuwa
Consultant Breast Surgeon, KKWCH

Dr Johann Tang
Consultant, Radiation Oncology, NCIS

Dr Arun Thomas
Consultant, Diagnostic Radiology, TTSH

Dr Evan Woo
Consultant, Plastic and Reconstructive Surgery, KKWCH

Dr Bertha Woon
Consultant Breast Surgeon, Gleneagles Medical Centre

Dr Andrew Tan EH
Consultant, Department of Nuclear Medicine & PET

Dr Tan Min-Han
Principal Research Scientist, Institute of Bioengineering & Nanotechnology

General Information

Meeting Location

Tan Tock Seng Hospital
11 Jalan Tan Tock Seng
Singapore 308433

Public Transport

All participants are encouraged to use Public transport.

MRT NS20 Novena

Bus (Thomson Road)

B1 21, 56, 57, 131, 131A, 66, 980

B2 5, 54, 143, 162, 162M, 167, 851, NR1

Bus (Moulmein Road)

B3 21, 124, 124A, 518, 518A

Bus (Balestier Road)

B4 21, 130, 131, 131A, 139, 145, 186

Private Car

Rates at TTSH

Mon-Sat (7am-6pm)

\$2.20 per 60min

Mon-Sat (6pm-7am)

\$2 per entry

Sunday

\$2 per entry

Rates at Square 2

Mon-Sat (before 6pm)

\$1.50 first hr, \$0.80 subsequent 1/2hr

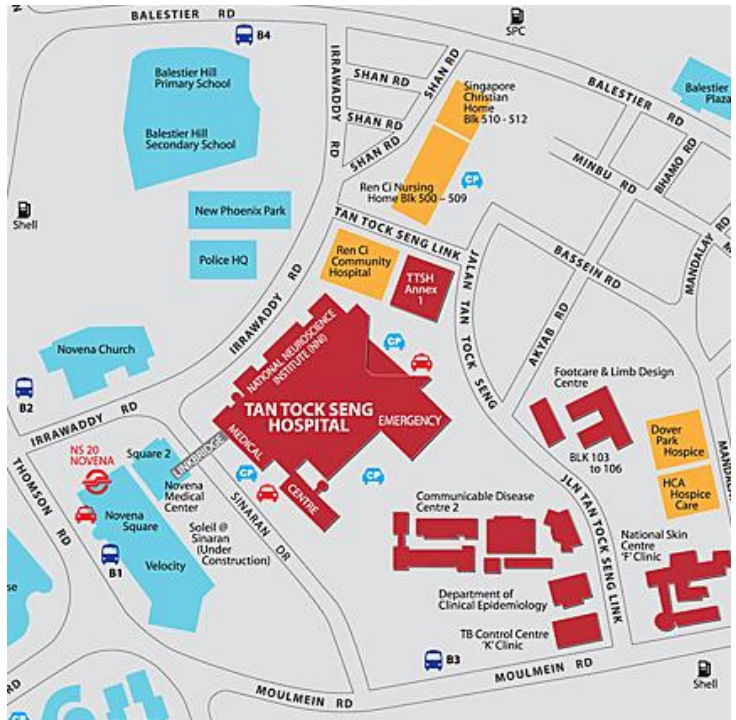
Mon-Sat (after 6pm)

\$2 per entry (6pm-7am)

Sunday

\$2 for first 4hr, \$0.80 subsequent 1/2hr

\$2 per entry (6pm-7am)



Social Dinner

Dinner Location

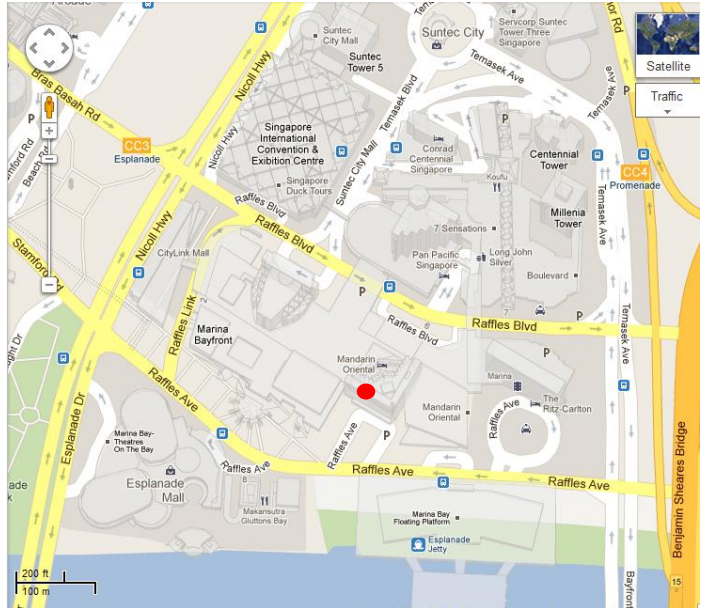
Garden Suite
Level 5
Mandarin Oriental Hotel
5 Raffles Avenue
Marina Square
Singapore 039797
Tel: 6338 0066

Public Transport

All participants are encouraged to use Public transport.

MRT

EW13/NS25	City Hall
CC3	Esplanade
CC4	Promenade



Private Car

Rates at Mandarin Oriental
(Marina Square)

Sat (7am – 2am)

\$2.40 for first 2hr

\$1.20/hr for next 2hr

\$1.40/half hr after that

Hotel Valet

\$12

Programme

1830 – 1900	Cocktails
1900 – 2100	Social Dinner
	Forum on “The Controversies of Mammographic Screening”
2100 – 2130	Prize presentation to Award Winners



Instructions for Presenters

Materials and Equipment

1. Only **digital material** will be allowed for presentation.
2. The use of the presenter's personal laptop for presentation is allowed. Approach the moderator(s) for assistance for connection to the projector before the commencement of the oral session. However, for ease of setting up the presentation, presenters are encouraged to create at least one of their digital presentations in **PowerPoint format (Microsoft Windows), Microsoft Office versions 1997 – 2004**, and transfer the digital material to the laptop provided by the Secretariat. The material should be transferred at least 20 minutes before the start of the scheduled oral session.

Presentation Guidelines

1. Please give careful attention to the guidelines for oral presentation (scientific papers).
2. The Secretariat Room is the designated preparation room with desktops/laptops where presenters can do last-minute adjustments to their digital presentations.
3. Arrive in the designated presentation room at least 10 minutes before the start of the scheduled session. Introduce yourself to the moderator(s).
4. All presenters are requested to be present at the start of the oral presentation session and should remain in the presentation room until their presentation is over.
5. After the initial introduction by the moderator(s), presenters are given **7 minutes** to present. There will be a single bell when there is a minute left (at the 6 minute mark) and multiple bell rings when time has expired. After which, there will be **2 minutes** allowed for a question and answer session.
6. It is recommended that the mouse arrow be used as a pointer.
7. Names and identification numbers should not appear on the presentations to protect patients' confidentiality.

Authorisation For Sharing of Presentation Material

The digital presentation material remains the property of the presenters and may not be reused without permission. The copyright of the images also remains with the authors. However, presenters who do wish to give permission for their digital presentations to be shared and downloaded are asked to indicate this in the declaration form.



WORKSHOP & CATEGORICAL SESSIONS

SINGAPORE GENERAL HOSPITAL DIAGNOSTIC
RADIOLOGY CONFERENCE ROOM
LEVEL 1

TAN TOCK SENG HOSPITAL E-LEARNING LABORATORY
LEVEL 3



Pre congress workshop

Diagnostic Radiology Residency: Train the Trainers Workshop

SGH Diagnostic Radiology Conference Room

10th February 2012 (Friday)

0830 – 1610

Registration Fee: \$100

This workshop is hosted by Dr Tan Bien Soo and Prof Robert Ryu. This "train the trainers" workshop is aimed primarily at staff who are involved in the ACGME residency programme. It serves as a forum to share ideas, challenges and innovations to enhance your knowledge and skills as a postgraduate medical educator.



Diagnostic Radiology Residency: Train the Trainers Workshop

Friday 10th February

SGH Department of Diagnostic Radiology Conference Room

0800 - 0830	REGISTRATION
0830 - 0840	Welcome Address
	Session Chairperson: Dr Chong Bee Kiang
0840 - 0910	Postgraduate Training in Singapore: Why fix something that is not broken? TBA
0910 - 0930	Collaborating the train the future Singapore Radiologist Dr Tan Bien Soo
0930 - 1000	The Role of the PD: Survival Tips & Tricks Prof Robert Ryu
1000 - 1030	MORNING TEA
	Session Chairperson: Dr Ong Chiou Li
1030 - 1050	Site Visit and Accreditation: How to pass painlessly Prof Robert Ryu
1050 - 1110	Faculty Development: What have we been doing Dr Daniel Wong
1110 - 1130	Resident on call Interpretation: Minor and Major Discrepancies Prof Robert Ryu
1130 - 1145	CRS Plain Film Test for R1 Dr Julian Goh
1145 - 1200	Auditing Plain Film Reports: SHS Residency Framework Dr Lester Leong
1200 - 1215	Auditing Plain Film Reports: the CGH Experience Dr Angeline Poh
1215 - 1230	Auditing Plain Film Reports: the NUHS Experience Dr Bertrand Ang
1230 - 1330	LUNCH
	Session Chairperson: Dr Vincent Chong
1330 - 1350	Online Teaching: The NUHS Perspective Dr Lynette Teo
1350 - 1410	Online Teaching: The RANZCR Perspective Prof SC Wang
1410 - 1430	Mobile Devices for Teaching Prof Robert Ryu
1430 - 1500	Assesment of the Trainee: How does RANZCR do it? Prof SC Wang
1500 - 1520	ACR ITE: How do I use it? Prof Robert Ryu
1520 - 1610	Motivating Faculty and Aligning Workplace Based Assessments to Drive Residents' Learning Dr Dujeepa Samarasekera
1610	Wrap Up



Categorical Sessions

Thoracic Categorical

E-Learning Lab, Level 3, Tan Tock Seng Hospital

Course 1 11th February (Sat) 1030 – 1200

Course 2 12th February (Sun) 1045 – 1200

Breast Categorical

E-Learning Lab, Level 3, Tan Tock Seng Hospital

Course 1 11th February (Sat) 1400 - 1530

Course 2 12th February (Sun) 0900 – 1030


These will be image based tutorial style sessions held at the eLab in Tan Tock Seng Hospital. Each participant will be have individual computers with cases loaded on it. Experienced faculty will take the participants through each case using an interactive style with opportunities for discussion and feedback. Places are limited.

Registration fee for each session: \$100



MAIN PROGRAMME

TAN TOCK SENG HOSPITAL THEATRETTE
LEVEL 1



Saturday 11th February

0800 - 0845	REGISTRATION
	Opening Session Chairperson: Dr Ian Tsou
0845 - 0900	Introduction & Welcome Address Dr Richard Yeo & Dr Anthony Goh
0900 - 0930	The Future of Digital Imaging Prof SC Wang
0930 - 0945	Mammographic Screening in Malaysia Dr Evelyn Ho
0945 - 1000	Update on Breast Tomosynthesis Dr Teh Hui Seong
1000 - 1020	MORNING TEA
	Breast Session 1 Chairperson: Dr Lester Leong
1020 - 1040	Ultrasound of hypoechoic nodules Dr Daniel Makes
1040 - 1100	Introduction to Ultrasound Elastography Dr Lester Leong
1100 - 1120	Accelerated Partial Breast Irradiation (APBI) Dr Johann Tang
1120 - 1200	The Role of Positron Emission Mammography in Breast Cancer Management Dr Mark Alan Gitelman
1200 - 1300	FY KHOO LECTURE
1300 - 1400	LUNCH
	Thoracic Session 1 Chairperson: Dr Gregory Kaw
1400 - 1420	Bronchial Embolisation for haemoptysis Prof Robert Ryu
1420 - 1440	Endovascular treatment of acute aortic syndrome Dr Sundeep Punamiya
1440 - 1500	Collagen Vascular disease Dr Gregory Kaw
1500 - 1515	Non tuberculous mycobacteria infection Dr Demetris Patsios
1515 - 1530	Complications from CT lung biopsy Dr Arun Thomas
1530 - 1545	AFTERNOON TEA
	Breast Session 2 Chairperson: Dr Teo Sze Yiun
1545 - 1600	Columnar aberrations Prof Tan Puay Hoon
1600 - 1615	Are we overtreating DCIS? Prof SC Wang
1615 - 1630	Introduction to ROLL Dr Teo Sze Yiun
1630 - 1645	Oncoplastic Breast Surgery Dr Esther Chuwa
1645 - 1700	Perforator flaps in breast reconstruction: The role of pre-operative imaging Dr Evan Woo
1700 - 1715	Long term outcomes of Singapore Breast Cancer Screening Dr Tan Min-Han
1830 - 2200	DINNER AT MANDARIN ORIENTAL, MARINA SQUARE




Sunday 12th February

0800 - 0900	REGISTRATION
	Thoracic Session 2 Chairperson: Dr Andrew Tan EH
0900 - 0920	Imaging of Mesothelioma Dr Demetris Patsios
0920 - 0940	PET-CT in thoracic malignancies Dr Andrew Tan EH
0940 - 1030	CT Lung Cancer Screening Dr Demetris Patsios
1030- 1045	MORNING TEA
	Breast Session 3 Chairperson: Dr Eugene Ong
1045 - 1100	Updated overview of breast MRI indications Prof SC Wang
1100 - 1115	Breast MR image management Prof SC Wang
1115 - 1130	Introduction to DCE-MRI and its potential application in the monitoring of breast cancer chemotherapy response Dr Thng Choon Hua
1130 - 1145	MRI Biopsy 101 Dr Eugene Ong
1145 - 1200	Imaging of Breast Fillers Dr Teo Sze Yiun
1200 - 1300	LUNCH
	Thoracic Session 3 Chairperson: Dr Anthony Goh
1300 - 1315	Endoscopic Bronchial Ultrasound Prof Lee Pyng
1315 - 1330	Lung biopsies: A pathologist's perspective Dr Seet Ju Ee
1330 - 1345	Stereotactic Ablative Radiotherapy (SABR) of Lung Cancer Prof Suresh Senan
1345 - 1400	Percutaneous Lung Ablation Prof Robert Ryu
	Education Session 1 Chairperson: Dr Tan Bien Soo
1400 - 1415	The US Residency System – Perspectives of a Programme Director Prof Robert Ryu
1415 - 1430	Our Diagnostic Radiology Postgraduate Programme – Why fix it when it is not broken? Dr Tan Bien Soo
1430 - 1445	AFTERNOON TEA
	Education Session 2 Chairperson: Dr Gervais Wan
1445 - 1500	Medicolegal issues in Chest Radiology Dr Angeline Poh
1500 - 1515	Informed Consent Dr Bertha Woon
1515 - 1530	A lawyer's perspective on medico legal issues Ms. Mak Wai Munn
1530 - 1600	Panel Discussion




SPECIALTY TRACKS

TAN TOCK SENG HOSPITAL SEMINAR ROOMS
LEVEL 3



Radiographers/Radiation Therapists Saturday 11th February


0800 - 0845	REGISTRATION
0845 - 0900	Introduction & Welcome Address Dr Richard Yeo & Dr Anthony Goh
	Radiographers/Radiation Therapists Session 1 Ms. Tan Chek Wee
0900 - 0915	An ultrasound evaluation of the incidence of deep vein thrombosis in the operated and non-operated contralateral lower limbs following unilateral total knee replacements Ms. Bi Zhen
0915 - 0930	Tomotherapy : Clinical Experience for Cranial Spinal Irradiation Ms. Hester Lee & Ms. Lee Zheng Zheng
0930 - 0945	Magnetic Resonance Imaging Post Processing: Beyond 3-Dimensional Ms. Ho Xiu Mei, Jamie
0945 - 1000	Q&A
1000 - 1020	MORNING TEA
	Radiographers/Radiation Therapists Session 2 Mr. Francis Ngoi
1020 - 1040	Volumetric Arc Radiation Therapy Ms. Yvonne Loh
1040 - 1100	Prone Breast Radiotherapy - NCC initial experience Ms. See Pei Shi
1100 - 1120	MRI Breast Imaging Ms. Yin Li Rong & Dr Helmut Rumpel
1120 - 1140	Stereotactic Body Radiation Therapy (SBRT) – the NUHS experience Mr. Cai Shao Bin
1140 - 1200	Q&A
1200 - 1300	FY KHOO LECTURE
1300 - 1400	LUNCH
1830 - 2200	DINNER AT MANDARIN ORIENTAL, MARINA SQUARE



Nursing

Saturday 11th February

1200 – 1300	FY KHOO LECTURE
1300 – 1400	LUNCH
	Nursing Session 1 NM Agnes Wong
1400 – 1420	Breast Imaging SEN Puispa Krishnan
1420 – 1440	Patient Education in SGH Mammography Centre SSN Toon Chien Yi
1440 - 1500	Care of Dialysis Catheter SN Christina Chua
1500 - 1515	PICC Programme: How I did it? NC Jennifer Lee & SSN Jamiah Nani
1515 - 1530	Q & A
1530 – 1545	AFTERNOON TEA
	Nursing Session 2 NM Tan Seok Gek
1545 - 1600	Transthoracic Needle Biopsy - How to assist SN Henry Lee
1600 - 1615	Preparation of Patient Undergoing Pleural Drainage NC Wong Yen Lee
1615 - 1630	Management of Pericardial Effusion in Paediatric Patients SN Shiny Jilse
1630 - 1645	Care of Patient: Porta Cath SSN Grace Lee
1645 - 1700	Management in Obstetrics: Placenta Accreta SN Freya
1700 – 1715	Q & A
1830 – 2200	DINNER AT MANDARIN ORIENTAL, MARINA SQUARE



Radiation Oncology

Sunday 12th February

0800 - 0900	REGISTRATION
	Lung SABR Symposium Session 1
0900 - 0910	Welcome and Introduction Dr Fong Kam Weng
0910 - 0930	Epidemiology of early stage NSCLC and survival in Singapore Dr Yap Swee Peng
0930 - 1000	Population Based Survivals in Early Stage NSCLC for European Populations Prof Suresh Senan
1000 - 1030	Lung SABR: Selection Criteria , treatment techniques and outcomes of Lung SABR Prof Ben Slotman
1030 - 1045	MORNING TEA
	Lung SABR Symposium Session 2
1045 - 1105	4D CT for treatment planning Dr Wilko Verbakel
1105 - 1200	Practical Aspects of Treatment Planning, Plan Verification and on-line Imaging Dr Wilko Verbakel
1200 -1300	LUNCH
	Lung SABR Symposium Session 3 (Combined with Thoracic Session 3)
1300 - 1315	Endoscopic Bronchial Ultrasound Prof Lee Pyng
1315 - 1330	Lung biopsies: A pathologist's perspective Dr Seet Ju Ee
1330 - 1345	Stereotactic Ablative Radiotherapy (SABR) of Lung Cancer Prof Suresh Senan
1345 - 1400	Percutaneous Lung Ablation Dr Robert Ryu
	Lung SABR Symposium Session 4
1400 - 1445	Step by Step Approach for 3 standard cases: How we do it at VUMC, Amsterdam Prof Slotman, Prof Senan, Dr Verbakel
1430 - 1445	AFTERNOON TEA
	Lung SABR Symposium Session 5
1445 - 1600	Step by Step Approach for 3 complex cases: How we do it at VUMC, Amsterdam Prof Slotman, Prof Senan, Dr Verbakel Q & A Close



ORAL PRESENTATIONS

TAN TOCK SENG HOSPITAL CONFERENCE ROOM
LEVEL 1

Oral Presentation Schedule

Saturday 11th February

TIME	TITLE PRESENTER
1020 - 1030	Angiosome Directed Angioplasty for Limb Salvage in Critical Limb Ischemia Mr Soon Chian Myau, Duke-NUS Graduate Medical School
1030 - 1040	Intra-arterial CT Angiography: A New Dimension in Bronchial Artery Embolisation Dr Seela Raj Santhosh Raj, Singapore General Hospital
1040 - 1050	Outcomes of Non surgical percutaneous treatment of Multiloculated Liver Abscesses with thick Septae: Comparative Study of Aspiration and Catheter Drainage Dr S Sivasubramanian, Khoo Teck Puat Hospital
1050 - 1100	Utilization of workflow-optimized software tool in Medical Imaging: A comparison study between advanced medical image visualization tools and Picture Archiving and Communication System (PACS) Dr K. Anbalagan, Khoo Teck Puat Hospital
1100 - 1110	Virtual Non Contrast Using Dual Energy CT versus True Non Contrast CT in evaluation of Hepatic masses: Initial experience Dr Trisha Shimpi, Khoo Teck Puat Hospital
1110 - 1120	Feasibility of Dual-Source Dual-Energy CT Imaging to Characterize renal lesions - Preliminary Observations. Dr Kheok SW, Khoo Teck Puat Hospital
1120 - 1130	Can Virtual Non Contrast Images of Dual Energy CT replace True Non Contrast images in Evaluation of Renal Pathologies. Dr Kheok SW, Khoo Teck Puat Hospital
1130 - 1140	Can CT Angiogram of the intracranial arteries replace Cerebral Catheter Digital Subtraction Angiogram in the Evaluation of Intracranial Aneurysm in Acute Non-traumatic Subarachnoid Bleed? Initial Experience Using Advanced Dual-Source Dual-Energy Multi-Detector Row CT Scanner with Advanced Image Visualisation Tool. Dr Srinivasan S, Khoo Teck Puat Hospital
1140 - 1150	How Effective is 100ml of Rectal Contrast for CT of Abdomen and Pelvis in Pelvic and Non-pelvic Pathologies? Dr Srinivasan S, Khoo Teck Puat Hospital
1150 - 1200	Prospective, Randomised Controlled Trial of Cutting Balloon Angioplasty (CBA) vs. High Pressure Balloon Angioplasty (HPBA) in Dialysis Arterio-Venous Graft (AVG) and Arterio-Venous Fistula (AVF) Stenosis resistant to Conventional Percutaneous Transluminal Angioplasty (PTA) Mr Aftab Syed, Duke-NUS Graduate Medical School
1200 - 1400	FY KHOO & LUNCH
1410 - 1420	Indirect portal venography during TACE: Still a necessity in the age of contrast enhanced cross-sectional imaging? Mr Terrence Hui, Yong Loo Lin School of Medicine National University of Singapore
1420 - 1430	Percutaneous transluminal angioplasty of Transplant Renal Artery Stenosis Dr Chew Lee Lian, Singapore General Hospital
1430 - 1440	The diagnostic accuracy of cardiac-gated MRI for staging of mediastinal tumours for surgical resectability Dr Ong Ching Ching, National University Health System
1440 - 1450	Role of Radiology in Differentiating Intestinal Tuberculosis from Crohn's Disease Dr Birinder Nagi, Postgraduate Institute of Medical Education and Research, Chandigarh, India
1450 - 1500	Intervention in Dialysis Arteriovenous Fistula Access - Data Analysis Dr Sanamandra Sarat Kumar, Singapore General Hospital
1500 - 1510	Evidence of Metabolic Changes in the Hippocampus in SLE Dr Jocelyn Wong, Singapore General Hospital
1510 - 1520	Visceral Adipose Tissue in Chinese and Indian Men, Correlation with Cardio-Metabolic Risk Factors and Dosimetric Implications Dr Shaun Chan, Singapore General Hospital

ANGIOSOME DIRECTED ANGIOPLASTY FOR LIMB SALVAGE IN CRITICAL LIMB ISCHAEMIA

Soon CM³, Tay KH¹, Taneja M¹, Teo KBT¹, Lo R¹, Burgmans MC¹, Farah GI¹, Yeow TN¹, Gogna A¹, Pasupathy S², Chng SP², Chua B², Tan SG², Khin PW¹, Tan BS¹

1. Interventional Radiology Centre, Department of Diagnostic Radiology, Singapore General Hospital, Singapore

2. Vascular Surgery Unit, Department of General Surgery, Singapore General Hospital, Singapore

3. Duke-NUS Graduate Medical School Singapore

Objective

To evaluate the clinical benefit in lower limb preservation after angioplasty guided by an angiosome model of perfusion in patients with lower limb ulcer or gangrene.

Materials and Methods

Retrospective review of 546 angioplasty procedures performed in 381 critically ischemic legs (131 legs with ulcers, 250 legs with gangrene) in 350 patients (183 males and 167 females) with mean age of 69.2 years (range 37–90 years) between January 2009 and December 2010 was performed. Diabetes mellitus was noted in 92% and end-stage renal failure was present in 27% of patients. The legs were categorised into direct or indirect angioplasty groups depending on whether straight line flow to the site of lesion based on the angiosome concept was achieved on completion angiography. Major amputation is defined as any amputation above the ankle and limb salvage is defined as freedom from major amputation. Limb salvage rate was compared between the direct and the indirect groups by Kaplan-Meier analysis.

Results

The angioplasty procedures were successfully performed in all patients. Repeat angioplasty sessions were required in 56 legs (14.7%). There were 197 legs in the direct angioplasty and 184 legs in the indirect angioplasty groups. The overall limb salvage rate was 76.9% (293/381). Limb salvage rates for the direct and indirect angioplasty groups were 85.8% (169/197) and 67.4% (124/184) respectively ($p < 0.001$). Bailout stent rate was 7.9%. There were 2 major distal embolisations requiring aspiration thrombectomy and thrombolysis. Thirty day mortality was 2.6%.

Conclusion

In our experience, angiosome directed angioplasty had superior limb salvage rate in patients with critical limb ischaemia.

INTRA-ARTERIAL CT ANGIOGRAPHY: A NEW DIMENSION IN BRONCHIAL ARTERY EMBOLISATION

Sela Raj S, Irani FG, Burgmans MC, Teo T, Yeow TN, Taneja M, Tay KH, Tan BS, Lo R
Interventional Radiology Centre, Department of Diagnostic Radiology, Singapore General Hospital, Singapore

Objective

To evaluate the usefulness of intra-arterial CT angiography (IACTA) in bronchial artery embolisation (BAE)

Materials and Methods

Retrospective review of 8 patients (male 7, female 1; mean age of 65.3 years) referred for BAE between August 2009 and August 2011 was performed. All of the patients had a history of pulmonary tuberculosis except for one with bronchiectasis. Each case was performed on a hybrid angiography-CT system (Hybrid-Angiographic Infinix Activ integrated with Aquilion 16 Slice, Toshiba Medical Systems Corporation, Japan). Embolisation was performed using PVA particles with sizes ranging from 355-500 to 500-710 microns. All IACTA images had multiplanar, standard and fine cut reconstructions. The DSA and IACTA images, and the procedure reports were reviewed by two radiologists to determine the additional value IACTA provided.

Results

All IACTAs were performed to determine if there was spinal supply due to uncertainty on DSA. IACTA excluded spinal supply in 5 patients prior to embolisation: three patients showed faint arterial branches coursing towards the spine on DSA images; in one patient, embolisation was performed just beyond the origin due to proximal artery spasm; and in the fifth patient IACTA showed a presumed 'bronchial' artery to be a paravertebral artery supplying the oesophagus and mediastinum which was subsequently not embolised. IACTA demonstrated spinal supply in the remaining three patients: in two of these patients, embolisation was performed with the catheter distal to the origin of the spinal supply, and in the third patient, no subsequent embolisation was performed because the concerned intercostobronchial artery showed no significant supply to the abnormal lung.

Conclusion

IACTA adds a new dimension to BAE by providing detailed information of spinal artery supply as well as cross sectional anatomy in the region of interest which increases operator confidence and safety. The information provided can potentially expedite or change the course of management during BAE.

OUTCOMES OF NON-SURGICAL PERCUTANEOUS TREATMENT OF MULTILOCULATED LIVER ABSCESES WITH THICK SEPTA: COMPARATIVE STUDY OF ASPIRATION AND CATHETER DRAINAGE

Sivasubramanian S, Babu S, Teh HS, Clarke M

Department of Diagnostic Radiology, Khoo Teck Puat Hospital, AlexandraHealth, Singapore

Objective

Multiloculated liver abscesses with thick septa used to be traditionally treated with surgery. We retrospectively analysed cases treated only by non-surgical percutaneous treatment and describe the outcomes.

Materials and Methods

We analysed 31 cases which were treated only by non-surgical percutaneous treatment. Case notes were reviewed for patient demography, clinical presentation, management. The outcome of treatment was measured by resolution of the abscess and 30-day mortality. We also show the outcomes with aspiration and catheter drainage. All these patients were put on intravenous antibiotics and a large bore drain was placed in the larger cavity of the multiloculated liver abscess. Repeated aspiration with saline washouts or upsizing of the drain was performed. Subset of patients received only one off aspiration of the abscess.

Results

All the patients were successfully treated and the 30-day mortality rate was 0. However, because of the thicker cavity and multiloculated nature of the cavity, there was associated higher risk of complications. However this was still below that for surgical management of these conditions. We also show difference between aspiration and catheter drainage.

Conclusion

Most of the thick walled and multiloculated liver abscesses with thick septa were managed with non-surgical percutaneous treatment. It is still a controversial area as to whether surgical management, aspiration or catheter drainage should be considered and on which group of patients.

UTILISATION OF WORKFLOW-OPTIMISED SOFTWARE TOOL IN MEDICAL IMAGING: A COMPARISON STUDY BETWEEN ADVANCED MEDICAL IMAGE VISUALISATION TOOLS AND PICTURE ARCHIVING AND COMMUNICATION SYSTEM (PACS)

Tan HK¹, Teh HS¹, [Dr K Anbalagan](#)¹, Kwek J¹, Srinivasan S¹, Lim SKJ¹, Marfuah S¹, Tan PL¹, Tan MCS², Liew PB², Tang PHA¹

1. Department of Diagnostic Radiology, Khoo Teck Puat Hospital. AlexandraHealth, Singapore
2. Integrated Health Information Systems

Objectives

To compare the duration of the loading time and auto scroll time between advanced medical image visualisation tools and standard picture archiving and communication system (PACS).

Materials and Methods

A total of 100 Computed Tomography (CT) cases were selected, consisting individual groups of CT brain (n=20), CT thorax (n=20), CT abdomen and pelvis (n=20), triphasic CT liver (n=20) and CT urogram (n=20). The cases were selected randomly with no age or sex discrimination. Number of sequences in each group was standardised. We evaluated (1) the average time taken to load and (2) time to complete a single auto scroll cycle for all the 100 CT cases in both workflow-optimised software tool and standard PACS. Results were obtained, compared and analysed for statistical significance.

Results

Across all the individual groups of CT cases, workflow-optimised software tool is faster in time to load (65.0% - 80.3%), and time to scroll (15.1% - 54.9%), compared to the standard PACS. The difference was statistically significant.

The mean time to load for advanced medical image visualisation tools compared to PACS was 3.69s vs. 10.5s for brain scan ($p<0.05$), 10.65s vs. 42.2s for thorax scan ($p<0.05$), 10.87s vs. 34.6s for abdomen & pelvis scan ($p<0.05$), 16.98s vs. 86.2s for triple-phase scan ($p<0.05$), and 23.14s vs. 84.3s CT urogram ($p<0.05$) respectively.

The mean auto-scroll time at 8fps, for standard 3mm slices, for advanced medical image visualisation tools compared to PACS was 7.13s vs. 13.0s, for brain scan ($p<0.05$), 16.66s vs. 34.8s for thorax scan ($p<0.05$), 24.56s vs. 28.9s for abdomen & pelvis scan ($p>0.05$), 20.57s vs. 30.3s for triple-phase scan ($p<0.05$), and 19.2s vs. 42.6s CT urogram ($p<0.05$) respectively.

Conclusion

Advanced medical image visualisation tools increase workflow efficiency with faster viewing and reading time than PACS, and with its advanced post-processing capability permits greater diagnostic accuracy.

VIRTUAL NON-CONTRAST USING DUAL ENERGY CT VERSUS TRUE NON-CONTRAST CT IN THE EVALUATION OF HEPATIC MASSES: INITIAL EXPERIENCE

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Objectives

Existing multiphase CT protocol for liver imaging includes non-contrast and triphasic post contrast sequences. With the advent of dual energy CT, virtual non-contrast CT (VNCT) images can be obtained using the same post-contrast dual energy CT (DECT) data without actually doing the true non-contrast scan. In this study, we aim to compare VNCT with true non-enhanced liver CT (TNCT), assess its efficacy in evaluating the liver lesions compared to TNCT and its capability to reduce the radiation dose.

Materials and Methods

100 patients underwent multiphase abdominal CT using dual energy MDCT scanner. The VNCT images were obtained using the portovenous phase DECT data with a commercial dual energy software. The mean CT Hounsfield units (HU), signal to noise ratio (SNR), image quality, lesion detectability and radiation dose were compared by two radiologists separately for TNCT and VNCT scans.

Results

Out of the 100 cases, comparison of TNCT with VNCT revealed that the mean CT HU value and SNR of the 20 normal cases, 10 cysts, 11 hemangiomas, 18 hepatocellular carcinomas, 13 abscesses, 8 metastases (n=100) were comparable. The image quality using dual energy VNCT was diagnostic. Radiation dose using biphasic DECT was lower than that of routine triphase CT.

Conclusions

Using DECT, VNCT images obtained can potentially eliminate the need of the traditional non-contrast sequence as part of a multi-phase CT liver imaging protocol with associated benefits of reduced radiation dose.

FEASIBILITY OF DUAL-SOURCE DUAL-ENERGY CT IMAGING TO CHARACTERISE RENAL LESIONS - PRELIMINARY OBSERVATIONS

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Objective

To study the feasibility of using Dual-Energy Imaging to characterise renal lesions.

Materials and Methods

Patients who had renal tumours, pyelonephritis and renal cysts that were demonstrated on Dual-Energy Body CT imaging technique acquired with a Dual-source Dual-Energy CT scanner were identified from the departmental Radiological Information System. Images were acquired at 100 kVp and 140 kVp. The CT Hounsfield units (HU) at 100 kVp and 140 kVp were measured and the DE ratio was calculated for each of the lesion.

Results

Sixty-one renal lesions consisting of 20 renal tumours, 21 pyelonephritis and 19 renal cysts were evaluated. The CT HU at 100 kVp as well as 140 kVp for the three groups were significantly different ($p < 0.01$). There was significant difference between CT HU at 100 kVp and 140 kVp for the pyelonephritis group ($p < 0.01$) but not the cyst group ($p > 0.01$). The DE ratio of tumours, pyelonephritis and renal cysts differed significantly ($p < 0.001$).

Conclusion

Dual-Energy CT imaging potentially allows characterisation and discrimination between renal lesions such as tumours, infections and cysts. Further study with more number of lesions will be useful to confirm and validate these initial findings.

CAN VIRTUAL NON CONTRAST IMAGES OF DUAL ENERGY CT REPLACE TRUE NON CONTRAST IMAGES IN EVALUATION OF RENAL PATHOLOGIES

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Objectives

To evaluate the accuracy of CT Hounsfield units (HU) of renal parenchyma and masses on virtual non-contrast (VNC) using dual source dual energy CT (DECT).

Materials and Methods

One hundred consecutive patients (age 23 – 89 years old) who had triple bolus CT urography using the DECT scanner were included in the study. VNC images were obtained using commercial dual energy software. The image quality and lesion detectability on VNC images were compared with true non-contrast images (TNC) control images. The mean HU value, signal to noise ratio (SNR), and radiation dose were also assessed.

Results

There were a total of 68 lesions detected, including renal cysts (n=42), renal carcinoma (n=9), pyelonephritis (n= 7), and renal calculi (n=10). Thirty-two studies were normal. The mean HU values and SNR of these lesions were comparable in VNC images and corresponding TNC images. The image quality of VNC images was comparable and diagnostic. VNC images were equally efficient as TNC images in detecting solid focal lesions and cysts. However 8 of 10 (80 %) calculi were detected using VNC images, whereas all were visualised on TNC images. With this new technique, the calculated radiation dose was 9.8 mGy, vs. 18.2 mGy ($p<0.01$) received using conventional technique.

Conclusion

Obtaining VNC images of the kidneys and the urinary tract using DECT software significantly reduced effective radiation dose without compromising SNR, image quality and lesion detectability. It can potentially obviate the need to obtain TNC images in CT urography.

CAN CT ANGIOGRAM OF THE INTRACRANIAL ARTERIES REPLACE CEREBRAL CATHETER DIGITAL SUBTRACTION ANGIOGRAM IN THE EVALUATION OF INTRACRANIAL ANEURYSM IN ACUTE NON-TRAUMATIC SUBARACHNOID BLEED? INITIAL EXPERIENCE USING ADVANCED DUAL-SOURCE DUAL-ENERGY MULTI-DETECTOR ROW CT SCANNER WITH ADVANCED IMAGE VISUALISATION TOOL

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Objective

To assess the accuracy of CT angiogram of the intracranial arteries, done with 64-channel multi-detector row computed tomographic (CT) scanner or a 64-channel dual-source dual-energy CT scanner with an advanced image visualisation tool in patients with acute non-traumatic subarachnoid bleed.

Materials and Methods

Retrospective analysis of 11 patients (age, 35 – 70 years old) of non-traumatic subarachnoid bleed who underwent catheter angiogram after initial contrast-enhanced 4 vessels CT angiogram of the Circle of Willis with either 64-channel multi-detector row computed tomographic (CT) scanner or a 64-channel dual-source dual-energy CT scanner. CT angiographic images were analysed using an advanced image visualisation tool. Correlation analysis was performed between the imaging findings of the CT and cerebral catheter digital subtraction angiography (DSA) which was the reference standard.

Results

Six aneurysms (2mm to 2.1cm) were detected in 5 patients by both CT angiogram as well as catheter angiogram (diagnostic accuracy -100%). Another two patients had AV malformations. All the lesions which were seen in catheter angiogram could be seen in CT angiogram.

The remaining 4 patients were negative for vascular malformation or aneurysms in both CT angiogram and catheter angiogram.

Conclusion

CT angiogram of the Circle of Willis acquired using 64-channel multi-detector row computed tomographic (CT) scanner or a 64-channel dual-source dual-energy CT scanner with an advanced image visualisation tool is as good as catheter angiogram for the diagnosis of aneurysm in patients with non-traumatic subarachnoid hemorrhage. Catheter angiogram may be indicated only if intervention is contemplated. However our observations were of a small sample size and further evaluation with a larger patient population will be required.

HOW EFFECTIVE IS 100ML OF RECTAL CONTRAST FOR CT OF ABDOMEN AND PELVIS IN PELVIC AND NON-PELVIC PATHOLOGIES?

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Objective

To determine the effectiveness and usefulness of routinely administered 100ml of iodinated rectal contrast for computed tomography (CT) of abdomen and pelvis for suspected cases of appendicitis, pelvic and non-pelvic pathologies..

Materials and Methods

CT images of 75 consecutive patients (Male=42, female=33, mean age,40 years old, range 16 to 58 years old) who had 100ml of rectal contrast administered were reviewed. Cases were categorised based on CT diagnosis into 3 groups, namely appendicitis , pelvic and non-pelvic pathologies. The effectiveness of rectal contrast in aiding diagnosis and reporting was assessed independently by two radiologists on a 5 point scale.

Results

CT scan revealed 28 cases of appendicitis, 10 cases of pelvic pathologies and 37 cases of non-pelvic pathologies.

The effectiveness of rectal contrast in aiding diagnosis and reporting were rated as poor or unacceptable in 5% cases of appendicitis, 10% of pelvic conditions and 31% of non-pelvic conditions. The rectal contrast was rated as useful or very useful in 13% cases of appendicitis, 85% of pelvic conditions ($p<0.01$), and 23% of non-pelvic conditions respectively. Both reviewers agreed that there were no artefacts due to 100ml of iodinated rectal contrast.

Conclusion

Administration of 100ml of rectal contrast for CT was very useful in patients with pelvic and adnexal pathologies, but not in the evaluation for non-pelvic conditions and In cases of appendicitis. Increasing the volume of rectal contrast may be needed to improve its effectiveness.

PROSPECTIVE, RANDOMISED CONTROLLED TRIAL OF CUTTING BALLOON ANGIOPLASTY (CBA) VS HIGH PRESSURE BALLOON ANGIOPLASTY (HPBA) IN DIALYSIS ARTERIO-VEINUS GRAFT (AVG) AND ARTERIO-VEINUS FISTULA (AVF) STENOSIS RESISTANT TO CONVENTIONAL PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY (PTA)

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2. Department of Vascular Surgery, Singapore General Hospital, Singapore
3. Department of Renal Medicine, Singapore General Hospital, Singapore

Objective

To compare the efficacy and safety of high pressure balloon angioplasty (HPBA) versus cutting balloon angioplasty (CBA) in patients with dialysis AVG/AVF stenoses resistant to conventional balloon angioplasty.

Materials and Methods

Patients with dysfunctional, stenotic dialysis AVFs/AVGs without central venous stenoses were enrolled and randomised to receive HPBA or CBA if conventional percutaneous transluminal angioplasty (PTA) was suboptimal, defined as residual stenosis of >30%. Primary end point was angiographic patency of AVF/AVG at 6 months. Secondary end points included technical success, procedural complication rate, 30-day mortality and 6 months secondary patency.

Results

Five hundred and sixteen patients were enrolled into the study from October 2008 till December 2009. Four hundred and thirty-nine (85%) patients had good results with conventional PTA. Eighty-one patients (mean age: 60 years, M:F 52:25) with suboptimal PTA results were eventually randomised with 39 patients and 38 patients in the CBA and HPBA arms respectively (two patients were lost to follow-up). Seventy-seven patients have reached 6 month follow-up (two patients are still pending for 6 month follow-up). Primary and secondary patency at 6 months were 60%, 64%, 40% and 84%, 91%, 81% for conventional PTA, CBA and HPBA groups respectively. The difference in primary and secondary patency between CBA and HPBA were statistically significant ($p < 0.013$ and $p < 0.024$ respectively). There was a significant complication of venous perforation following CBA which was successfully managed with prolonged balloon inflation. 30-day mortality was 0.01%.

Conclusion

Conventional PTA was effective treatment in the majority of patients with dysfunctional AVF/AVG. For stenoses resistant to conventional PTA, CBA is superior to HPBA as the second line treatment in terms of better primary and secondary patency.

INDIRECT PORTAL VENOGRAPHY DURING TACE: STILL A NECESSITY IN THE AGE OF CONTRAST-ENHANCED CROSS-SECTIONAL IMAGING?

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Objective

Transarterial chemoembolisation (TACE) is currently the treatment of choice for patients with intermediate hepatocellular carcinoma (HCC). A common practice during TACE is to perform indirect porto-venography (IPV) to document a patent portal vein (PV). As assessment of PV can be done on contrast-enhanced computed tomography (CECT) or magnetic resonance imaging (MRI), the necessity and value of IPV is being questioned. The aim is to evaluate if IPV is necessary if a patent PV is seen on pre-procedural imaging.

Materials and Methods

A retrospective review of all patients who underwent TACE between 2004 & July 2011 was performed.

Results

A total of 276 TACE was performed on 151 patients (117 men), 33 procedures were excluded due to incomplete data. TACE related imaging included CTs (pre- n=194, post- n=209), MR (pre- n=49, post- n=34) and IPV (n=93). The mean interval between pre-TACE imaging and the TACE procedure was 46 days.

Among the patients who had IPV, IPV did not detect any additional cases of main portal vein thrombosis (MPVT) when pre-TACE imaging was normal, although 1 additional case of right PVT and 3 cases of segmental/lobar PVT showed progression on post-TACE imaging. Among the patients without IPV, 1 case of new MPVT and 2 cases of segmental PVT showed progression on post-TACE imaging. There was no significant difference in TACE-related mortality or morbidity in both groups.

Conclusion

When the main portal vein is patent on pre-TACE imaging within a reasonable time, the detection of MPVT on IPV is unlikely and IPV does not alter the therapeutic decision or TACE-related mortality and morbidity.

PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY OF TRANSPLANT RENAL ARTERY STENOSIS

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Objective

To assess the outcome of percutaneous transluminal angioplasty (PTA) as the primary treatment for transplant renal artery stenosis (TxRAS).

Materials and Methods

A retrospective review of PTA of TxRAS from April 1999 to December 2008 was performed. Twenty-seven patients (17 males : 10 females) with the mean age of 49.5 years underwent PTA of TxRAS in the review period. Indications for PTA were uncontrolled hypertension (n=12), raised creatinine (n=5) and both uncontrolled hypertension and raised creatinine level (n=9). In one patient, TxRAS was demonstrated on Doppler ultrasound which was performed to investigate the cause of recurrent proteinuria. Mean follow up period was 56.2 months (range 7 to 108 months).

Results

The stenotic lesions were located proximal to the anastomosis (n=2), at the anastomosis (n=15), and distal to the anastomosis (n=14). Technical success rate was 96.3%. One case was complicated by extensive dissection during PTA, resulting in subsequent graft failure. The overall clinical success rate was 61.5%. Seven out of 26 patients had restenosis (26.9% of cases). These were detected at a mean of 14.3 months post-angioplasty (range 5-38 months). All 7 patients underwent a second PTA successfully. Four of these patients required more than one repeat PTA.

Conclusion

PTA is safe and effective in the management of symptomatic TxRAS and should be the primary treatment of choice. Close surveillance for restenosis is required and when diagnosed re-angioplasty can be performed.

THE DIAGNOSTIC ACCURACY OF CARDIAC-GATED MRI FOR STAGING OF MEDIASTINAL TUMOURS FOR SURGICAL RESECTABILITY

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Objectives

Accurate staging of mediastinal tumours is a diagnostic quandary for surgical resectability. Cardiac-gated MRI is the gold-standard modality for evaluation of the pericardium and heart. The objective of this study is to extrapolate these sequences to the imaging of mediastinal tumours, with particular focus on pericardial involvement and tethering of adjacent mediastinal/cardiac structures to the tumour.

Methods and Materials

A search of our MRI database between 2008 and 2011 for patients with cardiac-gated (cine steady-state free precession, T1W spin-echo) MRI mediastinal scans was performed. The MRI, CT images, and clinical notes were reviewed. The following parameters were evaluated: infiltration of mediastinal/epicardial fat, involvement of pericardium, tumour abutment of mediastinal/cardiac structures with loss of fat plane between tumour and adjacent structures (presumed tethering) and direct vascular invasion. The MRI findings were compared to CT and surgical findings.

Results

Thirty patients had MRI mediastinum scans performed, of which, 14 (12 males, 2 females) were performed using cardiac-gating. Thirty out of 14 patients had CT scans. On CT scans, tumour involvement of pericardium was seen in 11/13 patients, compared with 10/14 patients on MRI. CT scans showed epicardial fat involvement and presumed tethering of adjacent mediastinal/cardiac structures in 9/13 patients, whereas MRI showed epicardial fat involvement in 2/14 patients and no tethering. The MRI findings were confirmed in 9/14 patients with surgical resection, where no tethering was found.

Conclusion

Cardiac-gated MRI is an excellent modality for evaluating mediastinal tumour involvement of pericardium, epicardial fat and mediastinal/cardiac structures. This information is useful for preoperative assessment of tumour resectability.

ROLE OF RADIOLOGY IN DIFFERENTIATING INTESTINAL TUBERCULOSIS FROM CROHN'S DISEASE

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Objective

To review the radiological findings in proven cases of small bowel tuberculosis and Crohn's disease for the purpose of differentiating these two entities.

Materials and Methods

A retrospective analysis of radiological manifestations on barium examinations & contrast-enhanced computed tomography (CECT) of abdomen over last 15 years (1994-2008) in 92 patients of Crohn's and 780 patients with small bowel tuberculosis was done. The diagnosis of Crohn's disease and tuberculosis was based upon a combination of clinical, radiological and histopathological findings with response to treatment. The radiological findings of both diseases were evaluated & compared.

Results

The classical radiological features of Crohn's disease in small bowel were in the form of ulcero-nodular pattern and asymmetric involvement of ileum with conspicuous absence of ileo-caecal involvement. In tuberculosis, the ileo-caecal junction was the commonest site affected. Long eccentric strictures were the commonest finding in Crohn's disease, in contrast to short, annular and concentric strictures with significant pre-stenotic dilation of bowel loops in small bowel tuberculosis. CT examination findings of Crohn's disease in decreasing order of frequency were mural thickening of bowel, lymphadenopathy, mesenteric fat proliferation, increased mesenteric vascularity, mild lymphadenopathy, stricture and fistula. CT findings of tuberculosis were mural thickening of bowel, hypodense lymph nodes, omental thickening and high density ascites.

Conclusions

Crohn's disease is a great simulator of tuberculosis but radiological features do help in differentiating each other. Radiology plays an important role in diagnosing and differentiating Crohn's disease from intestinal tuberculosis.

INTERVENTION IN DIALYSIS ARTERIOVENOUS FISTULA ACCESS – DATA ANALYSIS

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Objectives

To evaluate the type of dialysis arterio-venous fistula (AVF) access, the site and number of stenotic lesions within them, in a large cohort of Asian patients.

Materials and Methods

This is a single centre retrospective analysis of 217 consecutive patients who underwent AVF angioplasty from January 2009 to May 2009 in our institution. The angioplasty images, reports and case notes were reviewed.

Results

In this cohort of 217 patients, 65.6% were male, with a mean age of 58 years (range 29-79 years). 55% had radio-cephalic (RC) AVFs while 33% had brachio-cephalic (BC) and 11% brachio-basilic transposed (BBT) AVFs. The left upper limb was the preferred limb for access (81%). 40% of patients had multi focal stenoses which were more common in the upper arm BC and BBT AVFs. Lesion distribution varied between the wrist and upper arm AVFs. The juxta-anastomotic segment (JAS) including the AV anastomosis was the most common site for stenosis in the RC AVFs (68%) with affection of the central vein seen only in 8% of the cohort. Central vein stenoses were found to be more common in the upper arm AVFs being 18% for BC AVFs and 26% for BBT AVFs. Although JAS stenosis were also present in the upper arm AVFs, cephalic arch stenoses (27%) and mid arm swing point stenosis (41%) were found to be peculiar to BC and BBT AVFs respectively.

In this cohort of patients, 447 interventions were performed in the same dialysis year to maintain patency of the access (2.05 interventions per patient per year).

Conclusions

Although the vessels are small at the wrist, the RC AVF is the preferred site for AVF creation in our patient population. Distribution of stenotic lesions in the various types of AVF does not differ from that seen in a Western population with the exception that there is a higher incidence of multiplicity of lesions. Furthermore, multiple repeat interventions are required to maintain fistula patency indicating the more complex nature of the lesions and problems associated with smaller vessels seen in the Asian population.

EVIDENCE OF METABOLIC CHANGES IN THE HIPPOCAMPUS IN SLE

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Objective

Multivoxel H1 MR spectroscopy (CSI) is increasingly used to study various neuropsychiatric disorders. We evaluated for metabolic changes in the hippocampus in patients with systemic lupus erythematosus (SLE).

Methods

MR structural and multivoxel H1 MR spectroscopic (CSI) imaging were performed on stable lupus patients and normal controls on a 1.5T scanner. The CSI volume of interest was centered on and tilted parallel to the hippocampal anteroposterior plane. Absolute N-acetylaspartate (NAA), choline and creatine concentrations were obtained from voxels centered over the hippocampus using the LC Model, and the metabolic ratios compared.

Results

In both 28 patients and 47 controls (mean age 40 years, 88% female), an increasing NAA/cho ratio was observed in the anteroposterior direction along the longitudinal axis of the hippocampus. Comparing patients to controls, there was a lower NAA/cho ratio in the hippocampal voxels in patients than in controls and this was statistically significant at $p < 0.05$.

Conclusion

Metabolic changes were observed in the hippocampus in stable lupus patients compared to controls.

VISCERAL ADIPOSE TISSUE IN CHINESE AND INDIAN MEN, CORRELATION WITH CARDIO-METABOLIC RISK FACTORS AND DOSIMETRIC IMPLICATIONS

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Objective

Obesity is a major health-care issue and visceral adipose tissue (VAT) is widely linked with the metabolic consequences of obesity. We evaluated for the anatomical landmark where VAT in Asian men best captures the distribution of abdominal fat, its correlates with cardio-metabolic risk factors and the dosimetric implications.

Materials and Methods

All subjects gave informed consent prior to medical examination, venepuncture and unenhanced abdominal multidetector CT scan. Five contiguous 1-mm sections centered at T11/L2, T12/L1, L1/2, L2/3, L3/4, L4/5 and L5/S1 disc levels were segmented into subcutaneous and VAT compartments after applying predefined window settings of -195 to -45 HU for fat, on Analyze 8.1. The VAT volume at each level was correlated with the mean total VAT volumes at all 7 levels.

Results

VAT volumes at each 7 levels strongly associated with total VAT volume ($r > 0.87$) and this was strongest at L2/3 ($r = 0.98$), compared to the traditional L4/5 level ($r = 0.89$). In 61 Chinese and 59 Indian men (mean ages: 66.3 and 65.8 years), VAT volume at L2/3 level was 78022.0 ± 36323.7 and 89148.1 ± 42238.5 mm³, and significantly correlated with BMI ($p < 0.0005$), waist ($p < 0.0005$) and hip ($p < 0.0005$) circumferences, fasting glucose ($p = 0.009$) and HDL ($p = 0.008$)

Conclusion

VAT volume at L2/3 level correlated strongest with total VAT volume, and also significantly with cardio-metabolic risk factors. Establishing the most reliable single level VAT measurement to best estimate total VAT has important radiation dose and cost implications in large-scale obesity-related health risk CT studies.



ELECTRONIC POSTERS

TAN TOCK SENG HOSPITAL CONFERENCE ROOM
LEVEL 1

TAN TOCK SENG HOSPITAL E-LEARNING LABORATORY
LEVEL 3



Scientific Poster Listing

POSTER NUMBER	TITLE PRESENTER
S01	Clinical Efficacy of 18F-FDG PETCT in Detecting Metastasis in Lung Cancer Patients with Non-elevated CEA Levels Dr Arthur Cho, Yonsei University College of Medicine, Korea
S02	Computed Tomography and Sonographic Examination of Hydatid Disease: Organ Involvement, Pattern and its Complications Dr Arvinder Singh, Government Medical College, Amritsar, Punjab
S03	Does Weekend Radiological Service Impact on Average-Length-of-Stay and Patient Discharge? Experience of a New Regional Hospital in Asia Mr. WT Choy, Khoo Teck Puat Hospital
S04	Benign Small Bowel Obstruction: A Myriad of Pathologies Dr Birinder Nagi, Postgraduate Institute of Medical Education and Research, Chandigarh, India
S05	The Role of Mammogram and Breast Ultrasound in the Assessment of Male Breast Disease Ms. Htun Michelle Aye Myat Myat, Singapore General Hospital
S06	Development of an Institution-wide Cancer Data Management System to Support Clinical Research for Breast Cancer Mr. John Chen, National Cancer Centre Singapore
S07	Prospective Study To Assess The Pain Score And Image Quality With The Use Of Breast Cushions During Mammography - Initial Findings Ms. Lai Mei San Lily, Singapore General Hospital
S08	Lobular Neoplasia on Breast Core Biopsy: Radiologic-pathological Correlation with Surgical Outcome Dr Lester Leong, Singapore General Hospital
S09	Volumetric Assessment of MRI Enhancement Kinetics Of Invasive Breast Cancers With A Post-processing Software With Correlation of Hormonal Receptor Subtypes Dr Lester Leong, Singapore General Hospital
S10	Diagnostic Yield and Complication Rates of CT Guided Thoracic Biopsies Dr Loh Eu Kuang, National University Health System
S11	Role of SPECT/CT in Patients with Wrist and Hand Pain: Comparing 99mTc-MDP Two-phase Bone Scintigraphy with SPECT/CT Dr Lu Suat Jin, National University Health System
S12	A Journey to Improve the Quality of Portable Chest X-rays Ms. Ng Siok Mei, National University Health System
S13	Prone Breast Radiotherapy – NCC Initial Experience Ms. See Pei Shi, National Cancer Centre Singapore



Educational Poster Listing

POSTER NUMBER	TITLE PRESENTER
E01	Know Your Nodes: MDCT of Abdominopelvic Adenopathy Dr Beh Chan Yiing Joey, Changi General Hospital
E02	Indirect CT Features of Small Colonic Cancers - A Pictorial Essay Dr Lau Li Ching, National University Health System
E03	MDCT of the Paranasal Sinuses: What the Surgeon Wants to Know Dr Mohammad Taufik, Changi General Hospital
E04	Imaging of Subdural Haematomas Secondary To Spontaneous Intracranial Hypotension Dr Sridhar Vidya, Singapore General Hospital
E05	Male Breast Carcinoma and Gynaecomastia: How To Tell The Difference Dr Tan Tien Jin, Changi General Hospital
E06	The Unsuspected Colorectal Carcinoma On Routine Abdomino-pelvic CT: An Imaging Collection Of Lessons Learned Thota Venugopal, Changi General Hospital
E07	Paediatric Ultrasonography: Conditions Not Commonly Encountered in a Non-Paediatric Specialised Hospital Ms. Goh Shy Yunn, Singapore General Hospital
E08	Pictorial Illustration of Non-Silicone, Non-Implant Breast Augmentation Ms. Tammy Moei, Singapore General Hospital
E09	Lower Extremity Ultrasound: A Pictorial Review of Musculoskeletal Pathologies Ms. Ooi Chin Chin, Singapore General Hospital
E10	"Newer wine in New Bottle" Integration of Advanced Imaging Tools with PACS - a Pictorial Presentation Dr S Srinivasan, Khoo Teck Puat Hospital
E11	MRI Breast - Overview of Traditional and Latest Trends Dr Malik Ghazala, University Hospital Sharjah, UAE
E12	Ultrasound as an Essential Part of DCIS Workup Dr Malik Ghazala, University Hospital Sharjah, UAE
E13	Embolisation of a Renal Arterio-venous Malformation with Onyx Dr Apoorva Gogna, Singapore General Hospital
E14	Magnetic Resonance Imaging of the Breasts Ms. Yin Li Rong, Singapore General Hospital
E15	Magnetic Resonance Imaging Post-Processing: Beyond 3-Dimensional Ms. Jamie Ho, Singapore General Hospital
E16	Retrieval of a Migrated Tips Extension Stent Dr Luke Toh, KK Women's and Children's Hospital
E17	Tomotherapy Clinical Experience for Cranial Spinal Irradiation Ms. Hester Lee, National Cancer Centre Singapore

CLINICAL EFFICACY OF ^{18}F -FDG PET/CT IN DETECTING METASTASIS IN LUNG CANCER PATIENTS WITH NON-ELEVATED CEA LEVELS

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Objectives

We propose to correlate CEA levels with ^{18}F -FDG uptake in primary and distant metastatic lesions, and to evaluate the clinical efficacy of FDG PET in finding metastasis in patients with adenocarcinoma with non-elevated CEA levels.

Materials and Methods

The charts of 150 patients (70 female, mean age 63 ± 10.34 , range 46-87) who underwent ^{18}F -FDG PET/CT with tumor marker studies (CEA, CYFRA 21-1, SCC Ag) and had histological confirmation for the primary lesion were reviewed. Distant metastasis for all patients was confirmed either by imaging follow-up ($n=20$) or by biopsy ($n=4$). Maximum SUV of the primary lesion and of the metastatic lesion with the highest maximum SUV was recorded.

Results

Out of the 150 patients, 24 patients had distant metastasis during the initial staging for NSCLC. There was no statistically significant differences noted between ^{18}F -FDG uptake of the primary lesions in metastatic or non-metastatic ADC (7.0 ± 5.2 vs. 8.1 ± 5.7 , respectively, $p=0.449$) or in squamous cell carcinoma (SqCC) (9.9 ± 5.6 vs. 10.2 ± 4.9 , $p=0.549$). ^{18}F -FDG uptake in the primary lesion was higher in SqCC than in ADC. There was no significant difference in CEA levels between the metastatic group from the non-metastatic group (1.35 vs. 1.25 , $p=0.290$). PET/CT found distant metastasis in 20 of the 24 patients.

Conclusion

^{18}F -FDG PET/CT is complementary to clinical tumour marker levels in detecting distant metastasis. ^{18}F -FDG PET/CT should be routinely performed in the staging workup for lung cancer.

COMPUTED TOMOGRAPHY AND SONOGRAPHIC EXAMINATION OF HYDATID DISEASE: ORGAN INVOLVEMENT, PATTERN AND ITS COMPLICATIONS

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Objective

To determine the organ involvement, disease pattern, classifications and various associated complications of hydatid disease on computed tomography (CT) and sonographic examinations.

Materials and Methods

A prospective study was carried out in the Radiodiagnosis Department, Government Medical College, Amritsar from Sept 2009 to Sept 2011. CT and sonographic examination of seventeen patients with hydatid disease were studied.

Results

Out of 17 study cases, there were 6(35.2%)males and 11(64.8%) females with male to female ratio 1:1.8. Four patients (23.5%) were within age range of 41-50 years with mean age of 36.6years. Most of the cases were below 50 years of age with only one case of > 70 years. The mean HU of the lesions was between 5-15. Liver was the most commonly involved organ seen in 10 (58.8%) cases, followed by lung (n=3, 17.6%), kidney (n=2, 11.7%) and one case each in the spleen and brain. There were 8 type I univesicular cysts, 9 type II multivesicular cysts, 5 type III calcified hydatid cysts and 8 type IV complicated hydatid cysts. The largest cyst measured about 20cm and smallest cyst 4.4cm. The most common complication was rupture of the hydatid in 7 cases. There were 1 case of bronchial-hydatid fistula and 1 case each of infected cyst and diaphragmatic rupture with pleural seedlings. Most common associated findings were ascites (n=5), pleural effusion (n=3), calcified cysts (n=5) and infected ruptured cyst (n=1).

Conclusion

Hydatid disease has varying imaging appearances and should be kept in mind when a cystic lesion is encountered anywhere in the body. Early detection with various imaging modalities helps in containment of disease and prevention of complications like rupture, infection and dissemination, thus preventing severe anaphylaxis.

DOES WEEKEND RADIOLOGICAL SERVICE IMPACT ON AVERAGE-LENGTH-OF-STAY AND PATIENT DISCHARGE? EXPERIENCE OF A NEW REGIONAL HOSPITAL IN ASIA

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Objective

To study the impact of weekend advanced radiological service on average-length-of-stay and scan to discharge interval in a new regional hospital in Asia.

Materials and Methods

In-patients who had advanced imaging (CT, MRI, US) performed on Saturdays and Sundays for the month of September 2011 in Department of Diagnostic Radiology, Khoo Teck Puat Hospital, were identified from the Radiological Information System. They were compared with In-patients who had scans done on Fridays and Mondays. There were a total of 1621 patients (Saturday, n=333; Sunday n=86; Monday, n=631; Friday, n=571) identified.

Results

There was no significant difference in the average-length-of-stay, scan to discharge interval or the radiology report grading between the scans done on weekends (Saturday and Sunday) and those done on weekdays (Friday or Monday) ($p>0.01$). For weekend service, 92% of the patients had their scans performed within 24 hours of the scan requests.

Conclusion

Patient discharge issues are complex and often multi-faceted. Weekend advanced radiological service is likely to have minimal impact on the average-length-of-stay and patient discharge behaviour

BENIGN SMALL BOWEL OBSTRUCTION: A MYRIAD OF PATHOLOGIES

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Objective

To evaluate the radiological spectrum and identify the various causes of benign small bowel obstruction based on radiological findings.

Materials and Methods

A retrospective analysis of barium enteroclysis and CT/CT enteroclysis of 305 proven cases of benign small bowel obstruction was done to know the site and cause of obstruction based on characteristic radiological findings. These radiological findings were correlated with the clinical presentation, operative and histopathological findings.

Results

Various causes of small bowel obstruction observed were due to tuberculosis (226), Crohn's disease (19), substance abuse (12), postoperative adhesions (10), radiation induced (7), benign tumours (6), ischemia (5), malrotation with ladd's bands (5), abdominal cocoon (4), internal herniation (4), volvulus(3), bezoar (2) & Pigbel disease (2).

Conclusion

Barium enteroclysis and CT/CT enteroclysis play an important role in diagnosing various causes of benign small bowel obstruction based on their characteristic radiological findings.

THE ROLE OF MAMMOGRAM AND BREAST ULTRASOUND IN THE ASSESSMENT OF THE MALE BREAST DISEASES

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Objective

There is controversy in the type of imaging modality to utilise in the assessment of male breast diseases. Literature review reveals that in some studies, both mammogram and ultrasound examinations are found to be equally important in the assessment of male breast diseases while other studies support the use of mammogram over ultrasound. The main objective of this study is to evaluate the performance of mammogram and breast ultrasound in the assessment of male breast diseases.

Materials and Methods

This study retrospectively reviewed the clinical, radiological and pathological records of 205 men with breast symptoms from October 2008 to April 2011. Breast Imaging Reporting and Data System (BI-RADS) categories 4-5 mammograms and solid sonographic masses were considered suspicious. One hundred and forty-two mammograms were performed in 205 men and 201 had ultrasound. Biopsy results or 2 years clinical follow-up were available for 60 patients. Three of 205 men (2%) had invasive ductal carcinoma. One carcinoma was not diagnosed on ultrasound. The sensitivity of mammogram in detecting cancer was 100% and its specificity was 80%. Positive predictive value was 38% and the negative predictive value was 100%. The sensitivity and specificity for ultrasound were 66% and 81% respectively. The positive predictive value and the negative predictive value of ultrasound were 20% and 98% respectively.

Conclusion

This study showed that mammography has a better sensitivity and positive predictive value in detection of male breast cancer, compared to ultrasound. The negative predictive value of 100% for mammogram suggests that mammograms read as normal need no further ultrasound examination if there are no suspicious clinical findings.

DEVELOPMENT OF AN INSTITUTION-WIDE CANCER DATA MANAGEMENT SYSTEM TO SUPPORT CLINICAL RESEARCH FOR BREAST CANCER

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Objective

We aim to develop an integrated research and data system for breast cancer in order to establish a reliable breast cancer data repository for research and registry purposes. This database allows patient outcomes to be quickly established.

Materials and Methods

Our system is organised into storage, middleware and application layers. In the storage layer, CAISIS is used to manage low level data. The middleware layer provides integration services to and from other existing agents. The application layer contains business logics for data entry, auditing and reporting. We have reviewed and streamlined workflow to closely integrate our system with existing clinical pathways.

Results

We have collected over 2000 breast cancer cases and over 20 variables, including demographics, history, staging, care plans and patient status. The mean age of breast cancer patients is 49 years (SD 9.6). 41.2%, 28.0% and 4.8% of the patients are of cancer stages 1, 2 and 3 respectively. 35.8% of the patients have gone through chemotherapy. 62.9% of the breast cancer patients are ER positive; 56.6% are PR positive; 14.6% are HER2 positive. This result has led to the publication of two journal manuscripts. It will also provide data and support to many other ongoing projects in our centre.

Conclusion

The purpose of this study is to contribute to the breast cancer registry and research by providing an accurate and timely health data repository.

PROSPECTIVE STUDY TO ASSESS THE PAIN SCORE AND IMAGE QUALITY WITH THE USE OF BREAST CUSHIONS DURING MAMMOGRAPHY – INITIAL FINDINGS

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Objectives

The use of a breast cushion between a woman's breast and the mammogram machine may help reduce pain and discomfort during the mammogram procedure. The objectives of the study were to prospectively evaluate if the Mammopad® breast cushion helped reduce pain and if it affected the mammogram image quality and dosage.

Materials and Methods

Women who were asymptomatic and had no breast implants or breast surgery were invited to participate. One breast would be randomly to have the Mammopad® applied during mammography while the contralateral breast would be without and serve as a control. Subjects would grade the pain score for both breasts. Radiologists would perform a blind comparison of the mammogram image quality of both breasts on a digital PACS workstation. The average glandular dose (AGD) was also recorded.

Results

41 women were recruited. 26 (63%) women indicated there was a reduction in the pain score with the Mammopad® side with the mean pain, while 7 (17%) said there was no difference and 8 (20%). Overall mean pain score is 6.4 ± 2.2 with Mammopad® vs. 5.3 ± 2.6 ($p < 0.001$). Women with fatty breasts had a significant reduction in pain score compared to women with dense breasts (4.0 ± 3.3 vs. 6.7 ± 1.9 , $p = 0.019$). Mammopad did not affect image quality. There was no significant difference in AGD with the use of Mammopad®.

Conclusion

There was a reduction in pain score with the use of Mammopad® with no significant difference in mammogram image quality and AGD to breasts.

LOBULAR NEOPLASIA ON BREAST CORE BIOPSY: RADIOLOGIC-PATHOLOGICAL CORRELATION WITH SURGICAL OUTCOME

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3 Department of Oncologic Imaging, National Cancer Centre, Singapore

Objectives:

Lobular neoplasia (LN) of the breast comprises atypical lobular hyperplasia (ALH) and lobular carcinoma in situ (LCIS). The objectives of the study are to correlate radiological and pathological findings of LN on breast core biopsies and to determine the upgrade rate following surgical excision.

Materials and Methods:

Cases diagnosed with ALH, LN, and/or LCIS on breast core biopsies during the years 2004 - 2010 were retrospectively reviewed for radiological and histological findings. The presence of associated flat epithelial atypia (FEA), calcifications within LN, pagetoid spread and classic/pleomorphic variants were correlated with pre-biopsy radiological findings and upgrade rate following surgical excision.

Results:

85 cases of LN were found following core biopsies of sonographic masses (n=20; 24%), mammographic architectural distortion (n=2; 2%) and microcalcifications (n=63; 74%). LN was found to be directly associated with calcifications in 29 cases (34%, P=0.006). 34 cases (40%) underwent subsequent surgical excision due to radiologic-pathological discordance (n=10; 29%), histological calcifications within LN (n=13; 38%), pleomorphic variants (n=6; 18%) and florid LN in ≥ 3 cores (n=5; 15%). Surgical specimens showed invasive carcinoma (n=4; 12%), ductal carcinoma-in-situ (n=2; 6%), residual lobular neoplasia (n=16, 47%), atypical ductal hyperplasia (n=5, 15%), diabetic mastopathy (n=2; 6%) and fibrocystic change (n=5; 14%). The upgrade rate was 7.1% (6/85). 11 of these cases were also related to synchronous, metachronous or contralateral breast cancers. Pagetoid spread (n=23; 27%) and FEA (n= 7; 8%) showed no statistical correlation with post-surgical histological upgrade and radiological findings.

Conclusion:

Radiologic-pathologic correlation is crucial in management of lobular neoplasias on core biopsy.

VOLUMETRIC ASSESSMENT OF MRI ENHANCEMENT KINETICS OF INVASIVE BREAST CANCERS WITH A POST-PROCESSING SOFTWARE WITH CORRELATION OF HORMONAL RECEPTOR SUBTYPES

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Objective

The aim of the study was to use an MRI computer-aided detection post-processing software to assess the enhancement patterns by percentage tumour volume in invasive breast cancers of different hormonal receptor subtypes.

Material and Methods

Pathology database search was performed on women with newly diagnosed breast cancers confirmed by core biopsies and had breast MRI assessment from March 2005 to March 2009. Only malignancies presenting as breast masses were included for analysis. In-situ cancers, rare types of breast cancers like metaplastic carcinoma or phyllodes tumour and non-epithelial malignancies were excluded. Enhancement kinetics data was analysed prospectively for the worst enhancement pattern and enhancement patterns by percentage tumour volume. The findings were then compared against the ER, PR, Her2 and triple negative hormonal receptor subtypes.

Results

194 breast cancer masses from 191 women were evaluated. . Analysis for the most suspicious enhancement kinetics pattern showed no statistical correlation with any of the receptor subtypes. There was higher tumour component by percentage volume showing early rapid enhancement in Oestrogen Receptor (ER) negative (64.1% vs. 53.6% $p=0.013$), Progesterone Receptor (PR) negative (65.4% vs. 52.5%, $p=0.001$) and triple negative tumours (65.3% vs. 54.6%, $p=0.028$) compared to ER positive, PR positive and non-triple negative tumours respectively.

Conclusion

Volumetric analysis of MRI enhancement kinetics was more useful in showing the vascular properties of breast tumours. The analysis revealed that ER negative, PR negative and triple-negative malignant masses had a greater volume containing rapid type initial enhancement.

DIAGNOSTIC YIELD AND COMPLICATION RATES OF CT GUIDED THORACIC BIOPSY

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Objective

To retrospectively evaluate the factors affecting diagnostic yield and complications of CT guided thoracic biopsies.

Methods

CT guided thoracic biopsies performed on 421 contiguous patients between Jan 2006 and March 2011 were evaluated. Patient demographics, needle size, number of passes, lesion size, depth of lesion and traversed lung distance were correlated with complications (pneumothorax, haemothorax and haemoptysis), adequacy of sample and final histopathological diagnosis. We excluded two patients as no follow up data was available.

Results

The final study population consisted of 419 patients (mean age = 62.8 years, M:F =256:133). The mean number passes were 2.5 (range: 1-8). Pneumothorax (detected on CT) occurred in 141 patients (33.6%) and 12 (3%) required insertion of an intercostal drain. Mild haemoptysis occurred in 12 patients (3%) and small haemothoraces in 3 patients. The traversed lung distance >3 mm and lesion size (<33 mm) were significant factors for pneumothorax occurrence ($p < 0.0001$). The biopsy samples were adequate in 384/419 patients (91.6%). The adequacy rate for infective/inflammatory, benign and malignant pathologies were 97.7%, 85.3% and 98.0% respectively. In eight patients (2%) with malignancy, the biopsy diagnosis was benign.

Conclusion

The traversed lung distance and the lesion size were the only significant factors for development of pneumothorax. CT guided lung biopsy is a safe procedure with a low risk of significant complications and a high diagnostic yield.

ROLE OF SPECT/CT IN PATIENTS WITH WRIST AND HAND PAIN: COMPARING ^{99m}Tc -MDP TWO-PHASE BONE SCINTIGRAPHY WITH SPECT/CT

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Objective

To assess the role of SPECT/CT and compare two-phase bone scintigraphy (BS) with SPECT/CT in the evaluation of patients with wrist and hand pain.

Materials and Methods

BS and SPECT/CT of patients with wrist and hand pain (53 patients, 84 lesions) were directly compared for lesion detection, localisation and characterisation using lesion-based and patient-based analyses in this retrospective study.

Results

Lesion detection: BS (75-83%) and SPECT/CT (100%). SPECT/CT detected significantly more lesions than BS ($P < 0.05$). Lesion localisation: BS (50.8-59.1%) and SPECT/CT (100%). SPECT/CT localised significantly more lesions than BS ($P < 0.001$). Lesion characterisation: BS (33.3-43.2%) and SPECT/CT (95.5-96.8%). SPECT/CT characterised significantly more lesions than BS ($P < 0.001$). Subset analysis of wrist and hands lesions: SPECT/CT detected, localised and characterised significantly more lesions than BS for lesions in the wrists but not in the hands. Within the wrist, BS localised lesions in the radiocarpal/ulnocarpal and carpometacarpal regions significantly better than intercarpal region ($P < 0.05$), while there is no significant difference in lesion detection and characterisation. Furthermore, localisation and characterisation of wrist lesions by BS were noted to be poorer when there were two or more lesions in close proximity in the wrist. Such limitations of BS were overcome with SPECT/CT.

Conclusion

SPECT/CT provided significant incremental value to BS and the addition of SPECT/CT to BS should be considered in the evaluation of wrist pain. SPECT/CT may potentially play a complementary role to MRI in the evaluation of wrist pain especially when MRI is not feasible or conclusive.

A JOURNEY TO IMPROVE THE QUALITY OF PORTABLE CHEST X-RAYS

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Objective

To improve the mean "good" quality score of portable chest x-rays (CXR).

Methods and Materials

A team consisting of a respiratory physician, radiologist, nursing clinician and radiographers embarked on a quality improvement project which involved quality planning tools, flowcharts, root cause analysis with a fishbone diagram and pareto charting to select the "vital few" root cause that were actionable. Interventions were undertaken to improve the quality of portable CXRs using training, re-training, individual coaching, education for nurses and a workflow for radiologists to reject poor quality images. Image quality was scored using the European Guidelines on Quality Criteria for Diagnostic Radiographic Images by 2 senior radiographers. A sample of 10% of the weekly portable CXRs were assessed.

Results

The quality score of CXRs increased from 12% to 75% in 6 months.

Conclusion

Quality of diagnostic radiographs have to be quantified for standards to be sustained.

PRONE BREAST RADIOTHERAPY- NCC INITIAL EXPERIENCE

See PS

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Objective

Breast cancers are commonly surgically treated, either with mastectomy or lumpectomy and post-operative radiotherapy. Most patients will only experience mild skin reactions. However women with large breasts have marked dose inhomogeneity and often have an inferior cosmetic outcome when treated with post-operation radiotherapy compared to smaller sized patients. Hence, prone position breast radiotherapy has been described as an alternative technique to improve dose homogeneity for women with large, pendulous breasts. The aim is to evaluate the feasibility of prone breast radiotherapy through dosimetry and clinical implementation and report the initial clinical experience in breast radiotherapy using the prone breast gadget.

Materials and Methods

Patients with irradiation of a large pendulous breast alone without lymph node involvement after conservative surgery were included in the study. Patients recruited into the study will undergo CT-imaging in the standard supine position in which a radio-opaque wire would be placed at palpable edge of the breast tissue. They will be then repositioned and imaged prone using a prone breast board. Two sets of images will be acquired. Plans will be constructed using the Eclipse treatment planning system for each of the treatment positions and the dosimetry will be evaluated accordingly.

Results

Initial prone breast board used was uncomfortable causing patients to have difficulty in keeping to a stable position. Hence, it prompted us to search for an ideal prone breast board that will allow the patient to be positioned easily, rapidly and reproducibly for daily treatment. Second obstacle we faced was difficulty in recruiting suitable patients for the study, as Asian women are generally smaller built.

Conclusion

Conformal breast radiotherapy is feasible in the prone position. Its main advantage is improved dose homogeneity within the target volume and lower radiation dose to the underlying lung, heart as well as infra-mammary skin. However, more numbers are required to justify the results.

E01

KNOW YOUR NODES: MDCT OF ABDOMINOPELVIC ADENOPATHY

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Background

Adenopathy is often associated with many malignant and inflammatory conditions in the abdomen and pelvis. Knowledge of the nomenclature, anatomy and drainage pathways of abdominal nodes is key in understanding patterns of disease spread and staging of tumours. Recognition of the distribution of abdominal and pelvic adenopathy is also useful in correctly identifying the pathologic organ or bowel, especially when the local signs of the disease are not obvious.

Learning Objectives

At the end of reviewing the exhibit, the reader should be able to:

Describe the nomenclature and anatomy of the major abdominal and pelvic nodes.

Describe the drainage pathways of the major abdominal and pelvic nodal groups.

Be familiar with the multidetector CT imaging appearances of abdominal and pelvic adenopathy in a spectrum of malignant and inflammatory conditions.

Key Imaging Details / Imaging Techniques

Review of the nomenclature and location of the abdominal and pelvic nodes, with an emphasis on the peritoneal ligaments that contains key nodes, such as the gastrohepatic and hepaticoduodenal ligaments.

Illustrate the main nodal drainage pathways of the major organs and bowel in the abdomen and pelvis.

Illustrate the spectrum of abdominal and pelvic adenopathy on multidetector CT in common malignant and inflammatory conditions, including examples of when an appreciation of the pattern of nodal distribution can correctly pinpoint the diseased organ.

Conclusion

Knowledge of the nomenclature, anatomy, drainage pathways and patterns of nodal disease spread is important in diagnosing malignant and inflammatory conditions in the abdomen and pelvis on multidetector CT.

INDIRECT CT FEATURES OF SMALL COLONIC CANCERS - A PICTORIAL ESSAY

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Learning Objectives

To highlight the value of indirect computed tomography (CT) features of small colonic cancers which would lead to tumour detection on CT.

Background

Colon cancer is a common malignancy and is associated with significant morbidity and mortality. It may present at different stages and with different morphologies, ranging from polypoidal, flat to annular lesions. Early diagnosis is important for improved prognosis.

Although colonoscopy remains the standard first-line screening tool, there is increasing use of CT as the first-line screening test. Computed tomography is especially useful for the detection of synchronous tumours, estimated at a frequency of 3-4%, proximal to a distal stenosing/large lesion preventing scope passage. However, the detection of small tumors or lesions with flat morphology is challenging on CT. Indirect CT features of small colonic tumours include focal mesenteric/pericolonic neovascularity and small (< 5 mm) perilesional nodes/nodularities. These may be the only clue to suggest the presence of a primary colonic cancer that is not obvious on CT. We present CT examples of these cases confirmed by surgery and histopathology.

Imaging and Procedure Details

Computed tomography scans were performed on either a 64 or 128 slice CT scanner. Thin-section and multiplanar reconstructions allow further assessment of colonic and pericolonic pathology.

Conclusion

Indirect CT features can be used to confirm the clinical suspicion of small colonic tumours and it is important for the reporting radiologist to be aware of them.

E03

MDCT OF THE PARANASAL SINUSES: WHAT THE SURGEON WANTS TO KNOW

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Background

Functional Endoscopic Sinus Surgery (FESS) is performed in patients with sino-inflammatory disease with an aim to re-establish normal ventilation and sinus drainage, through endoscopic removal of areas of blockage. Multidetector CT (MDCT) of the paranasal sinuses has an important role in pre-operative planning by characterizing the areas of obstruction, the sinuses that are involved, the structures responsible for the obstruction and normal variants that could complicate surgery. Therefore, a thorough understanding of the anatomy and drainage pathways of the paranasal sinuses, the important normal variants and the different techniques of FESS is important.

Learning Objectives

At the end of reviewing this poster, the reader should:

Be familiar with the anatomy and drainage pathways of the paranasal sinuses

Be able to describe the common patterns of sino-inflammatory disease and how they affect selection of type of surgery.

Be able to identify normal anatomical variants and other findings that contribute to obstruction or pose a surgical hazard.

Imaging and Procedural Details

Review the anatomy and drainage pathways of the paranasal sinuses

Briefly describe the patterns of sino-inflammatory disease

Review the different types of sinus surgery e.g. middle meatal antrostomy, frontal sinusotomy.

Review the normal anatomical variants that can contribute obstruction or pose a surgical hazard.

Conclusion

MDCT of the paranasal sinuses has an important role in pre-surgical planning. The radiologist must be familiar with the anatomy and normal variants that can contribute to obstruction or pose a surgical hazard.

IMAGING OF SUBDURAL HAEMATOMAS SECONDARY TO SPONTANEOUS INTRACRANIAL HYPOTENSION

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2. Department of Nuclear Medicine and PET, Singapore General Hospital, Singapore

Learning Objectives

The diagnosis of intracranial hypotension secondary to CSF leak will be discussed in this case report.

Imaging Details

A 35 year old Chinese male with past medical history of hypertension presented with 1 week history of progressively worsening generalized headache. He had no preceding history of trauma. He had a magnetic resonance (MR) imaging of his brain 1 month prior to this presentation (when he presented with diplopia) that showed features of spontaneous intracranial hypotension. In view of new and worsening neurological symptoms, MR imaging of his brain and Tc-99m radio-isotope scintigraphy was performed.

MALE BREAST CARCINOMA AND GYNAECOMASTIA: HOW TO TELL THE DIFFERENCE

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Learning Objectives and Background

To describe the clinical and imaging features which will allow the reporting radiologist to differentiate between male breast carcinoma from gynaecomastia, which are the two most important pathological conditions of the male breast.

Imaging Details

A review of the available published literature on male breast carcinoma and gynaecomastia as well as mammographic/sonographic images from actual clinical cases were used to describe how the clinical and imaging features could be used to differentiate between the two pathological conditions.

Conclusion

A detailed medical history and careful physical examination are important prerequisites when evaluating a male patient who presents with a breast mass. The imaging findings from mammography and breast ultrasound are equally useful adjuncts in identifying suspicious cases of male breast carcinoma which warrant biopsy.

THE UNSUSPECTED COLORECTAL CARCINOMA ON ROUTINE ABDOMINO-PELVIC CT: AN IMAGING COLLECTION OF LESSONS LEARNED

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Background

Colorectal cancer is a common and lethal disease with signs and symptoms that may be non-specific. CT abdomen and pelvis with or without contrast is commonly performed for a wide variety of general abdominal complaints and unlike CT colonoscopy, the large bowel may not be optimally prepared for evaluation. As such, careful and diligent assessment of the colon in all multidetector CT scans of the abdomen and pelvis is important in order not to miss an incidental colorectal malignancy, especially in older patients.

Learning Objectives

At the end of reviewing the exhibit, the reader should:

Be aware of the imaging clues of subtle or early colorectal cancer on the non-prepared colon on routine multidetector CT of the abdomen and pelvis.

Understand the utility of coronal reformations and historical comparison of scans in differentiating between pathological and non-pathological colonic thickening.

Key Imaging Details / Imaging Techniques

Illustrate the imaging spectrum of "missed" colorectal carcinomas on the non-bowel-prepared CT of the abdomen and pelvis with examples of subtle signs of malignancy e.g. eccentric thickening or enhancement, periserosal fat stranding and adenopathy.

Illustrate with examples of the use of existing "faeces" as a bowel contrast agent in detecting endoluminal colorectal masses.

Demonstrate the utility of coronal reformations in evaluating subtle colonic tumours.

Demonstrate the utility of comparing with historical studies in helping to differentiate between peristalsis and true colonic thickening.

Conclusion

Colorectal cancer is not an uncommon finding on CT of the abdomen and pelvis for non-specific abdominal complaints. Careful routine evaluation of the colon is instrumental in avoiding missing an unsuspected colorectal malignancy.

PAEDIATRIC ULTRASONOGRAPHY: CONDITIONS NOT COMMONLY ENCOUNTERED IN A NON-PAEDIATRIC SPECIALISED HOSPITAL

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Learning Objectives

To present uncommon paediatric/neonatal ultrasound cases performed at Department of Diagnostic Radiology, Singapore General Hospital (SGH), which is not a paediatric specialist centre.

Background

Requests for paediatric and neonatal ultrasonography are not uncommon at SGH even though it is not a tertiary level children's hospital. Having a busy Obstetrics and Gynaecology Department with a neonatal intensive care unit (NICU) does generate cases, which are often diagnostically challenging. Ultrasound services provided for the NICU patients are mostly done as portable scans. The scans for the less critically ill patients (such as from the Child Development Unit) are done either at the Inpatient or Outpatient Imaging Centers.

Abdominal ultrasound and Doppler studies form the bulk of inpatient work. Our outpatient cases range from abdominal to musculoskeletal scans.

Imaging Findings

The cases that we will present include congenital diaphragmatic hernia, situs inversus, abdominal aorta thrombosis, iliopsoas abscess, tethered spinal cord and neck cystic hygroma.

Conclusion:

Though paediatric ultrasound scans can be challenging, especially due to their low frequency in our clinical setting, findings from the scans frequently aid in solving diagnostic problems and treatment planning. A good knowledge of paediatric conditions, particularly in the newborn, is required. Close collaboration and co-operation between the Radiology and Neonatology departments are essential to further improve the provision of paediatric ultrasound services.

E08

PICTORIAL ILLUSTRATION OF NON-SILICONE, NON-IMPLANT BREAST AUGMENTATION

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Background and Learning Objectives

Breast injection augmentation is common in Asians and in recent years, there have been increasing use of new biocompatible, non-silicone fillers for breast injection augmentation. The objective is to demonstrate the mammographic, sonographic and MR features of the newer breast injection fillers like hyaluronic acid, polyacrylamide, Aqualift and Botox.

Conclusion

It is important for radiologists to be familiar with the various imaging features, possible complications and diagnostic challenges of these newer and increasingly popular methods of breast injection augmentation.

LOWER EXTREMITY ULTRASOUND: A PICTORIAL REVIEW OF MUSCULOSKELETAL PATHOLOGIES

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Department of Diagnostic Radiology, Singapore General Hospital, Singapore

Learning Objectives

To demonstrate the value of ultrasound and emphasise the technical consideration in depicting lower extremity musculoskeletal pathologies.

To recognise the diverse pathological conditions of the lower extremity musculoskeletal system as detectable by ultrasound.

To understand the technique and usefulness of dynamic US to optimally demonstrate the lower extremity pathologies.

Background

Lower extremity structures are commonly injured as a result of sports or chronic overuse. Systemic chronic medical condition such as diabetes, rheumatoid arthritis also manifest with abnormalities. Ultrasound has the well-known advantages of low cost, easy accessibility, non-invasiveness, dynamic capability and portability. The advancement of high resolution technology, power Doppler sonography, extended field of view and spatial compounding imaging have enhanced its value as a diagnostic imaging tool for the assessment of various joint and soft tissue pathologies.

Imaging Details

This educational exhibit illustrates the sonographic appearance of various pathologies affecting the hip, thigh, knee, lower leg, and foot. The advantages of ultrasonography, technique, common pitfalls and practical tips and hints are highlighted. Where available, correlation with clinical features or other imaging modalities such as X-rays and MRI are discussed.

Conclusion

Ultrasound is a valuable diagnostic tool for the evaluation of a great variety of soft tissue pathologies. In the appropriate setting, ultrasound can offer a rapid and focused diagnosis for various musculoskeletal problems affecting the lower extremities.

"NEWER WINE IN NEW BOTTLE" INTEGRATION OF ADVANCED IMAGING TOOLS WITH PACS – A PICTORIAL PRESENTATION

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2. Integrated Health Information Systems

Background and Procedure Details

Advanced image processing of cross sectional imaging, such as endoscopic imaging, 3D and multiplanar reformation (MPR), maximum or minimum intensity projections (MIP or MinIP), bone removal etc. were done using stand alone or exclusive image processing workstations or 3D lab, which were expensive and were in a different location within the department and were not accessible immediately to the reporting radiologists. Recent developments have enabled to integrate the advanced tools into picture-archiving and communication systems (PACS) system thereby improving the workflow, decreasing the time of reporting and improving the accuracy. Significant changes and advancements have also been achieved in storage and retrieval of the massive volume of images, especially with the server-based rendering and web-based storage.

Learning Objective

We illustrate the advancements in storage and advantage of integration of the advanced post-processing tools with PACS as a pictorial presentation

MRI BREAST- OVERVIEW OF TRADITIONAL AND LATEST TRENDS

Malik G

Medical Diagnostic Imaging, University Hospital Sharjah, Sharjah, United Arab Emirates

Learning Objectives

To describe the evolving field of breast MRI in diagnosis, screening, management and therapy monitoring by giving practical guidelines ranging from traditional contrast enhancement patterns to use of recent advances in MR imaging techniques.

Background

MRI has become a valuable tool in breast disease, especially in cases of diagnostic uncertainty, pre-operative staging and response monitoring to therapy. Breast MRI, being an area of intense and continuous research, is becoming an important tool for the diagnosis of breast cancer to be incorporated in routine clinical practice and as a screening tool as well.

Imaging and Procedural Details

This review serves to give an overview of breast MRI techniques for increasing the sensitivity and specificity. It would describe registration of serial dynamic images, segmentation and extraction of morphological features of breast lesions, advances in both spatial and temporal resolutions, the imaging sequences employed, pharmacokinetic of contrast uptake and use of dedicated and new phased-array breast coils. It will also describe the potential of diffusion-weighted MRI for increasing the specificity of breast lesions, diagnosis and monitoring of early response to therapy. In addition there would be a brief description of perfusion imaging based on first-pass contrast bolus tracking, and thus identifying those vascular indices which have great potential to increase specificity. There is also focus on latest advances including MR spectroscopy, automated image analysis and MR elastography.

ULTRASOUND AS AN ESSENTIAL PART OF DCIS WORKUP

Malik G

Medical Diagnostic Imaging, University Hospital Sharjah, Sharjah, United Arab Emirates

Background

Recent increased concerns about breast cancer have resulted in a rise in the number of breast screening methods and have affected the diagnosis and treatment of early breast cancer. The detection rate of abnormal masses is higher with ultrasonography (USG) than with mammography in women having denser breasts. Furthermore, with current technical advances and accumulated user's experience, USG is becoming an increasingly important tool to diagnose as well as characterise breast diseases. As a result, there are debates on utilising USG as a routine parameter in conjunction with other radiology modalities for evaluation of breast disease particularly in DCIS.

Learning Objectives

USG is helpful in increasing the specificity of mammography and help reduce the number of surgical or core biopsies performed in women with microcalcifications. It helps to reveal occult DCIS in patients with dense breasts. USG can be used preoperatively to detect clinically and mammographically occult DCIS in the contralateral breast.

Imaging and Procedural Details

In a tertiary care hospital breast imaging unit, USG was adopted as a part of breast investigation protocols in symptomatic and asymptomatic patients with either normal or positive mammograms. Another group who had USG were patients who were too young for mammography as first line investigation. USG was utilised to detect and characterise lesions. Another important advantage was observed in borderline cases of MRI with nipple discharge where ductography (procedure of choice) was not possible, indeterminate or contraindicated. USG was helpful to evaluate ducts as well as the intraductal contents.

E13

EMBOLISATION OF A RENAL ARTERIO-VEIN MALFORMATION WITH ONYX

Gogna A, Taneja M, Lin SE, Khoo LS, Tan BS, Lo HG, Irani FG, Burgmans MC, Yeow TN, Tay KH

Department of Diagnostic Radiology, Singapore General Hospital, Singapore

Background

Renal arterio-venous malformations (AVMs) are pathological intra-renal direct communications between the arterial and venous systems, most commonly presenting with gross haematuria. These may be congenital, or acquired (commonly iatrogenic, e.g. post biopsy). While nephrectomy is an established definitive therapy, endovascular approaches offer a significant nephron sparing advantage. A multitude of embolization techniques have been described, with various advantages and limitations.

Learning Objectives and Imaging Details

We present two cases of AVMs managed successfully with Onyx, which has thus far been used far more commonly in the neurointerventional arena. The rationale and technical details for this procedure are discussed in this poster.

MAGNETIC RESONANCE IMAGING OF THE BREASTS

Yin LR, Tan TM, Rumpel H

Department of Diagnostic Radiology, Singapore General Hospital, Singapore

Learning Objectives

The purpose of this presentation is to show how MRI of the breasts is done to obtain high quality images in terms of positioning techniques, patient screening and imaging protocols.

Background

Magnetic Resonance Imaging (MRI) is becoming more important for the detection and detection of breast cancer. It provides the highest sensitivity when compared with other breast imaging modalities.

Imaging Details

MRI protocols optimised to obtain high spatial and temporal resolution for evaluating lesion morphology, internal architecture and enhancement kinetics are described. Imaging pitfalls such as improper screening of patient, poor timing of contrast injection and imaging acquisition, poor patient positioning, poor fat-silicon-water suppression and possible artifacts such as motion, pulsation, chemical shift and magnetic susceptibility are discussed.

Conclusion

Although MRI breast has a high sensitivity, the specificity is variable. Therefore, it is still being used in association with other the conventional techniques like mammography and breast sonography.

MAGNETIC RESONANCE IMAGING POST-PROCESSING: BEYOND 3-DIMENSIONAL

Ho XMJ, Tan TM, Rumpel H

Department of Diagnostic Radiology, Singapore General Hospital, Singapore

Learning Objective

The purpose of this presentation is to demonstrate how post-processing is able to increase the diagnostic value and quality of Magnetic Resonance Imaging (MRI) raw data using case examples.

Materials

A Siemens Leonardo Workstation (Siemens, Erlangen, Germany) with a range of post-processing tools in a 3D laboratory setup was used to post-process imaging data from various Siemens Magnetom scanners. These include Skyra 3T, Verio 3T and Avanto 1.5T scanners (Siemens, Erlangen, Germany).

Imaging and Procedure Details

A review was made of all the MRI cases requiring post-processing since the inception of our 3D Laboratory. For the purpose of this presentation, cases were chosen based on two criteria. Firstly, those that demonstrated the different post-processing techniques and secondly those where post-processing made an impact on the final diagnostic quality of the images.

Unlike other modalities, certain MRI raw data are useful only after post-processing, e.g.: brain perfusion, functional MRI and spectroscopy studies. For cases where the raw data is already useful, intuitive and appropriate use of varied post-processing techniques can then further improve the diagnostic value of images like contrast-enhanced MR angiogram studies.

Conclusions

Post-processing can increase the diagnostic value and quality of raw data and post-processing is an area of specialisation that requires specific training. The formation of a 3D laboratory further enables the radiographer to focus on post-processing in an undisturbed environment and produce consistently high quality post-processed data. 3D Imaging and Post-processing Radiography is one of the specialisations that can be further developed in Singapore.

E16

RETRIEVAL OF A MIGRATED TIPS EXTENSION STENT

Toh HWL

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Learning Objectives

Details of successful retrieval of a large stent from the right atrium including stabilisation of the stent by using a "body floss" wire technique, dual snaring to fold and control the stent, and use of a large vascular sheath in the femoral vein to allow for easy stent removal.

Background

This case details the successful retrieval of a migrated 10mm diameter Gore Viabhan stent via the right common femoral vein in a 15 year old patient with a transjugular intrahepatic portosystemic shunt (TIPS). The stent was being placed to extend the existing TIPS stent into the hepatic vein in the patient with a reduced liver graft. Stent migration into the right atrium occurred at deployment of the extension stent.

Conclusion

With the increasing use of intravascular devices, skills in retrieval techniques are essential for the interventionist.

E17

TOMOTHERAPY CLINICAL EXPERIENCE FOR CRANIOSPINAL IRRADIATION

Lee WXH, Lee ZZ

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Learning Objective

To describe the delivery of craniospinal irradiation (CSI) with helical tomotherapy (HT).

Background and Procedure Details

CSI is used to treat patients with central nervous system malignancies, such as medulloblastoma.

CSI patients treated in National Cancer Centre received their treatment while lying supine, with standard thermoplastic mask and customized body vac-lok for immobilization. Daily megavoltage computed tomography (MVCT) would be carried out prior to treatment. The patients presented were treated successfully with HT.

Conclusion

HT delivers continuous arc-based intensity modulated radiation therapy (IMRT) that gives high conformality and excellent dose homogeneity for the target volumes. In addition, MVCT imaging allows for precision of patient positioning, permitting a reduction in planning margins and increased healthy tissue sparing in comparison with standard techniques.



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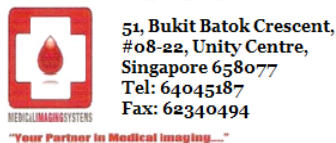
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