Poster Abstracts

Radiology

Tension pneumocephalus: Imaging findings
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Learning objectives: To review the various imaging findings associated with this rare neurosurgical emergency.
Background: Pneumocephalus is a relatively common finding after cranial surgery. Tension pneumocephalus, however, is a distinct clinical and pathological entity requiring active intervention. The study aims to report the salient clinical, pathological and radiological findings associated with tension pneumocephalus.
Imaging findings: It can be difficult to distinguish tension pneumocephalus from non-tension pneumocephalus based on imaging findings. The Mount Fuji sign, described as CT finding of bilateral subdural hypo-attenuating collections causing compression and separation of the frontal lobes can be useful in distinguishing the two.
Conclusion: As tension pneumocephalus can be a neurosurgical emergency, distinguishing it from non-tension pneumocephalus can have significant clinical consequences. Identification of signs suggesting tension pneumocephalus by radiologists can have significant implications for patient management and outcome.

Right paratracheal air cysts – Cases and literature review
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Learning objectives: To illustrate the CT signs of right paratracheal air cysts and review their pathology and clinical significance.
Background: A right paratracheal air collection has been reported to be observed in 2% of CT scans. We do not infrequently observe these in our clinical practice. They are almost always an incidental finding. The literature and general knowledge concerning this entity is sparse. There are a few reports of histological examination of surgically resected cases, which have shown that they are lined by ciliated columnar epithelia and communicate with the tracheal lumen.
Right paratracheal air cysts are located at the thoracic inlet. They are clinically associated with chronic cough, radiologically associated with emphysema and sabre trachea, and, pathologically associated with chronic tracheitis, which is a feature of chronic obstructive pulmonary disease (COPD). These associations suggest that raised intra-tracheal pressure is involved in their pathogenesis.
The differential diagnosis of right paratracheal air cysts includes other air-filled paratracheal pathologies, such as pneumomediastinum, pneumothorax, laryngocoele, pharyngocoele, Zenker’s diverticulum, apical hernia of lung, and apical paraseptal blebs or bullae. These can usually be readily distinguished from right paratracheal air cysts with CT. Rarely, they can become complicated by pooling of secretions, infection, compression of the recurrent laryngeal nerve and inadvertent endotracheal tube placement and perforation.
Imaging findings: CT scans of the chest or neck demonstrate a small right posterolateral paratracheal air collection at the T1 – T3 level. This is best visualised on the lung window. Sub-millimetre sections may demonstrate a communication with the tracheal lumen. Dynamic CT scan shows expansion during expiration and contraction during inspiration. Associated radiologic findings include emphysema and sabre trachea.
Conclusion: A small right paratracheal air collection at the level of the thoracic inlet is not infrequently observed on CT scans, and this poster shows cases and reviews the literature.
Use of capnography in MRI sedation
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Learning objectives: To provide details and experience of using capnography when monitoring sedated patients for MRI

Background: The use of anxiolytic doses of IV midazolam is common practice in MRI. The MRI room is a difficult place to monitor a patient’s level of consciousness and it is possible for a patient to become apnoeic. Monitoring is generally by use of oxygen saturation, but this is not an ideal tool as there can be a significant delay between the onset of apnoea and an alteration in saturation. Capnographic monitoring provides more immediate recognition of apnoea.

Imaging findings OR procedure details: The equipment required, the costs and the results of a trial of instituting capnographic monitoring will be discussed

Conclusion: Capnographic monitoring provides an extra element of safety for the patients in MRI. If the equipment is already available, such as a unit that performs general anaesthetics, it is a useful, minimally expensive tool that decreases the probability of an adverse event.

Conventional cystogram is not required prior to catheter removal in intra and extraperitoneal bladder injuries?
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Introduction: Patients who sustain direct bladder trauma are at significant risk of bladder rupture. Contemporary literature supports the conservative management for extra peritoneal (EP) bladder rupture by catheterised bladder drainage. In contrast, surgical repair with postoperative catheterisation remains the standard of care for intraperitoneal (IP) bladder rupture. A cystogram is regarded standard practice and is also used routinely to evaluate the integrity of the bladder prior to catheter removal in bladder trauma management. Indications and timings of cystogram following surgical or conservative bladder trauma management are not clearly defined in the current literature.

Aim: To review trends and types of injury in a large center, evaluate bladder integrity and need for cystography at 2 weeks following conservative management of isolated extra-peritoneal and surgically repaired noncomplex intraperitoneal (IP) urinary bladder injuries.

Patients and methods: A total of 15,046 patients were admitted to our Hospitals with traumatic injuries, including iatrogenic injuries between January 2000 and March 2006 as registered in the hospital trauma and operative database. Clinical data of all patients who sustained bladder injuries (n = 40, 0.03%) were reviewed retrospectively from the trauma database, including imaging studies and surgical operation. Patients with complex bladder injuries such as urethral and ureteric injuries, prolonged indwelling catheter in situ and patients with concomitant pelvic ring fracture presented a complex group. All recorded complications and follow-up results were reviewed. All patients underwent follow-up fluoroscopic cystography between 7 and 21 days from the day of injury.

Results: 24 males and 16 females with a median age of 40.9 years were identified. 45% of patients had iatrogenic injuries, two thirds of which were secondary to Gynecological procedures, 40% of all injuries were secondary to blunt (mainly Motor vehicle and bike accidents). When primarily repaired, a select group did not demonstrate a leakage on cystogram study.

Conclusion: Iatrogenic and blunt injury continue to represent the majority of bladder injuries in this metropolitan city, conventional cystography may be omitted prior to catheter removal following adequate, i.e. 14–21 days of catheter drainage in a select group of patients in clinical practice. This group was the conservatively managed, isolated extra-peritoneal and surgically repaired intra peritoneal noncomplex bladder injuries, a cystogram follow up can be omitted when clinically feasible.

Keywords: Cystogram, Urinary Bladder, intra and extra peritoneal injury
The effect of intoxication on clinical examination in the multi trauma setting

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**Purpose:** To assess the accuracy of physical examination findings in the acutely intoxicated patient compared to the non-intoxicated patient in the multi trauma setting.

**Method:** 462 consecutive multi-trauma patients at a large level 1 trauma centre underwent physical examination and subsequent whole body CT. The results of the physical examination (specifically: suspected clinical injury, regional tenderness, bruising, loss of consciousness, scalp laceration and unequal chest air entry), CT findings as well as the GCS, ISS and intoxication status were reviewed. Ultimately patients were divided into intoxicated (16.2%) and non-intoxicated (85.8%) and clinical findings were compared using CT as a gold standard.

**Results:** Accuracy of clinical findings was not significantly different between intoxicated and non-intoxicated groups across all body regions examined (brain, face, cervical spine, thoracolumbar spine, chest and abdomen/pelvis).

**Conclusion:** Intoxication does not significantly decrease the accuracy of clinical examination findings in multi trauma patients.

Is there a role for renal artery duplex ultrasound in 2010?

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**Purpose:** To assess appropriate indications for renal artery duplex ultrasound (RADUS) in 2010 and review the findings of RADUS performed over a 14-month period.

**Methods and materials:** The records of 50 patients undergoing RADUS in a single centre were reviewed. The patient demographics, indications and results of the investigation were recorded. Record was also made of subsequent imaging or procedures as suggested by the RADUS findings.

**Results:** The 50 patients had a mean age of 48 years (range 16 to 80); there were 22 males and 28 females. Indications for RADUS were: 33 for hypertension, 5 for hypertension and renal failure, 1 for hypertension and nephrotic syndrome, 1 hypertension and AAA, 1 hypertension and cardiomyopathy, 1 for bruit and 8 for renal failure. The right main renal artery was demonstrated in 28/50 patients and the left in 27/50. Both main renal arteries were demonstrated in 23/50 patients. Stenoses were reported in 6/50 patients and suspected in a further 3 patients. 3 patients underwent subsequent magnetic resonance angiography (MRA), 1 CT angiogram (CTA) and 8 digital subtraction angiography (DSA). No significant stenoses were demonstrated on MRA; 1 on CTA; 2 patients had stenoses on DSA but only one patient received treatment of a significant stenosis with a renal artery stent. This patient's RADUS demonstrated normal intrarenal waveforms and indices.

**Conclusion:** Renal artery duplex ultrasound is a time consuming and technically demanding examination with a significant false negative rate. It has a role in detecting renal artery stenoses in a sub group of patients who may benefit from intervention (particularly in light of the ASTRAL trial results) and in whom MRA is contraindicated but the pre-test probability and potential treatment options should be considered before referral.

**References**


Imaging the small bowel: Magnetic resonance enteroclysis, a technical and pictorial review
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Learning objectives
• To outline the imaging modalities available in the investigation of small bowel disease and the relative advantages and disadvantages of their use.
• To describe the technique of Magnetic Resonance Enteroclysis (MRE).
• To illustrate MRE imaging findings in a range of small bowel pathology including inflammatory bowel disease.

Background: Cross sectional imaging is now an integral part in the workup of small bowel disease with the benefit of being able to image the entire bowel as well as assessing extra-luminal disease. MR imaging offers further benefits including superior tissue contrast and the lack of ionizing radiation making it an ideal test for diagnosis and follow up in young patients with chronic disease. MRE provides optimal bowel distension helping in the diagnosis of subtle mucosal abnormalities.

Imaging findings or procedure details: The imaging technique of MRE used at our institution is described and illustrated with examples of the normal appearance of the small bowel and its mesentery. The diagnostic advantages and limitations associated with these sequences are also highlighted.

A pictorial review of the spectrum of small bowel pathology demonstrated on MRE is presented. The most common indication for imaging the small bowel with MRE is the diagnosis and follow-up of Crohn’s disease. The salient imaging findings associated with active and quiescent Crohn’s disease are presented as well as the extra-enteric findings of disease penetration like abscess formation and fistulation. Imaging findings in other small bowel pathology are also presented; these include small bowel tumours, jejunal diverticulosis, scleroderma and Peutz-Jeghers disease.

Conclusion: MR enteroclysis is an excellent front line test for the investigation of the small bowel. Its optimal bowel distension, superior tissue contrast and dynamic capability provide vital diagnostic information when imaging the small bowel.

Preoperative transcatheter embolisation of hypervascular metastases
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Purpose: To describe the use of transcatheter embolization of musculoskeletal metastases prior to surgical intervention.

Methods and materials: This exhibit is a retrospective review of preoperative transcatheter embolization of musculoskeletal metastases performed at our institution over a period of five years. Pre and post embolization arteriograms were studied documenting the site and appearance of the lesions before and after embolization. The histopathology of these lesions was also recorded.

Time from embolization to surgery and the embolization agents used were noted. Operative notes were reviewed to estimate the blood loss and the relative success of the metastatic tumour embolization.

Results: 10 cases of pre-operative transcatheter embolisation were performed in 8 patients (2 patients had bilateral femoral metastases embolised on separate occasions).

The metastatic lesions were situated in the proximal femur (4 cases), humerus (3 cases), acetabulum (1 case), gluteal region (1 case) and proximal tibia (1 case).

The metastatic lesions consisted of renal cell carcinoma (7 cases), hepatocellular carcinoma (1 case), colorectal carcinoma (1 case) and adrenocortical carcinoma (1 case). Five of these cases had presented with a pathological fracture.

Embolization agents used included a combination of polyvinyl alcohol (PVA) particles, gelfoam and coils. All embolizations were performed within 24 hours of surgery. 9 out of the 10 cases were considered successful with minimal blood loss encountered.

Conclusion: Pre-operative embolization should be considered as an adjunct in the management of hypervascular metastases when surgical intervention is indicated.
‘Vascular susceptibility sign’ in identifying thrombi in intracranial vasculature with susceptibility weighted imaging (SWI)
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Purpose: We highlight the usefulness of the intracranial ‘vascular susceptibility sign’ on susceptibility weighted imaging (SWI) in identification of thrombus in the intracranial vasculature.

Methods and materials: A retrospective review of MRI studies with SWI sequence in stroke patients was done. Two blinded radiologists reviewed each case with agreement by consensus in order to try and establish imaging features or patterns. Imaging was performed using a 1.5 T SIEMENS MAGNETOM Symphony Tim syngo MR B15. Imaging parameters were: T2 SWI 3d Axial Sequence, Slices per slab 32, FoV read 230 mm, FoV phase 81.3%, Slice thickness 4.00 mm, TR 55 ms, TE 40.0 ms. The additional scanning time was approximately 3 minutes with automated image display produced by the main MRI workstation and then sent to the local PACS as a separate phase, magnitude and SWI sequence.

Results: We identified 25 cases of thrombus in the intracranial vessels. The ‘vascular susceptibility sign’ on SWI shows the presence of hypointensity within a vessel in which diameter of the thrombosed vessel exceeds the diameter of contralateral normal vessel. This sign proved to be useful in detecting small thrombi in more distal vasculatures and providing vital information regarding the site, size, morphology and nature of the thrombi.

Conclusion: SWI offers the potential to improve the accuracy and diagnostic specificity in localizing in-situ thrombus in the intracranial vasculature. On SWI fresh thrombus contain a high concentration of deoxyhemoglobin and appear hypointense. Traditional MRA can demonstrate arterial occlusion well; however, distal thrombo-emboli are often difficult to visualize. SWI offers added advantage by direct visualization of thrombo-emboli in smaller intracranial vessels and with an accurate determination of its location. Direct visualization of in-situ thrombus may have the potential for influencing decisions regarding specific interventions.

Rosette-forming glioneuronal tumor: Relatively new CNS tumor radiologists should know
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Purpose: To describe the imaging findings of Rosette-forming Glioneuronal Tumour (RGNT), a benign, mixed neuronal–glial tumour, which was recently recognised as a distinct tumour entity in the 2007 WHO Classification of Tumours of the Central Nervous System.1

Methods and materials: We report our experience with a case of RGNT and summarised the imaging findings of the 44 known cases of RGNT in the English literature.

Results: RGNTs appear on imaging as a circumscribed lesion that may span the cortical ribbon and underlying white matter or be more deeply situated, abutting the ventricular system. Our case presented as a posterior fossa fourth ventricle midline mass. Patient underwent resection and had histopathological confirmation. It is important to identify this tumour entity separate from more aggressive lesions like ependymoma, medulloblastoma etc. RGNT can also occur at sites outside of its usual location. Most tumours appear as solid lesion, 41.9% of cases. Mix solid and cystic changes are seen in 30.2% of cases and 27.9% of cases exhibit only cystic features. On MRI, the solid areas have been reported as iso- or hypointense on T1-weighted and hyperintense on T2-weighted images. The majority of RGNT showed variable gadolinium enhancement, in 71.4% of cases. Focal enhancement pattern was most commonly observed 38.1%, while smaller number of cases showed heterogeneous pattern, nodular and ring enhancement pattern. These patterns may represent mural nodules or plaques within otherwise cystic masses. Calcification was detected only in 21.9% of cases.

Conclusion: RGNT is a low grade tumour occurring in the fourth ventricle demonstrating solid, cystic or mixed features. It frequently shows focal contrast enhancement and is often associated with hydrocephalus. As they are benign tumours knowledge of this entity is of prime importance as it alters the treatment planning, neurosurgical options and prognosis for the patient.
CT guided interventions: There's an app for that
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Learning objectives: The presented technique eliminates the need for the operator to estimate the axial angulation of the needle by using one of the many consumer electronic devices available with internal accelerometers, combined with free or inexpensive software to provide a live accurate display of axial needle angulation.

Background: Placing a needle at a precise angle in CT interventional procedures requires practice and skill. Adjusting needle angulation to the planned trajectory during the procedure is often required with additional image acquisitions to check position. From the operators perspective beside the patient, ‘through slice’ cranio-caudal needle angulation is often easier to estimate than ‘in slice’ axial angulation.

Imaging findings OR procedure details: The initial planning acquisitions and needle entry point skin marking are performed as normal. The electronic device is placed in a disposable sterile plastic bag by an assistant, which is then sealed by the operator after aseptic precautions. The capacitance touch-screen of the device remains operational through sterile gloves and bag. Holding the edge of the device to the barrel of a syringe or biopsy device provides an accurate live display of the vertical angulation of the attached needle. The needle can be accurately directed at the axial angulation defined by the planning scan needle trajectory vector. As is standard practice, ‘check’ scans are performed as the needle is advanced along its planned course to monitor for local complications and needle deflection.

Conclusion: This simple aid to CT-guided intervention is inexpensive and easy to implement in daily practice. Potential benefits for the patient include limiting radiation dose from ‘check’ scans, reducing complications from needle misplacement and shortening procedure duration.

The CT anatomy of internal hernias
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Learning objectives: To learn the CT anatomy of the peritoneum and mesentery. To understand the anatomical basis and CT signs of internal hernias.

Background: An internal hernia is the pathological protrusion of a viscus through a congenital or acquired peritoneal or mesenteric opening into an intra-abdominal compartment. The most common internal hernia is a paraduodenal hernia, followed by periceacal, Foramen of Winslow, and transmesenteric hernia. Other types of internal hernia are rare. Clinically, they may be silent, or present with abdominal pain and intestinal obstruction. A delay in diagnosis may result in strangulation and infarction. Historically, pre-operative investigation has been with radiographs and endoluminal contrast studies. CT scan can provide a preoperative diagnosis, or suggest the diagnosis. CT interpretation requires knowledge of the anatomy of the peritoneum, the characteristic locations of internal hernias, and the CT signs.

Imaging findings: The CT findings of internal hernias include small bowel obstruction, the gathering of dilated bowel loops in an abnormal location, and abnormalities of the vascular pedicle. The CT findings will be illustrated on CT reformations as well as axial images.

Conclusion: This poster illustrates and explains the anatomical basis of internal hernias as demonstrated on CT scan.
Hippocampal calcification
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Purpose: To determine the incidence of intrahippocampal calcification (IHC) in the age group commonly undergoing Head CT. There are multiple well-documented causes of intracranial calcification, with bilateral intrahippocampal calcification (IHC) only reported in rare conditions such as lipoid proteinosis, and a single case report of unilateral IHC due to Taenia solium cysticercosis. Our recent experience with multiplanar Head CT suggests this is however probably not uncommon.

Methods and materials: Retrospective review of 150 consecutive non-contrast CT brains from January 2010 was performed. The presence of IHC and vascular calcification using axial and multiplanar (sagittal and coronal) reconstructions was performed. Patient's ages ranged from 64 to 83 years.

Results: Bilateral IHC was noted in 7 out of 150 patients (4.7%). This was best appreciated on coronal reconstructions. Of these 7 patients, 5 also demonstrated vascular calcification (71.4%).

Conclusion: IHC is a relatively common CT finding which is best appreciated using coronal reconstructions. The high incidence of vascular calcification in cases of IHC raises the possibility that it is related to atherosclerotic vascular disease.

References

Cystic breast lesions in infants, children and adolescents
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Purpose: Pathologic breast conditions are rare in childhood and adolescence. The spectrum of paediatric breast disease is different from adults. Most paediatric breast lesions are benign. Subsequently, a conservative approach of clinical and sonographic follow-up is more commonly adopted in children. An enlarging solid mass may require a biopsy but in the remainder, the risk of deformities in developing breasts from interventions including biopsies outweighs the very low prevalence of malignancy. Little is known about the description and management of paediatric cystic breast lesions. This paper focuses on the sonographic features and management of cystic breast lesions in infants, children and adolescents.

Methods and materials: We retrospectively reviewed ultrasound images and clinical documentation of all children and adolescents who presented to the Children’s Hospital of Westmead, NSW from January 2006 to January 2010 for breast ultrasounds. Solid breast lesions were excluded from analysis.

Results: Eleven patients (10 females) with simple and complicated cystic breast lesions had a mean age at presentation of 6.6 years (range: 1 week to 15 years). Eight patients (5 infants and 3 adolescents) presented with bilateral retroareolar cysts with unilateral infection. All aspirated specimens grew Staphylococcus aureus. The other 2 patients were diagnosed with developmental breast asymmetry and gynaecomastia.

Conclusion: In our experience, infected retroareolar cysts accounted for the majority of cystic breast lesions in an acute setting in infant, children and adolescents. All these patients had contralateral and clinically asymptomatic retroareolar cysts. Treatment for retroareolar cyst was not required, except in infection where medical management was indicated.

References
The pituitary infundibulum: imaging findings of pathological conditions and normal variants
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Most radiologists are familiar with imaging of the pituitary gland, which is routinely seen on MRI. The infundibulum, located immediately cephalad, is a much smaller structure and is sometimes overlooked. It can be responsible for serious clinical presentations. We present the MRI images of a few cases of abnormal infundibulum and the clinical and endocrine features. We also show and discuss normal variants in the appearance of this small but important structure.

Exploring the Amyand Hernia: CT and US appearances
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Learning objectives: To identify the Amyand hernia, and recognise the subtypes and the different surgical management of each type.

Background: Appendix-containing inguinal hernias are known as Amyand hernias. Traditionally, these hernias have been diagnosed at surgery, but are increasingly diagnosed on abdominal computed tomography (CT) scans or groin ultrasound (US).

Imaging findings: This presentation describes the behaviour and classification of Amyand hernias, along with the CT and US appearances.

Conclusion: The classification of Amyand hernias determines their subsequent surgical management, as such it is important for the radiologist to be familiar with the appearances of the subtypes of Amyand hernias.
The A to Z of OPGs
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Learning objectives
1 To recognise the normal anatomical structures seen on the orthopantomogram (OPG)
2 To recognise the artefacts seen on the OPG
3 To be able to appreciate the technical errors and errors in patient positioning that can produce sub-optimal OPG images

Background: The OPG is a commonly requested examination, referred by both medical practitioners and dentists. Despite its frequency in practice, there is a reluctance by many radiologists to provide a detailed radiological report, due to an unfamiliarity with the normal anatomy and artefacts seen on the OPG.

Imaging findings: This presentation demonstrates the normal anatomy seen on the OPG, as well as artefacts produced by the tomographic technique. Examples of images produced by improper patient positioning are also shown.

Conclusion: A better understanding of the normal OPG will help the general radiologist to provide a more accurate and comprehensive report of studies referred by both dentists and medical practitioners.

‘No non-dental abnormality’ – Dental anatomy and common dental anomalies
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Learning objectives: To recognise the normal dental anatomy and common dental anomalies that are seen on dental radiographs.

Background: Dental anatomy and dental anomalies are only superficially taught in many medical courses, yet as radiologists we are often required to report dental radiographs on a regular basis. There is potential for many reporting errors arising from a lack of appreciation of the appearances of many common dental anomalies.

Imaging findings: This presentation describes the basic dental anatomy of dental radiographs, and demonstrates the common dental anomalies and normal variants that the general radiologist may confront.

Conclusion: Recognition of dental anatomy and anomalies will allow the general radiologist to produce a more confident and detailed report for the referring dentist.
OMG! – A Lucent lesion on this OPG!
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**Learning objectives:** To recognise the radiological features of lucent lesions occurring in the mandible and maxilla.

**Background:** ‘Oh my gosh’ (OMG) is a phrase often heard in the radiology reporting room, when a lesion is found on an orthopantomogram (OPG). Many radiologists are unfamiliar with the pathology of jaw lesions, and find it difficult to make a diagnosis.

**Imaging findings:** This presentation demonstrates the radiological features of both benign and malignant lesions of the mandible and maxilla, and describes the differentiating features of these lesions.

**Conclusion:** Radiologists need to be aware of the spectrum of lucent lesions seen in the jaws, and be able to offer an appropriate differential diagnosis in each case.

Coronal Fractures of the Hamate
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**Learning objectives:** Familiarity with the plain radiographic findings of coronal fractures of the hamate and importance of early recognition.

**Background:** Usually occurring in the setting of a punch injury, coronal fractures of the hamate and associated hamatometacarpal dislocation often go unrecognised and, as plain radiography is frequently the only means of initial imaging, familiarity with plain radiographic findings is essential to diagnosis the injury as early as possible in order to optimise patient outcome.

**Imaging findings OR procedure details:** Plain radiographs of several patients demonstrating different coronal fractures of the hamate and correlation with computed tomography, including 3D reconstruction.

**Conclusion:** Although easily diagnosing hamate fractures, computed tomography is generally not employed unless suspicion is raised on plain radiography or a complication develops. Plain radiographic findings are often relatively subtle and should be a specific review area, particularly in the setting of punch injuries, in order to establish an early diagnosis.
A review of soft tissue signs in plain film radiography
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Learning objectives
Review anatomy of the wrist, elbow, knee, and forefoot
Pathophysiology of fat pad signs
Mechanisms of injury resulting in fat pad signs
Radiographic appearance of fat pad signs in the wrist, elbow, knee, and forefoot
Clinical relevance of fat pad signs
Role of fat pad signs in diagnosis
Limitations of fat pad signs in diagnosis

Background: Plain film radiography of the wrist, elbow, knee, and foot is a common investigation following acute injury to these regions. The purpose of plain film radiography in this setting is to identify fractures and demonstrate the extent and nature of the injury. Radiologists and clinicians reviewing films have traditionally been encouraged to evaluate the soft tissue planes on plain film musculoskeletal imaging. The presence of fat pad signs, effusions, and other soft tissue signs were often seen as a surrogate marker for the presence of occult or subtle fracture.

Whilst there is a role for reviewing the soft tissues of these joints, the usefulness of fat pad signs in confirming or excluding injury has been questioned.

A literature review was performed to review the types and locations of soft tissue signs, the anatomy and pathophysiology of soft tissue derangement in injury, and the usefulness of these signs in clinical imaging.

Imaging findings: The most commonly described soft tissue signs were the navicular fat stripe and pronator quadratus sign of the wrist, and the supinator sign and posterior fat pad sign of the elbow. There were also articles describing infrapatellar fat pad disruption of the knee, and intermetatarsal fat pad sign of the forefoot.

Conclusion: Whilst fat pad signs are useful for determining whether further imaging is required, they cannot be used to confidently confirm or exclude the presence of injury.

Improving post-graduate radiology education: Exploring a multidisciplinary, multimodal, multicentre approach
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Purpose: With an increase in post-graduate medical student numbers, more sophisticated models of medical education are being developed to improve learning experiences in a clinically relevant context. With a shift towards case-based learning models, radiology as a discipline has suffered under-representation within this framework.

Materials and methods: We sought to investigate methods of improving delivery of a core radiology curriculum including imaging anatomy, basic image interpretation, imaging techniques, and radiation safety. There should also be scope for integrating tertiary educational concepts such as referral skills, clinical reasoning in image interpretation, clinical radiology in patient management, evidence-based imaging, and research.

A literature review was performed to identify content, education models, delivery methods, and assessment tools that are evidence-based or supported in practice.

Whilst the role of delivering radiology education in universities and tertiary hospitals is well established, there is an increasing role for off-campus, electronic, and regionally delivered content to accommodate the increased number of graduates and increased complexity of radiology content within the clinical setting.

The results were discussed at university curriculum review meetings to ensure the hospitals and universities efforts were synchronous.

Results: Case-based radiology education should be encouraged where possible. Clinical radiology content should be implemented into current clinical case-based learning scenarios and improved radiology content delivery at the bedside with non-radiology clinical educators. This would be one component of an integrated multidisciplinary, multimodal, multicentre delivery strategy.

It should complement existing teaching opportunities across a variety of disciplines and will be developed with a local, regional, and international focus.

Formative, summative, and qualitative assessment should be integrated into this model.

Conclusion: The critical component to improving post-graduate radiology education is integrating novel, engaging, and multi-modal delivery strategies across a range of teaching environments. These strategies should have evidence-based content and outcome measures.

References
An integrated approach to radiology research in the hospital setting
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Purpose: With an increased demand for high-quality, evidence-based medical imaging services, there has been a resultant increase in interest in radiology research. There has also been an increase in the research expectations of future radiologists as reflected in the recent changes to the RANZCR radiodiagnosis curriculum.

To accommodate the increased interest in radiology research, novel solutions to meet this demand were explored. The cornerstone in improving our response to this interest was to develop a research framework that fosters original research, outlines researcher obligations, overcomes common barriers to research progression and publication, integrates core time and data management initiatives, whilst being streamlined with hospital and RANZCR requirements.

Methods and materials: In order to create a facilitative framework, common barriers to research were identified within the department and a literature review was performed to broaden the search. In identifying these barriers, solutions were developed to help researchers manage their time and efforts effectively. These solutions were integrated into a research framework with Project Proposal templates that can be offered to interested researchers and collaborators. The process was designed to meet RANZCR Stage 3 Accreditation.

Results: A framework consisting of four (4) documents was established:
1. Expression of Interest – ‘First Steps’
2. Research Project Proposal – ‘Next Steps’
3. Expression of Interest in Radiology and Research Protocol
4. Collaborator Profiles

Conclusion: The Expression of Interest – ‘First Steps’ document has been a well-received starting point of information and promotional tool for research within the department. Building on this, the Research Project Proposal – ‘Next Steps’ has been invaluable in establishing transparent and workable relationships with researchers and collaborators with integrated pre-emptive solutions to commonly encountered blocks to research. Having a clear protocol and documented approach to expressions of interest in radiology and research has improved our ability to provide an equitable and thorough response.

Assessment of bleeding risk prior to invasive radiological procedures: A systematic review
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Purpose: To review the evidence regarding the use of screening blood tests prior to invasive radiological procedures and to identify prognostic factors that should be identified as part of an evidence-based pre-procedural risk assessment.

Materials and methods: A search strategy was formulated using the following terms:
Population – patients undergoing invasive procedures of any type e.g. radiology, surgery, biopsy, etc.
Intervention – pre-procedural blood tests e.g. coagulation, PT, APTT, INR, FBC, etc.
Comparator – history, examination, any risk assessment
Outcomes – bleeding, haemorrhage, any adverse event

The principle database used was PubMed Clinical Queries using a broad (sensitive) search, using prognosis as the category, with the above search terms and variations. CINAHL, Medline, ERIC, and Google were also used to increase search scope.

Articles were included if they were scientific research papers, no language restriction, and available in full-text. There were no date limits and all study types were appraised. Papers were considered if they were principally related to pre-procedural risk-assessment, invasive procedures, bleeding, and preferably radiology. Articles were excluded if they were not scientifically rigorous, reproducible, or relevant. The reference lists of these articles were reviewed to identify other articles that had not been identified in the primary search (pearling)².

Articles were rated using the CEBM (University of Oxford Centre for Evidence Based Medicine) Levels of Evidence guidelines² according to the study type.

Results: 4 systematic reviews, 8 trials, and 44 observational studies were included in the review. 3 studies were specific to radiology, the remainder were from other surgical disciplines. 6 articles were excluded according to the above criteria. A summary of key findings and summaries of levels of evidence was generated.

Conclusion: Indiscriminate coagulation screening prior to invasive procedures is not recommended. Clinical assessment including thorough history and selective use of appropriate blood tests should be advocated.

References

References


Assessment of bleeding risk assessment prior to invasive radiological procedures: A shift from indiscriminate screening to evidence-based clinical assessment

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Purpose: To apply the results of a systematic review indicating that indiscriminate screening prior to invasive procedures is not a reliable indicator of bleeding risk and should be replaced with evidence-based clinical assessment prior to invasive radiological procedures.

Materials and methods: A systematic review was performed to determine if routine coagulation screening in patients prior to radiological procedures should be performed. As part of the systematic review, several key features were identified:

• Routine screening for bleeding risk should not be performed
• If the bleeding history is negative, coagulation tests are not required
• A bleeding history (using structured questionnaires) should be performed and used to direct further assessment
• There is an increased risk of site haematoma in interventional radiology procedures in patients with thrombocytopenia
• 30–95% of screening blood tests are not checked

The next step in moving from a screening to case-based assessment paradigm was open discussion. The topic was initially discussed at an interdisciplinary neurointervention meeting. The evidence was then reviewed and presented at the radiology journal club and radiologist consultant meeting for critical appraisal and peer review. Nursing staff were also approached for early feedback to elucidate clinical or practical issues that might arise from the change.

The ‘Developing and Reviewing Policy, Procedure, and Guidelines’ hospital policy was used to produce a draft copy that could be presented to all relevant stakeholders for review prior to producing a final draft for authorisation.

Results: Approximately 7,500 pre-procedure blood tests per annum will be avoided by adopting this policy, saving the hospital approximately $298,000 per annum.

Conclusions: Implementation of this policy will occur once authorisation has been granted. Ongoing review, and a post-implementation study will be implemented to ensure the effectiveness and ongoing safety of this hospital policy change.

References
1. Danaher LA. Assessment of Bleeding Risk Prior to Invasive Radiological Procedures: A Systematic Review.
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Should this test be done? A radiology case series in the palliative care setting

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Learning objectives: A case series of three patients is used to stimulate structured discussion on the following topics in medical imaging of palliative care patients:

• ‘Should we do this test?’ versus ‘Can we do this test?’
• Addressing diagnostic uncertainty in palliative care without using medical imaging
• Decision making in palliative care imaging
• Fundamental principles of palliative care medicine
• Patient-centred care and autonomy
• Ethical issues and end-of-life decision making
• A review of the literature to broaden the scope of experience and opinion

Background: In an age where a full body CT scan can be acquired in a few seconds, there has been a subtle shift in referrer mindset from ‘should we do this test’ to ‘can we do this test’. Lichtenstein reflects on this phenomenon,

‘Given the need to multitask and make rapid decisions, optimal medical practice requires the doctor to use intuitive, automatic cognitive processes. It is also imperative that a doctor knows when to override intuition and routine with deliberate reasoning. Knowing when to do this requires skills in self awareness, introspection and empathy.’

Applying concepts learnt in the palliative care setting, there is scope for clinicians to improve referral practices for all patients. This includes avoiding uncomfortable and disruptive medical imaging tests that have little bearing on patient outcome through to complex decisions made with patients regarding their treatment that accommodate comfortable levels of diagnostic uncertainty.

Methods: The first of three cases looks at managing symptom control in advanced malignancy rather than ongoing imaging. The final two cases illustrate how clinical examination and anticipating known complications of the disease process avoid needless investigations and optimise patient care.

Conclusion: Responsible and compassionate healthcare delivery should reflect the individual needs of patients and consider the fundamental question, ‘Should this test be done?’

Reference
Comparison of primovist enhanced MR imaging and multiphase CT scan in the detection of liver lesions
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Objective: To compare the detection and characterization of focal liver lesions between Primovist enhanced MRI and contrast enhanced dynamic 5 phase CT.

Patients and methods: We performed a prospective cross sectional study on 34 patients, age ranged from 40 to 77 years (mean 60.30 years) in University Malaya Medical Center. The patients were suspected to have focal liver lesions on the basis of sonographic findings, an elevated α-fetoprotein level or deranged liver enzymes. Patients that fulfilled the eligibility criteria had the Primovist enhanced MR imaging of liver done in addition to the planned dynamic 5 Phase CT within 6 weeks. The patients were scanned in a 1.5-T MR system (Magnetom Vision; Siemens, Erlangen, Germany) and 1.5T Sigma Hdx (GE) MR with high-performance gradients (25-mT/m maximum Gradient strength and 600-_sec rise time) and a torso phased-array coil. T1-weighted fast low-angle shot gradient-recalled-echo (GRE) MR sequences were performed, and subsequent images were used for evaluation. The pre contrast scanning sequences included T2 HASTE, T2 *fl2d, T1 fl2d and VIBE (Volumetric Interpolated Breath-hold Examination) measurements. The dynamic acquisition were performed in four phases that is arterial and portal venous phase MR images which were acquired at 20 and 50 seconds after a bolus of gadoxetic acid (Primovist; Bayer, Schering, Berlin, Germany) at a dose of 0.1 mL/kg (0.25 mmol/mL). The contrast agent was manually administered IV at a rate of 2 mL/s followed by a 10-mL saline flush. Subsequently delayed images were obtained at 3 minutes and 10 minutes post injection. Two blinded observers independently and randomly reviewed the CT and MR images of each patient separately. The detection and characterization of the liver lesions were evaluated based on the Wilcoxon Test. The sensitivity, specificity, positive and negative predictive values were calculated based on the true positive, false positive, true negative and false negative values obtained.

Results: Statistical analysis using Fisher’s Exact test showed no statistical significance in the detection of the lesions (presence HCC in 23 lesions and 9 non-HCC tumours) between CT and MR (p < 0.05). However, there was significant difference between the dynamic phase and delayed phase imaging of MRI (p > 0.001). This shows that the lesions were detected both on CT and MRI, however, the delayed images delineated the lesions better resulting in a more confident diagnosis. The sensitivity and specificity in the detection of liver lesions (both HCC and non-HCC tumours) on gadoxetic acid enhanced MRI compared to 5 phase CT was 90% and 75% respectively. The positive predictive value and negative predictive values were 90% and 75% respectively.

Conclusion: Gadoxetic acid- enhanced MRI and 5 phase CT have similar diagnostic performance in the detection of liver lesions, but MRI is better at characterizing the lesions.

Impact of implementing Canadian CT head rules on number of CT head studies in emergency department
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Purpose: Canadian CT head Rules is a decision making tool that helps emergency physicians screen patients with minor head injuries who would require imaging to exclude intracranial pathology mandating intervention. It has been designed to lower unnecessary radiation exposure in these patients. This study reviews its efficacy in an emergency department in Australia.

Methods and materials: In a retrospective study, all patients who had a CT scan of brain for investigation of Minor head injury during November and December 2008 in Emergency Department of Redland Hospital were selected. At the time, decision to perform a CT scan was at clinician’s discretion, although Canadian CT head rules were accessible. Clinical presentation and CT finding were extracted from files and compared to the Canadian CT Head Rules.

Results: From 46 patients who had brain imaging for minor head injury, 33 met the criteria for CT imaging based on Canadian CT head rules. Most common finding requiring imaging was age more than 65. In patients under 65 years old (n = 19), 12 could have avoided radiation exposure with application of CT head rules. In all patients only two had CT finding related to their presentation requiring intervention, and both made the criteria to have imaging based on Canadian CT head Rules.

Conclusion: Canadian CT Head Rules is a useful clinical tool that would reduce radiation exposure, especially in young population who present to emergency department following minor head injuries. While its specificity is not high, sensitivity of the rule remains very high (98.4%).

References
Dropping the dose: Instituting a paediatric fluoroscopic dose reduction programme
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Purpose: The operator’s technique can considerably affect the dose incurred in fluoroscopic examinations. This study assessed whether a programme of audit and staff education could reduce typical incurred doses for paediatric fluoroscopic examinations in a tertiary hospital setting.

Methods and materials: An initial audit reviewed the doses incurred in the previous 10 months’ fluoroscopic examinations of paediatric patients. Methods of actively reducing dose were reviewed, with particular attention to systemic factors which might be contributing to the dose. Education sessions for radiologists, registrars and radiographers were held. A follow up audit then reassessed the typical doses.

Results: Over 400 cases were reviewed, involving children ranging in age from just under 18 years to less than 24 hours of age. Studies included videofluoroscopy, contrast swallow and meal examinations, tube oesophagograms, follow throughs, loopograms and enemas. Micturating cystourethograms and intussusception reductions were also included. Overall doses were improved in the second audit, and in particular the frequency and magnitude of ‘high outlier’ doses were reduced.

Conclusion: Reviewing practice, actively educating staff regarding technique, and providing ongoing feedback can reduce the dose incurred in paediatric fluoroscopic examinations.

References
Hiorns MP, Saini A, Marsden PJ. A review of current local dose-area product levels for paediatric fluoroscopy in a tertiary referral centre compared with national standards. Why are they so different? Br J Radiol 2006; (Apr); 79 (940): 326–30.

Gullet things: A pictorial review of oesophageal and para-oesophageal pathology
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Learning objectives: To review examples of important oesophageal and para-oesophageal pathology.

Background: In the age of CT, oesophageal and para-oesophageal pathology is often overlooked as dynamic studies under fluoroscopic guidance are less commonly performed. Pathology in this area is often now identified by endoscopy, but radiological studies continue to identify and delineate important conditions involving this area.

Imaging findings OR procedure details: The CT appearance of many oesophageal conditions is pathognomonic. Examples of this include perforation, leiomyomata, hernias, diverticula and mediastinitis.

Conclusion: Oesophageal and paraoesophageal pathologies are easily overlooked without a dedicated review of the area, or clinical clues to suggest the diagnosis.
Contrast enhanced ultrasound of the liver
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Learning objectives: The use ultrasound contrast agents is demonstrated in the characterization of liver lesions for diagnostic and interventional purposes.

Background: Ultrasound contrast agents are increasingly used in clinical practice for characterization of liver lesions. Their microbubble structure stabilised by a shell, is freely transported in the bloodstream after intravenous injection, but does not extravasate into the interstitial fluid like with CT and MRI contrast agents. At a low mechanical index, the microbubbles strongly reflect ultrasound waves producing a contrast specific signal in the capillary system, thus acting as a real-time blood pool tracer.

In the last six years at the Royal Perth Hospital, ultrasound contrast agents (Optiscan and Definity) have been used in aiding the diagnosis in almost a hundred cases. A review of some of the more representative examples, are presented as a teaching aid.

Imaging findings/procedural details: Ultrasound contrast agents demonstrate the enhancement pattern of hepatic lesions in real time in multiple vascular phases. Thus, liver lesions with typical enhancement patterns such as haemangiomas, focal nodular hyperplasia, metastases, hepatocellular carcinomas and portal-venous tumour thrombus can be differentiated with a high level of probability and confidence. Benign features such as focal fatty sparing, regenerating nodules, simple cyst and abscesses can also be characterised. This technique is of particularly useful in characterizing incidental liver lesions. It can be repeated as necessary and easily documented using video/ digital media without the use of ionizing radiation. Ultrasound contrast agents are generally very safe, non-nephrotoxic with a low rate of hypersensitivity reactions.

Conclusion: Contrast enhanced ultrasound is a useful, practical, radiation free way of characterizing and diagnosing liver lesions with examples shown from our clinical practice.

Utility of radiopaedia iPhone application as a self-directed learning tool for continuing professional development
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Purpose: To assess the utility of an interactive, case-based radiology iPhone application as a self-directed learning tool for continuing professional development in radiology.

Materials and methods: Radiopaedia is one of the world’s largest free online radiology resources with a rapidly growing, user-contributed collection of radiology articles and high quality patient cases. Broadening the appeal and availability of this content was a logical transition with the development of a novel iPhone application to provide selected cases to users ‘on-the-run’.

Radiology teaching files are compiled, peer-reviewed, and bundled into a range of iPhone applications on a variety of subspecialty radiology topics.

The user interface is intuitive, interactive, and portable providing users with a stimulating learning experience in any location, at any time. Images can be zoomed, moved, and easily navigated. Cases are presented by diagnosis or as unknowns. Representative images are accompanied by questions, answers, detailed discussion, and learning aides such as diagrams, mnemonics, and pathology slides where appropriate. All cases are linked to their parent article in www.radiopaedia.org and referenced to international journals and textbooks.

Results: Since its launch in August 2009, four volumes have been released (brain, gastrointestinal & hepatobiliary, musculoskeletal, and paediatric). At the time of publication, over 33 000 copies (combined Lite and Full versions) had been downloaded worldwide. User feedback has been positive with an average rating of 3.54 out of 5 from 737 user reviews.

Conclusion: The Radiopaedia iPhone application represents an important step forward in the way in which educational radiology content is delivered. Encouraging download numbers and positive user feedback would suggest that high quality radiology resources are well received and in high demand.

Reference
http://www.radiopaedia.org
A penetrating inferior vena-caval filter – Lessons to be learnt!
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Learning objectives: To determine the reliability of imaging options and considering adjunctive means of identifying a potentially penetrating Inferior vena caval filter.

Background: Vena caval filter interruption was first described by Armand Trousseau in 1865 as a means of managing venous thromboembolism.

We describe a case of penetration of the duodenum by a standard stainless steel Greenfield vena caval filter for which initial imaging modalities did not unravel a diagnostic dilemma.

The case involved an 83 year old woman who presented with vague epigastric discomfort. She was noted to have a transient globally deranged liver function tests (Gamma Glutamic Transpeptidase = 640, Aminotransferase (ALT) = 95, Aspartate Aminotransferase (AST) = 197 and Bilirubin = 28).

Her past medical history included having had a cholecystectomy for cholelithiasis and a Greenfield vena caval filter inserted for recurrent Deep Venous Thrombosis and Pulmonary Emboli.

Imaging findings OR procedure details: She was investigated in the first instance with an ultrasound scan which confirmed a previous cholecystectomy, along with evidence of a dilated common bile duct and hepatic duct.

A fine cut Computer Tomography (CT) Scan subsequently undertaken revealed findings in keeping with the ultrasound scan, with the identification of an inferior vena caval filter at the level of the second part of the duodenum.

Subsequent imaging and findings at time of Endoscopic Retrograde Cholangio Pancreatography (ERCP) revealed the vena caval filter penetrating the wall of the small bowel.

Conclusion: We describe this unique presentation of a penetrating vena caval filter and suggest that a clinician may be inclined to consider further imaging and directly visualizing the bowel lumen by endoscopy at ERCP when this complication / diagnosis is considered. This would supplement inconclusive ultrasound and CT scans of which the latter would be expected to have an element of artifact resulting from the metallic device in question.

Management of splenic artery aneurysms – A radiological perspective
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Purpose: To assess the role of radiology for the screening, diagnosis and treatment of Splenic artery aneurysms.

Methods and materials: Retrospective review of a case series was undertaken to study the presentation and management of patients who presented with a splenic artery aneurysm to a tertiary level hospital in a 6 month period.

Results: The two case presentations were in the emergency department setting. Both cases were initially diagnostic dilemmas, with both cases presenting as epigastric pain that went on to become haemodynamically unstable. The first case was a 57 year old lady who was otherwise well, whilst the second patient was a 29 year old female who was known to have risk factors for a splenic artery aneurysm – this involved her being 30 weeks gestation in the context of a history of portal hypertension secondary to extra-hepatic portal vein thrombosis.

Further risk factors for splenic artery aneurysms, not evident in these cases, include recurrent pancreatitis and Ehler’s Danlos syndrome / medial fibrodyplasia. Imaging in the form of Computerised Tomography and Ultrasound scans were quintessential in the diagnostic aspects of the case. A successful emergency caesarian section was undertaken at the time of surgical intervention for the second case mentioned, followed by successful coiling of a residual un-ruptured Splenic artery aneurysm thereafter.

Both cases had satisfactory outcomes following treatment

Conclusion: There is a role for radiologic screening of patients who may be suspected to have or at risk of splenic artery aneurysm through radiologic options. There is scope for greater familiarity with the diagnosis of splenic artery aneurysms especially in the context of significant risk factors being evident. Radiologic intervention for an otherwise clinically and haemodynamically stable patient is a potentially successful, minimally invasive means of managing splenic artery aneurysm that are not ruptured or leaking.

References
Complications and their predictors associated with PICC line insertion

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Purpose: Peripherally inserted central catheters (PICC) are commonly used for prolonged venous access, but may be associated with complications and high failure rates. We explored the rate and reasons for failure.

Methods and materials: We performed a retrospective longitudinal cohort study on 152 consecutive patients undergoing PICC insertion at a metropolitan teaching hospital in the radiology department under imaging guidance. Electronic and written medical records were accessed and demographic and co-morbid data were extracted. Date of PICC insertion and removal were recorded. PICC failure was defined as premature line removal due to any unplanned event or complication. The reason for failure was recorded. Cox proportional hazards regression was modelled to explore predictors of PICC failure.

Results: 40/152 (26.3%) of PICCs failed. Mean PICC survival was 25 days. Common reasons for failure included blockage (17/40, 43%), suspected sepsis (8/40, 20%), superficial infection (4/40, 10%) and migration/pullout (7/40, 18%). Concurrent infection (Hazard ratio [HR] = 2.6, p = 0.04, 95% confidence interval [CI] 1.04, 6.4), obesity (HR = 2.5, p = 0.01, 95% CI 1.2, 5.3) and inpatient insertion of PICC (HR = 5.7, p < 0.01, 95% CI 2.2, 14.4) were significant predictors of failure. Outpatient management of PICC was associated with longer survival (HR = 0.2, p < 0.01, 95% CI 0.01, 0.43). Age, sex, concurrent cancer, diabetes, vein of insertion, length of exposed line and indication for PICC were not significant predictors of failure.

Conclusion: PICCs are associated with high rates of failure. Obese patients, patients with concurrent infections, and inpatient management or insertion of PICC are predictors of failure.

Magnetic resonance imaging in assessment of anorectal fistulae and its role in management

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Objectives: This study was conducted to assess the diagnostic accuracy of magnetic resonance imaging (MRI) in perianal fistula in comparison to the operative findings.

Materials: We included in this study all patients, who had been admitted to colorectal unit with peri-anaI fistula in 2009. After preoperative clinical examination, MR imaging was done using a 1.5 and 3 Tesla superconducting magnet with external coil. Imaging was done using inversion recovery (STIR) and T1WI post contrast sequences in axial, coronal and sometimes sagittal planes. The images were evaluated for the presence of the primary fistulous tract, Internal opening and its relations to the sphincters. Secondary extensions were observed. Any abscesses or collections also were recognised. These findings were compared to the operative findings.

Result: 56 patients were included in the study, 46 male and 10 female with mean age 39.3 years +/-11.44 SD (range between 14–56 years). Primary fistulae were recorded in 40 cases and 16 cases were recurrent. MRI findings were as follow; superficial tract (4–7.1% cases), inter-sphincteric (33–58.9% cases), trans-sphincteric (14–25% cases), extrasphincteric (4–7.2% case) and non visualised tract in 1(1.7%) case. With MRI, horse-shoe extension was detected in 5(8.9%) cases and abscess cavity was seen in 20(35.7%) cases (15 ischiorectal and 5 supralevator). MRI finding was correlated with the surgical finding in 52 patients (92.8%) which is highly significant (P = 0.003). Fallacies of MRI were observed in 4 patients with recurrent fistulae.

Conclusions: MRI could be very useful in successful treatment of perianal fistulae by reliable assessment of fistula anatomy and correct assessment of the extent of the disease and relation to the sphincter complex.
Safety and efficacy of antegrade femoral artery closure with the StarClose device
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Purpose: To evaluate safety and efficacy of the StarClose device (Abbott Vascular, Abbott Park, Illinois, USA) in antegrade femoral artery puncture closures.

Methods: Following infrainguinal endovascular PTA, antegrade femoral artery closure was performed with the StarClose device in a prospective trial from April to June 2008 in a single tertiary referral institution radiology department in Germany. 51 StarClose devices were deployed in 51 patients (27 male; median age 77±11 years). Sheath sizes between 5 and 8 F (French) were used (Median 5 F). Time to achieve haemostasis, time to ambulation and any complication events were recorded in the immediate postprocedure period and the following 24 hours. Additionally late complications were assessed clinically.

Results: There was one immediate failure of device deployment in a patient with extensive inguinal cicatrisation after femoropopliteal bypass surgery resulting in acute hemorrhage refractory to prolonged manual compression, thus requiring instant surgical repair. Total complication rate was 2% (1/51). Among the other patients, mean time to achieve haemostasis was 36 ± 58 seconds and mean time to ambulation was 142 ± 62 minutes.

Conclusion: The StarClose device safely and effectively closes antegrade arterial punctures after infrainguinal endovascular intervention up to 8 F, even in patients who would be considered to be at high risk for puncture-site bleeding. The device is associated with a low complication rate. Haemostasis is achieved rapidly and patients are ready to ambulate early.

Transperineal ultrasound in evaluation of urethral diverticulae
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Learning objectives: To compare MRI with transperineal ultrasound in the evaluation of suspected urethral diverticulae

Background: Urethral diverticulae are estimated to occur in 1–6 % of women. These are usually diagnosed between the 3rd and the 5th decade. Urethral diverticulae can be asymptomatic, but symptoms usually include: urinary frequency, urgency, dysuria, post-void dribbling and dyspareunia. Presentation may also occur following the finding of a palpable mass.

It is thought that urethral diverticulae develop secondary to repeated infections and obstruction of the periurethral and urethral glands. The infection results in cyst or abscess formation. These eventually rupture into the urethral lumen and remain as an outpouching which epithelialises to become a true diverticulum. Rare congenital cases are thought to be the remnants of Gartner duct cysts. 90% of urethral diverticulae open into the distal 2/3 of the urethra, most commonly at the posterolateral wall of the mid urethra. Diagnosis can be difficult, particularly in view of the relatively non-specific symptoms.

Investigations include voiding cystourethrography (VCUG) and MRI. VCUG is an invasive procedure and MRI is not always easily accessible and can be expensive.

Transperineal ultrasound is a further technique which can be used to identify urethral diverticulae. This is a non-invasive and cheap investigation and is well tolerated by the patients. As with MRI, transperineal ultrasound has the added benefit of further evaluating peri-urethral masses shown not to be diverticulae. The differential for a peri-urethral mass would include: vaginal wall cyst, Skene’s gland abscess, ectopic ureteroceles or peri-urethral fibrosis.

We have reviewed cases of suspected urethral diverticulae and performed both MRI and transperineal ultrasound for comparative purposes.

Imaging findings OR procedure details: Transperineal ultrasound, in the cases reviewed, showed good correlation with MRI in evaluating for urethral diverticulae, and for evaluation of peri-urethral masses. A selection of the cases will be presented and the images compared.

Conclusion: Transperineal ultrasound showed good correlation with the findings at MRI with regards to peri-urethral imaging. It is suggested that initial investigation of suspected urethral diverticulae or peri-urethral abnormality be performed with transperineal ultrasound. This technique is non-invasive and acceptable to the patients and less costly than MRI.
An approach to CT characterisation of pancreatic neoplasms
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Objective: The pancreas is a site of origin of a diverse range of benign and malignant tumours, and with the fairly ubiquitous availability of CT for imaging of the abdomen, knowledge of the typical appearance of these neoplasms as well as the features of locoregional invasion is fundamental for all general and abdominal radiologists. This exhibit aims to outline the characteristic CT appearances of pancreatic neoplasms, illustrate features that may help differentiate tumours, and provide a practical diagnostic approach.

Method: A retrospective search of the author’s institutional database for cases of pancreatic neoplasms was correlated with a pathological database for histologic confirmation. Images were reviewed and illustrative cases identified.

Results: Pancreatic ductal adenocarcinoma accounts for 90% of cancers of the pancreas and CT can provide initial assessment of the primary tumour, local invasion, regional lymph node involvement as well as sites of distant metastasis to triage patients as non-operable, those requiring additional investigation and those proceeding directly to surgery. Other solid neoplasms include neuroendocrine tumours, lymphoma and metastases. A number of cystic tumours can arise in the pancreas, including serous cystadenomas, mucinous cystadenomas, intraductal papillary mucinous neoplasias and pseudopapillary tumours. Tumour mimics include pseudocysts, infection, pancreatitis and multiple causes of non-neoplastic duct expansion.

Conclusion: Cross sectional imaging with multidetector CT is an effective initial imaging technique for the detection, characterisation and staging of pancreatic neoplasms often allowing a definite diagnosis, or allowing appropriate selection of further investigation options.

Pictorial review of systemic lupus erythematosus
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Learning objectives: Describe the spectrum of radiological findings of various organ manifestations of SLE.
Formulate differential diagnoses based on imaging.
Recognise the importance of radiology in the diagnosis and management of SLE.

Background: Systemic lupus erythematosus (SLE) is a chronic, multisystem autoimmune disease that has a relapsing and remitting course. It has a high morbidity rate and may significantly reduce the quality of life in affected individuals. The risk of death directly due to SLE is the highest in the first three years after diagnosis. Most mortality is secondary to acute or progressive organ failure, thromboembolism secondary to antiphospholipid syndrome and infection secondary to immunosuppressive therapies.

Imaging findings or procedure details: SLE patients can present with a range of non-specific symptoms. It is therefore important to recognise the imaging modalities available for various organ systems in diagnosing disease complications. In this study, we addressed each of the systems affected by SLE with a review of the relevant literature. We performed a retrospective review of a database of SLE patients in the last ten years with particular organ complications. The database is retrieved from a specialised SLE clinic at an Australian tertiary hospital. We then compiled a comprehensive pictorial review of the radiological findings of each organ manifestations of SLE based on the database.

Conclusion: Whilst the diagnosis of SLE is based on clinical and laboratory features with no universally accepted diagnostic radiological findings, imaging is nonetheless useful for the diagnosis of specific organ manifestations. As SLE can manifest in different ways, this pictorial review aims to serve as a valuable reference tool in an endeavour to assist clinicians and radiologists in the diagnosis of the disease, recognition of the various organ systems manifestations and detection of the complications of treatment therapies.
Equivalent image quality and dose reduction with additional filtration in digital chest radiology

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**Purpose:** To compare image quality and patient dose for chest radiographs obtained using flat panel digital detector, using different technique factors, with and without additional filtration.

**Methods and materials:** A random set of adult patients requested for chest PA and Lateral radiographs were selected from two work areas. All radiographs were obtained using local machine settings on identical Philips Digital Diagnost x-ray units with amorphous Silicon detectors in each area. Patient details and technical data were recorded for 116 radiographs (60 from area 1 and 56 from area 2) in 58 patients. Differences in technique including additional filtration (0.1 mm Cu+1 mm Al in area 2), density setting (4+ in area 1 and 0 in area 2) for both views and different kVp used for Lateral images (125 in area 1 and 109 in area 2) were noted.

Image quality was assessed from the printed films by three blinded radiologists using established European guidelines and modified criteria. Radiation dose was estimated from the machine reported DAP data and from measured air kerma. Dosimetry was also compared with chest phantom data using both techniques.

**Results:** There was no statistically significant difference in the perceived image quality using local techniques between the two work areas for 80% of comparisons of each view (PA and Lateral). Image quality was considered better for 10% of PA and 20% of lateral comparisons using additional filtration. Phantom studies indicated 30% reduction in entrance surface dose using additional filtration alone. Combination of additional filtration, lower density setting and kVp reduced patient entrance surface dose significantly (64% for chest PA and 50% for chest lateral) in area 2 with equivalent image quality.

**Conclusion:** Optimisation of technique factors and additional filtration reduced patient dose significantly, without affecting perceived image quality of chest images.

Measurements of Cardiac ultrastructure using magnetic resonance diffusion tensor tractography at 9.4 Tesla

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**Purpose:** The key to understanding the mechanical and electrical properties of the heart is the organisation of myocytes. In disease states such as hypertrophic cardiomyopathy the complex structure is distorted, a finding that is histologically characterised as ‘disarray’. In this study we used Diffusion Tensor imaging (DTI) to characterise the myofibril structural motifs that underpin the functional basis of the mouse heart.

**Methods and materials:** Ex vivo DTI measurements of a normal mouse heart were performed at 9.4 Tesla. Resolution was 0.15 × 0.15 × 0.5 mm voxel size. 32 diffusion directions were acquired. Myofibril tracking was performed on the primary eigenvector using defined regions of interest (ROI).

**Results:** A region of the septum exhibited striking anisotropic diffusion reflecting a focus of high myofibril co-linearity. Two major myofibril motifs were demonstrated. The first, a highly ordered endocardial helical motif that runs in the septum from the cardiac base in a helical fashion to the apex then continues as an ascending loop to the cardiac base. The second motif is an epicardial circumferential loop that is seeded from an epicardial ROI. This loop passes around the left ventricle in an opposing direction the apical-basal loop, then continues to involve the fibres of the right ventricle. These findings are striking since they replicate the independently derived ‘helical-ventricular band’ concept of Torrent-Guasp (Gilbert, 2007).

**Conclusion:** Our results demonstrate the enormous potential of DTI to elucidate the ultrastructural form of the heart. This has important implications in both health and disease.

**Reference**
Imaging of endolymphatic hydrops in Meniere’s disease at 1.5 Tesla using phase-sensitive inversion recovery
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Purpose: Endolymphatic hydrops is the primary histopathological finding in Meniere’s disease. We demonstrate the feasibility of imaging hydrops at 1.5 T using a phase-sensitive inversion recovery (PS-IR) MRI following intratympanic injection of gadolinium (Gd) chelate. We also propose and test a novel refinement of technique to overcome limitations imposed by variable absorption of Gd.

Methods and materials: Subjects were injected with 0.1 mL of 1:8 diluted Gd administered by transtympanic injection. 2D PS-IR images with variable TI values and real reconstruction were obtained 24 hours following injection. Data was collected from 2 control subjects and 13 patients with Meniere’s disease.

Results: In two control subjects, Gd uptake was seen into the perilymph but no enlarged endolymphatic structures were demonstrated. Endolymphatic hydrops was identified in 11 out of 13 patients, where diluted endolymphatic structures were clearly identified as filling defects within or adjacent to the opacified perilymph. ROI analysis showed a large range in the degree of perilymphatic signal enhancement, presumably due to variability in the effectiveness of Gd transit from the middle ear into the perilymph. The use of three TI values permitted unambiguous identification of hydrops in all patients with Gd uptake into perilymph.

Conclusion: Following intratympanic Gd administration in patients with Meniere’s Disease, PS-IR sequences with real reconstruction allows clear demarcation of contrast in signal intensity between bone, unopacified endolymph and perilymph. Use of a PS-IR sequence with multiple TI values allows confident identification of endolymphatic hydrops in Meniere’s patients even when Gd uptake has been suboptimal. This is the first time endolymphatic hydrops has been demonstrated at 1.5 T.

RANZCR – Implementing quality!
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In 2010 the RANZCR commenced work on a suite of projects that will continue and extend the successful projects completed by the Quality Use of Diagnostic Imaging (QUDI) Program in 2009. This work is fully funded through a two year DoHA funding agreement, under their diagnostic imaging quality projects program.

The aim of these projects is to promote safe, appropriate, efficient and high quality radiology services for all Australians.

The five projects funded under the current agreement include:

• InsideRadiology
  ➢ Further development of this popular resource for health consumers and referrers of radiology
• CT dose optimisation
  ➢ 2 local projects – in collaboration with State health departments
  ➢ Individual practice level quality improvement activities involving audit – feedback and a didactic workshop of optimisation training provided by a medical imaging technologist, radiologist, and medical radiation physicists with support from practice radiologists and medical imaging technologists.
• RaER
  ➢ Support for continued data collection
  ➢ Analysis of events in the database relating to critical data, clinical handover/takeover and diagnostic error to identify possible causal factors and preventative strategies
  ➢ Support an international conference on error in radiology
• NHMRC-RANZCR TRIP fellowship to address an evidence practice gap relating to patient safety in diagnostic imaging which has been identified through the RaER database
• Radiology written report guideline project
  ➢ Development of a consensus and evidence based guideline about the form and content of the written radiology report.
In addition, a long term research project that aims to test the effectiveness of GP education and audit and consumer / patient education for reduction of imaging referrals for non – red flag acute low back pain. This poster will summarise progress to-date of all of these projects with links to results and other useful resources.
The role of delayed-enhancement MRI (DE-MRI) in the assessment of myocardial viability
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Learning objectives: To understand the physics, technical factors, physiology, image interpretation, and clinical utility of DE-MRI in the assessment of myocardial viability prior to coronary artery revascularisation.

Background: Historically, improvement in left ventricular function following coronary artery revascularisation has been a measure of myocardial viability. DE-MRI demonstrates viable myocardium corresponding to areas of contractile dysfunction pre-operatively, and these patients receive the greatest benefit from coronary artery revascularisation.

DE-MRI images are acquired ten minutes following the injection of gadolinium, using an ECG-gated segmented gradient-recalled echo sequence with an inversion recovery pre-pulse.

Imaging findings: The DE-MRI sequence is T1 weighted. The inversion time is set so that signal from normal myocardium is nulled. Acute and old myocardial infarction both demonstrate high signal. The exception to this rule is ‘no reflow’, which is infarcted myocardium that has microvascular occlusion; matched first-pass perfusion images show a corresponding perfusion defect. Delayed enhancement that involves the subendocardium and conforms to a vascular territory allows differentiation from non-ischaemic causes of myocardial damage.

DE-MRI images are acquired as a stack of short axis views, as well as long axis views, and these are interpreted alongside matched CINE images. CINE images show left ventricular function. Stunned myocardium and hibernating myocardium are viable. Stunned myocardium has normal perfusion and is the result of a recent brief ischaemic episode. Hibernating myocardium has chronic hypoperfusion and ischaemia with sufficient blood flow to maintain viability. Stunned myocardium and hibernating myocardium appear viable on DE-MRI. In patients with infarcted myocardium, DE-MRI shows the transmural extent of infarction, which has an inverse correlation with recovery of contractile function following revascularization.

Conclusion: DE-MRI provides pre-operative assessment of myocardial viability, and identifies patients who would benefit from revascularization.

Early diagnosis of infective lower thoracic spondylodiscitis in patients undergoing multi-detector CT abdomen pelvis for acute abdominal presentations
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Learning objectives: Report the early diagnosis of unsuspected infective lower thoracic spondylodiscitis in three patients undergoing standard multi-detector CT (MDCT) abdomen pelvis for acute abdominal presentations.

Review neurological mechanisms for lower thoracic pathology to cause symptoms referred to the abdomen.

Discuss the pathology and imaging findings of infective spondylodiscitis, emphasising the utility of MDCT for early diagnosis.

Background: Spondylodiscitis comprises a group of related infective entities affecting the spine. Distinction from a range of alternative conditions may be difficult. Localization of spondylodiscitis may occasionally be masked by referred symptoms.

Innervation of the intervertebral disc and adjacent structures is by a complex neural network comprising both somatosensory and sympathetic components. Current theories, anatomic basis, character and distribution for referred pain will be described.

Reports of infective spondylodiscitis causing isolated abdominal presentations are limited, and the utility of standard MDCT has not been emphasised. Published data will be presented.

Imaging of infective spondylodiscitis will be reviewed. Early detection requires demonstration of an inflammatory infiltrate, which can be shown by MDCT.

Imaging findings OR procedure details
(a) 67-year-old male. 1 week abdominal distension and right flank pain. MDCT abdomen pelvis showed T11/12 spondylodiscitis. Laboratory tests showed raised inflammatory markers and staph aureus bacteraemia.
(b) 86-year-old male. 1 month history of central abdominal pain and constipation. MDCT abdomen pelvis showed T10/11 spondylodiscitis, confirmed by Gd-MRI. Laboratory tests showed raised inflammatory markers and strep agalactiae bacteraemia.
(c) 87-year-old male. 1 month history of bilateral upper quadrant pain exacerbated by sitting forward, anorexia and abdominal distension. MDCT abdomen pelvis showed T7/8 spondylodiscitis. Laboratory tests showed raised inflammatory markers and staph aureus bacteraemia. Paraspinal CT-guided FNA grew staph aureus.

Conclusion: Lower thoracic spine is an important review area for MDCT studies of the abdomen pelvis performed for acute abdominal presentations.
MRI brain findings in Creutzfeldt-Jakob Disease (CJD) – Experience of a regional neuroscience service
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Purpose: To review the MRI brain findings in a cohort of 6 patients with Creutzfeldt-Jakob Disease (CJD) – experience of a regional neuroscience service.

Methods and materials: 5 patients with definite CJD and one patient with probable CJD (WHO criteria) were studied (3 male, age 53–83 years). Clinical features, EEG, and CSF protein 14–3-3 investigations were reviewed. MRI brain images and original reports were analysed for presence of: cortex, striatum or thalamus DWI / FLAIR / T2-W signal changes; white matter abnormalities; other findings.

Results: All 6 patients had 2–16 week history of rapidly progressive dementia. 5 patients showed gait disturbance/ataxia and myoclonus. Seizures were a feature in 4 patients. All patients deceased within 1–26 weeks.

4/6 patients showed MRI changes suggestive of CJD, which comprised increased signal affecting cortex, striatum or thalamus, readily seen on DWI, less conspicuous on FLAIR and subtle on T2-W sequences. All 4 patients showed cortical involvement, which was widespread and asymmetric in three. 3/4 patients also showed striatum and thalamus involvement, which was the predominant abnormality in one. White matter signal abnormalities were minimal.

2/6 patients showed nonspecific abnormalities, predominantly white matter T2 hyperintense foci.

All patients had abnormal EEG, 4 of which were suggestive of CJD (periodic sharp wave complexes). Subsequent to MRI, CSF protein 14–3-3 was shown to be positive in all patients.

Conclusion: In this cohort of patients with rapidly progressive dementia due to CJD, MRI brain findings were suggestive of the diagnosis in 4/6 cases.

References


Case report – Aberrant postero-inferior middle turbinate
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Learning objectives: To describe a rare case of variant turbinate anatomy.

Background: Many variations of the turbinates have been described. These can contribute to chronic or recurrent rhinosinusitis, apparent masses, or epistaxis. Nasoseptal and sinus embryology is complex. Common variations will be discussed.

Imaging findings: Non contrast CT examination of the sinuses revealed a left middle turbinate without the normal lateral nasal wall attachment, and therefore lack of a left middle meatus. The aberrant middle turbinate had an abnormal posterior lateral nasal wall attachment, curving postero-inferiorly to extend into the left nasopharynx. The turbinate was covered in thick, nodular mucosa, and may have caused intermittent obstruction to nasopharyngeal drainage. The patient had presented with recurrent epistaxis, presumably from the thickened aberrant turbinate mucosa.

Conclusion: Naso-septal variations are common, but we present a rare variation, with only one previous case in the literature. Appreciation for variant anatomy is important to identify potential causes of obstruction, identify possible surgical approaches, and to differentiate variant anatomy from true neoplastic lesions.
Patients presenting with symptoms of stroke within
the thrombolysis time window: Timeliness and
communication aspects of imaging care
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Purpose: Patients presenting within 3 hours of onset of symptoms of
acute stroke may be eligible for and benefit from thrombolytic therapy.
In this setting the initial computed tomography (CT) brain scan serves
to identify patients for whom thrombolysis is likely to be safe and has
the potential to improve outcome. Rapid imaging and effective com-
munication between the referring clinical and medical imaging teams
is therefore of critical importance. In this audit of a cohort of patients
presenting with symptoms of acute stroke to a tertiary referral centre,
we sought to investigate the timeliness with which imaging was carried
out and the effectiveness of communication between clinician and
radiologist.

Methods and materials: A retrospective analysis of a cohort of 85
patients presenting with symptoms of acute stroke between January
2008 and January 2009 was conducted. Emergency Department (ED)
and Imaging time points were compared to performance indicators for
imaging timeliness in acute stroke. Information conveyed via the
written imaging request forms was collated and the format and content
of the subsequent CT brain reports was analysed to investigate effec-
tiveness of communication.

Results: In 12 of the 85 presentations in this cohort, the imaging
request form contained specific documentation of the patient’s poten-
tial for thrombolysis. The median time from ED triage to CT image
acquisition for these patients was 00:30:50 mins compared to
1:13:56 hrs for the whole cohort.

Conclusion: Our data appear to show that specific documentation on
the medical imaging referral form of a patient’s potential for thromboly-
sis is associated with expedited imaging in the setting of acute stroke.

Literature review: A review of the current published
evidence on the efficacy and safety of intra-arterial
verapamil for cerebral vasospasm in aneurismal
subarachnoid haemorrhage
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Australia

Purpose: To examine the current published literature on the efficacy
and safety of intra-arterial Verapamil in aneurismal subarachnoid
haemorrhage (aSAH).

Methods and materials: A search of major databases including
Pubmed, Medline, Cochrane, OVID and Google using a broad range
of search terms was undertaken. The results were then reviewed by
the author to assess which studies were applicable using the following
inclusion criteria:

Study group: Patients experiencing angiographically demonstrated
cerebral vasospasm post aSAH.

Chemical agent: Verapamil, the use of studies where other agents
were used was excluded.

Outcome: Both clinical and non-clinical measures.

Level of evidence: Minimum requirement of a case series. Individual
case studies were not considered in this analysis.

The studies were then critically reviewed by the author.

Results: Four case series studies were found. The total number of
procedures was small (34,18,12,36). The studies are non homo-
genous in their method of dosing (bolus or infusion), amount and rate
of infusion involved, length of infusion, criteria for assessment of reso-
lution of vasospasm and criteria for clinical outcome. All trials seem to
concur in supporting evidence behind safety of intra-arterial Verapamil.
The evidence behind the therapeutic benefit is less conclusive. Of the
4 trials reviewed 3 conclude there is a reduction in vasospasm with
Verapamil infusion (be it a clinical or non clinical measure). Whilst one
concludes there is no effect on vasospasm by Verapamil. All studies
have minor flaws in their methods. Overall there is level 4 evidence
for the safety and efficacy of intra-arterial Verapamil in aSAH (OCEBM
2005).

Conclusion: The current limited evidence of 4 case series appears to
support the safety of Verapamil’s use, particularly at low doses. The
evidence behind the treatment effect is conflicting as far as angi-
ographic change in vasospasm however there is a generally positive
result in clinical measures.
MRI requests for spinal cord compression
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Australia

Purpose: To review requests for MRI in the assessment of spinal cord compression

Methods and materials: Retrospective audit of all MRI spine requests in a tertiary referral hospital for the last 6 months where the clinical query was cord compression. If the terms cord compression, cauda equina or central canal stenosis were on the request form they were included in the study.

Results: Ninety seven referrals for possible cord compression were identified. Twenty five had MRI evidence of cord or cauda equina compression. Of these seven went on to have surgery, none within 48 hours of the MRI. Nine patients had malignancy of which, one had RT the same day of the MRI, five had RT the following day, one had radiotherapy 2 weeks later and one had no RT. The only patient who had emergency surgical management was in shock due to retroperitoneal bleeding with no cord compression.

Conclusion: Given the number of requests for possible cord compression and the general lack of emergency management it is not possible to perform all these tests acutely. A mechanism for identifying the genuine acute cord compressions and ensuring undue delay does not occur needs to be instituted.

Matching clinical need and timely imaging reporting in the emergency department: The Flinders Medical Center experience
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Purpose: Timeliness of radiology reporting in the emergency department (ED) is of paramount importance to patient safety. Delays can result in diagnostic error and hinder test result communication. The aim was to develop a 24 hour, 7 day (24/7) staffing model for ED plain radiographic reporting that would result in prompt reporting of these ED imaging studies prior to patient discharge.

Methods and materials: Flinders Medical Centre Radiology, Hospital, and ED information systems were used to measure the number of new patients seen and imaging procedures performed per hour over a 24/7 cycle. Radiology information system data were used to regularly measure the number of unreported studies. Anticipated reporting output estimates were made using a published Australian model. Comparison was made with data from a similar hospital where 24/7 staffing was present.

Results: Measures of unreported imaging studies can be generated on a regular and frequent basis. In the absence of 24/7 coverage, a peak and trough pattern over a 24 hour period is typically seen, exacerbated at weekends due to reductions in radiologist staffing levels, but with similar levels of clinical need. ED activity projections over 24/7 are relatively stable. In combination with estimates of radiologist reporting outputs, a 24/7 staffing model has been developed that limits the number of unreported studies per unit time to safe levels. The hospital with 24/7 radiologist coverage released 25%, 46%, 55% 60%, 75% and 93% of their first available reports within 1, 2, 3, 4, 8 and 12 hours of request registration, respectively.

Conclusion: Timeliness of reporting in the ED is one of the important components of a quality framework. Non 24/7 radiologist staffing models are associated with unsafe rates of unreported studies. Using existing ICT systems, and an estimate of radiologist reporting output, a 24/7 staffing model was developed to promote patient safety in the ED.
Reducing operator hand dose in interventional procedures
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Learning objectives: To observe a simple, no-cost technique for reducing cumulative hand dose during prolonged interventional procedures of the abdomen and pelvis.

Background: Management of multiple complex medical and surgical conditions by interventional radiologists is now common. Radiation dose to the operator should be kept as low as possible. The highest risk procedures are those involving the abdomen and pelvis where the operator’s hands may be directly adjacent to the radiation field. The incident skin dose to the hands, for one hour of fluoroscopy is approximately 0.4–0.5 mGy, thus 100 complex procedures in a 12 month interval approximates 0.5 Gy. The Australian Radiation Protection and Nuclear Safety Agency recommends an annual maximum cumulative dose to the hands of 0.5 Gy per annum.

Imaging findings or procedure details: This technique is a ‘no-cost’ option for interventional radiologists to reduce hand dose without inhibiting hand or equipment dexterity. This three step technique involves the use of a thyroid collar, folded into a suitable shape to fit into a standard ultrasound probe cover. The probe cover is wrapped using a simple technique to allow easy manipulation and sterility. Artery forceps are used to secure the protection device to the sterile draping. The hand is then protected from accidental exposure to the incident beam during table movement and scatter from the patient.

Conclusion: The three step ‘collar-cover’ technique is a simple, no-cost method to reduce radiation dose to the fingers and hand of the operator during prolonged genito-urinary, abdominal and pelvic interventional procedures.

Intraoperative ultrasonography evaluation of risk of malignancy index in ovarian cysts
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Purpose: The aim of the study was to compare intra-operative, Laparoscopic/Laparatomic Ultrasonography with pre-operative Transvaginal or Abdominal Ultrasonography for the evaluation of the Risk of Malignancy Index (RMI) in the ovarian cysts. We expected to have a more accurate and sensitive intra operative RMI and more accurate estimation of the ovarian cyst size which could result in more appropriate surgical approach and reduction of Intraoperative Frozen Section sampling.

Methods and materials: 5 women who underwent surgical management of their ovarian cysts were included. An ultrasonic probe was placed over the surface of ovarian cyst and pictures were captured and saved for later evaluation. The results of intra-operative and pre-operative RMI were compared and the accuracy of two method were evaluated with final histopathology result.

Results: Of 7 patients 5 had intra operative ultrasonography at the time of the procedure. One woman with moderate RMI, was found to have border-line ovarian cyst at the time of frozen section and histopathology examination while intra-operative RMI was higher than pre-operative one .One of them had low RMI pre and intra-operative with histopathology of benign cystadenoma.Three of them had moderate RMI pre-operatively and intra-operatively. It was noted that in the ovarian cyst more than 9 cms the accuracy of vaginal ultrasound was less than intra-operative ultrasound.

Conclusion: The intra-operative ultrasound is undervalued and not readily used in ovarian cysts evaluation. As vaginal ultrasound has limitation when the cyst is more than 5 cm. Intra-operative ultrasound can accurately evaluate the cysts more than 5 cm in terms of abnormal features. As well as the limitation of BMI can be overcome by intra-operative ultrasound. It appears that intra-operative ultrasound has a place in the management of ovarian cyst but more studies are needed to confirm its usefulness in ovarian cysts management.
Intrasinusal septation: Frequency and clinical significance in dural arteriovenous fistulas
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Background and purpose: Intrasinusal septation is a variation of the dural sinus, which potentially affects the cerebral venous return in dural arteriovenous fistulas (DAVFs). We analyzed frequency and location of the intrasinus septation of the superior sagittal sinus (SSS), straight sinus (StS), transverse sinus (TS) and sigmoid sinuses (SS) by MDCT angiography. We demonstrate its clinical significance in the treatment and development of DAVFs.

Methods: Axial and reconstructed images of MDCT angiography in 65 cases without lesion affecting sinus drainage was reviewed with a special interest in intrasinusal septation. Angiography of 86 cases of DAVFs was reviewed to evaluate their relationship with the intrasinusal septation.

Results: Intrasinusal septation was found in 46 of 65 cases with normal sinus (n = 45). Location of the intrasinusal septation was SSS in 28, StS in 17, TS in 22, and SS in 15, and 21 cases showed multiple septation in multisinus. 86 DAVFs, some of transverse sigmoid sinus DAVFs and SSSDAVF were associated with intrasinusal septation or associated with parasinus components of the shunted venous pouch.

Conclusion: Intrasinusal septation frequently exists in normal subjects, and may contribute development of DAVFs. Selective transvenous embolization can be effective for the treatment of DAVFs with intrasinusal septation.

A new view of lobar collapse
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Learning objectives: To understand the radiographic signs of lobar collapse and its causes by illustration and description of multidetector CT (MDCT) reformations.

Background: The radiographic signs of lobar collapse are fundamental to interpretation of the chest radiograph. A CT scan is a powerful teacher of anatomy and radiographic signs. An image that looks like a chest radiograph can be generated from a MDCT scan of the chest using post-processing software. The generated radiograph looks identical to a conventional radiograph, except for minor differences related to supine position and absence of magnification effects.

Imaging findings: PA and lateral chest radiographs have been generated from MDCT scans of lobar collapse using post-processing software. The PA radiograph has been compared with coronal CT sections, and the lateral radiograph has been compared with sagittal CT sections to illustrate radiographic signs. The CT sections have been presented with lung windows to show radiopacity of the collapsed lobe(s), hyperexpansion of uninvolved lobes, fissural displacement and reorientation, and the direction of collapse; mediastinal windows or maximum intensity projection (MIP) images to show mediastinal shift, hilar displacement and ipsilateral elevation of the diaphragm; MIP images to show crowding or paucity of vascular markings and the silhouette sign; minimum intensity projection (MinIP) images to show tracheal deviation, crowding of bronchi and bronchial reorientation; and, volume rendered images to show ipsilateral reduction in size of the rib cage. Multiplanar reformations (MPRs) have also been used.

Conclusion: A MDCT scan of lobar collapse can be viewed with post-processing software to generate an image that resembles a PA chest radiograph and lateral chest radiograph. The post-processing software also allows coronal and sagittal CT sections to be viewed with different techniques to illustrate and explain radiographic signs. This poster also discusses the causes of collapse, and radiographic and clinical nuances.
Efficacy of ‘exercise’ angiography in the assessment of peripheral vascular disease
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Purpose: Peripheral vascular disease with overall prevalence of up to 10% is associated with lower limb arterial stenosis and occlusion restricting blood flow and leading to intermittent claudication, rest pain, ulceration and gangrene. Digital subtraction angiography (DSA) and percutaneous transluminal angioplasties (PTA) are often performed for the revascularization. Not infrequently, the run-off arteries are poorly opacified by contrast on DSA because the proximal stenosis or occlusion can decrease and slow the blood flow. The cool condition of DSA room may cause vasoconstriction further compromising the vessel clarity on DSA images. Severe infra-popliteal disease may be mistakenly diagnosed. Exercise results in hyperaemia of distal legs and vasodilatation of tibial arteries, and therefore, potentially helps to improve the calibres and flow characteristic of tibial arteries. The purpose of this study is to assess the efficacy of ‘on-table’ lower limb exercise on the angiographic visualization of tibial arteries.

Method and materials: Consecutive patients presented for peripheral DSA with angiographically apparent infra-popliteal disease from September 2009 to December 2010 were included. Patients with completely normal looking tibial vessels were excluded. The patients were asked to perform foot dorsi-flexion and plantar-flexion for 30 seconds on the table after the initial angiogram had showed small, irregular, stenotic or occluded tibial arteries. DSA was immediately repeated after the exercise. The artery dimensions and transit time of contrast through the tibial arteries on both pre and post DSA studies were recorded and compared.

Results: 11 patients (6 males and 5 females, age 47 to 92) with 39 tibial artery segments were studied. There was an overall 23% improvement of the run-off vessel diameters, with 34% mean increase of contrast flow rate.

Conclusion: ‘Exercise’ angiography can improve visualization of the run-off arteries and avoid the erroneous diagnosis of infra-popliteal disease that may exclude patients from having appropriate endovascular or surgical treatment.

Dynamic CT assessment of abnormal laryngeal and tracheal movement disorder
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Learning objectives: Certain laryngeal and tracheal conditions are associated with abnormal structural movement during the respiratory cycle. Dynamic volume CT with the 4-D capability can become a non-invasive alternative to laryngoscopy in diagnosing these conditions.

Background: Laryngeal and tracheal physiology depends on dynamic neuromuscular forces acting on a basic framework of cartilage and specialised soft tissues, including vocal folds, responsible for respiration and phonation. CT and MRI have become the most commonly used imaging techniques for general laryngeal pathology. Abnormal structural movement of the upper airway may however not be straightforwardly demonstrated by the conventional CT or MRI as they do not have the capability to view moving structures over time. At present, direct examination via endoscopy remains the criterion standard for evaluation of both structural and functional laryngotracheobronchial pathologic conditions. However, expertise to operate a laryngoscope is often not promptly available in the acute clinical setting.

The recent advent of 320-slice multidetector CT (320-MDCT) has the ability to provide a dynamic volume assessment of the entire laryngeal and tracheal airway during the respiratory cycle. The purpose of this exhibit is to demonstrate the utility of 320-MDCT in diagnosing certain laryngeal and tracheal conditions that may not be otherwise seen on conventional CT imaging

Imaging findings or procedural details: 320-MDCT is useful in detecting, monitoring, and assessing treatment response on (a) vocal cord dysfunction with inappropriate closure of the cords during breathing, (b) vocal cord paralysis with cord immobility, (c) tracheomalacia with tracheal ring collapse during expiration, (d) excessive dynamic airway collapse due to the posterior tracheal membrane bulging and (e) others.

Conclusion: The 320-MDCT can be a valuable tool in the dynamic assessment of abnormal laryngeal and tracheal movement disorder. Its associated radiation dose is relatively low because of the excellent soft tissue – airway interface. This CT technique would also allow better understanding of the underlying laryngeal pathophysiology.
CT angiography for lower gastrointestinal bleeding: Is it an appropriate test for all patients?
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Purpose: The leading causes of haemodynamically significant lower gastrointestinal bleeding (LGIB) include diverticulosis and angiodysplasia, together accounting for up to 80% of cases. The often intermittent nature of LGIB can be difficult to confirm on imaging and only 30% of patients require definitive treatment. The trend for CT angiography (CTA) as a rapid noninvasive primary investigative tool may delay treatment, including transcatheter embolisation, which may be important when significant LGIB occurs, often in elderly patients with multiple co-morbidities. The purpose of this retrospective study is to examine the appropriateness of CTA in the investigation of LGIB.

Methods and materials: We included all consecutive patients who underwent both CTA and DSA for LGIB from 2008–2009 at our institution. CTA and DSA findings were compared. Clinical parameters, including haemoglobin, packed red cells received, heart rate (HR), systolic blood pressure (SBP), and estimated blood loss at time of CTA were recorded.

Results: 25 patients (16 males, 9 females, age 15–91 years) were studied in total. Active bleeding was evident on both CTA and DSA in 6 patients, the average haemoglobin being 90 g/L, all 6 patients demonstrating a HR over 100 bpm and SBP under 90 mmHg. The remaining 19 patients had a negative DSA despite a positive CTA, with all demonstrating average haemoglobin of 105 g/L and HR under 100 bpm. Average time interval between CTA and DSA was 6.9 hours.

Conclusion: A positive CTA whilst useful for determining the site and potential aetiology of LGIB, may only be useful in selecting patients for DSA if the average haemoglobin is 90 g/L or less, with an abnormal HR and SBP. However, CTA as an initial investigative tool can lead to a significant delay in treatment whereas early DSA and embolisation without CTA may have provided greater morbidity and mortality benefit to these potentially unstable patients.

Performance of multi-slice CT Coronary angiogram as a gate keeper to invasive coronary angiography ¡V A single centre study
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Background: Multi-Slice Computed tomography coronary angiogram (MSCTA) has good sensitivity and negative predictive values. Application of this technology is evolving in New Zealand. This is a review of a single centre study.

Methods: Retrospective study in patients who had MSCTA in Hamilton Radiology Limited, between the period from March 2007 to February 2010.

Results: 209 referrals for MSCTA were made during the study period. 2 (1%) patients were excluded in the final analysis. The average age was 57 ± 11 yrs. 54% were males. Indications for CTCA were self referral 3%, atypical chest pain 40%, angina 28%, unstable angina 2%, non-specific ECG changes 7%, post-myocardial infarction 1%, ventricular tachycardia 1%, pre-surgery assessment 6% and no documented symptoms in 12% of patients. Pre-MSCTA investigation includes 7% with positive exercise tolerance test (ETT), 26% negative ETT, 35% inconclusive ETT, 1% had positive nuclear perfusion scan. 31% had no stress test prior to MSCTA and this group was not included in the analysis of efficacy of MSCTA as a gatekeeper for invasive angiography as listed in the table below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Pts</th>
<th>Severe disease in CTCA</th>
<th>For Angiogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Stress Test</td>
<td>16</td>
<td>5</td>
<td>3 (19%)</td>
</tr>
<tr>
<td>Inconclusive Stress</td>
<td>72</td>
<td>16</td>
<td>18 (25%)</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Test</td>
<td>54</td>
<td>8</td>
<td>11 (20%)</td>
</tr>
<tr>
<td>Total</td>
<td>142</td>
<td>29</td>
<td>32 (23%)</td>
</tr>
</tbody>
</table>

Conclusion: MSCTA along with stress test reduced the need for invasive angiography in approximately 77% of patients.
Comparison of breast cancer detection and diagnosis in women with and without breast prosthesis and explanted breast prosthesis
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1Royal Perth Hospital, 2BreastScreen WA, Perth, WA, Australia

Worldwide, several million women have undergone breast augmentation surgery – either for cosmetic or post-breast cancer reconstruction purposes. Although breast implants do not cause breast cancer, they do present a challenge with regards to imaging and clinical examinations in breast cancer screening. In addition, a subgroup of women have undergone prosthesis explantation for various reasons, both personal and medical. The post explantation radiological appearance (mammogram, ultrasound, MRI) can mimic breast disease. The appearance of the explanted breasts is determined largely by the presence of the fibrous peri-implant capsule post surgery. As a result, false positives can occur and as a consequence, unnecessary diagnostic and therapeutic interventions performed. We performed a retrospective audit of BreastScreen WA records and found 274379 women (985243 screening episodes) with no breast implants who were screened from January 1995 to December 2008. 48766 episodes (5%) were recalled for further assessment. 45361 recall episodes were attended, with 5679 breast cancers detected (13%).

3350 women with implants were screened from January 1995 to December 2008. From 8647 screening episodes, 261 episodes (3%) were recalled for further assessment. 230 episodes were attended, with 22 cancers detected (9%).

696 women who had undergone prosthesis explantation in the same period. From 1565 screening episodes, 78 episodes (5%) were recalled. 77 recall episodes attended further assessment, of which 8 cancers were detected (10%). Although the recall rates were similar, women who have never had breast prosthesis (13%) had higher true positives than women with prosthesis explantation (10%). Women who have breast prosthesis, however, had a lower recall rate than women without breast prosthesis (both virgin and explanted breast prosthesis) and a lower true positive.

Cardiac CT imaging of apical hypertrophic cardiomyopathy and other mimics
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1Department of Radiology, 2Department of Cardiology, Melbourne, Australia

Learning objectives: To illustrate and review the cardiac CT appearances of apical hypertrophic cardiomyopathy (HCM) and to distinguish it from other conditions affecting the apical myocardium.

Background: Apical HCM is a rare variant of HCM with predominantly apical myocardial hypertrophy which can be associated with an adverse prognosis. Without adequate imaging, this condition can be misdiagnosed for other conditions of the apex.

Imaging findings or procedure details: Cardiac CT of a small group of patients (7) with either suspected or a known diagnosis of apical HCM on echocardiography was reviewed. Comparison is made to the cardiac CT findings on patients with left ventricular non-compaction cardiomyopathy, Loeffler’s cardiomyopathy and hypertrophic obstructive cardiomyopathy. The presence of apical HCM was able to be demonstrated in all of the patients reviewed. Differentiation from other conditions affecting the apical myocardium and additional findings such as apical aneurysm can also be made.

Conclusion: We demonstrate that cardiac CT alone is capable of diagnosing and differentiating apical HCM from other conditions of the apical myocardium.
320 slice CT – Influence of axial and helical CT parameters on spatial resolution
L Mak, F Parrish, J Troupis and M Crossett
Southern Health, Clayton, Australia

**Purpose:** The purpose of this study is to evaluate the dependence of spatial resolution on various imaging parameters and in-plane position of the subject in a multidetector-row CT (MDCT).

**Methods and materials:** A line-pair phantom was imaged using a 320-slice CT system. The scans were performed in axial and helical (high and low pitch) modes. For each scan mode, the tube currents were fixed at 50 mAs, 200 mAs and 400 mAs and the tube voltages at 120 kVp and 135 kVp. In addition, the phantom was scanned in the field centre and 120 mm off-centre. The influence of placing the phantom along the Z-axis (i.e. direction of table movement) and at 45-degree to the Z-axis (XYZ plane) was also evaluated. Coronally reconstructed images were blinded and compared by two radiologists for spatial resolution.

**Results:** The spatial resolution in the centre of the field showed a significant improvement with axial volume at 50 mAs compared to the remainder of the measurements across the field. The spatial resolution in the XYZ plane decreased in the centre of the field compared to the periphery, which in turn was comparable with the other planes.

**Conclusion:** In our 320-slice CT system, the resolution of axial CT was comparable to, and at low mAs better than, that of helical CT in the field centre. This suggests that single rotation whole organ imaging improves spatial resolution and has significant implication where spatial resolution requirements are essential as in cardiac CT.

Heterotopic pregnancy – Case reports and a short review of literature
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Gosford Hospital, Gosford, Australia

**Learning objectives:** Spontaneous heterotopic pregnancy is a rare clinical occurrence in which intrauterine and extrauterine pregnancies coexist. The condition can be life threatening and can easily be overlooked. A high index of suspicion is needed in a) patients with risk factors for an ectopic pregnancy and b) in low risk women who have free fluid in the pelvis with or without an adnexal mass in the presence of an intrauterine gestation.

**Background:** Heterotopic pregnancies are becoming commoner following assisted conception techniques, however spontaneous heterotopic pregnancies though rare are known to occur. The literature variously describes the incidence ranging from 1 in 3,800 to 1 in 30,000 in spontaneous pregnancies. However the reported incidence is 1%-3% in IVF gestations. The Beta- HCG levels in heterotopic pregnancy are deceptively normal unlike ectopic pregnancy because of the presence of an intrauterine gestation. The treatment of heterotopic pregnancy also differs from that of ectopic pregnancy since Methotrexate cannot be used in heterotopic pregnancy.

**Imaging findings or procedure details:** We present two cases of spontaneous heterotopic pregnancy presenting to our hospital. Both cases were diagnosed, by transabdominal as well as transvaginal ultrasound, before the onset of complications and were treated appropriately.

**Conclusion:** Heterotopic pregnancy is a rare entity which has an increasing incidence due to assisted reproductive techniques. Spontaneous heterotopic pregnancies are also known to occur. Timely diagnosis and treatment can be life saving.
The use and misuse of plain abdominal radiographs in the emergency setting
S McKeen
Royal Adelaide Hospital, Adelaide, SA, Australia

**Learning objectives:** To establish the current role of plain abdominal radiographs in the adult emergency setting.

**Background:** Despite the evidence suggesting a low diagnostic yield, plain abdominal radiographs continue to be performed in adult patients in the emergency setting, particularly in patients with non-specific abdominal symptoms where a clinical diagnosis cannot be established. With the increasing availability of multidetector-row computed tomography and ultrasound, the question arises as to whether there is any indication for performing plain abdominal radiographs on adult patients with acute abdominal symptoms and signs.

**Imaging findings:** The majority of plain abdominal radiographs performed in the emergency setting are either normal or nonspecific in appearance. In a small percentage of cases, there is an abnormality that may be attributed to the patient’s symptoms, the most common being bowel obstruction.

**Conclusion:** Plain abdominal radiographs are insensitive in the evaluation of adult patients with abdominal symptoms, and whilst they may have a limited role in specific clinical situations, should not be used as a screening test for patients with non-specific abdominal symptoms.

The use of positive oral contrast in abdominal computed tomography
S McKeen
Royal Adelaide Hospital, Adelaide, SA, Australia

**Learning objectives:** To determine the current role for positive oral contrast in abdominal computed tomography (CT).

**Background:** Positive oral contrast agents have traditionally been administered to the majority of patients undergoing abdominal CT. There has been a more recent trend towards using neutral oral contrast agents, such as water and osmotic solutions. Many abdominal CT scans, particularly in acutely unwell patients, are performed without any oral contrast being administered. The question arises as to whether there is any role for positive oral contrast in abdominal CT.

**Imaging findings:** Neutral oral contrast allows differentiation between the enhancing bowel wall and the lumen when IV contrast has been administered, allowing evaluation of mural abnormalities. Positive oral contrast limits assessment of the enhancing bowel wall when IV contrast is also administered, however may improve evaluation of mural abnormalities in the absence of IV contrast. High attenuating intraluminal contrast also allows differentiation of bowel loops from adjacent fluid collections and cystic structures. Fistulae, diverticulae and extravasation are also well-demonstrated.

**Conclusion:** The majority of abdominal CT scans can be performed using neutral oral contrast or without any oral contrast at all. Positive oral contrast may be of benefit when there is concern for extraluminal fluid collections, fistulae or diverticulae, and when IV contrast is contraindicated.
Reversible cerebral vasoconstriction syndrome
A McNaught and A Goh
Royal North Shore Hospital, Sydney, NSW, Australia

Learning objectives: (1) To review the characteristic imaging findings of Reversible cerebral vasoconstriction syndrome (RCVS) or Call-Fleming syndrome. (2) To review the spectrum of associated imaging features and their time course. (3) To define the most useful imaging modalities for diagnosis and follow up (4) To understand the best current explanations of underlying aetiology and pathogenesis.

Background: RCVS is a cluster of disorders which have the characteristic angiographic feature of reversible segmental multifocal vasoconstriction of cerebral arteries, distinguishable from vasospasm by geographical separation of the vasoconstriction from haemorrhages, and from vasculitis by reversibility. Patients are young adults and classically present with thunder-clap headaches with or without focal neurological defects or seizures. RCVS has until recently been considered uncommon. New case series suggest that it is more common than previously thought and likely under recognised. Important sequelae of RCVS include sub-arachnoid haemorrhage (SAH), intracerebral haemorrhage (ICH) and cerebral ischaemia/infarction in young patients. The time course between onset and appearance of complications reflects progressive involvement of small to large cerebral arteries. There are significant associations with female sex, the postpartum period, and vasoactive substances.

Imaging findings or procedure details: Two cases from our institution with angiographically confirmed RCVS and associated subarachnoid haemorrhage.

Conclusion: RCVS is an under-recognised entity which is an important cause of otherwise unexplained SAH, ICH and cerebral ischaemia/infarction in young adults. Imaging findings are characteristic and diagnostic, although the underlying cause is still unclear.

Traumatic arteriovenous fistulas
A McNaught and B Steinfort
Royal North Shore Hospital, Sydney, NSW, Australia

Learning objectives: To review the CT and conventional angiographic features of traumatic arteriovenous fistulas and their treatment options.

Background: Traumatic arteriovenous fistulas (AVF) can occur in the context of penetrating trauma or iatrogenic injury. They can be difficult to identify on CT angiography (CTA) due to the inherent lack of temporal resolution, and patients routinely require conventional angiography for diagnosis and treatment. There are multiple treatment options including no treatment, vessel sacrifice, covered stent insertion and venous coiling.

Imaging findings or procedure details: CT angiography and classical angiography images from a case of iatrogenic vertebral artery to vertebral venous plexus fistula caused by inadvertent insertion of an intended internal jugular central venous catheter into the vertebral artery.

A CVC was being inserted prior to coronary bypass surgery when the mishap occurred. Initially the fistula was thought to be the more common internal jugular to carotid fistula, and a carotid cut down was performed in theatres. When the carotid was seen to be intact, the patient was transferred to radiology for CTA. Early arterial phase CTA showed dense contrast within the vertebral venous plexus and subclavian vein, on the contralateral side to the injection, prior to contrast reaching the veins of the upper neck. As the patient had limited cardiac reserve, repair was considered necessary prior to surgery. Balloon assisted venous coiling via a trans-arterial approach was considered the safest option as ongoing anticoagulation was undesirable. This was successfully completed prior to the patient undergoing coronary bypass grafting, and both were performed without incident.

Conclusion: CTA is a valid adjunct in assessment of AVF. There are multiple treatment options which should be tailored to the clinical situation.
CMRI measurements and ranges of the normal adult thoracic aorta and main pulmonary artery
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1Princess Alexandra Hospital, Brisbane, QLD, 2The Prince Charles Hospital, Chermside, 3Queensland University of Technology, Brisbane, QLD, Australia

Purpose: Cardiac MRI is a modality that is being used more frequently for the purpose of cardiovascular imaging. Currently, limited data exists for normal measurements of the adult thoracic aorta and main pulmonary artery. The purpose of this study was to obtain a range of normal measurements of the adult thoracic aorta and main pulmonary artery and to assess agreement between measurements made on two-dimensional (2D) and three dimensional (3D) image acquisitions.

Methods and materials: Forty-nine normal volunteers underwent cardiac MRI scans using a 1.5T Twinspeed GE Healthcare system with ECG-gating and suspended respiration. Steady state free precession (SSFP) cine MR images were acquired in standard imaging planes for the assessment of cardiac function. 2D and 3D sagittal oblique SSFP image acquisitions of the thoracic aorta were obtained. Two independent examiners made measurements of the ascending aorta, aortic arch, descending thoracic aorta and main pulmonary artery in set locations, recording the maximum arterial dimensions at each level. Bland-Altman plots were used to determine inter-observer variability and agreement between 2D and 3D techniques.

Results: Normal measurements of the thoracic aorta and main pulmonary artery were tabulated. Overall, there was no statistically significant difference between observer measurements. There was no statistically significant difference between measurements taken from 2D and 3D SSFP images of the aorta.

Conclusion: Normal values for the adult thoracic aorta and the main pulmonary artery were established using cardiac MRI. Either 2D or 3D SSFP acquisitions may be used to obtain measurements of the aorta.

Early cystic fibrosis structural lung disease does not preferentially affect the upper lobes in infants and preschool children
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1Telethon Institute for Child Health Research, 2Princess Margaret Hospital, Perth, WA, Australia

Purpose: Cystic fibrosis lung disease is considered an upper lobe predominant disease, as patients with established and end-stage lung damage have X-ray and computed tomography (CT) changes that are more prominent in the upper lobes. However we do not know whether early cystic fibrosis structural lung disease in infants and preschool children also disproportionately affects the upper lobes.

Methods and materials: 82 children with cystic fibrosis age 1 to 6 years from a newborn screened population underwent volumetric inspiratory and limited slice expiratory CT scans under general anaesthesia, using a low dose scanning protocol. All scans were assessed by a single paediatric thoracic radiologist for the presence of bronchiectasis, mucous plugging and air trapping in each lobe, with the lingula considered a separate lobe. Intra-observer reliability was determined by rescoring a random selection of 20 scans after a minimum 3 months and calculating kappa coefficients of agreement. Differences in the frequency of abnormalities between lung regions were compared using Chi-square tests.

Results: Intra-observer reliability for assessment of structural lung disease was good, with kappa values of 0.74 (substantial agreement) for bronchiectasis, 0.44 (moderate agreement) for mucous plugging and 0.55 (moderate agreement) for air trapping. Bronchiectasis, mucous plugging and air trapping were detected in 19%, 6% and 38% of all lobes, respectively. None of the abnormalities were more common in the upper lobes compared to the middle and lower lobes (frequency of bronchiectasis 26% vs 24% vs 26% for the upper, middle and lower lobes, respectively, p = 0.979; mucous plugging 15% vs 7% vs 9%, p = 0.252; air trapping 50% vs 46% vs 51%, p = 0.809). Similarly, all abnormalities were evenly distributed between left and right lungs.

Conclusion: Early cystic fibrosis structural lung disease is not more common in the upper lobes, but is distributed evenly throughout the lung.
Imaging of the child with craniosynostosis
J Myers¹ and D Lisle
¹Christchurch Hospital, Christchurch, New Zealand, ²Royal Children’s Hospital, Brisbane and Queensland Diagnostic Imaging, Holy Spirit Northside Hospital. Associate Professor, University of Queensland, Australia

Learning objectives
• Roles of radiological imaging in the management of craniosynostosis.
• Important differential diagnoses and their appearances.

Background: Craniosynostosis refers to premature fusion of one or more cranial sutures, resulting in deformity of the skull. Craniosynostosis may be seen in association with various genetic syndromes, such as Crouzon’s and Apert’s syndromes. More commonly, craniosynostosis occurs as an isolated anomaly. Specific abnormal head shapes are associated with fusion of individual or multiple sutures. The commonest of these is scaphocephaly secondary to isolated fusion of the sagittal suture.

The clinical presentation of craniosynostosis is quite variable. Obvious craniofacial deformity noticeable at birth is more commonly associated with craniofacial syndromes. Prolonged or difficult labour may result from failure of normal moulding of the head. The examining paediatrician quite often diagnoses isolated suture fusion by palpation of a bony ridge along the line of the suture. Occasionally, a child with isolated suture fusion may present at a few months or even years of age with an abnormal head shape that was not noticeable at the time of birth. In all of these situations imaging plays an important role in diagnosis and management.

Imaging findings: Plain radiography and CT, including CD reconstruction, is used to demonstrate the fused suture and resulting skull deformity. Current surgical management consists of highly complex restructuring procedures and the post-operative appearances may be unfamiliar to many radiologists. Examples of post-operative CT scans will be included in this exhibit.

Conclusion: This exhibit will illustrate and discuss the roles of various imaging modalities, particularly radiography and CT, in isolated and syndromic craniosynostosis, including diagnosis and pre-operative planning. Theories as to the aetiology and mechanisms of craniosynostosis have evolved significantly since premature fusion of cranial sutures was first described in the 19th century. The surgical treatments have also evolved and progressed.

Bariatric surgery gone bad – Our local experience
V Low, J Lu and C Noy
Victoria Park, Perth, WA, Australia

Learning objectives: It is important for radiologists to be familiar with the normal anatomic appearance of the more common forms of bariatric surgery and be able to recognise their potential complications on imaging. The objective of this exhibit is to give an insight, from a radiological perspective, into the more common forms of bariatric surgery in Australia, their normal radiological appearance as well as the appearance of some of their more common associated complications, using cases encountered in our centre during the period 2001-2007 to illustrate.

Background: Obesity is a major medical problem both within Australia and throughout the developed world. Bariatric surgery has become the most rapidly growing form of treatment of obesity in recent years. Currently, the two main approaches to bariatric surgery are (1) gastric restriction including, most commonly (in Australia), Laparoscopic Adjustable Gastric Banding (LAGB) and, more recently, sleeve gastrectomy, and (2) gastric bypass (in particular, Roux-en-Y gastric bypass (RYGB)). While bariatric surgery is an effective and generally safe means of achieving durable weight loss, complications, as with all surgical procedures, can arise and require further treatment.

Imaging findings or procedure details: The normal radiological findings of LAGB, RYGB and sleeve gastrectomy are presented as are some of the more common complications of each, with emphasis on the complications found in our centre during 2001–7. The complications presented include: LAGB band slippage/prolapse (+/- obstruction); band malposition/malplacement, LAGB component malfunction (port/band disconnection and rotation of the access port); infection; scarring; oesophageal dysmotility; RYGB with leak; and sleeve gastrectomy with leak.

Conclusion: As new bariatric surgical techniques are developed, it is important for radiologists to be aware of these developments and their expected imaging appearances and also to be able to recognise the complications or other adverse events that may arise from such procedures.
Revised TNM staging for lung carcinoma: A pictorial essay
B Parameswaran, R Cassunbhoy and B Sawyer
Peter MacCallum Cancer Centre, Melbourne, VIC, Australia

Learning objectives: To illustrate the new TNM classification for lung carcinoma, emphasizing the major modifications in the revised staging system.

Background: Lung carcinoma continues to be the leading cause of cancer-related death in men and women. The TNM classification used to stage lung carcinoma, until as late as 2009, was based on the data from 5,319 cases collected largely at a single institution and mainly treated by surgery. Over time, data from other centres challenged some of the descriptors used and various revisions of stage groupings were suggested.

The International Association for Study of Lung Carcinoma [IASLC] established a Lung Carcinoma Staging Project in 1998 to validate new recommendations. Data from over 81,000 cases from more than 19 countries treated by all modalities of care were analysed. The results of this project were accepted by the International Union Against Cancer [IUAC] and the American Joint Committee on Cancer [AJCC] as the primary source for revision of the lung cancer staging system in the 7th edition of their staging manual. The new TNM staging system incorporates major changes to the T and M components, and introduces several new subclasses based on survival data with prognostic implication.

Imaging findings or procedure details: Our exhibit illustrates the new TNM classification cross-correlating images from CT scans and other radiological investigations with reference diagrams, highlighting the major modifications in the revised staging system.

Conclusion: Several important modifications have been made to the TNM staging of lung carcinoma. It is imperative that radiologists involved with imaging for the primary staging of lung carcinoma have a thorough knowledge of the new classification.

Primary CNS lymphoma: A pictorial review
H Patel, D Anderson, B Kumar, A Kellman and D Nandurkar
Monash Medical Centre, Melbourne, VIC, Australia

Learning objective: To review the MR appearances of primary central nervous system lymphoma (PCNSL).

Background: PCNSL is a form of extra nodal non-Hodgkin's lymphoma, of B cell origin with increasing incidence. It occurs in both immunocompromised and immunocompetent host. The management of this disease differs from that of other forms of lymphoma. Despite a high rate of recurrence and poor long-term survival, the combination of chemotherapy and radiotherapy in recent years has resulted in improved treatment response and survival. Administration of steroids at presentation, results in a lower diagnostic yield from biopsy/resection and more so resection offers no therapeutic benefit. It is hence crucial that characteristic imaging features should alert the radiologist to the diagnosis of PCNSL with a view to avoidance of corticosteroids and early neurosurgical intervention for a stereotactic biopsy.

Imaging findings: PCNSL may present as a solitary or a multifocal lesion, with up to 40% patients demonstrating multifocal abnormality. The average lesion size at presentation ranges between 1.5–2 cm. It may involve the cerebral hemispheres, the basal ganglia, the corpus callosum or the periventricular white matter. Several authors report the peripheral hemispheric site as the commonest. Contact with either ependymal or meningeal surface and bulky infiltration of the corpus callosum are characteristic features of PCNSL. Cerebellar involvement is seen in up to 10% cases and spinal involvement is rare. Contrast enhancement is observed in most lesions. Lesion may exhibit variable signal on T2 weighted images ranging from hypo to hyperintense to gray matter. Hydrocephalus is not a common feature.

Conclusion: PCNSL has some characteristic imaging features. Its diagnosis on imaging, mainly MRI is crucial in order to avoid unnecessary steroid use which can obviate the diagnosis and to facilitate stereotactic biopsy over resection as the new treatment regimes have resulted in improved outcomes.
Primary CNS lymphoma MRI features: A retrospective review
H Patel, D Nandurkar, D Anderson, B Kumar and A Kellman
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Purpose: This study aimed to retrospectively determine the MRI features of central nervous system lymphoma (CNSL) in 33 consecutive patients presenting in a single tertiary hospital over a 5-year period.

Methods: Patients with histologically confirmed CNS diffuse large B cell lymphoma (DLBCL) were identified from the pathology records of the hospital from 2005–2009. Two radiologists independently reviewed their MR images. All examinations were performed on a 1.5 or 3 Tesla MRI scanner.

Results: Thirty-three patients (18 male/15 female, age range 31–83, average: 65) with CNSL were identified. 25/33 had PCNSL (two immunocompromised) and 8/33 had secondary CNS lymphoma (SCNSL). Ninety-seven lesions were identified in 33 patients. On T1 weighted imaging there were no consistent signal characteristics. On T2 imaging most lesions were iso or hyperintense relative to gray matter. Contrast enhancement was present in 90/97 lesions. All patients had supratentorial involvement. Supratentorial lesions were lobar in 25/33 patients, periventricular in 20/33 patients, with 14/33 patients demonstrating both lobar and periventricular involvement. Basal ganglia and corpus callosum involvement was seen in 11/33 and 16/33 cases respectively. Multifocal involvement was seen in 21/33 cases. Leptomeningeal involvement was rarely seen and both diffusion restriction and hydrocephalus were uncommon.

Conclusion: CNSL typically has a lobar or a periventricular predilection, with multifocal involvement common. Basal ganglia and corpus callosal involvement is also common, however both infratentorial and leptomeningeal involvement is uncommon. Contrast enhancement is usual. T1/T2 signal characteristics were not discriminatory. Recognition of the characteristic imaging features of lymphoma can obviate inadvertent steroid use and direct a stereotactic biopsy over resection, which offers no therapeutic benefit.

The utility of MRI in dementia syndromes
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Royal Melbourne Hospital, Melbourne, VIC, Australia

Learning objective: To familiarise radiologists with the current role of MRI in the diagnosis and monitoring of dementia.

Background: Dementia is a significant cause of morbidity in an increasingly aging population. Alzheimer’s disease (AD), vascular dementia (VaD), mixed dementia, dementia with Lewy bodies (DLB) and fronto-temporal dementia (FTD) account for the vast majority of neurodegenerative syndromes. Mild cognitive impairment (MCI) is a dementia prodrome, with 10–15% annual progression to AD and is the target of drug therapies aiming to halt disease progression. The role of structural imaging to exclude reversible causes of cognitive impairment such as normal pressure hydrocephalus, neoplasm, subdural haemorrhage and encephalitis is expanding to incorporate advanced techniques in early diagnosis, evaluation of disease progression and emerging therapies. MR imaging techniques applicable to the diagnosis of dementia syndromes include structural imaging, spectroscopy, perfusion and diffusion tensor techniques.

Imaging findings: Structurally, atrophy of the hippocampus and entorhinal cortex is a marker of AD. Infarcts and white matter lesions are associated with VaD, although cerebrovascular disease frequently coexists in AD. Relative preservation of medial temporal lobe volume in the appropriate clinical setting is typical of DLB. FTD is associated with selective frontal and temporal lobe atrophy. Reduction in N-acetylaspartate and elevation of Myoinositol using 1HMR spectroscopy has been documented in AD and FTD. MR perfusion with contrast bolus tracking mirrors the perfusion patterns established with brain SPECT. Arterial spin labelling can be used as a non-invasive surrogate of perfusion patterns. Diffusion tensor imaging evaluates the structural integrity of white matter tracts, with variable involvement in MCI, AD and FTD. Less common dementia syndromes demonstrate characteristic imaging features.

Conclusion: Characteristic findings of structural MR and advanced MR imaging techniques can be a valuable tool in the diagnosis of specific dementia syndromes and have an evolving role in monitoring of disease progression.
Endovascular treatment of intracranial aneurysms with new generation flow diverting stents. Early experience in an Australian neurointerventional centre

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Purpose: The Pipeline embolization device (PED) (Chestnut Medical Technologies, Inc., Menlo Park, CA) is an endovascular implantable device designed to treat wide-necked and fusiform intracranial aneurysms. We present a single centre initial experience with the PED and very early follow-up results for a series of 10 patients, from September 2009–April 2010.

Methods and materials: 10 patients with aneurysms that have morphology assessed as being difficult to treat with coiling or stent assisted coiled were selected. All patients were premedicated with 75 mg clopidogrel and 100 mg aspirin daily for 72 h preoperatively and for 6 months thereafter. Planned imaging follow-up consists of MRI/MRA at 3 months and catheter cerebral angiogram at 6 months.

Results: Pipeline Endovascular Devices (PEDs) were successfully deployed in 10 patients. A mixture of single and overlapping devices were used. In one patient aneurysm coils were used to prevent prolapse of the stent into the aneurysm.

8 patients had no new post-operative neurological deficit. 1 patient suffered a post-operative transient ischaemic event, which resolved entirely with IV anti-platelet and anticoagulant therapy. 1 patient suffered post-operative seizures. No deaths have been recorded.

Complete angiographic occlusion of the aneurysm has been demonstrated in the 2 patients that have been followed up on MRA/MRI to date. 9 patients have a modified Rankin score (mRS) of 0 at present.

Conclusion: Flow diverting stents are being established as a useful new tool in the endovascular management of cerebral aneurysms, particularly those with unfavourable morphology. This early data on experience in a large Australian neurointerventional and neurosurgical centre is in line with other published data.

References

Embolization of traumatic visceral arterial injuries in the OR using portable C-Arm, how far can we push the limits

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Tan Tock Seng Hospital, Singapore

Purpose: To retrospectively review and describe our experience in the use of portable C-arm in the operating room (OR), in embolization of traumatic visceral arterial injuries.

Methods and materials: Between January 2006 and July 2009, a total of 12 patients with traumatic visceral organ arterial injury received embolization in our institution’s dedicated trauma OR using portable C-arm units; as opposed to using the conventional angiography suite. All cases had documented contrast extravasation on CT angiography (CTA) and all embolization were performed within 1 hour of the CT. CTA was used to localize the bleeder/s and study the relevant anatomy prior to embolization, in order to overcome the small field of view imposed by the C-arm unit. Angiographic success, clinical progress and reintervention rates were studied.

Results: A total of 12 embolizations were performed, including liver \((n = 8)\), kidney \((n = 2)\) and spleen \((n = 2)\). Technical success in identifying the culprit vessel and embolization was achieved in 11 out of 12 patients. In 1 case, the culprit hepatic artery could not be identified using C-arm angiography, only to be identified on repeat angiography using a conventional angiography unit. Micro-coils \((n = 8)\) and gel-foam slurry \((n = 3)\) were used as embolic materials. All patients were successfully discharged after embolization of the bleeding vessels. No case needing conversion to open surgery was recorded.

Conclusion: Visceral artery embolization using portable C-arm angiography in the trauma OR is a feasible option in optimizing the therapeutic window and workflow in trauma patients. Nevertheless, limitations inherent to small field of view of C-arm units demands careful patient selection and pre-operative CT plays a crucial role.
Three cases of retropharyngeal calcific tendonitis: A rare and treatable cause of acute neck pain
J Quayle and J Challen
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Learning objectives: To identify retropharyngeal calcific tendonitis (RCT) as a differential diagnosis in the clinical presentation of acute neck pain, and recognise its radiographic signs in plain film, CT and MRI.

Background: This slide show presents three cases of RCT which presented to Nambour emergency department with undifferentiated neck pain.

RCT is an inflammatory reaction to the deposition of hydroxyapatite crystals within the tendon of longus colli. The primary presenting complaint is acute neck pain made worse by movement, however occipital pain, muscular spasms of the neck, odynophagia, dysphasia, and fever have also been described. The symptoms can be relatively nonspecific and thereby being able to recognise the imaging findings of RCT helps to elicit the cause of the patient’s neck pain, preventing further unnecessary investigations and procedures.

Imaging findings OR procedure details: We will present the plain film, CT and MRI findings of RCT from our 3 patients which include: prevertebral soft tissue swelling and oedema, amorphous calcification anterior to C1/C2 and the absence of an enhancing collection in the retropharyngeal space.

Conclusion: RCT of the longus colli muscle is a benign treatable condition with similar presenting complaints to the more serious diagnosis of a retropharyngeal abscess. Early recognition of this entity prevents incorrect treatment and unnecessary hospital admission as well as providing early relief to the patient with simple anti-inflammatory treatment.

Role of contrast-enhanced ultrasound in diagnosis of indeterminate hepatic lesions
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Learning objectives: This poster aims to describe our protocol for contrast-enhanced ultrasound of the liver, and to share our experience and findings of 20 cases over the last two years.

Background: In recent times, contrast-enhanced ultrasound is considered a useful tool in determination of suspicious hepatic lesion in a subgroup of patient who is unable to undergo a CT or MR examination due to patient’s poor renal function. It is also considered cost-effective when compared to alternative molecular imaging modalities such as MRI.

Imaging findings OR procedure details: We used Sonovue®, which is a Sulfurhexafluoride microbubble agent, in conjunction with a Toshiba Apio XG®. Images were obtained both as real-time cine loops as well as 4D-volumetric sets. All contrast-enhanced liver studies performed in the last two years were reviewed. Surgical and histological data were correlated where possible.

Conclusion: Contrast-enhanced ultrasound of the liver is a safe, cost-effective technique with exquisite temporal and spatial resolution. It is provides an alternative and cost-effective form of investigation for indeterminate hepatic lesions in patients with renal impairment and are at risk for hepatoma.
Compliance issues with the clinical decision making pathway for suspected pulmonary embolism at Sir Charles Gairdner Hospital (SCGH)
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Purpose: To examine Emergency Department (ED) compliance with the SCGH Pulmonary Embolism Pathway; and to investigate whether the use of this particular Pathway reduces inappropriate investigations.

Methods: An audit was performed of patients who underwent CTPAs for suspected PE from the SCGH ED in February 2008/2009. Parameters considered included compliance and D-dimer use. Investigations were termed ‘inappropriate’ if they were not sanctioned by the Pathway. A retrospective Wells score was produced using the patients’ clinical notes and inter-observer discrepancies calculated. Results were compared with similar data collected from Royal Perth Hospital (RPH).

Results: 32 patients underwent CTPAs from SCGH ED during the time period. 6/32 (19%) were reported with PEs with the remainder excluded. The SCGH Pathway was recorded in the patient notes in only 14/32 (44%) of cases but in only one of these cases was there an ‘inappropriate’ investigation. Of the cases without a Pathway recorded, 5/18 (28%) had ‘inappropriately’ performed D-dimers: all of these D-dimers were positive and the subsequent CTPAs negative for PE. In 5/32 cases a D-dimer was not performed as per the SCGH Pathway in a context where it would have been performed under the RPH Pathway: in only one of these cases was a PE identified on CTPA.

Conclusion: Despite a mandatory PE Pathway at SCGH, the majority of patients did not have a Pathway recorded. Even allowing for misplacement of the form, there was a high number of ‘inappropriate’ D-dimers: together, these results suggest poor compliance. Furthermore, the sanctioned non-performance of D-dimers in certain contexts appears questionable in light of other studies. In view of these significant preliminary results, further data collection is ongoing and will be updated by the time of presentation.

Accuracy of choline detection in the assessment of breast lesions using single Voxel proton H1 Mr Spectroscopy at 3.0 Tesla
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Background and purpose: The aim of our study is to assess the relationship of total choline-containing compounds (tCho) in breast lesions using in vivo 1H MR spectroscopy (MRS) at high field (3.0 Tesla) and to determine the accuracy of MRS for diagnosing malignant enhancing lesions.

Methodology: Total of 28 women between April 2009 and April 2010 were identified at conventional imaging and prospectively examined with dynamic contrast enhanced MRI and single voxel 1H MRS. Patients were subjected to study protocol using 3.0 Tesla GE MR HDX scanner. A choline metabolite peak at 3.2 ppm was defined as positive. 38 lesions were identified and analyzed using a dedicated workstation.

Results: 28 patients (ages : 28- 82 years) with total of thirty eight (38) enhancing lesions (size range 0.5 cm – 4.8 cm) with reference to histopathology were evaluated. There were 21 malignant (55%) and 17 benign (45%) lesions. Twenty two lesions (22/38) were positive for choline peak and 19 of these were histology proven malignant. Sixteen (16/38) showed negative choline peak with 2 turned out to be malignant. The diagnostic sensitivity and specificity were 90.4% and 82.4% respectively and positive predictive value of 82.6%. Significant correlation of MRS with histopathology was obtained with p value of 0.01 (p < 0.50).

Conclusion: This study showed sensitivity and specificity of 90.4% and 82.4% respectively for detection of malignancy with proton (1H) MRS at 3.0 Tesla. MR Spectroscopy is useful as an adjunct to standard MRI breast protocol to improve distinction between benign and malignant lesions.
Multiplanar 3-dimensional ultrasound the neonatal brain: A comparative study
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Introduction: Three-Dimensional (3D) ultrasound of the cranium in infants may be a beneficial supplementary method to evaluate the intracranial structures. This study was carried out to evaluate the utility of multiplanar 3D ultrasound in imaging the paediatric brain by comparing 3D-ultrasound and 2D-ultrasound in evaluating the intracranial structures in terms of image quality, time required for obtaining the data and detection of intracranial abnormalities particularly intracranial haemorrhage.

Methodology: A total of 123 clinically stable infants between the ages of 1 day to 250 days were examined with both 2D and 3D cranial ultrasound. The sagittal, coronal and axial images were obtained. The image quality of the 2D and 3D images was then compared. Interobserver and interoperator variability/dependency was examined. The duration of image acquisition and discrepancy between the findings were also appraised.

Results: There was no statistical difference in image quality between the images acquired by both techniques particularly in sagittal and coronal planes (P value of 0.74 and 0.86 respectively). Image quality in axial plane acquired on 3D ultrasound was significantly better than those acquired on 2D ultrasound (P value < 0.01). There were no significant interobserver and interoperator variability noted between both 2D and 3D ultrasound. 3D images were acquired approximately 6 minutes faster than 2D images (P value < 0.01). There were no statistical difference between the findings noted on both 2D and 3D ultrasound (P value = 0.44).

Conclusions: Multiplanar 3D ultrasound was found to be comparable to conventional 2D ultrasound. Furthermore, it has the advantage of axial plane, faster examination time, capability of repeated volume data assessment without the need to repeat the ultrasound examination and multiple options of volume data rendering.

Value of multidetector CT in the detection of a cause for fever in adults
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Objectives: To determine the value of 16 slice multidetector CT in detecting a cause for patients presenting with fever by correlation with clinical outcome.

Material and methods: We randomly selected 100 patients who were referred for a contrasted CT of the abdomen and pelvis or a CT of the thorax, abdomen and pelvis for evaluating a cause of fever. Fever was defined as temperature >38.3°C on more than 3 occasions. The CT was performed using a 16 slice multidetector CT. The images were evaluated using the GE Adv. Workstation AW 4.2_07. The CT findings were then correlated with the final clinical diagnosis established by the attending physician based on positive cultures, serology, histology, operative findings, internationally accepted criteria for certain diseases or clinical and imaging follow-up.

Results: Only 71 patients fulfilled the selection criteria, and from them, an abnormality was detected in 70 patients. In 45 patients, CT was able to identify an attributable cause for fever. Out of the 26 patients which did not have an attributable cause, 17 of these patients were diagnosed with other causes while 9 patients had no focal disease process despite extensive investigations and the fever resolved spontaneously with no further evidence of any inflammatory, infectious or malignancy process in clinical follow up of 6–12 months.

Conclusion: In patients presenting with fever, 16 slice multidetector CT revealed 72.6 % sensitivity and 100 % specificity in locating the cause of fever, and may play a significant diagnostic role when the cause or source is not apparent clinically.
3-D CT-Potential and pitfalls
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Learning objectives: Reporting MDCT images poses many diagnostic challenges. These at times can be resolved by the use of supplementary 3-D reconstructions.

Background: The greatest challenge of MDCT today is dealing with the sheer volume of data. Unlike the original single slice axial (CAT) scan, each MDCT examination now typically generates hundreds or even thousands of images which often cannot be adequately evaluated in the axial plane alone. The volume of high resolution data now available facilitates the use of multiplanar reformats and 3-D rendering techniques.

And although we radiologists are accustomed to cross sectional interpretation, clinicians have difficulty in ‘translating’ these images into a practical perspective. It is therefore only natural that 3-D volume rendering may offer better conceptualization in pre-operative and oncology therapy planning, as well in the evaluation of many other body systems and surfaces. A famous example was Tutankhamen’s CT scan in 2005 which helped re-create an accurate image of the dead king’s face thousands of years after his death. The technique, however, is not without its technical limitations and axial/MPR correlation is essential in many cases.

Imaging findings OR procedure details: We present examples where 3-D volume rendering provided complementary diagnostic information and others in which the findings were deceptive or misleading.

Conclusion: 3-D CT is an indispensable tool in modern medical imaging and provides valuable diagnostic information additional to that achieved from cross sectional imaging. The radiologist should, however, be aware of the limitations of the application and the risks of misinterpretation.

Combination of methyl cellulose and sorbitol as neutral oral contrast agent for CT: Comparison with Volumen
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Purpose: Our purpose was to assess the performance of a new combination for administration as neutral oral contrast for CT Enterography, performed for various clinical indications. We wanted to compare the performance of the combination of methyl cellulose and sorbitol in water to that of commercially available 0.1% barium suspension, Volumen.

Methods and materials: The study was conducted at two of our institution’s centers, Ar-Rayan and Olaya. Prospectively 60 patients were included in the study randomly divided into two groups. Group 1 received 1000–1500 ml of Volumen and group 2 was given an equal amount of methyl cellulose plus sorbitol combination. Contrast enhanced CT scan was performed on a Siemens 6 detector row CT and a 64 detector row CT by GE. Similar imaging and reconstruction protocols were used for both machines for standardization. Random, blinded evaluation of the studies was done by two of the four authors. Data for luminal distension in duodenum, jejunum and ileum were recorded along with assessment of mural details.

Results: Our results showed that the combination contrast gave better luminal distension and mural details than the commercially available Volumen. Moreover there was a significant cost difference between the two types of contrast.

Conclusion: MDCT enterography using a combination of methyl cellulose and sorbitol as neutral contrast agent gives better results than Volumen. The difference of cost is also significant and thus it is our recommendation that this combination should be routinely used for this purpose.

References
Imaging appendicitis: Diagnostic accuracy of pre-operative imaging and prevalence of negative appendicectomy in an Australian tertiary referral hospital
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Purpose: To assess the prevalence of negative appendicectomy and evaluate the diagnostic accuracy of pre-operative imaging in an Australian tertiary referral hospital.

Methods and materials: Patients undergoing appendicectomy at The Townsville Hospital in 2009 were included in the study. Negative appendicectomy was assessed by histopathology findings. In a subset with pre-operative abdominal computed tomography (CT) or ultrasound imaging we determined the agreement between histopathology and radiology reports.

Results: 268 patients were included in the study. 59 (22%) of the patients had pre-operative CT or ultrasound. Radiology reports were conclusive for 36 (61%) of these patients, with 27 (75%) positive and 9 (25%) negative for appendicitis. At appendicectomy there were 85% true positive and 44% true negative imaging studies. Of the 23 patients with inconclusive imaging studies 10 (43%) had appendicitis. 60 (29%) of the 209 patients who did not have pre-operative imaging had a negative appendicectomy.

Conclusion: We found a higher prevalence of negative appendicectomy and lower utilisation of diagnostic imaging at our institution than reported elsewhere.1 Appendicectomy outcomes may be improved by implementing a clinical scoring system to guide use of pre-operative imaging.2

References

Ultrasound guided corticosteroid injection of the subacromial bursa: A prospective study of short term therapeutic response
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Purpose: To determine the therapeutic response of subacromial bursal (SAB) injection of corticosteroid and local anaesthetic for the relief of subacromial bursitis and rotator cuff pathology.

Methods and materials: Prospective follow-up of patients after SAB injection in our radiology department took place between January 2007 and December 2008.

Using clean technique, a combination of betamethasone 5.7 mg/mL (Celestone Chronodose, Schering-Plough) and bupivacaine hydrochloride 0.5% (Marcain, AstraZeneca) was injected into the subacromial bursa via 25 gauge needle under ultrasound guidance. A telephone interview was conducted after 7 days using a standard pro-forma. Therapeutic response was assessed using 4 simple pain response categories; ‘full improvement’ (no pain), ‘partial improvement’, ‘no change’ or ‘worse’ after injection, as experienced at the time of follow-up. Adverse events data was recorded.

Results: 540 SAB injections were performed in 505 patients aged between 21 and 92 years (mean 60.6 years). 67 patients underwent repeat ipsilateral injection and 35 patients had bilateral injections during the study period. 88.7% of patients were referred from general practice.

4 patients could not be contacted. Telephone interviews were conducted after 536 injections (median 7 days, range 6–23 days). 23.5% cases reported ‘full improvement’ in shoulder pain, 62.3% ‘partial improvement’, 12.5% ‘no change’ and 1.7% ‘worse’ pain at the time of follow-up. No infections were recorded. Adverse events were; flushing (3.7%), initial pain flare (2.3%), bruising (1.3%), hyperglycaemia (1.3%) and vasovagal attack (0.6%). These had resolved by the time of review in all cases.

Conclusion: Musculoskeletal corticosteroid injections are common therapeutic procedures performed in radiology practice. Our short term follow-up study has demonstrated this intervention to be effective in providing pain relief in subacromial bursitis and rotator cuff pathology. It is a relatively safe and well tolerated procedure.
Persistent sciatic artery (PSA): An unusual but interesting and clinically pertinent vascular anomaly
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Learning objectives: PSA is an unusual vascular anomaly and because of its vulnerable position, it is associated with a high risk of aneurysm formation and its complications. The following case and a review of published articles are aimed at increasing the awareness of the existence of this condition, imaging findings and treatment options available.

Background: The sciatic artery is the primary arterial supply of the lower limb bud during early embryonic development, which typically regresses after the first trimester when the femoral arterial system assumes this role. Remnants persist as the peroneal, popliteal and inferior gluteal arteries, but in up to 0.05% of people the artery in its entirety may persist in either a complete (large calibre) or incomplete (narrow calibre) form. Patients could remain asymptomatic, or may present with consequences of aneurysm formation including: pulsating mass, buttock pain, acute or chronic lower limb ischemia.

Imaging findings: In our case who presented with left lower limb claudication, Magnetic Resonance Angiography (MRA) showed a large left-sided PSA, originating at the left internal iliac artery and passing out of the pelvis through the greater sciatic notch, with a small calibre left superficial femoral artery. Initial CT angiography (CTA) supplemented the MRA findings by excluding an aneurysm in the buttock and demonstrated thrombus within popliteal artery. But follow up CTAs, two and three years later, illustrated thrombosed aneurysm of proximal PSA.

Conclusion: PSA is a rare but clinically significant vascular anomaly for both vascular interventionists and surgeons. Failure to identify a PSA may lead to unnecessary bypass a low calibre superficial femoral artery. Although MRA is a safe and effective modality for investigating lower limb ischemic symptoms, but CTA is complementary and should be performed prior to invasive procedures. Treatment options depend on the type and symptoms and can be surgical or interventional.

Pyogenic ventriculitis: Magnetic resonance imaging (MRI) findings in two cases
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Learning objectives: This poster aimed to highlight the MRI findings of pyogenic ventriculitis that may appear relatively subtle on Computed Tomography (CT) scan.

Background: Pyogenic ventriculitis is an uncommon severe intracranial infection that most often occurs as a complication of a brain abscess ruptures into the ventricles but rarely may result from the extension of meningitis, or a neurosurgical procedure or device. Its symptoms and signs may be subtle and its course can be indolent but lethal. Although ventriculitis has been well described on CT scan and ultrasound but the MRI findings of just a few adult cases have been yet described. Moreover, MRI is superior to CT scan in demonstrating the key features of this disease. The following two cases and a review of published articles are aimed at increasing the awareness of the existence of this condition and the importance of MRI in illustrating the characteristic Hallmarks of pyogenic ventriculitis.

Imaging findings: In both cases, there were abnormal periventricular intensities on Fluid Attenuated Inversion Recovery (FLAIR) sequence and enhancement on contrast-enhanced T1-weighted MRI. Irregular Intraventricular debris which were demonstrated on both Diffusion-weighted Imaging (DWI) and FLAIR sequences, projected as hypointensities in the dependent portions of lateral ventricles on T2-weighted images. DWI sequences provided better lesion contrast than FLAIR.

Conclusion: Neuroimaging, especially MRI, is crucial in clearly depicting the pyogenic ventriculitis. Hence, it is important for radiologists to be aware of the specific MRI features of this life-threatening infective entity.
Middle mediastinal mass lesions: good, bad and ugly
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Learning objectives: To present the imaging findings of four pathologically different mediastinal mass lesions with similar appearance on chest X-ray (CXR) and discuss how to overcome their differential diagnostic dilemma.

Background: Primary mediastinal masses are a diverse group of lesions which present a diagnostic challenge to radiologists. A thorough understanding of mediastinal anatomy is essential for evaluation of a mediastinal mass, since specific lesions have a predilection for certain sites. Many mediastinal masses are serendipitously discovered on chest radiographs obtained for other reasons, but some patients will come to clinical attention with vague chest complaints or with signs and symptoms related to compression or invasion of mediastinal structures.

Imaging findings: We are presenting four patients who showed a similar finding of a well-defined right paratracheal mass lesion on their CXRs but after further investigations with cross-sectional imaging and biopsy, different diagnoses of Bronchogenic Cyst (Good), Mediastinal nodal angiomatosis (Good), Benign Schwannoma (Bad) and Thrombosed Superior Vena Cava (Ugly) were established. Unique imaging clues of these cases were:

• Punctate calcifications in Schwannoma,
• Fluid density of bronchogenic cyst,
• Heterogeneous enhancing lesion with stable size and density on serial CTs and high intensity on T₂ weighted sequences with early and prolonged diffuse inhomogeneous enhancement on dynamic Magnetic resonance images (MRI) of Nodal Angiomatosis
• Continuity of thrombosed Superior Vena Cava (SVC) with SVC.

Conclusion: Although a routine CXR often initiates the evaluation of mediastinal disorders, it is rarely diagnostic. The most conclusive ensuing cross sectional imaging is spiral CT, providing important information about anatomic location, extent of disease, tissue invasion and tissue density. MRI is superior to Spiral CT for imaging nerve plexus, for distinguishing tissue planes and invasion, and imaging in non transaxial planes. However, occasionally tissue biopsy is required for definite diagnosis, as depicted in the examples shown.

Pitfall: Pulmonary Cryptococcal infection presenting as a solitary pulmonary nodule with Significant [¹⁸F] Fluoro-2-Deoxy- D-Glucose (FDG-PET) uptake can mimic primary lung cancer
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Purpose: To highlight the imaging characteristics of pulmonary cryptococcosis, manifested as a solitary pulmonary nodule, using chest computed tomography (CT) and positron emission tomography with [¹⁸F] fluoro-2-deoxy- D-glucose (FDG PET).

Methods and materials: Six cases of pathologically proven pulmonary cryptococcus infection are described, each of them presenting as solitary pulmonary nodule. We retrospectively analyzed CT features and FDG-PET characteristics.

Results: The patients were four males and two females, with the age ranging from 41 to 65 years. In all cases, chest CT showed a solitary pulmonary nodule on initial presentation. Convergence of peripheral vessels, pleural indentation and spiculation were demonstrated in four, three and two cases, respectively. Cavitation was observed in one lesion. FDG-PET was performed in four cases, and showed significant FDG uptake in all of them. Chest CT findings and accumulation of FDG made it difficult to distinguish pulmonary infection from malignancy. All patients had CT guided lung biopsy for final diagnosis.

Conclusion: Pulmonary cryptococcosis can present as a solitary pulmonary nodule with chest CT and FDG PET findings similar to primary pulmonary malignancy. Assessment of exposure history is crucial and lung biopsy for final diagnosis and subsequent adequate treatment are mandatory.
Axillary lymph node ultrasound (U/S) and fine needle aspiration (FNA) biopsy: What are their values in breast cancer management planning?
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Purpose: To evaluate the combined-value of Axillary Lymph Node (ALN) ultrasonography and FNA in anticipating ALN metastasis (ALNM) in breast cancer patients at breast screen level with the aim of avoiding unnecessary Sentinel Lymph Node Biopsy (SLNB) before Axillary Lymph Node Dissection (ALND).

Methods and materials: 174 patients with histopathologically-proven breast carcinoma for whom breast surgery with SLNB or ALND was recommended, were enrolled into the study from January 2008 to Jun 2009, prospectively. Preoperative U/S assessments of the primary tumour and axilla were performed. Sonographic features like visualization of lymph nodes, short and long axis sizes, shape, cortical thickness, echogenicity, hilum change, contour irregularity, surrounding abnormalities and Doppler of peripheral vessels were evaluated. If abnormal ALN were identified, most of these were evaluated with FNA.

Results: Thirty eight patients (21.83%) had ALNM. Abnormal U/S findings were observed in 40 individuals from whom just fifteen (8.6%) were true positives for ALNM. While, the overall sensitivity, specificity, positive predictive value (PPV) and negative predictive value of ALN U/S in anticipating ALNM were 39.5%, 81.6%, 37.5% and 82.8%, respectively, ALN FNA showed specificity and PPV of 100% with diagnostic rate of 89.6%. Marked hypo- or anechogenicity was by far the strongest predictor of ALNM (odd ratio: 10.11, \(P = 0.002\)). Tumour size >15 millimetres (mm) was the second strongest variable in our study (odd ratio: 4.37, \(P < 0.001\)). Of 56 patients with breast tumour size >15 mm and ALN visualized on U/S, 24 (42.85%) individuals had ALNM (\(P < 0.001\)).

Conclusion: Ultrasound-guided-FNA of suspicious ALN is a highly accurate and specific test which can bypass the unnecessary SLNB before ALND.

Role of compound real time sonography in evaluation of meniscal injuries
M Sandhu

Purpose: This study was designed to assess the utility of Real Time Spatial compound sonography (CS) in diagnosis of meniscal injuries of the knee.

Methods and materials: 24 patients presenting with a history of meniscal injury participated in this study. All patients underwent conventional sonography (CNS) and CS examination followed by MRI. Only unilateral injuries were included, contra lateral knee was used as a control.

Results: CS was significantly superior with respect to the clarity of tissue plane definition, excellent contrast resolution, reduction of artifacts like speckle and refractive shadows resulting in reduced posterior shadowing from the bones. Overall, the sensitivity, specificity and accuracy was 80%, 89.3%, 85.4% for CNS, and 90%, 85.7% and 87.5% for CS respectively. Negative predictive values were 86.2% for CNS and 92.3% for CS.

Conclusions: We feel that CS should be routinely used for evaluation of meniscal injuries as it has better sensitivity, making it an attractive screening tool. It has the potential to become a gatekeeper to MR, especially when the clinical suspicion of a meniscal tear is not very high. Unnecessary MRI examination can safely be avoided with 90% accuracy when the clinical suspicion is not very high and when USG is normal. Although it cannot replace MRI, CS is an excellent low cost alternative when MR is not available or when waiting period for MRI can cause unnecessary delay in management.
Feasability of CCK stimulated magnetic resonance cholangiography for the evaluation of gall bladder emptying
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Objective: To determine if magnetic resonance cholangiography (MRC), before and after cholecystokinin (CCK) administration, is feasible for the evaluation of gall bladder dysfunction.

Method and materials: After approval of Institutional Review Board a prospectively designed study included 12 adult subjects with abdominal pain (8 women, 4 men), all had pre and post CCK stimulated MRC. Imaging MRC sequences included thin slice T2W oblique coronal and axial, thick slab MRC and T2W respiratory triggered PACE SPACE sequences. This sequence was used to measure gall bladder volume using the volume analysis function on the Leonardo workstation (Siemens, Erlangen, Germany). MRC images were analyzed pre and post CCK administration and volume of the gallbladder calculated. After obtaining axial and coronal half Fourier single shot turbo spin echo images (HASTE) of the gall bladder, CCK was administered intravenously over a 20 minute period. During the 20 minute administration period conventional sequences were obtained and HASTE was thereafter repeated.

Results: All CCK stimulated MRC studies were technically successful. All subject tolerated CCK administration well, no immediate side effects were noted. In 8 subjects correlation was made with CCK stimulated HIDA scans. The average gall bladder ejection fraction by MR was 65% (SD 15) and by HIDA 56% (SD 20). Despite performing a MR calibration in 6 scans there was disagreement in the values of GBEF between the modalities.

Conclusion: CCK stimulated MRC is a technical feasible addition to MRC imaging which can provide a functional evaluation of the gall bladder. This could be a useful additional component to the MR work-up of non-acute abdominal pain, without need for additional imaging, incurring ionizing radiation and cost.

The usefulness of diffusion-weighted imaging in characterization of liver lesions in cirrhotic patients
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Objective: To evaluate if ADC measurements from diffusion-weighted imaging (DWI) and subjective evaluation of signal intensity of lesions on DWI evaluate help to differentiate benign and malignant liver lesions in patients with cirrhosis.

Methods: Retrospective review of radiology database from October 2006 to February 2009 revealed 37 patients, with biopsy-proven cirrhosis, who had pathological grading of hepatocellular cancer (HCC). Another 20 cirrhotic patients had hypovascular nodules that remained stable for at least 12 months. These were deemed to be regenerating nodules (RN). Hemangiomas were seen in nine cirrhotic patients. The number of HCC, RN, and hemangioma lesions (>1 cm in size) evaluated using DWI were 60, 56 and 12, respectively. Of the HCC lesions, 22 were well-differentiated (WD HCC), 27 were moderately-differentiated (MD HCC) and 11 were poorly-differentiated (PD HCC). DWI was performed using single shot EPI with b values of 50, 400 and 800 s/mm² in a 1.5 T MR scanner (Mangetom Avanto, Siemens, Erlangen, Germany). ADC values below are given in 10⁻³ mm²/s.

Results: HCC patients were more likely to be males (p = 0.05) and had a higher age compared to those with benign disease (mean age 56.8 vs. 51.6 years, p = 0.03). There was a significant difference in ADC between RN and HCC (median ADC 1.03 vs. 0.96, p = 0.03, Mann Whitney test). The median ADC of WD HCC, MD HCC and PD HCC were 1.13, 0.87, 0.78, respectively (p < 0.0001, Kruskal-Wallis test). On ROC analysis, an ADC of less than 1.20 had a sensitivity and specificity of 91.7% and 33.9% of diagnosing HCC. On visual analysis all HCC were hyper- or isointense (n = 47 or 13) to surrounding liver while all RN were iso- or hypointense (n = 49 or 7). No HCC was hypointense to liver and no RN was hyperintense. The mean (SD) ADC of hemangioma was 1.77 (0.20).

Conclusions: There is a significant difference in ADC values between RN and HCC. While ADC measurements are sensitive for detecting HCC, there is a wide range of ADC values for RN which reduces its specificity in differentiating benign and malignant lesions. On subjective analysis of DWI, HCC show are predominantly hyperintense, probably as a result of T2 hyperintensity and reduced diffusion. ADC values of higher histological grades of HCC are significantly lower than that of WD HCC. Hemangiomas in cirrhotic patients have lower ADC values than would be expected in non-cirrhotic patients.
Ultrasound evaluation of traumatic peripheral nerve injuries
A Sciuk, A Hollister and A Simoncini

Purpose: The accurate diagnosis and localization of peripheral nerve injury associated with traumatic injuries remains difficult. About eighty percent of nerve lesions associated with blunt trauma, fractures and gunshot wounds recover without surgical intervention and current treatment is to follow all of these nerve injuries, with surgical exploration of those which do not recover after 3 months. Unfortunately, nerves which have been transected recover best if the repair is done acutely. Diagnosis of nerve injury in open injuries can be difficult if the patient is a child, obtunded, there are multiple injuries or if local anaesthetic has been used. Common imaging modalities such as CT scans and MRI do not visualise the peripheral nerves well because of their small size and wandering non-planar paths in the extremities. Electrical studies including electromyography and nerve conduction studies are neither sensitive nor specific in this setting. Ultrasound with the newer high frequency probes is particularly useful for visualizing peripheral nerves because of their unique signal characteristics. In addition, ultrasound is readily available, noninvasive, quick and relatively inexpensive. This modality has been used to assess peripheral nerve lesions in brachial plexus palsy and following nerve repair.

Methods and materials: We have used ultrasound to evaluate the peripheral nerves in trauma in twenty eight nerves in nineteen trauma patients over a six month period. Six patients had gunshot wounds, four had lacerations, eight had blunt trauma, and one had severe burns. The patients were fifteen male and four female and ages ranged from four to seventy five years. Ten median, six ulnar, eight radial, two peroneal, one tibial, and one thumb digital nerve were evaluated. Two studies were done on the day of injury, five within 2 weeks of injury, eight within 6 months of injury.

Results: We were able to visualize the involved nerves in eighteen patients. One patient had a gunshot wound to the leg with compartment syndrome and fasciotomy. Neither immediate initial study nor follow-up examination three days post injury could visualize the tibial nerve because of bullet fragments and marked soft tissue swelling. This patient was lost to follow up. In one other patient, the tibial nerve could not be visualized four days post injury but was seen sonographically to be in continuity two months post injury.

Six patients had ultrasound evidence of nerve transaction. Five of them were explored surgically where nerve transaction was found and repaired. After the surgery three of them had slow return of the nerve function, one of them had no return and one of them had advancing Tinel sign. The sixth patient was lost to follow-up.

Twelve patients had ultrasound confirmed nerve continuity. Four of them were however explored surgically and the nerves were found to be intact. Six of them have not had surgery and spontaneous nerve function return was observed on follow-up clinical examination. One of the patients had advancing Tinel sign and in one of them the initial study was originally limited but repeated examination proved continuity of the nerve. This was further confirmed surgically, however, there was no nerve function return.

Conclusion: Ultrasound evaluation is a promising imaging modality for early localization and categorization of peripheral nerve injury. In the conclusive ultrasound examinations all but one study were able to accurately assess the morphology of the nerves. The accuracy of the sonographic diagnosis was later confirmed by either surgical exploration or spontaneous return of the nerve function. In the cases, where the contiguity of the nerves were confirmed sonographically and surgically this approach effectively reduced the time between the injury and surgical exploration, depicting precisely the side and character of the nerve injury.

Clinical relevance/application: Early ultrasound diagnosis of peripheral nerve injury can have a significant impact on the management algorithm. Earlier surgical repair of transected nerves may become possible with ultrasound studies. Better appreciation of the type and extent of nerve injury in closed trauma or gunshot wounds is also available by using this modality. Further prospective studies are needed to fully evaluate high frequency ultrasound and its effect on diagnosis and intervention in peripheral nerve injury.
Intradural haemorrhage of the spinal canal
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Learning objectives: To illustrate examples of common causes of intradural haematoma in the spinal canal.

Background: Subarachnoid haemorrhage of the spinal canal is rare accounting for less than 1% of SAH. Spinal subdural haemorrhage is also uncommon, occurring four times less frequently than extradural haematoma in the spine. The most common causes are trauma, vascular malformations and bleeding diatheses.

Imaging findings: Imaging findings vary with the location of haemorrhage. We present a series of cases illustrating the spectrum of intradural haemorrhage into the canal. Cases include traumatic haemorrhage with nerve root avulsion, bleeding diathesis with spontaneous haemorrhage and spontaneous haemorrhage from intramedullary lesion. Intradural haematoma is primarily an MR diagnosis, however, we also present an example of when initial detection is possible on CT examination.

Conclusion: We present a series of cases illustrating the spectrum of appearances and some of the more common causes of intradural haemorrhage into the canal.

Nipple discharge: Imaging findings with pathological correlation
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Learning objectives: To illustrate imaging findings and correlating pathological diagnoses in patients presenting with nipple discharge.

Background: BreastScreen Australia provides free mammographic screening for asymptomatic women over the age of 40, targeting women aged 50–69. Occasionally women will present to screening programs with a history of nipple discharge, which is uncommonly associated with significant underlying breast disease.

Procedure details: 76 women with nipple discharge were recalled for assessment from 2004–2008 at BreastScreen WA, of whom 72 were recalled primarily for their symptoms. 36 patients had pathological investigations, including 18 patients with nipple discharge cytology, 16 with fine needle aspiration cytology, 11 with core biopsies and 8 with surgical biopsies or resections. Of these, there were 10 patients with pathologically proven intraduct papillomas, 1 patient with multiple peripheral papillomatosis, 1 patient with invasive ductal carcinoma and ductal carcinoma in situ, and several with imaging findings consistent with benign mammary duct ectasia.

Conclusion: We confirm that the presentation of nipple discharge in a screening program is uncommonly associated with significant breast disease, and present representative cases of the radiological findings with pathological correlation, of benign and malignant causes including benign mammary duct ectasia, solitary intraductal papillomas, multiple peripheral papillomatosis and ductal carcinoma in situ.
Avascular necrosis of the femoral head: Review of pathophysiology, radiographic findings, classification, and clinical management
F Shay, L Danaher and A Coulthard
Royal Brisbane and Women’s Hospitals, Brisbane, QLD, Australia

Learning objectives
• Brief review of vascular anatomy of femoral head
• Review pathogenesis and risk factors of avascular necrosis (AVN) of the femoral head
• Evaluation of natural history and aetiology
• Differential diagnoses and differences on radiological findings
• Characteristic imaging features and methods of classification will be emphasised
• Review of treatment options based on classification, radiological and clinical findings

Background: The femoral head is one of the most susceptible areas to AVN, due to its vascular anatomy. AVN causes significant disability to this typically young, active patient population. Femoral head AVN is a common cause of primary and revision total hip replacement (THR) due to patient age and often presents bilaterally. Although patients are normally asymptomatic, a high index of suspicion is necessary for at-risk patients. Early radiographic recognition and diagnosis are important for optimal early management to prevent and delay progression as well as improving the long term quality of life of the patient.

Procedure details: A broad overview and key concepts of avascular necrosis of the femoral head will be exhibited.

Conclusion: Early radiographic identification and monitoring of avascular necrosis of the femoral head as it progresses is important in achieving a better long term management and quality of life for a younger patient population.

Demystifying biostatistics: Concepts, relevance, and review of biostatistics for radiologists with research scenarios and illustrations
F Shay, A Coulthard and L Danaher
Royal Brisbane and Women’s Hospitals, Brisbane, QLD, Australia

Learning objectives
• Understand statistical terms and review examples of applications
• Learn how to determine which statistical analysis method is appropriate
• Review research scenarios with critical reasoning of variables, statistical methodology, and analysis
• Find out how and where to find help with statistical analysis
• Review the most commonly used statistics packages

Background: Biostatistics is the use of statistics to analyse biological and medical data. In practice, biostatistics identifies trends in a statistically significant sample of data while estimating significance and salience of published research. Biostatistics is an essential component of all aspects of research from conception of a project to presentation of a published article. Biostatistics should determine the structure of a study, the method of data collection, and the most appropriate statistical methodology for data analysis. An understanding of biostatistics should lead to more favourable peer review of submitted grant applications and manuscripts. Understanding biostatistics assists critical appraisal of radiological literature.

Procedure details: Principles of biostatistics will be reviewed. A guideline for statistical methods will be outlined for variables, methods and analysis, with case-based scenarios used to highlight teaching points and improve understanding. High yield strategies and references for biostatistics analysis will be incorporated throughout the exhibit. A self-assessment quiz will be included to reinforce teaching points.

Conclusion: Understanding basic biostatistics is fundamental to performing and interpreting radiological research.
Developing a radiology research department
F Shay, A Coulthard and L Danaher
Royal Brisbane and Women’s Hospitals, Brisbane, QLD, Australia

Learning objectives
- Review the development of a radiology research department
- Define the roles and expectations of within a radiology research department
- Review benefits of developing departmental research, education, facilitation, and collaboration with multidisciplinary teams
- Identify research blocks and strategies to overcome reluctance to participate in research
- Review promotion, funding, and challenges of a research department

Background: Research has been traditionally under represented in radiology departments because of service load, time constraints, and lack of suitable supervision and mentoring. An increase in junior medical officer numbers coupled with increasing interest as radiology as a specialty has led to prior research experience being perceived as a discriminator for appointment to radiology programs. A need to facilitate and channel research interests into outcomes, led our institution to create a radiology research department.

Procedure details: This exhibit outlines the roles required for an optimal research team structure to meet the needs to gain funding, coordinate and facilitate research and collaborate with other disciplines. Methods for developing research capacity, recognising research blocks and countering limitations are reviewed and strategies for achieving improved research outcomes discussed.

Conclusion: Consideration of the multiple factors needed to develop a research department should lead to successful research outcomes and improved research profile.

Going digital: Creating a digital film library of teaching cases
F Shay, A Coulthard and L Danaher
Royal Brisbane and Women’s Hospitals, Brisbane, QLD, Australia

Purpose: Digital imaging has revolutionised the way medical images are used, distributed, and archived. However, many radiology departments have large ‘legacy’ film teaching libraries, representing many years of collection. These libraries are susceptible to film degradation. The library may become disorganised and key cases may be ‘borrowed’ and lost. Digitising a legacy film library preserves rare cases and can maximise user accessibility.

Methods/Materials: A PACS based digital film library was created using a 17 × 14 automated film digitiser that:
- Preserves the existing film library
- Integrates digital cases
- Protects patient confidentiality
- Adopts a digital film library format that promotes self-directed learning and self-assessment.
- A modified ACR coding system was used to organise the library. PACS coding, clinical history, pathology and film interpretation were included
- An automated process was developed to merge case data into a usable format.
- A clear protocol was produced for the digitisation process

Results: Cases were selected according to image quality, radiological interest, common teaching lessons, and red flag cases. The cases were reported to a set format and entered into the database. This information was merged with a ‘report template’ and presented in a clinical scenario and radiographic findings format. Formatted cases were then uploaded to the PACS server. A PACS code for retrieving cases was produced automatically from a modified ACR code. An online survey was developed before launch to determine user preferences and feedback. A post launch survey has been written to evaluate the digitised format.

Conclusion: The PACS-linked digital library solution described is robust and sustainable system, allowing new digital cases to be added prospectively whilst simultaneously preserving and rejuvenating the legacy film library.
Acute traumatic aortic injury: The essentials
E Smith and S Constantine
Queen Elizabeth Hospital, Woodville, Australia

Learning objectives: To review the pathogenesis and key imaging features of acute traumatic aortic injury (ATAI) following blunt trauma.

Background: Traumatic aortic injury was originally described by Vesalius in 1557 however Parmley was the first to evaluate the role of rapid deceleration in the pathogenesis of thoracic aortic injury. ATAI most frequently results from high speed motor vehicle accidents or with rapid deceleration forces. The thoracic aorta is most often injured with a predilection for the isthmus. The exact pathogenesis remains unknown however a variety of proposed mechanisms exist. There is limited consensus in the literature on the optimal classification of these often fatal injuries.

ATAI is immediately fatal in an estimated 75–85%. With improvements in imaging quality and treatment options there is now a promising outcome for those reaching hospital alive. It is therefore essential for the Radiologist to be aware of imaging findings to enable prompt and accurate diagnosis.

Imaging findings: Traditionally a multi-modality imaging approach was used to diagnose ATAI with a strong reliance on conventional angiography. Chest radiography is still used as a screening tool primarily for assessment of mediastinal haematoma and for exclusion of other life threatening pathologies.

Computed Tomography (CT) is now the imaging method of choice with sensitivity approaching 100%. Findings reflective of ATAI on CT can be classified as either direct or indirect. It is often the indirect findings which can create confusion with imaging limitations and anatomical variation potentially confounding this diagnostic difficulty.

Conclusion: ATAI is life-threatening. Clinical signs and symptoms are often unreliable and therefore a high level of suspicion is required. CXR represents a good preliminary screening tool however CT is the imaging modality of choice. The Radiologist must be familiar with the direct and indirect signs of aortic injury and also factors which may lead to diagnostic difficulty.

Percutaneous radiofrequency ablation (RFA) for NSCLC and lung metastases: Indications and limitations
K Steinke
Royal Brisbane and Women’s Hospital, Brisbane, QLD, Australia

Percutaneous RFA of lung lesions is a meanwhile established minimally invasive therapy, both for primary lung tumours (NSCLC) and for metastases.

Bronchial carcinoma is the leading cause of death from malignant disease worldwide, both in men and in women, outnumbering cancer deaths of colorectal, breast, prostate and ovarian cancer combined. 80% are NSCLC and only 20% of the tumours qualify for a surgical approach with curative intent. A substantial proportion of the resectable patients are not amenable to surgery because of co-morbidities. External beam radiation and chemotherapy are of modest and often only short lasting success with local recurrence and overall poor survival rates.

Lung metastases frequently occur in the course of malignant disease and are often the only site of disease progression despite local control of the primary tumour. Site, number and size of the metastases are often the limiting factor for surgery of a sometimes potentially still curative disease.

From our experience with the ablation of well over 100 patients so far we can state that percutaneous CT-guided lung RFA is a safe intervention with negligible mortality, modest morbidity, feasible on an outpatient-base or with an overnight stay with good short and mid-term results.

Lung metastases especially from colorectal cancer (CRC), but also from renal cell carcinoma (RCC), head and neck cancer, sarcoma and thyroid carcinoma qualify for this procedure.

Up to 5 metastases per hemithorax and tumour diameters ideally smaller than 3.5 cm are well suitable for this procedure. Overlapping ablations can be performed.

Palliative ablations for pain control of circumscribed chest wall tumours or lung tumours invading into the chest wall are a well recognised indication.

Pneumothorax and pulmonary parenchymal haemorrhage are the most frequent complications.

By means of representative examples indications, limitations and complications of this minimally invasive therapeutic option are discussed and clarified.
Percutaneous CT-guided radiofrequency ablation (RFA) of lung lesions: Lessons learned
K Steinke
Royal Brisbane and Women’s Hospital, Brisbane, QLD, Australia

Purpose: Percutaneous CT-guided RFA ablation of lung lesions is a minimally invasive therapy both for primary and for metastatic lung disease. We assessed type and frequency of peri- and post-procedural problems and complications with lung RFA.

Material and methods: We have performed percutaneous lung RFA on over 100 patients using two different electrode types and have evaluated them regarding problems and complications during and after the procedure and mid- to long term follow-up. Number of lesions was restricted to five per hemithorax, lesion size to 3.5 cm in longest diameter.

Results: Technical problems occurred in <5% and consisted in hard tumours bouncing off the electrode tip, desiccated tissue that adheres to the electrode tines preventing the easy withdrawal of the electrodes into the shaft and failure to reach target temperature. Lesions abutting the heart or major vessels also constitute a technical challenge, because of potential mechanical injury of these structures with electrode positioning, but mainly because of oftentimes incomplete ablation and subsequent local recurrences due to cooling effects of the circulating blood.

Pneumothorax and intraparenchymal haemorrhage are the main intra-procedural clinical complications. Our pneumothorax rate was 28% and 1/5 of these patients required a chest tube. Our major intraparenchymal haemorrhage rate was 5%. Symptomatic effusions requiring pleurocentesis occur in less than 5% of the procedures and are often hemorrhagic. Cavitation occurred in 20% of the lesions treated.

Post-procedural pleuritic pain is encountered in >90% of ablations, typically treated with non-steroid analgesics. A slightly raised body temperature (<39°C) is observed in many patients for one week post ablation.

Conclusion: Percutaneous CT-guided lung RFA is, despite a range of minor complications, a safe minimally invasive procedure for the treatment of lung malignancy. By means of representative examples we present the restrictions to and complications of lung RFA and discuss their management.

Schistosomiasis: Quantifying liver complications using WHO criteria
R Strahan
Southern Health, Clayton, Australia

Learning objectives
1 To review the epidemiology, pathophysiology and life cycle of Schistosomiasis mansoni.
2 To illustrate the liver changes as demonstrated by ultrasound, based on the published World Health Organization (WHO) criteria.

Background: Schistosomiasis is a human disease syndrome caused by infection from one of several species of parasitic trematodes of the genus Schistosoma. According to the WHO, schistosomiasis affects more than 270 million individuals distributed in 76 countries in Africa, Asia and America. Among these, 10% present the severe form of the disease and 50–60% of infected individuals (>100,000) present clinical manifestations of the disease. 85% of affected individuals are in Africa. In Sub-Saharan Africa, more than 200,000 deaths per year are due to schistosomiasis but less than 10% of people requiring treatment are reached. Thus constituting a huge public health problem for third world countries involved. It should also be noted, with increasing migration/ refugees to Australia, especially from Africa, patients present to our health services with clinical manifestations, likely not having been treated. Treatment of early disease can reverse the changes. To aid research into schistosomiasis, a ‘practical guide to the standardized use of ultrasonography for the assessment of Schistosomiasis-related Morbidity’ has been published by WHO in 2000.

Imaging findings: The degree of liver involvement is based on 3 categories and for S. mansoni, three scores should be reported: an Image Pattern (IP) score reflecting abnormalities in liver texture; a Periportal Thickening (PT) score, and finally a Portal Hypertension (PH) score for signs of increase in portal pressure. The PT and PH scores depend on height adjusted measurements. Images and explanations of all these scores will be given.

Conclusion: Schistosomiasis infection has a high prevalence worldwide. More patients are presenting outside the endemic areas so we need to be aware of the image patterns of severity.
Anomalous pulmonary venous return and pulmonary hypertension
W Sung and V Au
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Anomalous pulmonary venous connection is an uncommon congenital malformation, and may be partial or total. Partial anomalous pulmonary venous drainage (PAPVD) is more common than total anomalous pulmonary venous drainage (TAPVD), and is often associated with other congenital cardiac anomalies. Whilst many patients with PAPVD remain asymptomatic, some may present in later age with symptoms related to left-to-right shunt, right heart failure and pulmonary hypertension. We report two cases of women, who presented with shortness of breath and were found to have pulmonary hypertension. Incidental finding of anomalous pulmonary venous connection was made on CTPA studies as a work up for the possible causes of pulmonary hypertension. The cases demonstrate, although uncommon, anomalous pulmonary venous connection should be considered as a differential diagnosis of idiopathic pulmonary hypertension and the importance of locating the pulmonary veins in patients with idiopathic pulmonary hypertension.

Multidetector CT/CTA assessment of acute pancreatic graft dysfunction: Non-Invasive differentiation of aetiology
Z Tan and K Lau
Southern Health, Clayton, Australia

Learning objectives:
- To review the anatomy of simultaneous pancreatic-kidney transplantation
- To discuss the causes of acute pancreatic graft dysfunction and CT/CTA differentiation between aetiologies
- To discuss the advantages of CT/CTA, particularly its utilisation in the setting of potential renal impairment

Background: Simultaneous pancreatic-kidney transplants are the treatment of choice for patients with type 1 diabetes mellitus and chronic renal failure, as it enables normal glucose metabolism, stabilization of diabetes-related vascular complications, and improved long-term renal graft survival. Early pancreatic graft failure is an important and not uncommon post-operative complication. Its main causes are pancreatitis, rejection and pancreatic artery thrombosis, and given marked differences in management, graft loss can occur without timely, appropriate intervention.

Imaging findings: CT/CTA findings of different aetiologies in acute pancreatic graft dysfunction:
- Vascular thrombosis: abrupt cut-off of transplant pancreatic artery, hyperdense thrombus, non-enhancing pancreatic graft
- Transplant pancreatitis: irregular, beaded pancreatic vessels, normal renal vessels
- Rejection: simultaneous changes of pancreatic and renal arteries (irregularity, beading)

CT can also assess for other post-operative complications. It is non-invasive and in the setting of potential renal impairment, contrast administration may be minimised given recent advances in temporal and spatial resolution.

Conclusion: Distinguishing between the causes of acute pancreatic graft dysfunction is necessary to determine timely, appropriate management and thereby potentially minimising graft loss. CT/CTA enables non-invasive, accurate differentiation between the causes of acute pancreatic graft dysfunction as well as assessment of other post-operative complications. Advances in CT temporal and spatial resolution enable minimisation of intravenous contrast administered and hence contrast-induced nephropathy.
Gallbladder cancer imaging: Pearls and pitfalls
CH Tan, C Peters, K Lim and A Kow
Tan Tock Seng Hospital, Singapore

Learning objectives: To know the local staging of gallbladder (GB) cancer, its typical and atypical imaging features as well as common imaging pitfalls.

Background: The diagnosis of GB cancer carries poor prognosis. Timely radiologic diagnosis allows for curative treatment. Accurate imaging assessment provides the surgeon with important information with regards to tumour respectability and appropriate presurgical planning.

Imaging findings OR procedure details: We illustrate the various stages of GB cancer through the use of multiplanar reconstructed CT images. The typical features of this disease on the various cross-sectional imaging modalities are also highlighted. Atypical features and potential pitfalls in diagnosis, including false positive benign and inflammatory conditions, are discussed.

Conclusion: Early diagnosis of GB cancer can be challenging but potentially lifesaving. Imaging assessment of extent in advanced disease is important to determine resectability in the appropriate cases. Familiarity with the imaging characteristics can therefore impact significantly on treatment.

Contrast-enhanced ultrasound of the kidney – Pearls and pitfalls
G Tan, G Wansaicheong and A Prakash
Tan Tock Seng Hospital, Singapore

Learning objectives: This poster aims to describe our protocol for contrast-enhanced ultrasound of the kidney, and to share our experience and findings of 50 cases over the last one-and-a-half years.

Background: Contrast-enhanced ultrasound has entered the imaging mainstream only in the last few years. It is a safe technique with exquisite temporal and spatial resolution, and cost-effective when compared to alternative molecular imaging modalities such as MRI.

Imaging findings OR procedure details: We used Sonovue®, which is a Sulfurhexafluoride microbubble agent, in conjunction with a Toshiba Aplio XG®. Images were obtained both as real-time cine loops as well as 4D-volumetric sets. All contrast-enhanced renal studies performed in the last one-and-a-half years were reviewed, and correlated with surgical and histological data where available. We encountered a range of lesions from simple cysts to renal cell malignancy, and describe the typical features of each of these conditions, as well as common pitfalls encountered.

Conclusion: Contrast-enhanced ultrasound of the kidney is a safe, cost-effective technique with exquisite temporal and spatial resolution. We describe our workflow and scan protocol, and demonstrate salient features of common benign and malignant conditions.
Transarterial embolization of systemic arteries for the treatment of various thoracic hypervascular lesions: Angiographic findings and treatment strategies
S Tanoue, H Kiyosue, Y Sagara, N Hongo, S Matsumoto and H Mori
Department of Radiology, Oita University Faculty of Medicine, Oita, Japan

Purpose: Systemic arteries in thoracic area supply bronchial wall, mediastinal organs, thoracic vertebra and spine, ribs, soft tissues, a spinal nervous system. Although various pathologies can be treated by transarterial embolotherapy, there are potential risks of serious complications such as spinal cord ischemia and migration of embolic material. The purpose of this study is to evaluate angiographic findings, safety and efficacy of transarterial embolization of systemic artery for the treatment of various thoracic lesions.

Methods and materials: Between 2000 and 2009, thirty-one patients with thoracic hypervascular lesions underwent transarterial embolization. The lesions included intercostal artery pseudoaneurysm in 5, intercostal-pulmonary vessel shunt in 4, paravertebral arteriovenous fistula in 1, bronchial artery abnormalities in 15, and metastatic bone tumors in 6 patients. Embolic materials were microcoil, particles, and n-butyl cyanoacrylate.

Results: The vascular abnormalities were clearly demonstrated on selective angiography. Selective angiography of the targeted arteries showed a radiculomedullary artery supplying spinal cord in three, and pulmonary venous drainage in one case. These anastomoses had potential risks of neurologic complications. The cases showing spinal arteries were treated by superselective embolization of feeding arteries. The case with pulmonary venous drainage was treated with large size of polyvinyl alcohol particle and gelatine sponge to avoid migration of embolic material into systemic arteries. Angiographical success was obtained in all except one case. The one case could not be treated by transarterial embolization due to long, tortuous and abundant collateral vessels. The hemostatic effects were obtained in all of hemorrhagic cases. Though neoplastic cases showed decrease of tumor stains, they required surgical resection or repeated intervention for local tumor control. No procedure related complication was observed.

Conclusion: Transarterial embolization is safe and effective treatment for systemic arterial lesions in thoracic area. The treatment strategy should be considered based on detailed evaluation of angiographic findings.

Artefactual renal artery stenosis: Experiences with false positive diagnoses made by multi-detector CT angiography
M Teh and J Tibballs
Sir Charles Gairdner Hospital, Perth, WA, Australia

Learning objectives: Highlight artefactual results of renal artery stenosis made by multi-detector CT angiography and analyze their mechanism of manifestation, such as to prevent inappropriate referral for invasive diagnostic procedures and intervention.

Background: Renal artery stenosis is the most common cause of potentially curable secondary hypertension. The advent of multi-detector CT angiography allows for the detection of renal artery stenosis via a non-invasive imaging modality. As the availability of CT improves, the use of this modality as a screening tool for renal artery stenosis has increased. False positive diagnoses can lead to referral for invasive diagnostic angiography and potentially interventional procedures.

Imaging findings OR procedure details: Experiences involving three patients diagnosed with renal artery stenosis by multi-detector CT angiography are detailed. The CT images are compared to digital subtraction angiography or MR angiography. No evidence of renal artery stenosis was subsequently identified by these diagnostic modalities. The image findings suggest that multi-detector CT angiography is prone to false positives due to mis-registration of pulsatile vessels by two dimensional data acquisition, an issue not seen with the other two modalities.

Conclusion: By recognising the potential for false positive diagnoses of renal artery stenosis on multi-detector CT angiography and by understanding the possible basis for their formation, inappropriate referral for invasive angiography and intervention may be avoided.
Importance of casting type calcification in the diagnosis of early breast cancer
P Thakur, J Waugh, J Evans and L Tabar
Breastscreen, Carlton South, Australia

Learning objectives
1. Mammographic recognition of this important subset of DCIS
2. The value of vacuum assisted biopsy as an accurate diagnostic tool in DCIS and early breast cancer (EBC)
3. Long term outcomes/survival of patients with CMC compared with EBC diagnosed by other imaging characteristics.

Background: DCIS is now considered to be a spectrum of disease, with CMC at its most aggressive end. Tabar has presented data, with over 20 years follow-up, where a large cohort of EBC patients were divided into subset by different types of microcalcifications. Monash Breastscreen (BS), Melbourne’s largest service, has reviewed data on their EBC and DCIS detection including those characterised by CMC.

Imaging findings OR procedure details: A range of microcalcification types will be displayed with appropriate correlation of pathological slides. Monash BS data charted on EBC and DCIS incidence. Graphs of long-term survival associated with EBC diagnosed by CMC and other subsets.

Conclusion: Radiologists, surgeons, pathologists and other members of the interdisciplinary team should be aware of the significance of casting type microcalcifications when they are detected as part of EBC or DCIS. The incidence of this mammographic pattern in screened women at one of Australia’s largest Breastscreen services is presented.

Epidural fat effacement is an important sign in CT imaging of the lumbar spine
M Truong and L Lam
Liverpool Hospital, Sydney, NSW, Australia

Learning objectives: To demonstrate the importance of epidural fat effacement as a sign of extradural pathology in CT imaging of the lumbar spine with MRI correlation.

Background: Epidural fat in the spinal canal is most abundant in the lumbar region. It is present anterolaterally, on either side of the thecal sac at the level of the neural exit foramen as well as posteriorly in the midline. These small triangular areas of epidural fat are well seen with CT imaging and are normally attenuated at the levels of the pedicles and laminae. CT assessment of the central canal is limited due to low contrast resolution however abnormal effacement of the epidural fat is a useful sign in detecting mass effect within the spinal canal.

Imaging findings: We present several cases of different extradural pathologies in the lumbar spine which were missed on initial CT imaging and subsequently detected with MRI. In retrospect, epidural fat effacement was demonstrated on all CT imaging studies to indicate the presence of extradural pathology causing mass effect.

Conclusion: MRI is the preferred imaging modality for the lumbar spine in patients with neural impingement symptoms. However, CT is not an uncommon initial investigation for reasons which include limited availability of MRI and patient contraindications for MRI. We have demonstrated that epidural fat effacement on CT imaging is a useful sign in detecting extradural pathology within the lumbar spine and stress the importance of carefully assessing the non osseous structures in CT imaging of the spine.
A pictorial review of breast MRI for invasive lobular carcinoma
R Vander Wal, D Taylor, J Anderson and E Wylie
Royal Perth Hospital, Perth, WA, Australia

Purpose: Invasive lobular carcinoma (ILC) accounts for 5 to 15% of breast carcinoma. Compared with ductal carcinoma it is more often mammographically occult (19%), multicentric and bilateral. Lobular neoplasia expands the terminal duct lobular units to spread in a pagetoid manner through the ductal system resulting in reduced prominence of a focal lesion. MRI is increasingly used for ILC workup because of its high sensitivity for disease (93%) and underestimation of size by mammography and ultrasound.

MRI detects additional ipsilateral lesions in 32% of patients and contralateral in 7%. Surgical management has been observed to change in 28.3%.

The recent COMICE trial found MRI did not reduce reoperation rates of all types but did note ILC was more likely to undergo reoperation. Low numbers of ILC (133, 9%) limited subgroup analysis. Importantly, MRI showed previously undetected contralateral disease in 2%.

A pictorial review of ILC at our institution is presented to aid familiarisation with MRI appearances.

Methods and materials: Search of the local cancer register and PACS at our institution’s breast clinic found 37 pathologically proven cases of ILC on whom breast MRI had been performed. Records and images were reviewed for collection of clinical presentation, initial investigations, MRI result and management.

Results: The spectrum of MRI findings for our case series is presented.

Conclusion: Breast MRI is increasingly used in the diagnosis and management of ILC. This pictorial review provides an overview of recent clinical experience at our institution.

References
Diagnosis and follow-up of spinal osteomyelitis – Correlation with the clinical features and inflammatory biochemical markers
R Vicknesvaran, J George and J Kasthoori
Sir Charles Gardiner Hospital, Perth, WA, Australia

Background and purpose: Follow up MRI scans are being used increasingly in patients diagnosed with pyogenic vertebral osteomyelitis to monitor treatment response, however their role has not been clearly established. Our aim was to describe the spectrum of MRI findings in patients with pyogenic vertebral osteomyelitis on diagnosis and on completion of 6–8 weeks of antibiotic treatment. We also identified the MR imaging parameters that can aid in assessing response to treatment with patients clinical status and biochemical markers.

Methods: A prospective cross sectional study was performed on 13 patients (involving 31 non-contiguous foci) with pyogenic vertebral osteomyelitis on initial diagnosis and 6–8 weeks post treatment. First we identified the MRI parameters that best correlated with clinical status on follow up. Subsequently, follow-up imaging findings were categorized as improved, equivocal or worse, when compared with the baseline findings, based on a simple grading system that focused on the parameters that was identified the first step which were the soft-tissue rather than the osseous component. Lastly, we assessed the degree of agreement between the MRI findings with the clinical status and biochemical markers.

Results: Lumbar vertebrae were the most commonly involved level (54%) with Staphylococcus aureus being the most common causative organism accounting for 54% of cases. Compared to the diagnostic scan, the follow up scans more frequently demonstrated vertebral body loss of height, 42% and 52 % respectively. However, the spinal canal compromise showed improvement in 10 patients (77%) in the follow up scans and worsened in 3 patients (23%). Paraspinal component also was seen to improve in the follow up scans in 57%. The follow up MRI correlated with the clinical status in 7 patient (6 improving and 1 worsening) accounting for 54% cases. Follow up biochemical markers improved in 8 patients (67%) and worsened in 2 patients (17%).

Conclusion: There is a role for follow up MRI scans performed 6 to 8 weeks post treatment in patients who are clinically or biochemically worsening and in those who’s clinical and biochemical markers do not correspond to each other. Resolution of soft tissue component and end plate formation are reliable signs of healing. There should be awareness of the atypical pattern and signal changes on the MRI which represent early spinal osteomyelitis to avoid delay in treatment. The use of a contrasted scan is controversial as there may be continuous enhancement despite clinical resolution.

Occult paediatric fractures on plain radiographs
1L Wang, 1D Wang1,2 and C Hiew2
1Prince of Wales and Sydney Children’s Hospital, 2University of New South Wales, Sydney, NSW, Australia

Learning objectives: This exhibit reviews some of the commonly overlooked or subtle paediatric fractures on plain radiographs. To summarize simple key review areas in paediatric skeletal radiographs. To illustrate these occult fractures by regions.

Background: Despite advanced musculoskeletal imaging with MRI and CT over the last decades, plain radiographs remain the most commonly performed, most easily accessible first-line investigation in search of a fracture in children.

Imaging findings OR procedure details: Common types of commonly missed fractures include: buckle fracture, plastic bowing fracture, Salter-Harris type 1 fracture, avulsion fracture, stress fracture, and intra-articular fracture.. Review fractures by locations of the elbow/forearm, hand, ankle/leg, pelvis and spine. Non-accidental injury patterns are also presented.

Conclusion: Fractures account for one of the most common paediatric emergency department presentations. The pattern of injury is different to adult fractures due to plasticity of paediatric bones, as well as the strong ligamentous attachments. Ability by radiologists, orthopaedic surgeons and emergency physicians to detect subtle fractures on plain radiographs is vital.
Typical and atypical radiological findings of neuroblastoma – A pictorial review
L Wang, ¹ S Wang² and J Taylor¹
¹Prince of Wales and Sydney Children’s Hospitals,
²Royal North Shore Hospital, Sydney, NSW, Australia

Learning objectives: To review typical and atypical findings on radiological and nuclear medicine studies in children with neuroblastoma.

Background: Neuroblastoma is one of the commonest paediatric malignancies. It can arise from the sympathetic tissue and outside of sympathetic chain. Metastases are common. Imaging modalities have expanded rapidly in the last decade, including plain radiograph, ultrasound, CT, MRI, MIBG and MDP bones scans now routinely used in the diagnosis, staging and follow-up of neuroblastoma. Approach on the selection and strengths of modality is reviewed. Imaging findings are presented from selected cases at Sydney Children’s Hospital.

Imaging findings: Neuroblastoma typically present as a calcified abdominal mass. Other locations include paravertebral regions of the thorax and neck. Metastases can be found in the lymph nodes, skin, orbit, liver, CNS and bones. Staging of the disease is vital for treatment and prognosis. Plain radiographs typically show calcification, with possibly an accompanying mass. Bone metastases can also uncommonly be the first presenting finding. Ultrasound is frequently the first investigation for abdominal masses. Shadowing from calcification, with an echogenic abdominal mass is the most common finding. CT or MRI are generally performed for staging and primary tumour characterisation. Intraspinal invasion is not an infrequent finding. MIBG and bone scans are also part of the staging investigations, and monitoring treatment response/relapse. Some patients had unsuspected distant recurrences that were found on MIBG/bone scan.

Conclusion: Neuroblastoma has a protean presentation and appearance on imaging. The integration of multiple modalities provide the best management plan, as well as follow-up surveillance.

Thyroid nodule ultrasound-guided fine needle aspiration: Indications, methods and results of a department audit
A Wang and D Van Gelderen
Austin Health Radiology, Heidelberg, Australia

Purpose: Thyroid nodules are common, and knowledge of the indications and correct techniques for ultrasound-guided FNA of thyroid nodules is important.
The ultrasound features suspicious for thyroid malignancy, and the recommended techniques for ultrasound-guided fine needle aspiration (FNA) of thyroid nodules are briefly revised.
The results of an audit assessing the adequacy rates of ultrasound-guided thyroid nodule FNA and the techniques employed by our radiology registrars are presented.

Methods and materials: An audit of the technique and results (specifically the adequacy rate) of 163 ultrasound-guided thyroid nodule FNAs by 9 radiology registrars from August 2005 – January 2010 was performed.

Results: An overall adequacy rate of 76% was obtained (comparable to quoted literature rates of 66 – 97%). Most biopsies were performed in the first year of training. Best adequacy rates were obtained in the third year of training. Two thirds of registrars used suction, with an average of 3.7 needle passes per nodule. The three registrars with the highest adequacy rates used 22 gauge needles with suction, with an average of four passes per nodule.

Conclusion: An audit of ultrasound-guided thyroid FNAs conducted in our radiology department demonstrated an overall adequacy rate of 76%, comparable to rates quoted in the literature.
Quadratus femoris abnormalities. An uncommon cause of hip pain
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Purpose: To describe abnormalities of the quadratus femoris muscle as an uncommon cause of hip pain.

Methods and materials: Case series review of 5 patients with abnormalities of the quadratus femoris muscle. MRI changes of the quadratus femoris muscle were examined along with the degree of ischiofemoral space narrowing. This was correlated with the location and duration of symptoms

Results: 3 patients had abnormalities of the quadratus femoris associated with narrowing of the ischiofemoral space suggesting impingement as a mechanism. 2 patients had abnormalities without narrowing and a history more suggestive of an acute muscle tear.

Conclusion: Quadratus femoris pathology is an unusual cause of hip pain and can be caused by impingement or acute tear. Impingement can be suggested by a narrowed ischiofemoral space.

References
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Intraosseous discharge in calcific tendinopathy – A pictorial review
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Learning objectives: To become familiar with the imaging features of intraosseous discharge in calcific tendinopathy.

Background: Calcific tendinopathy is a benign self-limiting disorder caused by deposition of calcium hydroxyapatite within a tendon. It occurs in about 3% of adults, with a peak in the 4th to 6th decades. It is asymptomatic in the majority. It occurs most commonly in the rotator cuff tendons of the shoulder and is also seen in the hip, elbow, wrist and knee in decreasing frequency. Intraosseous discharge is one of the least common findings in calcific tendinopathy, with an unknown incidence. We present a pictorial review of cases of this entity with plain radiographic, magnetic resonance imaging (MRI) and ultrasound findings.

Imaging findings: Imaging findings of intraosseous discharge may be confusing without the initial diagnosis of calcific tendinopathy. Cortical disruption and marrow involvement in intraosseous discharge may mimic more sinister disorders like osteonecrosis, metastases, chondroid matrix-producing neoplasms or infection. This is especially so in MRI due to the difficulty of appreciating calcification on MRI. The key to diagnosis on imaging is the presence of material that is uniformly low signal on all sequences in a subcortical location, at a tendinous insertion to the bone. There may be residual material of similar signal intensity in the overlying tendon with a defect in the tendon, and cortical irregularity immediately superficial to the lesion.

Conclusion: Intraosseous discharge in calcific tendinopathy is an uncommon finding in a relatively common condition. Knowledge of the imaging findings will aid the radiologist in making an accurate interpretation and avoid misdiagnosis of a potentially more sinister pathology.
Contrast enhanced ultrasound assessment of Crohn's disease activity
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Purpose: To determine whether contrast enhanced ultrasound assessment (CE-US) of bowel wall microvasculature is an independent predictor of inflammatory activity in Crohn's disease.

Methods and materials: Thirty patients experiencing an exacerbation of their Crohn's disease (Crohn's Disease Activity Index, CDAI > 100) and requiring a colonoscopy or sigmoidoscopy were recruited. The CDAI and serum C-reactive protein (CRP) levels were recorded. CE-US was performed following a bolus intravenous injection of Definity (perflutren lipid microsphere). Bowel wall enhancement of the thickest small or large bowel segment was profiled using appropriate software to generate a time-intensity curve of the contrast wash-in. The bowel wall thickness (BWT) was also recorded. The reference standard for inflammatory activity was accepted to be the Crohn's Disease Endoscopic Index of Severity as scored by the endoscopist. Pearson's correlation co-efficient was calculated to determine the strength of the association between the area under the time-intensity curve (AUC) and the CDEIS. Multivariate linear regression modelling was used to assess whether the AUC predicted for the CDEIS independent of the CDAI, CRP and BWT.

Results: There were 18 males and 12 females with a median age of 33 years (range 17 – 73). The median values (and range) for CDAI, AUC and CDEIS were 284 (108–557), 147 (33–326) and 16 (0–33) respectively. Pearson’s correlation co-efficient for the relationship between AUC and CDEIS was 0.132 (p > 0.05). AUC was not an independent predictor of CDEIS after adjustment for CDAI, CRP and BWT.

Conclusion: Bowel wall enhancement as measured by the area under the time-intensity curve with CE-US demonstrates a weak relationship with inflammatory activity as assessed endoscopically. The AUC does not predict for CDEIS independent of conventional parameters such as CDAI, CRP and BWT. This may be due to the fact that CE-US is a transmural assessment of bowel wall inflammation whilst the CDEIS is limited to mucosal changes.

Magnetic resonance features of primary central nervous system lymphoma in the immunocomponent patient and mimics
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Purpose: Primary CNS lymphoma (PCNSL), although a rare diagnosis, needs to be considered by radiologists and clinicians when confronted with a patient with an intra-axial enhancing lesion(s). The management of PCNSL and the common mimics of high grade glioma, tumefactive demyelination and metastases differs greatly. This pictorial review will discuss and illustrate a spectrum of imaging findings in primary CNS lymphoma, and the common differentials likely to be encountered by MRI radiologists.

Methods: A retrospective search of the author’s institutional database from 1998 to 2010 for cases of primary CNS lymphoma was performed. The imaging features of all the cases of PCNSL with available images were compared with a similar number of randomly selected cases of high grade gliomas and metastases and the small number of cases of tumefactive demyelination in the database.

Results: Enhancing intra-axial lesions have a range of differential diagnoses. PCNSL, typically demonstrates homogenous moderate to intense enhancement and contacts a CSF surface. They may be single or multiple at the time of diagnosis. Although many imaging findings overlap with the mimics, knowledge of common features can help raise PCNSL as a differential in the appropriate clinical context. This can allow diagnostic neurosurgical biopsy rather than therapeutic excision, with consequently reduced patient morbidity.

Conclusion: Awareness of the spectrum of imaging findings in PCNSL, will allow more accurate diagnosis and guide appropriate management.
A comparison of pre-operative imaging (high resolution ultrasound and MRI) with histological tumour thickness in surgically resected specimens of anterior tongue squamous cell carcinoma (SCC)
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**Purpose:** Tongue squamous cell carcinoma (SCC) is an oral cavity cancer, with poor prognosis in the presence of occult cervical lymph node metastasis. A correlation between increasing tumour depth and cervical nodal metastases has been demonstrated. We compare pre-operative evaluation of tumour thickness as measured with MRI and intra oral ultrasound, with the histological tumour depth of the surgical specimen. Secondary objectives were to determine the most accurate imaging modality and early post-surgical outcomes.

**Methods and materials:** Patients planned for surgical treatment of tongue SCC were prospectively recruited and underwent pre and post gadolinium enhanced MRI and/or high-resolution intra-oral ultrasound. A determination of tumour depth on each modality was reported independently. Following fixation of the surgical specimen, tumour depth was determined histologically. Direct comparison between tumour depth as reported on radiology and pathology reports was undertaken.

**Results:** 24 patients with tongue SCC have undergone pre-operative imaging:
- 18 patient’s have had MRI and US (17 pt with available Histopathological (HP) correlation)
- 4 patient’s MRI only (3 pt with available HP correlation)
- 2 patient’s US only (Both with available HP correlation)

Both modalities demonstrated a high linear correlation when compared to the standard of the surgical specimen. In the case of MRI, the Pearson correlation co-efficient measured 0.87 and for ultrasound the value was 0.89.

A correlation between increased tumour thickness and the likelihood of cervical lymph node metastasis was also demonstrated.

**Conclusion:** Preoperative assessment of tongue SCC tumour depth is accurate when compared to the ‘gold’ standard of histology. Furthermore, initial evidence suggests that preoperative imaging may be able to identify patients at higher risk for the presence of occult cervical metastasis and therefore influence surgical technique and immediate postoperative management.