CARDIAC / CHEST & LUNG POSTER PRESENTATIONS

P029   A survey investigating postero-anterior chest X-ray clinical technique amongst radiographers and assistant practitioners in the UK

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Background: Whilst many factors considered 'gold standard' technique for the posteroanterior chest projection are well-researched and standardised, anecdotal evidence suggests a discrepancy regarding optimum positioning of the X-ray tube, with some radiographers using a horizontal tube, and others applying a caudal angle. No published evidence supports the benefits of either technique.

Method: Following University ethical approval, an invitation e-mail with a link to a short questionnaire and participant information sheet was emailed to radiographers and assistant practitioners in Merseyside. Questions related to basic demographics; length and level of experience; positioning preference in CR and DR rooms (horizontal v angled tube) and reasoning behind tube positioning preference. The survey was open for 9 weeks in total, with reminders at 5 and 8 weeks.

Results: From 63 responses a horizontal tube was marginally preferred in both DR rooms (59%) and CR rooms (51%). Many participants indicated 'undergraduate teaching' influenced the approach used (24% in DR, 37% in CR). 25% of participants who use caudal angulation stated reduction in dose to the thyroid as the rationale for their technique in both CR and DR rooms.

Conclusion: Both techniques are taught in the Diagnostic Radiography curriculum; evidently there is variation in practice demonstrated. Further empirical research is required to standardise practice and give evidence-based reasoning to technique choice, ensuring an optimised radiation dose. A limitation of this study is the small sample size of 63 participants, from only 7 NHS Trusts in Merseyside.

P031   A comparison of bolus track and test bolus CT pulmonary angiography protocols and the implications on pulmonary and aortic vessel enhancement, effective dose and suboptimal scan rate

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Background: Multiple CT protocols exist to time contrast enhancement for CTPA acquisition. However, there is no clear consensus on which protocol results in optimal enhancement. The purpose of this research is to compare test bolus and bolus track CTPA protocols in terms of enhancement of pulmonary vessels and aorta, radiation dose and suboptimal scan rate for the determination of the optimal protocol.

Methods: A total of 200 CTPA examinations performed between January and February 2021 were assessed retrospectively. All scans were performed on a 2x128 Dual Source Siemens Drive Scanner. CT attenuation was measured in Hounsfield Units (HU), with measurements taken from the main pulmonary trunk, right pulmonary artery, left pulmonary artery, ascending and descending aorta. Mean effective dose was calculated from the dose-length product (DLP). Suboptimal scan rate (error rate) was calculated as the percentage of examinations below 210HU.

Results: The average HU of the pulmonary arteries was 358 HU in the test bolus group and increased to 394 HU in the bolus track group with a P value of < 0.05. The average HU of the aorta was 235 HU in the test bolus group and increased to 319 HU in the bolus track group with a P value of < 0.001. Mean effective dose reduced by 4.2% in the Bolus Track protocol group (2.4Sv vs 2.5Sv, P > 0.05). 80% less suboptimal scans were performed with the bolus track protocol (5 scans <210HU vs 9 scans <210HU).

Conclusion: The bolus track protocol results in better enhancement of the pulmonary arteries and aorta, with the added benefits of a lower suboptimal scan rate and lower effective dose.

P032   Chest X-ray and CT-scan radiography image analysis for diagnosis Covid-19 and the impact on lungs

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Background: This project diagnoses Covid-19 cases using chest X-rays and computerized tomography (CT) radiographs. This study is helpful along with existing diagnosis techniques and provides an alternative such as RT-PCRs which have high accuracy but are expensive and sophisticated and require skilled professionals for collecting samples and screening. This provides an alternative AI-driven automated diagnosis using radiography images is much sought after.

Method: A transfer learning-based deep learning approach to identify the presence of Covid-19 from chest X-rays and its progression stages from CT-scans using pre-trained AI models trained on images to identify and provide a diagnosis for the presence of Covid-19 and detect its progressive stages. In this project, we use radiographs of the lungs to provide diagnosis using state-of-the-art artificial intelligence techniques like vision transformers (ViT) and deep transfer learning using InceptionResNet-v2 a pre-trained CNN architecture on chest X-rays for computer vision tasks for detection of Covid-19.

Results: The predictions made for the presence of Covid-19 in chest X-rays are supported by explaining the outcomes shown in the form of saliency heatmaps of the affected regions within the chest X-rays and the damage caused to the lungs. Further for a better diagnosis, the CT-scan images provide much better accuracy in finding the progression pattern of the Covid-19 and the damage caused to the lungs the progression stages of Covid-19 affect the lungs from 4 days to 14 days period.

Conclusion: This project comes in as an assistive technology for radiologists, clinicians, and practitioners and would also help in triaging from.

P033   Gastroduodenal artery aneurysm: a rare cause of abdominal pain and a great peril of gastrointestinal haemorrhage

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Background: Abdominal visceral artery aneurysms (VAAs) are important to diagnose and treat early to prevent life-threatening complications, including haemorrhage from rupture. Most VAAs arise from the celiac axis and are classified as true aneurysms, or pseudoaneurysms. Gastroduodenal artery (GDA) aneurysms are rare comprising 1.5% of the VAAs and are usually related to atherosclerosis and pancreatitis. The release of proteolytic enzymes in pancreatic inflammation may result in vascular wall destruction and rupture of the aneurysm, with a mortality rate of 40%. Additional conditions associated with development of GDA aneurysms include trauma, ethanol abuse, and congenital vascular anomalies.

Purpose: A 56-year-old hypertensive woman presented with acute onset of severe epigastric pain and a pulsatile abdominal mass. Serum amylase and lipase were elevated. Chest radiography showed left-sided pleural effusion. Abdominal sonography displayed decreased echogenicity of the pancreatic parenchyma and the collection of fluid around the head of pancreas. CT images disclosed changes in density of the parenchyma, and a peripancreatic fluid collection. A densely calcified semi-circular structure measuring 1.6 cm was visualized in the vicinity of the celiac axis. On the contrast-enhanced MIP reformatted CT images, a large saccular aneurysm corresponding to the calcified lesion was seen arising from the celiac artery. CT angiography confirmed the visceral aneurysm involving the GDA, just proximal to the origin of the anterior pancreaticoduodenal artery. Because the patient was at high risk for gastrointestinal bleeding, endovascular stent grafting was performed.

Summary: CT angiography may efficiently delineate VAAs, facilitating complex diagnosis of a perilous visceral emergency.

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P035   Hot or cold? You decide! GP Chest X-ray hot reporting with same-day access to CT - the Welsh experience

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Following the Welsh Governments introduction of the Single Cancer Pathway (SCP, 2019) our Radiology Directorate in CTMUHB was unable to offer scanning and reporting of CT examinations for patients with suspected lung cancer on CXR within the specified timeframe using conventional practice. This prompted a need for innovation. Welsh Cancer Network funding enabled four Radiographers to undertake a 1-year MSc in CXR interpretation. With multidisciplinary input appropriate patient information and pathways were devised. This allowed GP patients attending for CXRs to have their examination immediately reported and coded remotely, enabling the performing Radiographer to give appropriate feedback to the patient. Where there was a suspicion of cancer or other pathology Radiographers organised a same-day CT scan or follow-up CXR with onward referral to the lung cancer multidisciplinary meeting where appropriate. We present our findings and Welsh experience of initiating a same-day hot reporting service for GP referred CXR's. We demonstrate the significant time savings that are possible with regard to report turnaround times for CXR/CT and the positive effect this innovation has had on the patients Lung Cancer pathway.

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P036   Radiography image analysis of Chest X-rays for diagnosis of pathological conditions in the lungs

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Background: Chest X-ray radiography image analysis for diagnosis of pathological conditions of the lungs. It provides an alternative to existing diagnostics methodology which needs a lot of direct human intervention to an AI-driven automated diagnosis using radiography images is much sought after.

Method: A transfer learning-based deep learning approach to identify pathological conditions from chest X-rays from pre-trained AI models trained on images to identify and provide a diagnosis for the presence of possible pathological conditions out of 14 different pathological conditions. In this project, we use radiographs of the lungs to provide diagnosis using state-of-the-art artificial intelligence techniques like deep transfer learning using DenseNet-121 pre-trained CNN architectures on chest X-rays for computer vision tasks for detection of pathological conditions of the lungs. The diagnosis is interpreted explaining the overall results with explainability and interpretability of the AI algorithms using saliency heatmap the Gradient-weighted Class Activation Mapping (Grad-CAM) algorithm to get a perspective behind how the algorithm makes a prediction and how it classifies images giving probability scores of a possible medical condition.

Results: The predictions made for the presence of the pathological condition in chest X-rays are supported by explaining the outcomes shown in the form of saliency heatmaps of the affected regions within the chest X-rays and the damage caused to the lungs. This is also supported along with a probability score of how likely is the pathological condition affecting the lungs.

Conclusion: This project comes in as an assistive technology for radiologists, clinicians, and practitioners and would also help

P037   EVALI - E-cigarette or vaping product use-associated lung injury

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The incidence of respiratory illness resulting from E-cigarette or vaping product use-associated lung injury (EVALI) is increasingly recognised with associated hospital admissions and reported EVALI related deaths. We describe the

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background, pathogenesis, radiological pattern and distribution of EVALI in an acutely presenting patient utilising chest x-ray and CT imaging. We aim to assist the reporter in considering EVALI, in the right clinical context, as a cause of acute centrilobular nodular opacification, which histopathologically is thought to represent micronodular organising pneumonia but on imaging may resemble hypersensitivity pneumonitis (HP).

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P038   Exercise-induced pulmonary edema: A potentially fatal condition in healthy individuals

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Background: Pulmonary edema (PE) after intense exercise is a rare, yet potentially fatal condition that occurs in previously healthy individuals. Although numerous cases of high-altitude PE have been described in the literature, PE developing in individuals exercising at sea level is only sporadically reported and, in some cases, has been associated with subclinical cardiac abnormalities. From a pathophysiology standpoint, it has been postulated that mitral valve dysfunction during intense physical exercise can cause increased pulmonary vascular pressure, which may disrupt the capillary barrier leading in turn, to stress-induced alveolar haemorrhage, hypoxaemia and PE.

Findings: A 38-year-old man presented with haemoptysis that had developed during intense land exercise. He was afebrile and had cough with production of frothy pink sputum. Patient had dyspnoea at rest with arterial oxygen saturation 82% and tachypnoea. ECG, echocardiography, and chest radiography were quite unremarkable. Chest CT revealed bilateral, patchy alveolar areas of airspace consolidation, with some peribronchial cuffing predominantly involving the central lung parenchyma. Diffuse ground glass attenuation was present. Repeat chest radiograph 24 hours after admission demonstrated diffuse alveolar areas of increased opacity that predominated at the lung bases. Patient was treated with oxygen and pulmonary vasodilators. On day 3, the radiologic findings of PE appeared confined to the upper lung lobes and disappeared within 2 days.

Conclusion: Although rare, PE may develop during intense physical exercise in individuals with no prior history of cardiac disease. Knowledge of this emergency is important to avoid delay in diagnosis and eliminate possibility of a fatal event.

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P039   Leptospira lung infection in the COVID-19 pandemic - great mimicker of coronavirus pneumonia

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Background: Leptospirosis (LS) or Weil disease is a zoonotic disease caused by spirochaete Leptospira spp. Harboured in rodents, spiral bacteria are excreted in the urine of infected animals and offend humans by direct contact or through contaminated water, soil, or vegetation. Typical point of entry is abraded skin around the feet. Incidental exposure to the infective organisms may occur via swimming in contaminated water. LS is a serious, generalized and rapidly evolving infectious disease that may cause multiorgan failure with a high mortality rate.

Findings: A 63-year-old man, recreational swimmer presented with fever, dyspnoea, and myalgia. He had bilateral abnormal chest auscultation. Blood parameters showed elevated bilirubin and urea/creatinine, anaemia, and thrombocytopenia. D-dimers and CRP were increased. Chest radiography showed multiple nodular densities, with ill-defined ground glass appearance. CT demonstrated a combination of bilateral ground-glass and small nodular opacities with small patchy areas of consolidation due to alveolar haemorrhage, and superimposed septal and bronchial wall thickening (crazy paving pattern). Patient was suspected for COVID-19 pneumonia. The RT-PCR test results turned negative for SARS-CoV-2 but positive for Leptospira. ELISA testing detected early rise in IgM. Antibiotic treatment was then administered, and the patient recovered quickly.

Conclusion: Because lung abnormalities are nonspecific for COVID-19 pneumonia, imaging findings should not be used as an independent diagnostic tool to confirm or exclude coronavirus infection. LS may as well mimic COVID-19 and as such, radiologists and clinicians need to assess the patient history, clinical symptoms and course, imaging findings, and molecular testing results for diagnosis.

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P040 CT-guided lung biopsy: An audit of diagnostic adequacy and safety

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Background: Computerised tomography (CT)-guided percutaneous lung biopsy (PTLB) is a well-established approach for obtaining histopathology of thoracic lesions. As the indications and demand for PTLB rises, it is important to recognise and mitigate its associated complications. The most common post-procedural complications are pneumothoraces, with the potential need for subsequent chest tube insertion, and pulmonary haemorrhage.

Method: A complete 2-cycle retrospective audit was completed. It compared diagnostic adequacy of tissue samples and complication rates against standards set by the British Thoracic Society (BTS). The first cycle was completed between January 2020 - February 2021. It revealed that diagnostic adequacy met the target standards, but the complications rates did not. As a result of this, a saline track sealing technique was introduced. The measures were re-audited between February - December 2021.

Results: 69 patients were included in the second cycle. The overall diagnostic adequacy rate was 99%. 33% of patients developed a clinically insignificant pneumothorax; none required chest drain insertion. 6% of patients developed haemoptysis. The mortality rate associated with the procedure was nil.

Conclusion: The diagnostic adequacy rate met the BTS standard, similar to the previous audit. Target complication rates were met for clinically significant complications (pneumothoraces requiring chest drainage and mortality rates). However, complication rates are higher than the BTS standards for clinically insignificant complications. This shows that the implementation of the saline track technique minimally improved complications. Further suggestions for improvement include the adoption of approaches described in the PEARL protocol, with re-auditing planned in 12 months.

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P041 An audit of the outcomes of percutaneous cholecystostomy

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Background: Percutaneous cholecystostomy is a minimally invasive image-guided placement of a drainage catheter in the gallbladder. This procedure is a temporary measure in high-risk patients diagnosed with acute cholecystitis, who are unfit for definitive laparoscopic cholecystectomy. Research has shown that percutaneous cholecystostomy is effective in treating up to 90% of patients with acute cholecystitis, and up to 54% do not proceed to have cholecystectomy (1).

Method: A retrospective study was conducted to determine the outcomes and to compare the findings with benchmarks in the review on percutaneous cholecystostomy by Little et al (2) and a systematic review by Winbladh et al. (3) for patients with percutaneous cholecystostomy for acute cholecystitis at a tertiary university hospital. The target sample size was 100 cases.

Results: 35% of the cholecystostomy was done as a definitive treatment. The readmission rate was 42% in 6 months. Cholecystitis-related readmissions accounted for 41% while cholecystostomy-related admissions accounted for 24%. 15% underwent subsequent laparoscopic cholecystectomy with a mean waiting time of 194 days. 30-day mortality was 8% with 7% died as inpatient. 90-day mortality was 3% with 2% died as inpatient.

Conclusion: Percutaneous cholecystotomy is a means of treatment for unwell and unfit patients with acute cholecystitis. The audit showed satisfactory technical and clinical success, and zero post-procedure mortality post percutaneous cholecystostomy at our hospital. Procedure-related complication rate such as tube dislodgement was higher than the benchmark. Action plan included improving technique to minimise tube dislodgement such as anchoring the drain with a suture and reinforce the slack tubing with dressings.

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P042   Patient compliance with preparation instructions for stress cardiac MR - annual re-audit

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Background: Cardiac magnetic resonance imaging (CMR) and its perfusion modality provides invaluable diagnostic information for the presence of myocardial ischemia (sens 80-90%, spec 70-80%) and its diagnostic performance is at least equivalent to that of nuclear perfusion imaging. The preparation entails 24h refraining from nitrates, caffeine and nicotine, with a reminder SMS being sent 1 week before scan date. Last year the service operated suboptimally, whereby this year it worked in full capacity.

Method: 60 consecutive individuals were scanned in March 2021 in Southampton General (UHS) and their electronic notes were reviewed for their compliance. This practice was compared against the standard Local policy and UHS guidelines in concordance with the Euro-CMR registry (Klinke et al., 2013) and the SCMR-standardised protocol (Kramer et al, 2020). The standard for each section would be 100%. The results were compared with the prior compliance audit.

Results: The sample percentage that did not adhere to preparation instructions were 11% for caffeine, 0% for nitrates and other anti-anginal drugs and 7% for nicotine (N=60). The previous audit found adherence issue in 10% for caffeine, 2% for nitrates and 25% for nicotine (N=60).

Conclusion: This audit highlights the need for appropriate preparation to stress CMR reflecting the importance of accurate reports. Additionally, appointment cancellation results in loss of resources (CMR and staffing). Here both audits showed a satisfactory degree of compliance (>= 89%) for both parameters. As a result, we are planning to: 1) adjust SMS service to specific advice for stress patients, 2) review the information leaflets with the patients representatives.

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