recipient of the Nobel Peace Prize.

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SP01.4 The radiograph as memento mori, time for reappraisal?

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Background: Memento mori is a Latin phrase meaning "remember you must die". At a Roman triumph with the return of a victorious general, the people would look at the victor at the head of the column. However behind the victor an aide would be whispering into his ear "Remember, thou art mortal." Prior to radiography the inside of the body was only seen in limited places - the operating theatre, the battlefield or the graveyard.
Purpose: The discovery of X-rays by Wilhelm Conrad Röntgen on 8 November 1895 transformed our understanding of both ourselves and of the physical world. To see our living skeleton produced a strong sense of unease and of the macabre. We are now so used to seeing medical images that we can forget the impact that they had in earlier times. We see things differently with Röntgen's light. The avuncular old man holding a scythe becomes the grim reaper. The pleasant seaside scene becomes under the rays a danse macabre or Totentanz. The danse macabre or Totentanz is an allegory on the universality of death. No matter one's position in life, the "Dance of Death" unites all of us.
Summary: The impact on the popular imagination of the new photography will be assessed and illustrated with contemporary images. Does radiography still remind us of our mortality, or are our responses more nuanced?

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Proffered papers: GI and hepatology

SP02.1 Analysis of Imaging Modalities in the Diagnosis of Early-Stage Hepatocellular Carcinoma in Adults with Cirrhosis

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Background: The aim of this study was to compare and critically evaluate the role of functional MRI and CT in the diagnosis of early-stage Hepatocellular carcinoma (HCC) in adults with cirrhosis. HCC is the most common primary liver cancer and has become the leading cause of death in patients with cirrhosis. Diagnosis of HCC is often delayed as patients remain asymptomatic until an advanced stage resulting in a poor prognosis. Recent advances in functional CT and MRI techniques have been introduced in clinical practice to improve the diagnosis of HCC.
Method: A systematic literature review was conducted to identify articles suitable for this evaluation. Approximately 600 articles were found across multiple databases, which were reduced to 34 after the application of inclusion and exclusion criteria, and 11 articles were selected to review.
Results: MRI was demonstrated to be the superior modality of choice for adult patients with cirrhosis due to its high sensitivity and specificity, without radiation exposure. However, limitations pertaining to scan duration associated with the addition of specialised sequences remain a challenge. Alternatively, perfusion CT imaging offers a faster scan time and has shown promise in significantly improving detection rates of small HCCs compared to conventional CT.
Conclusion: This literature review demonstrates that the optimal clinical circumstances in which to select MRI or CT for the diagnosis of HCC should be based on patient circumstances, which include (but are not limited to) acute transient dyspnea, limited breath-hold capacity, chronic kidney disease, and patient safety preferences.

SP02.2 The appropriateness of MRCP requests in investigation of suspected common bile duct stones

Ahmad-Said Ali Attia

Background: Ultrasound and LFTs are the primary investigation for patients with moderate suspicion of common bile duct stones followed by the gold standard investigation Magnetic resonance cholangiopancreatography. In cases with high suspicion of common bile duct stones do not require an MRCP before endoscopic or theatre management.
Purpose of poster: Deliver a simple educational piece of information about guidelines from the British Society of Gastroenterologists (BSG) regarding appropriateness of MRCP requests and when performing the scan may not be necessary, hence reducing the number of inappropriate requests and reducing the pressures on the radiology department especially in DGHs where there is limited capacity for possible scans per day.

Summary of content: The poster includes the standard to the audit as per RCR and BSG guidelines. The poster includes also include the indicator, the target, methodology, results of audit's first cycle, the action plan, results of the second cycle of the audit and the references.

1. Williams E et al. Updated guideline on the management of common bile duct stones (CBDS). Gut 2017; 66: 765e782. 2. Maple JT et al. The role of endoscopy in the evaluation of suspected choledocholithiasis. Gastrointest Endosc 2010; 71: 731e44.

SP02.3 Superior mesenteric vessels: The key piece to the puzzle

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Background: Abdominal Computed Tomography (CT) is increasingly used in the acute setting as a diagnostic tool, playing a key role in determining management pathways for patients. Radiologists are often focused on assessing the solid organs and bowels, where majority of the abnormalities are. There are however cases where the vital clue to making the correct diagnosis is in careful examination of the superior mesenteric vessels.

Learning points:

- Recognising key radiological findings relating to various superior mesenteric vessel pathologies.
- Identify complications from the diseased SMA/SMV.
- To always include scrutiny of the vessels in routine abdominal CT reporting.

Summary of contents:

Multiplanar CT and ultrasound images will be used to demonstrate important findings from various superior mesenteric vessel pathologies, ranging from the common thromboembolic event and external compression by tumour, to rarer entities such as spontaneous SMA dissection, SMA-SMV fistula, pseudo-aneurysms and vascular compression disorders (SMA syndrome). Complications from these pathologies, such as midgut ischaemia from SMA/SMV occlusion and haematuria associated with Nutcracker syndrome will also be demonstrated. Key learning pearls generated from each case will be highlighted.

This poster will demonstrate how important it is to always examine the superior mesenteric vessels thoroughly, for without it, the correct diagnosis would not have been made. Routine scrutiny of the superior mesenteric vessels should be included in any abdominal CT checklist.

1. Sakamoto, I. et al. (2007) Imaging appearances and management of isolated spontaneous dissection of the superior mesenteric artery. EJR. 64(1), 103-110
2. Jung, S.C. et al. (2013) Spontaneous dissection of the splanchnic arteries: CT Findings, treatment, and outcome. AJR. 200, 219-225
3. Okino, Y. et al. (2001) Root of the small bowel mesentery: correlative anatomy and CT features of pathologic conditions. RadioGraphics. 21, 1475-1490

SP02.4 MR and sCT reference images for CBCT verification within an anal and rectal cancer MR only workflow

David Bird[1]; Matthew Beasley[1]; Michael Nix[1]; Marcus Tyyger[1]; Hazel McCallum[2]; Mark Teo[1]; Nathalie Casanova[1]; David Buckley[3]; Rachel Cooper[1]; Alexandra Gilbert[1]; David Sebag-Montefiore[3]; Ann Henry[3]; Richard Speight[1]; Bashar Al-Qaisieh[1]
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Background: MR-only treatment pathways require either the MR-simulation or synthetic-CT (sCT) as a reference image for cone beam CT patient position verification. This study aims to be the first to assess the impact of using RT position T2-SPACE MR or sCT as a reference image for CBCT patient position verification using XVI (Elekta) software for a cohort of anal and rectal cancer patients.

Methods: CT and T2-SPACE MR simulation and routine CBCTs were acquired for 32 patients (18 rectum and 14 anus undergoing radical VMAT EBRT). A validated research model generated sCTs. MRs and sCTs were rigidly registered to CT and resampled into the CT frame of reference. DICOM tags were copied from CT to MR and sCT to allow import into XVI (Elekta). The routine clinical registration protocol, using the XVI grey scale algorithm, was undertaken for all reference images and CBCTs (110 anus, 116 rectum). Linear mixed effects modelling identified systematic differences.

Results: Systematic translation and rotation differences to CT for MR were ≤±0.3 mm and ≤±0.4 ° for anal cancers; and ≤±0.4 mm and ≤±0.1 ° for rectal cancers, and for sCT were between; ≤±0.8 mm and ≤± 0.2° for anal cancers; and≤±-0.6 mm and ≤±0.1 ° for rectal cancers.

Conclusion: T2-SPACE MR or sCT can successfully be used as reference images for XVI-based CBCT position verification for anal and rectal cancer patients with systematic differences to CT <1 mm and <0.5 °. However, support is required from vendors to clinically enable MR as a reference.

SP02.5 Magnetic Resonance Elastography: Liver Fibrosis

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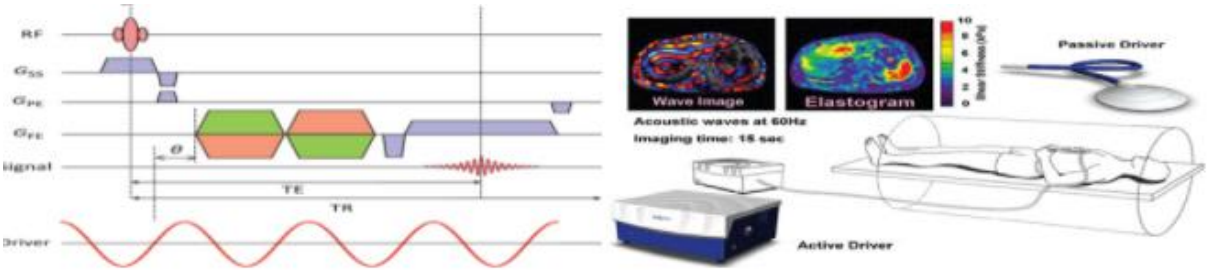

Introduction: Chronic injury to the liver leads to inflammation and hepatocyte necrosis, which when untreated can lead to liver fibrosis. Liver biopsy has been the clinical standard to assess liver fibrosis. (1) However, this invasive method has some drawbacks such as the risk of complications, sampling error, and relatively high cost. (1, 2) MR Elastography (MRE) has recently become commercially available as a non-invasive method for measuring liver stiffness. (2) MR Elastography MRE was originally developed by Dr. Richard Ehman at the Mayo clinic in 1995. It is a technique (3) for quantitatively assessing the mechanical properties of tissue, primarily the tissue stiffness, with fewer technical failures than UltraSound (US) Fibro scan and Biopsy. (1), (4) MRE requires three components. 1.Driver 2. Gradient echo pulse sequence with motion encoding gradients (MEG) 3. Post processing software (3)

1. Driver An active driver, like a loudspeaker (Fig:1), generates sinusoidal variations in air pressure that are transmitted through a long plastic tube to the passive driver (a disc with a drum-like skin) that is positioned securely over the liver. The passive driver generates mechanical waves that propagate through the liver (1, 3, 4). The shear waves (in the frequency range from 40 – 80Hz) that are created by the passive driver cause tiny tissue displacements (3). The frequency used is around 60Hz because of this lower frequency results in waves with better propagation than higher frequency waves (4).

2. Phase-contrast pulse sequence with motion encoding gradients (MEG) The induced shear waves are imaged with a phase-contrast pulse sequence(3) in order to detect the tiny tissue displacements.(1) A pair of bipolar gradients known as Motion Encoding Gradients (MEG) is inserted in the pulse sequence.(4) (Fig: 2) The MEGs are applied at the same frequency as the mechanical wave but with a controlled phase relationship θ.(4) The MEGs are synchronized with the mechanical waves to encode the tiny tissue displacements, typically 10-7mm, into the phase of the MR signal along the encoding direction. (3),(4)Multiple slices at each phase offset are acquired in a breath-hold. For four-phase offsets, the acquisition requires four separate breath-holds.

3. Calculation of tissue stiffness the shear wave speed is related to tissue stiffness (3). Shear waves travel faster in stiff tissues and slower in soft tissues (5). The tissue stiffness can be calculated by repeating the acquisition (but changing the phase offset θ) between the MEGs and the driving waveform (4). Typically, four-phase offsets are acquired and these four images are displayed as a cine which gives the appearance of wave propagation. The acquired images consist of both phase and magnitude information. The phase images show the shear wave propagation (shear wavelength and amplitude decay) whilst the magnitude images show anatomical information (3). Post-processing The phase images are used as the input into an inversion algorithm that calculates the shear stiffness of the tissue (3) based on the speed of the propagating waves. (1) The shear stiffness images are known as electrograms. From the elastograms, quantitative measurements of the tissue stiffness can be determined. (3) Colour maps can be applied to the wave images. Red and blue hues indicate opposite wave polarity and the color saturation indicates wave amplitude.(4) Two-color electrograms are created to qualitatively represent the shear modulus with the scales of 0-8kPa and 0-20kPa(4).

Conclusion: Over the last two decades, MR elastography has significantly evolved.(1) It is now the best modality for the most accurate quantification and hence staging of liver fibrosis(5) compared to other modalities (US and Biopsy).

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SP02.6 Assessing the diagnostic sensitivity of CT and Ultrasound in suspected appendicitis

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Background: Acute appendicitis is one of the most common emergency presentations in surgery(1) . CT Scan is considered a highly sensitive and specific tool in the assessment of acute appendicitis(2). Ultrasonography is still considered as a first-line imaging modality in children/young adults and women of child-bearing age because of concerns regarding high radiation exposure associated with CT. Nevertheless, it is operator-dependent and can be affected by anatomy variation and the patient's body habitus(3).
Method: 1 Retrospective analysis of 9 months' data of all patients who underwent appendicectomies. 2 Review pre-appendicectomy radiology reports and post-appendicectomy histopathology reports. Target: For CT: The sensitivity value should be >90%(4). For US: The overall sensitivity value (includes adults and paediatric subgroup) should be >70% on interval scan following an initial US screening test. The sensitivity value in the paediatric subgroup should be >85%(4). The CT positive predictive value should be >92%(5). The negative appendicectomy rate should be <10% for CT(6).
Results: Out of a total of 304 patients who underwent appendicectomies, 88 patients had pre-appendicectomy CT, and 56 patients had pre-appendicectomy Ultrasound. The CT sensitivity was 95%. The overall Ultrasound sensitivity was 24%, and the sensitivity in the paediatric subgroup was 40%. The CT positive predictive value was 92%. The CT negative appendicectomy rate was 0%.
Conclusion: All the targets of the CT scan were met. Although no interval Ultrasound scans are performed in the hospital, the results highlighted the poor performance of Ultrasound, compared to CT, in the assessment of appendicitis.

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Proffered papers: Clinical oncology – therapy

SP03.1 Evidence of OAR dose reduction for anal and rectal cancer MR-only planning treatments

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Background: For anal and rectal cancers there is no direct evidence showing the benefit of MR-only planning to patient treatments. This study aims to assess the impact of MR-only planning on target volumes and treatment plan doses to organs at risk (OARs) for anal and rectal cancer patients vs. a routine CT-simulation pathway.
Methods: 46 patients (29 rectum and 17 anus) undergoing radical VMAT EBRT received CT and T2-SPACE MR simulation. For CT and MR, RT target volumes (TV) and organs were delineated and RT VMAT treatment plans were optimised following our routine clinical protocols independently. The impact of dose boosting was also assessed. Differences in TV volumes and OAR doses (Vx Gy (volume receiving x dose)) were assessed.
Results: MR GTV and primary PTV volumes reduced vs. CT by 13 cc and 98 cc (anus) and 44 cc and 109 cc (rectum) respectively. The following OARs had statistically significant dose reductions vs. CT; for rectum; bladder and uterus, and for anus; bladder, penile bulb, and genitalia. With GTV boosting, statistically significant dose reductions were also found for additional OARs including; sigmoid, small bowel, vagina, and penile bulb (rectum) and vagina (anus). Further OARs had dose reductions close to statistical significance for standard and boost plans.
Conclusion: Our findings provide evidence that MR-only planning for anal and rectal cancers results in statistically significant reductions in TV volumes and reduced doses to OARS. OAR dose reductions may translate into less treatment related toxicity for patients.