



et al., 2015). Both effects can reduce dose to target volumes or increase the dose to organs at risk. PerFRACTION™ (Sun Nuclear Corporation) is a commercial software package for performing autonomous in-vivo 2D EPID-based transit dosimetry (Sun Nuclear Corporation, 2017). The aim of this study is to determine how accurately PerFRACTION™ can identify clinically relevant changes caused by breast swelling and shifts in patient setup.

Methods: An anthropomorphic phantom was used to simulate breast swelling margins and setup shift. 18 breast radiotherapy plans were created and delivered following local protocols. 2D gamma analysis results calculated by PerFRACTION™ were assessed by ROC (receiver-operator characteristic) analysis (Bojecho and Ford, 2015), to quantify the test performance and select optimal gamma analysis criteria and gamma passing thresholds for in-vivo protocols.

Results: PerFRACTION™ detected clinically relevant breast swelling (>10 mm, $p < 0.001$) but was unable to detect setup shifts > 5 mm in any cardinal direction. An optimised protocol is derived from the ROC analysis to identify breast swelling, setting gamma analysis criteria of 3%/3 mm and a gamma passing rate threshold of 86.7%.

Conclusion: Results show promising accuracy using PerFRACTION™ to identify clinically relevant breast swelling. As a phantom cannot perfectly imitate the complexity of a real patient, further work is planned to measure performance in a patient cohort.

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4. Sun Nuclear Corporation (2017) PerFRACTION 3D Pre-Treatment QA and In-Vivo Monitoring.

SP04.6 Identification of discrimination parameters for diagnosing breast cancer using Raman spectroscopy

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Background: The present study focuses on identifying the features and parameters of Raman spectroscopy for diagnosing cancer in human breast surgical samples.

Method: The collection of specimens of the human breast including tumor and normal tissue was conducted under a protocol approved by the institutional ethical committee. Thirty five clinically unprocessed, fresh human breast surgical samples (20 cancerous and 15 normal tissues) were obtained. Confocal spontaneous Raman spectroscopy in reflection mode was performed using incident excitation laser monochromatic beam of 532 nm.

Results: There were 17 identifiable peaks. Most of the positive bands seen around 751, 841, 979, 1147, 1168, 1415, 1558, 1594, 1938, 2109, 2333, 2449, 2705, 2889, 3154, 3243, 3295 cm^{-1} can be assigned to different vibrational modes of proteins and lipids. The differences observed between spectral profiles of cancerous tissues are less pronounced compared with normal breast tissues. However, notable spectroscopic differences exist in both the absolute and relative intensities of the peaks in the spectra. The wavenumber range 830 --1938 cm^{-1} spectral region provided several identifiable peaks and the Raman region corresponding to protein vibrations. The Raman fingerprint region 2800 --3200 cm^{-1} provided the best discrimination. The absolute and relative Raman intensity is very high in cancerous breast tissue in this spectral region. The Raman fingerprint region provided information on the complex interactions between multiple bonds including carbon-hydrogen stretching in lipids resulted in broad peaks.

Conclusion: The Raman spectra were recorded and analyzed for the human normal breast and cancer tissues.



Proffered papers: Neuro and head and neck

SP05.1 Evaluation of a remote blended-learning neuroradiology teaching programme during the COVID-19 pandemic

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The Royal London Hospital

Background: Maintaining an effective registrar teaching programme is essential for training outcomes, but traditional methods are constrained by the COVID-19 pandemic, particularly social distancing and remote working. We evaluate a remote video-conference based teaching programme with web-based individual case viewing.

Method: 16-seminar teaching programme implemented to address the educational needs of specialist trainees in their Neuroradiology attachment (10 trainees). Each consisted of trainee-led didactic presentation followed by review of relevant trainer-selected cases. Post-intervention qualitative survey assessed pre- and post-programme satisfaction with the subject matter, as well as preferences between two platforms for case sharing. Perceived advantages and



disadvantages of this educational method were identified.

Results: Survey response rate was 80%. All trainees found the programme "very useful" and rated the sessions more accessible (4.75), and improved by the addition of web-based imaging playlists (4.5) on 5-point Likert scales, as compared to "traditional" teaching. Radiopaedia was preferred (32.5% vs 25%) over pacsbin as a viewing platform. Trainee confidence with neuroradiology reporting increased from 2.25 to 3.875 over the course of the programme, although confounded by concurrent informal training. Qualitatively, trainees valued the increased accessibility of sessions and opportunity for individual study review. Disadvantages included reduced interactivity and software technical requirements.

Conclusion: Remote radiological education is feasible, especially when supplemented with user-navigable case playlists. Free to access platforms for both video conferencing and DICOM sharing are functional for this purpose with high levels of user satisfaction. Potential pitfalls include teacher and learner technical familiarity with platforms and altered interactivity.

SP05.2 Novel dual phase cerebral CT angiography and venography using a single bolus of contrast injection- assessing the diagnostic quality

Jennifer Dale; Maxine Helsby; Athar Barakat; Shubhabrata Biswas; Kumar Das

The Walton Centre

Cerebral CT angiography (CTA) and CT venography (CTV) are typically acquired using 2 separate contrast boluses and acquisitions. On the other hand, dual phase cerebral CTA-CTV is a technique to demonstrate both arterial and venous phases in a single setting and using only a single bolus of contrast. This allows for smaller contrast dose (reducing the risk of contrast induced nephropathy), reduced cost and less time; in comparison to 2 separate single phase acquisitions- often acquired on two separate settings. This study aimed to assess the quality of dual phase CTA-CTV compared to single phase studies. Mean attenuation (in HU) from specific arteries and venous structures were calculated from dual phase CTA-CTVs (n=10). Using Student's 't'-test the values were compared with the mean attenuation values of the same arteries and veins described in literature published previously from our unit. Two neuroradiologists reviewed the dual phase CTA-CTVs to subjectively assess for venous contamination in the arterial phase scans and arterial contamination in the venous phase scans. The mean attenuation for each artery and vein on the dual phase CTA-CTVs were higher compared to those in single phase scans ($p < 0.05$). 90% of CTA images from the dual phase scans demonstrated mild venous contamination. Also, 90% of the CTV images acquired by the dual phase technique showed only mild venous contamination. Dual phase CTA-CTV can generate high quality arterial and venous phase images as demonstrated by high attenuation achieved in the arteries and veins, without any significant vascular contamination.

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<https://www.ncbi.nlm.nih.gov/pubmed/26587933> 2. Das K, e. (2014). 3D CT Cerebral Angiography Technique Using a 320-Detector Machine With a Time-Density Curve and Low Contrast Medium Volume: Comparison With Fixed Time Delay Technique - PubMed - NCBI. [online] Ncbi.nlm.nih.gov. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/24332170> [Accessed 2 Aug. 2019].

SP05.3 Stroke detection using low intensity radio frequencies with data visualisation

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Rapid on-scene diagnosis is crucial for patients suffering from a stroke. The authors are researching a new experimental head scanner[1] for that purpose. It uses low intensity radio frequencies which are intrinsically safe for the patient and operator(s) and avoid the costly shielding and specialist infrastructure required by CT/MRI. This, combined with the inherently low cost of its component parts and the prospect of a compact, portable construction, enables it to be carried in ambulances and used on-scene at the patient's location while sharing diagnostic data with remote stroke specialists in real time via 4G/5G connections. Enabling stroke patients to be diagnosed before arriving at the hospital will greatly increase the percentage who commence treatment within the first hour after the onset of their stroke. This will be transformative for these patients, greatly improving their outlook and reducing the number who require costly rehabilitation and long-term care, which will help to reduce the current £26bn annual cost of stroke to the UK nation[2]. The authors present the latest results from their research into visualising the data captured during a scan in novel ways that reliably display whether the distinctive signature of a stroke is present in the data. A new approach is described that analyses the reflected portion of the scanning beam rather than the through-head portion, which facilitates the use of computationally-efficient conventional signal processing techniques. The results conclusively show that an identifiable signature is indeed discernible in the data from which a diagnosis can be made.

1. Heatley, D. and Abdel-Maguid, M. (2020) Stroke detection by scanning with low intensity radio frequencies. UKIO 2020. 2. The Stroke Association. State of the Nation – Stroke Statistics 2018. stroke.org.uk.



SP05.4 Barium swallow - Are we using it safely in ENT patients?

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University Hospitals Bristol NHS Trust

Background: Many patients with high dysphagia are referred to the Ear Nose and Throat (ENT) team on a suspected cancer pathway. If no cause is found at direct/nasoendoscopic inspection, some are then referred for barium swallow, to seek other causes. Dysphagia can be difficult to localise clinically and oesophageal cancer can present with high dysphagia. As endoscopy (rather than barium swallow) is accepted as the optimal investigation for diagnosing oesophageal cancer (1), the purpose of this study was to assess if using barium swallow in this way is leading to missed/delayed diagnoses of oesophageal cancers in these patients.

Method: 5 year retrospective data collection between 2014 and 2018. Radiology Information System and the Cancer Registry were cross-referenced to identify all patients diagnosed with oesophageal or oesophagogastric junctional cancer within 1 year after a barium swallow referred by ENT.

Results: Within the 5 year period, 10 oesophageal cancers were diagnosed in ENT patients within 1 year of having a barium swallow. Of these, 9 were reported on the barium swallow and 1 was missed. This gives a "miss rate" of 10%, which is slightly higher than published "miss rates" for endoscopy (2). Incidence of oesophageal cancers in this patient group was however low, with 2 cases diagnosed per year out of a total of approximately 380 examinations per year (0.5%), making meaningful statistical comparison difficult.

Conclusion: Our current use of barium swallow is safe and does not appear to lead to a significant number of missed oesophageal cancers in ENT patients.

1. NICE guideline 12. Suspected cancer: recognition and referral. Published date: June 2015. Last updated: July 2017. Available from URL: <https://www.nice.org.uk/guidance/ng12/chapter/1-Recommendations-organised-by-site-of-cancer#upper-gastrointestinal-tract-cancers> 2. Menon S, Trudgill N. (2014) How commonly is upper gastrointestinal cancer missed at endoscopy? A meta-analysis *Endosc Int Open. Jun; 2(2): E46-E50.*



Proffered papers: Education

SP06.1 E-learning for sonographers: Saving Babies Lives

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Background: Saving Babies Lives care bundle version two (SBLv2) has been introduced into maternity units in England, with the aim of reducing perinatal mortality. As part of the package there is a requirement to undertake additional components within third trimester growth scans. Sonographers need to understand the SBLv2 documentation and how to undertake and interpret both uterine artery Doppler and cervical length assessment.

Purpose: We aim to introduce new Health Education England/College of Radiographers e-learning modules on SBLv2 written by and for sonographers. This content is free for NHS, Higher Education and those working with NHS patients. Learning outcomes: * Introduce the new SBLv2 e-learning modules * Explore the basic content of the 4 sessions * Reflect on how the learning materials can be used in clinical practice

Summary of content: An overview of the four sessions will be provided. These include: 1. An Introduction section, which comprises of terminology, a review of growth assessment by ultrasound, safety, consent and communication. 2. Uterine artery Doppler. Within this session there is information about undertaking and interpreting the examination and optimising equipment settings. 3. Middle cerebral artery Doppler. This will have a similar format to the uterine artery Doppler session. 4. Cervical Length Assessment. The session covers technique, equipment settings, normal and abnormal measurements of the cervix.

SP06.2 Embarking on a virtual radiology events and learning meeting: tips to optimise education

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Imperial College Healthcare NHS Trust

Background: Radiological errors are not uncommon, reported to occur in 3-5% of cases on average (*Lee C.S. et al., 2013*). The historical 'Discrepancy Meeting', with its somewhat negative connotations, has been renamed the 'Radiology Events and Learning Meeting' (REALM) in recent years by the Royal College of Radiologists (RCR) to shift the emphasis away from a culture of blame and instead encourage learning as a team and also recognise excellence. In the recent worldwide pandemic, meetings have almost universally shifted to the virtual sphere, and REALM is no exception.

Purpose of poster: To provide an overview of the updated standards for radiology events and learning meetings, highlighting changes from previous standards. To describe potential pitfalls when running a virtual REALM and ways to