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Undergraduate radiology in low- and middle-income countries (LMICs)

Authors: Meghavi Mashar, Abu Aboiye, Morgan Sehdev, David Launer, Mariame Sylla, Ruchir Mashar, Natalie Posever, Jessy Jindal, Aparna Komaraju, Ritu Gill

Category: Other

Purpose: LMICs have limited access to the undergraduate educational resources of more developed countries. The Global Medical Education Collaborative (gmecollab.org) provides virtual teaching to LMICs. We conducted a needs assessment of our students to gauge radiology teaching.

Methods and materials: An online survey with subjective questions and a 21-question objective test were created. Responses were collected over two months and analysed.

Results: 75% (n = 45) of active students responded, from years two to six across ten LMICs. Students reported learning common systematic interpretation (n = 37) and common pathology (n = 34) on chest radiographs (CXR) and selecting appropriate imaging (n = 34). The median composite confidence score of interpretation of radiographs, ultrasound and computed tomography (CT) was 2 (‘slightly confident’) on a five-point Likert scale, with the highest score for CXR interpretation [3, ‘somewhat confident’]. The mean test score was 38% (pass mark 50%). Questions on selecting imaging were poorly answered (22%). A positive correlation existed between confidence score and test score (r coefficient 0.3, [0.04, 0.58 95% CI], p < 0.05), though not with student year.

Conclusion: This is the first formal assessment of LMIC undergraduate radiology education. All respondents had radiology exposure but confidence interpreting most modalities was low. Test performance was poor, showing further teaching is vital, even on commonly taught areas (CXR interpretation and selecting imaging). Students need involvement in curricular development, as the correlation between confidence and test scores implies awareness of their learning needs. From our data, a focus on modality selection and systematic interpretation will be useful for any intervention.

Diagnostic accuracy of chest X-ray for diagnosis of COVID-19

Authors: Chukwuemeke Igwe, Mohammed Nabi, Mohamed Nasr, Hassan Mahmoud, Ali Abougazia, Jayant Vanjari, Constantine Fragkoulakis, Susan Geary

Category: Other

Purpose: To identify the diagnostic accuracy of chest X-ray for diagnosis of COVID-19.

Methods and materials: A retrospective analysis of electronic patient records from radiology picture archiving communications system (PACS) and integrated clinical environment (ICE) databases at Kings Mill Hospital. We identified chest radiographs of 119 patients who presented and tested positive for reverse transcriptase polymerase chain reaction (RT-PCR) swabs during the emergence of the pandemic (March and April 2020). The data was analysed on an Excel spreadsheet.

Results: Normal chest X-rays were reported in 21% of the total 119 COVID-19-positive patients, while 31% had findings not typical of COVID and 48.9% had the typical COVID-19 pattern. The sensitivity and specificity of chest X-ray for COVID-19 diagnosis were 0.47 (47%) and 0.29 (29%) respectively.

Conclusion: Chest X-ray is not a statistically significant imaging modality in diagnosis of patients with COVID-19. The gold standard for diagnosis of the virus remains detection of viral ribonucleic acid (RNA) through RT-PCR swabs of respiratory tract samples. Imaging modalities have added value in evaluating disease progression and monitoring critically ill patients with COVID-19.

Test-retest repeatability and reproducibility of ADC measurements of focal and diffuse myeloma lesions at 3T whole-body MRI

Authors: Khalil ElGendy, Tara Barwick, Antoni Sergot, Aristeidis Chaidos, Holger Auner, Andrea Rockall

Category: Other

Purpose: This is the first study to our knowledge to assess the repeatability of apparent diffusion coefficient (ADC) measurements of myeloma lesions using test-retest of diffusion-weighted imaging of the whole-body magnetic resonance imaging (MRI) of myeloma lesions using 3T-MRI.

Methods and materials: 11 patients with multiple myeloma were prospectively recruited from a single tertiary referral centre. All patients underwent baseline whole-body MRI. At baseline, a single bed position axial diffusion-weighted imaging (DWI) was repeated after the patient got off the scanner for a short period of ten minutes to permit test and retest DWI measurements. Ethical approval and informed consent were obtained.

Results: 47 regions of interest were identified (23 focal lesions and 24 diffuse lesions) through different bed positions (pelvis = 6, thorax = 5, head and neck = 1). The interclass correlation coefficient (ICC) for intra-observer agreement was 0.99 (0.98–0.99), while the coefficient of variation (CV) was 5%. The ICC for the inter-observer agreement was 0.89 (0.80–0.934) and CV was 17%. For test-retest repeatability, the ICC was 0.916 (0.85–0.95) and CV 14.5%. ICCs were similar between focal lesions (0.83) and diffuse lesions (0.80), while CVs were 12% and 19% respectively.

Conclusion: ADC measurements of diffuse disease and focal lesions in patients with multiple myeloma are repeatable and reproducible. This supports future research of the role of ADC measurements as a potential objective tool in the assessment of disease status, response to interventions and prognosis in multiple myeloma patients.

Incidence of indeterminate CTPA examinations during first wave of COVID-19 pandemic in a tertiary centre

Authors: Hiba Abbas, Cheryshane Fernandopulle, Marko Berovic, Hasti Robbie

Category: Thoracic

Purpose: To compare the incidence of indeterminate computed tomography pulmonary angiograms (CTPA) between COVID-19 and pre-pandemic periods.

Methods and materials: Consecutive CTPAs from emergency/inpatient settings were evaluated in two periods: from 1 March 2019 to 15 April 2019 and from 1 March 2020 to 15 April 2020. Positive SARS-CoV-2 reverse transcriptase polymerase chain reaction (RT-PCR) results were recorded. One observer scored CTPAs for presence/absence of pulmonary embolism (PE), motion artifact and attenuation of the main pulmonary artery (MPA). Motion artifact was recorded when it was deemed detrimental to diagnostic accuracy. A Pearson Chi-squared test was performed to compare motion artifact in COVID-19 versus non-COVID-19 groups.

Results: In the pre-pandemic period, there were 158 CTPAs (n = 158, 60 male, median age = 59). 17% had PE (n = 27/158). Motion artifact and inadequate contrast enhancement were documented in 11.4% and 12% respectively. In the pandemic period, there were 238 CTPAs (n = 238, 122 male, median age = 57). 47.1% had positive PCR tests. 25.6% had PE. Motion artifact and inadequate contrast opacification were recorded in 39.9% and 5.9% respectively.

Conclusion: CTPA scans increased by 50.6% during the pandemic with near 10% increase in positive PEs. In patients with COVID-19 there was significantly higher motion artifact (25.2% (n = 60) versus 14.7% (n = 35), p < 0.001).

There was high demand for CTPAs with a higher incidence of PE during the COVID-19 pandemic. Acquiring diagnostic CTPAs in severe COVID-19 situations can be challenging and the high incidence of indeterminate CTPAs...
can have adverse clinical outcomes. Careful consideration of factors such as better imaging equipment and enhanced operator training is needed to improve the diagnostic image quality.

Incidence, classification and associated features of lung lacerations from a UK level 1 trauma centre

Authors: Kyo Bye, Steve Amerasekera

Category: Thoracic
Purpose: To our knowledge, there is no published literature on the prevalence of lung lacerations in trauma patients in the era of routine whole-body computed tomography (CT). We assessed the number, classification and associated features of lung lacerations in patients presenting to a level 1 trauma centre.

Methods and materials: We reviewed all the whole-body CT reports from 1 January 2019 to 15 May 2020 (1,569 reports) to identify those with lung lacerations. The images were independently classified according to Wagner et al 1988 by two radiologists, with any discrepancies classified by consensus. Additional clinical data was collected from electronic patient records.

Results: 18 (15 male, three female) cases of pulmonary laceration were identified, with a mean age of 43 (range 19–86). Hospital stay ranged from one to 68 days (mean duration of 17 days). Lacerations were classified as type I (compression shear), six type II (compression shear), 12 type III (direct penetration). One case did not fit any category. Five cases had multiple lacerations, each with its own classification. The injury mechanisms were: fall from height six; penetrating trauma six; road traffic collision three; pedestrian hit by car three. Ten cases had a surgical chest drain and three cases required thoracic surgery for rib internal fixation. One patient died.

Conclusion: Lung lacerations are a rare complication of major trauma with only 18 cases identified from 1,569 trauma cases (incidence 1.1%). They are associated with a long hospital stay (mean duration 17 days).

Determining a D-dimer threshold for diagnosing acute pulmonary embolism in COVID-19 patients

Authors: Simon Rutpet, Mike Darby

Category: Thoracic
Purpose: The purpose of the study was to determine the average value of D-dimer in the COVID-19-positive patients diagnosed with acute pulmonary embolus (PE) and use the data to recommend a level that would increase the diagnostic accuracy of the study.

Methods and materials: Retrospective review of 200 confirmed adult COVID-19 patients, who underwent a computed tomography pulmonary angiogram (CTPA) study for a suspected pulmonary embolism across two Bristol hospitals between 27 December 2020 and 20 January 2021. A CDN radiology information system (CRIS) and picture archiving communications system (PACS) were used to review imaging and requests, and an integrated clinical environment (ICE) system was used to review D-dimer results.

Results: The PE pickup rate of 12.5% was well below the non-pandemic 14.5–37.4%. The average D-dimer among all patients was 7,900 ng/ml; 13,900 ng/ml for intensive treatment unit patients and 2,600 ng/ml elsewhere. There was a correlation between the D-dimer value and COVID-19 severity, where in the mild, moderate and severe cohorts the D-dimer was 1,700 ng/ml, 5,700 ng/ml and 11,600 ng/ml respectively. The severity and D-dimer also correlate — the more diffuse the changes, the higher the D-dimer values.

Conclusion: The current D-dimer cut-off of 500 ng/ml has proven inadequate in this setting, having a negative effect on the sensitivity and specificity of the study, leading to overscanning. It is therefore the recommendation that local hospitals review their protocols and consider increasing the threshold to >1,000 ng/ml to reduce overscanning while retaining a high standard of care. The limitations of this small two-centre study are not lost to the authors, but the findings are supported by other similar studies with comparable results.

Rate of pulmonary thromboembolic disease in COVID-19 patients: Stratification by referral source and D-dimer value

Authors: Geoffrey Lie, Harsimran Laidlow-Singh, Zelen Aziz

Category: Thoracic
Purpose: High rates of pulmonary thromboembolic disease (PTD) are seen in COVID-19 patients. Current guidance from the British Society of Thoracic Imaging recommends a low threshold for computed tomography pulmonary angiography (CTPA) in this population, which has driven a dramatic rise in CTPA requests at our institution. We aim to report the incidence of PTD on CTPA at our institution (a tertiary hospital and major trauma centre) in all patients investigated during sample periods of the COVID-19 pandemic, and to determine whether positivity rates varied with referral source and D-dimer level.

Methods and materials: Retrospective cohort study. Picture archiving communications system (PACS) search for CTPAs performed during the first (1 April 2020 to 6 May 2020) and second (1 December 2020 to 6 January 2021) waves of the pandemic. Electronic patient records analysed to identify COVID-19 status and D-dimer.

Results: Overall 217/781 positive for PTD (27.8%) indicating a high rate in this large cohort. We present further subgroup analysis of PTD rates according to COVID-19 status, referral source and D-dimer level. The rate of PTD varied with referral source and was highest in critical care patients. No patients with a negative D-dimer (<0.5 μg/ml) had a positive study. Only 3% of patients with a D-dimer less than four times the upper limit of normal had PTD. D-dimer was not qualitatively correlated with likelihood of PTD or thrombus burden.

Conclusion: During the pandemic our institution performed a large volume of CTPAs, with a high overall positive rate of PTD comparable with the wider literature, justifying use of CTPAs in this cohort. Critical care patients have higher rates of PTD. A negative D-dimer is useful in assessing risk of PTD in COVID-19 patients.

COVID-19 CT severity score on CT pulmonary angiography (CTPA): Correlation with clinical disease severity and short-term prognosis

Authors: Maria T. Tsakok, Robert Watson, Sheila Lumley, Zahi Qamhawi, Faraaz Khan, Archie Lodge, Cheng Xie, Fergus Gleeson, Rachel Benamore

Category: Thoracic
Purpose: Establish if COVID-19 computed tomography (CT) severity determined on CTPA is associated with clinical disease severity and outcome measures.