



clinics. Variation in demographics and correlation to uptake. Variation in the process of consenting in static and mobile clinics. Reflections: Lessons learned, frequent asked questions, most common errors and what happens after the first round?

CARDIAC / VASCULAR INTERVENTION / CHEST & LUNG

P043 Pulmonary artery dissection: CT findings of fatal acute vascular emergency

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Background: Pulmonary artery (PA) dissection is a rare complication of pulmonary hypertension that has been sporadically reported. This condition usually progresses rapidly to death due to bleeding before any surgical intervention is attempted.

Purpose: We discuss the clinical-imaging presentations of PA dissection to call attention to this vascular emergency. In most cases, dissection of PA is associated with chronic pulmonary hypertension secondary to congenital cardiovascular abnormalities or mitral stenosis. Other conditions that may be seen in association with PA dissection include endocarditis, trauma, amyloidosis, and atherosclerosis. Most dissections affect the PA trunk. Patients typically present with acute onset of severe chest pain, dyspnoea, and haemodynamic decompensation demanding admittance to the emergency room. This is usually followed by sudden death as the dissection transects into the pericardium causing cardiac tamponade, or the mediastinum. Radiographic findings may include pleural and pericardial effusion, and mediastinal widening, in addition to marked widening of the PA and increased cardiac size due to the co-existent pulmonary hypertension. Chest CT supplemented with CT-angiography (CTA), is well suited for demonstrating the presence and extent of PA dissection. CTA with multiplanar reconstruction is extremely helpful in the accurate, direct and quick display of the dissection that is crucial for supportive or surgical management of these patients. If there is indication for immediate thoracic intervention, that may include placement of a vascular prosthesis or aneurysmorrhaphy.

Summary: Radiologists play a key role in early, correct and definitive diagnosis of life-threatening PA dissection that may enable immediate treatment.

1. Neimatallah MA, Hassan W, Moursi M, Al Kadhi Y. (2007) CT findings of pulmonary artery dissection. *Br J Radiol* 80(951):e61-63.

2. Khattar RS, Fox DJ, Alty JE, Arora A. (2005) Pulmonary artery dissection: an emerging cardiovascular complication in surviving patients with chronic pulmonary hypertension. *Heart*. 91(2):142-145.

3. Song EK, Kolecki P. (2002) A case of pulmonary artery dissection diagnosed in the Emergency Department. *J Emerg Med*. 23(2):155-159.

P044 Are we adequately labelling angiograms in interventional radiology?

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Introduction: It is essential for radiographs to be adequately labelled with key information; however, no national guidelines exist for labelling angiographic images in Interventional Radiology. The aim of this study is to evaluate how consistently angiographic examinations are labelled and to develop a mechanism to improve labelling rates.

Methods: All angiographic images were assessed to determine whether they were labelled with the following parameters: laterality, post-procedure (if applicable) and type of devices deployed (if applicable). All annotations were assessed for legibility. Data were collected retrospectively for 100 consecutive lower limb angiograms performed over a 12-month period (June 2018 - May 2019). A reassessment was performed four months after implementation of improvements (June to September 2019). A total of 32 cases were examined post-implementation.

Results: In the first cycle, only 15% of angiograms were labelled for laterality; this was 38% for post-procedure and 0% for devices deployed. Significant improvement was noted in the second cycle, 69% of images were labelled for laterality; this was 66% for post-procedure and 50% for devices deployed. In both cycles, all image labelling were considered legible.

Conclusion: Prior to the implementation of the recommendations, angiographic labelling was poor. After implementation, there was a significant improvement in labelling rates. The inclusion of a reminder in the WHO checklist and raising awareness among radiographers have been important factors contributing to this improvement. Regular departmental meetings and a reassessment in 6 months is proposed to ensure 100% angiographic labelling is achieved.

P045 Manifestations of COVID-19 on plain film radiograph: A pictorial review

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Background: Coronavirus-induced disease 2019 is a highly infectious disease caused by severe acute respiratory syndrome coronavirus. As the prevalence of COVID-19 increases, it is crucial for radiologists and clinicians to recognise the manifestations of the infection on a chest radiograph that may be performed for a suspected case, or for other purposes. The British Society of Thoracic Imaging (BSTI) has advised imaging is not appropriate to screen for, and diagnose COVID-19, but chest radiography may be useful as a first-line imaging modality when polymerase chain reaction (PCR) is unavailable, or the patient is seriously ill.



Furthermore, it can help deal with complications or look for an alternative diagnosis. Current radiological literature on COVID-19 is focused on CT findings, and further studies are needed to further our understanding of radiographic features.

Purpose: Based on a comprehensive literature review, we aim to illustrate the radiographic manifestations of COVID-19 infection, with case examples from our institution.

Imaging findings: Cases include: 1. 45-year-old male with difficulty in breathing, and productive cough. Admission chest radiograph showed mild pulmonary congestion only. A repeat chest X-ray showed progressive bilateral consolidation. 2. 75-year-old male with shortness of breath, productive cough, and confusion. Initial chest radiograph revealed consolidation in the right mid zone and mild pulmonary congestion. 3. 51-year-old male with a dry cough, fever, and shortness of breath. Admission chest radiograph showed consolidation in the left lung base. Subsequent X-rays showed patchy consolidation.

P046 Gentle reminder – Anatomical variants seen in chest x-ray

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Background: One of the most common imaging investigations is a plain chest x ray. It is a simple and quick test, therefore helps clinicians where urgent information is needed to make a diagnosis and promptly manage patients usually in chest and abdominal emergencies. Chest x-ray can be used to diagnose many pathologies but its comprehensive anatomy can make diagnosis difficult. In the vast majority of time chest anatomy is similar irrespective of race, geographical location or sex, however there are few differences that a clinician might encounter when evaluating a chest radiograph. Anatomical variation refers to an anatomic structure that is different from normal but it is mostly non pathological. They are not disorders and most variants are discovered incidentally when the patient is being evaluated for something else.

Purpose: These normal variations sometimes mimic significant pathology and this might lead to a wrong diagnosis. Each and every one of us is different, some have minor variations and some have major variations so it is the responsibility of the clinician or the radiologist to identify it. This poster seeks to remind clinicians and radiologists of the normal variants found on chest radiographs through pictures of chest radiographs.

Summary: This poster will have pictures highlighting the normal variants on chest x ray and brief explanations.

1. Miller, J. et al. (1998) Common anatomic variants simulating mediastinal pathology on chest radiographs: Confirmation with alternate imaging modalities. *Emergency Radiology* 5, 219-230.

P047 Evaluation of one year of implementation of the National Optimal Lung Cancer Pathway at a pilot institution

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Background: Lung cancer is the third commonest cancer in the UK but accounts for the most deaths. Survival rates are lower than many other European countries, with patients often diagnosed at a late stage. The national optimal lung cancer pathway (NOLCP) aims to promote early diagnosis and shorten times from diagnosis to treatment. Our institution is an NOLCP pilot centre. We audited the radiology components of the NOLCP during its first year (April '18- March '19). This included: referral origin onto NOLCP, CXR to CT interval, imaging reporting times, CT-guided lung biopsy timing and cancer detection rate. Pathway standards include: CXR and CT reported within 24hours and CT within 72hrs of abnormal CXR.

Purpose: Outline background and details of the NOLCP. Share learning from implementation at our institution, including audit results and an insight into benefits and challenges.

Summary: Background, Steps in the pathway and differences to previously (flow charts) and Audit results (graphical presentation): 285 patients entered the pathway. 72% of CXRs were reported in ≤ 24 hours and 95% ≤ 5 days. 200 patients underwent thoracic CT. Interval between CXR report and CT was: 14% ≤ 72 hrs; 61% ≤ 7 days. 57% of CTs were reported on the same day. 18 patients underwent CT-guided lung biopsy and 22 underwent tissue sampling via EBUS/bronchoscopy/FNA. Cancer was diagnosed in 31/285 (11%) and 16% of those who had CT. Discussion including improvements made and challenges faced (suitability of referral, bottlenecks in capacity).

1. De Angelis R, Sant M, Coleman MP, et al. (2014) Cancer survival in Europe 1999-2007 by country and age: results of EURO-CARE-5 - a population-based study. *Lancet Oncol*; 15:23-34.

2. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/cancersurvivalinengland/adultstageatdiagnosisandchildhoodpatientsfollowedupto2016>.

3. "Implementing a timed lung cancer diagnostic pathway", A handbook for local and care systems, NHS England, April 2018.

4. Public Health England. (September 2015). Routes to Diagnosis 2006-2013; preliminary results. A National Cancer Intelligence Network short report.

<https://www.gov.uk/government/news/cancers-are-being-diagnosed-earlier-in-england>.



P048 Comparison of 3D and 4D tumour volumes for lung treatment planning

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Background: Radiotherapy for lung cancer now routinely uses 4DCT for accurate delineation of the tumour volume. The aim of this work is to assess the effect 4DCT has had on delineated volumes and treatment plans for photon lung planning.

Method: Forty radical lung patients had volumetric modulated arc therapy (VMAT) plans with internal target volumes (ITVs) outlined using a 4DCT with a 0.5cm isotropic planning target volume (PTV) margin. The tumours were re-outlined by clinicians using a 3DCT with an anisotropic margin of 1cm left/right/ant/post and 1.5cm sup/inf. The PTVs were compared and volumes that were exclusive to each method were calculated. The patients were re-planned using the 3DCT volume and the clinical goals compared to the 4DCT plans.

Results: To date, seventeen patient outlines have been analysed. The 3D-PTV was larger than the 4D-PTV for fourteen of the patients and was 20% larger on average (range 72% to 150% of the 4D-PTV). Two patients had small sections (<2cc) of the 4D-GTV that were outside the 3D-PTV. Sixteen patients had sections of the 4D-PTV that were outside the 3D-PTV ranging up to 16% of the initial 3D-PTV volume. The 4D plans showed decreased doses to the organs at risk compared to the 3D plans whilst still achieving the target clinical goals.

Conclusions: The 4D-PTVs covered areas that were not covered by the 3D-PTVs, suggesting the 4D method is more accurate than using large margins and a 3D scan. The 4D plans have also reduced doses to the organs at risk.

P049 Neuroimaging in staging patients for curative intent stage II and III non-small cell lung cancer

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Background: Approximately 10% of patients with newly diagnosed non-small cell lung cancer (NSCLC) will have brain metastases. ^[1,2] National Institute for Health Care Excellence (NICE) recommend that patients with curative intent stage II and III NSCLC should proceed to CT or MRI head, respectively, prior to treatment. ^[3] Early detection and management of brain metastases may slow disease progression and increase overall survival.

Methods: Patients diagnosed with curative intent stage II and III NSCLC between January to October 2019 were audited for pre-treatment neuroimaging. Local imaging portal (PACS) was used to obtain neuroimaging details. Results 31 patients had been diagnosed with stage II - III NSCLC. Of those patients with stage II disease (n= 7), 5 were treated with curative intent: 40% had CT head; 0% had MRI head; 60% had no neuroimaging. Of those with stage III disease (n= 24), 10 were treated with curative intent: 20% had CT head; 40% had MRI head; 40% had no neuroimaging.

Conclusion: Our audit highlights that our centre is not currently meeting NICE guidance. Further work is needed to ensure that patients with stage II and III NSCLC intended for curative treatment have appropriate neuroimaging staging. Proposed interventions: present results at Departmental Respiratory meeting and/or Lung MDT, create laminated aid memoir to be available at every MDT, consider automated radiology addendum to prompt neuroimaging and re-audit at 6 months.

1. Schuette,W. (2004) Treatment of brain metastases from lung cancer: chemotherapy. Lung Cancer. 45(suppl 2): S253-7.

2. O'Dowd, E.L., Kumaran, M., Anwar, S., Palomo, B., and Baldwin, D.R. (2014) Brain metastases following radical surgical treatment of non-small cell lung cancer: is preoperative brain imaging important? Lung Cancer; 86(2), 185-9.

3. National Institute for Health Care Excellence. (2019) Lung cancer: diagnosis and management, <https://www.nice.org.uk/guidance/ng122/chapter/Recommendations#further-staging>.

P050 Innovative use of DIBH in SABR

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Background: When delivering SABR treatment, minimising margins and OAR (Organs at Risk) dose is a critical concern for safe delivery of the highest possible ablative dose. Use of breath-hold in lung SABR has been well documented to eliminate respiratory motion and reduce dose to normal lung tissue. We report the dosimetric outcomes of a planning study using DIBH in patients with non-lung thoracic metastasis.



Method: 3 cases have been considered at MDM. A mid-sternal bone metastasis [1], a manubrium (with the patient in a thermoplastic shell) [2] and a patient with IMC recurrence directly anterior to a previously irradiated oesophageal volume [3]. Of the above, 2 DIBH plans were delivered to patients with both cases planned in both free-breath and DIBH. A summary of the

| Table 1: | | | |
|---------------------|-------------|-------|------------|
| Case [1] | | | |
| | Free-breath | DIBH | Difference |
| V50 (cc) | 56.63 | 54.3 | 2.33 |
| V30 (cc) | 108.32 | 93.98 | 14.34 |
| Heart (Gy) | 25.41 | 22.64 | 2.77 |
| Case [2] | | | |
| | Free-breath | DIBH | Difference |
| V50 (cc) | 54.2 | 45.79 | 8.41 |
| V30 (cc) | 108.32 | 93.98 | 14.34 |
| Greater Vessels (G) | 12.62 | 10.46 | 2.16 |
| Trachea (Gy) | 4.73 | 2.43 | 2.3 |

dosimetric impacts is shown in table 1. DIBH also results in a reduction in plan uncertainty as defined by the likelihood of the target volume moving outside the ITV during respiration while treating in free-breath.

Results: The dosimetric advantages and successful delivery shows that DIBH has applications for SABR beyond those typically considered. Treatment for these cases was delivered with standard departmental techniques as used for mediastinal lymphomas, both on a thoracic board and in a thermoplastic shell.

Conclusion: DIBH is dosimetrically advantageous for SABR treatment to non-lung thoracic metastasis. Further work will be done to evaluate the efficacy of breath-hold in other non-standard sites. The discussion of these cases also further reinforces the value of a multi-disciplinary radiotherapy discussion of SABR cases.

P051 A pictorial review of chest radiograph learning opportunities from a five-year database review of challenging cases

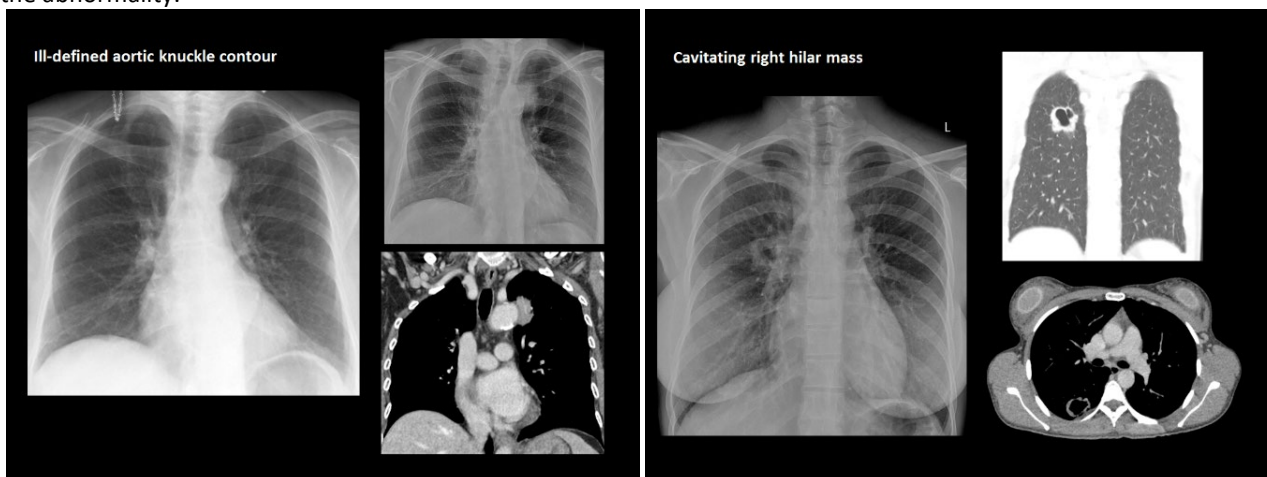
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Gloucestershire Hospitals NHS Foundation Trust

Background: The chest radiograph remains one of the most frequently performed investigations in every radiology department. The composite nature of imaging inevitably makes some clinically important pathology difficult to interpret. We performed a five-year retrospective review of chest radiograph learning cases identified in our trust, the majority obtained from formal discrepancy meetings, with a view to identify any patterns and emphasise these review areas.

Purpose: Using this data, we present a pictorial review to highlight important chest radiograph review areas using a combination of CT correlation and clinical follow-up.

Summary: The poster will briefly summarise the findings from our retrospective five-year review of chest radiograph learning cases which included 25 instructive cases. In common with national reviews, we found that pathology is most commonly missed in the hilar region (50%) followed by the mediastinum and lung apices. The pictorial review will include nine chest radiograph learning cases including; a cavitating hilar mass, an ill-defined aortic knuckle contour indicating an adjacent mass, a sclerotic lesion in a thoracic vertebra which led to a diagnosis of bone metastases, rib notching suggestive of coarctation in a young man who presented with tiredness, a retro-cardiac mass and a variety of hilar and apical lung masses. The positive findings and learning points will be described under each radiograph. Subsequent cross-sectional imaging will be included to demonstrate the abnormality.



Roddie, M. (Oct 2019) *Spotlight on: Common pitfalls in interpretation of the chest radiograph; why the lateral projection is important.* REAL Newsletter. Case 090, Issue 2.

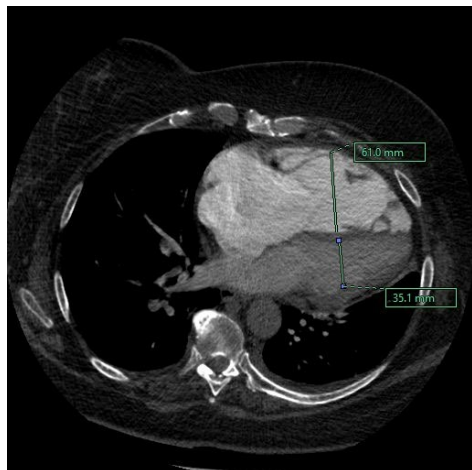


P052 CTPA for the assessment of right ventricular dysfunction in pulmonary embolism – Are we using the correct methods?

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Background: Right ventricular (RV) dysfunction is the major cause of morbidity and mortality in acute pulmonary embolus (PE). Computed tomography pulmonary angiography (CTPA) is accurate in diagnosis of both PE and subsequent RV dysfunction. The 2019 European Society of Cardiology guidelines on management of PE^[1] advocate for risk-stratification of patients to determine appropriate therapeutic management. Specifically; they advocate the measurement of right ventricle:left ventricle (RV:LV) diameter >1 on CTPA as a reliable sign of RV dysfunction. Our aims were to establish (i) if RV dysfunction is accurately assessed by radiologists (ii) if RV:LV diameter is used for assessment.



Method: We evaluated 216 consecutive patients undergoing a CTPA during January 2019. 50 patients (23%) were diagnosed with PE. Their RV:LV diameter was measured on reformatted long axis views. The text of the radiology report was analysed. **Results:** Sixteen patients (32%) with PE were reported as having "right ventricular strain". This was qualified with a descriptor of the specific features of RV strain in 13 cases (76%), however RV:LV diameter was only used in 4 cases (33%). Poor qualifiers such as contrast reflux into

the IVC were otherwise used. Reanalysis showed 2 of these 16 had no CT features of RV dysfunction and 2 patients with RV dysfunction were not identified. Sensitivity and specificity for RV dysfunction was 87.5% and 94% respectively.

Conclusion: Radiologists are reasonably accurate at assessing RV dysfunction in patients with PE. However, more rigorous assessment and more consistent reporting would help in risk stratification of these patients.

1. Konstantinides S et al.(2019) ESC Scientific Document Group, 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). European Heart Journal 00, 1-61.

P053 Do the British Thoracic Society guidelines reflect advances in practice in CT guided lung biopsy?

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Background: Lung biopsy diagnostic accuracy and complication rates are measured against the British Thoracic Society (BTS) guidelines (2003). However, since 2003, lung biopsy technique has changed both in biopsy of small central lesions rather than proceeding directly to surgery, and the histological requirement for core biopsy rather than fine needle aspirate. This change has altered diagnostic accuracy and complication rates, however BTS guidelines remain unchanged since 2003.

Purpose: The purpose of this project was to evaluate local practice against current (2003) BTS guidelines for CT guided lung biopsy, and in particular if biopsy complications and diagnostic rate still lie within these guidelines, which remain unchanged.

Summary: An audit of local practice showed that pneumothorax rate increased from 16% overall (0.5% drainage) in 2007-14 when FNA or core biopsy was performed, to 18% overall (2.9% drainage) in 2014-19 when all cases underwent core biopsy. This data is still within the BTS target of <21.5% overall (and <3.1% drainage). Diagnostic accuracy improved from 85% (2007-14) to 92% (2014-19) (BTS target 85-90%). We demonstrate that a change in practice has improved diagnostic accuracy of malignancy with an increased the risk of complication. Although our figures are still within BTS guidelines, we await other studies as to whether an update of the BTS guidelines may be necessary to reflect these changes in outcome and safety.

Manhire, A., Charig, M., Clelland, C., et al (2003). Guidelines for radiologically guided lung biopsy. Thorax, 58, pp.920-936.



P054 Degree apprenticeships – The whys and the wherefores in diagnostic radiography

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University of Exeter

Background: The Integrated Degree Apprenticeship (IDA) for Diagnostic radiography was published in 2019 and Higher Education institutes are currently preparing for delivery of this programme.

Purpose: The aim of this poster is to explore the rationale for degree apprenticeships within education in general and also in relation to diagnostic radiography.

Summary: This poster will consider a brief of history of radiography education, that has led to current degree level pre-registration qualification. An overview of the political landscape that led to the implementation of the apprenticeship levy will be discussed along with a summary of the subsequent development of degree apprenticeships in healthcare. This will conclude with a brief overview of the IDA in diagnostic radiography.

P055 A rare case of a biopsy-proven solitary cardiac metastasis in a young patient with rectal adenocarcinoma

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Patients with inflammatory bowel disease are at increased risk of colorectal neoplasia. Malignant transformation of chronic perianal lesions to squamous cell carcinoma or adenocarcinoma is a very rare but known complication, especially in patients with Crohn's disease^[1]. Colorectal cancers tend to metastasise to lymph nodes, liver or lungs, although rectal cancers more commonly metastasise to the thorax than colonic tumours^[2]. Metastasis to the heart is rare, especially in rectal cancer^[3], with only a few cases described in the literature. We describe a case of a young female with Crohn's disease who developed a rectal adenocarcinoma within a chronic peri-rectal fistula tract. The patient underwent chemo-radiotherapy and post-treatment pelvic MRI demonstrated a partial response. Interval routine post-treatment CT revealed a large necrotic mass arising from the interventricular cardiac septum. The patient was admitted to hospital shortly after the CT with tachycardia and pyrexia and was treated empirically with antibiotics for suspected endocarditis. Cardiac MRI confirmed a large right ventricular mass invading the cardiac septum with a mobile component prolapsing into the tricuspid valve. PET-CT demonstrated intense uptake of the cardiac mass with no other areas of pathological uptake. Cardiac biopsy was performed as imaging findings were concerning for a solitary metastasis. Endomyocardial biopsy proved metastatic adenocarcinoma consistent with the primary rectal histology. This case presented a diagnostic challenge due to the unusual location of metastasis with no other evidence of metastatic disease. Cardiac biopsy is high risk, but multi-modality imaging findings provided sufficient concern to prove this rare metastasis.

1. Laurent Abramowitz, L., Beaugerie, L., Fléjou, J-F., Laurent Siproudhis, L., Magali Svrcek, M. and Andrew Wisniewski, A. (2017) Anal Neoplasia in Inflammatory Bowel Disease: Classification Proposal, Epidemiology, Carcinogenesis, and Risk Management Perspectives. *J Crohns Colitis*, 11(8), 1011-1018.
2. Hemminki, A., Hemminki, K., Riihimäki, M., Sundquist, J. (2016) Patterns of metastasis in colon and rectal cancer. *Sci Rep* 6, 29765.
3. Ayyala, S. S., Kannarkatt, P. T., Kovacs, J. E., Terrigno, N. J. and Urcuyo, D. M. (2017) A Rare Case of Atrial Metastasis From a Rectal Adenocarcinoma. *J Clin Med Res*, 9(10), 886-888.

GI UPPER AND LOWER AND HEPTOBILIARY

P056 Outcomes of radical radiotherapy (55Gy/20#) for oesophageal carcinoma at Clatterbridge Cancer Centre NHS Foundation Trust, UK (CCC) between Jan 2014 and May 2016

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Where chemoradiotherapy is contraindicated, a definitive treatment for oesophageal carcinoma is radical radiotherapy (RT). At CCC, standard dose fractionation is 55Gy/20#. We performed a retrospective audit to assess outcomes. Patients (pts) were identified who received this treatment between Jan 2014 and May 2016. Clinical records including letters, histology and imaging reports were used. 26 pts were identified. Median age was 72 years; 15 were SCC, 11 were adeno; 2 were T1, 13 were T2, 11 were T3; 12 were node positive. For RT technique, 18 had 3D CRT (69%) and 8 had VMAT (31%). Median volume of GTV was 37 cm³ and of PTV was 217 cm³. All pts completed RT treatment. Symptomatically, 19 had response (73%), 5 had no response (19%), and 2 had unknown response to dysphagia (lost to follow-up). Radiologically at first imaging within 6 months of RT: 3 had complete response (12%), 5 had partial response (19%), 9 had stable appearances (35%), 4 had no response (15%), and 5 had unknown response (19%). Overall, 10 had no radiological recurrence (38%), 13 had radiological recurrence (50%), and 3 had unknown recurrence status (12%) as no subsequent scan. Median overall survival (OS) was 11 months (range 3 to 50 months). 1, 2- and 3-year OS rates were 46%, 23%, and 12%. Median disease-free survival was 7 months (range 3 to 38 months). 1, 2- and 3-year disease free survival rates were 35%, 15%, 4%. Pearson correlation coefficient for GTV and OS was -0.3 (p = 0.13).