Hello and welcome to the March issue of the REAL Newsletter. In this issue, as well as the usual selection of cases which have been sent from around the country, Dr Dave Saunders and Dr Lalani Carlton Jones have produced a beautiful targeted teaching summary of the common pitfalls in neuroradiology. Thank you Dave and Lal for taking the time to do so. We would like to invite any of our readers, young or old, whether UK based or not, to make similar contributions.

The new guidelines on how to run a Radiology Events and Learning Meeting (REALM) are now available on the RCR website (see panel opposite). I would like to thank the authors who contributed to the previous two iterations of this guidance. I chaired my first local REALM – at that time called the Learning from Discrepancy Meeting (LDM) – in November 2011. It was with some trepidation that I stood up in front of a department of 60 consultant colleagues. I had been a consultant for just over four years and would regularly reach for the RCR LDM guidance booklet to help me steer the meeting. I hope anyone in a similar position today chairing a REALM will find the new standards document equally helpful.

The most common question I am asked by colleagues from around the country is ‘What do we say when a manager asks for the outcomes following the meeting?’ The new REALM guidance document makes it clear, see standard five opposite. I remember my manager asking me for this information in 2012 and my answer was a simple ‘no’. A similar answer should be given to anyone who wants to use the REALM output to judge which radiologists are making the most mistakes. Assessing individual radiology performance is not part of a REALM.

Another common question is ‘Why does the RCR advise anonymity of the cases?’ An atmosphere of trust, also termed ‘psychological safety’, in any complex system is critical in ensuring optimal outcomes. For that reason all REALM cases must be kept strictly anonymous. Although the chair can keep a database of the anonymous cases which have been discussed, they should not keep a record of the patient or radiologist details after the case has been prepared for presentation. It also helps with the first question – even if s/he wanted to, it would be impossible for the chair to forward information about specific patients or radiologists if the cases are anonymous in the meetings. Although non-anonymised cases are often discussed in small groups between radiologists (informally or in sub-speciality LDM type meetings), the RCR is clear that no patient identifying details, nor the details of the notifier or primary reporter, should be disclosed at the main trust departmental REALM to which all radiologists should be invited at least six times a year. If a departmental meeting like this does not exist in your trust, contact us (real@rcr.ac.uk) so we can help you make it happens.

In the same way as a well-run REALM, the REAL Newsletter will continue to try and improve patient outcomes through the dissemination of learning points following radiology events.

Please share your cases with REAL@rcr.ac.uk

Dr Jon Smith
Chair, REAL Panel

THE ROYAL COLLEGE OF RADIOLOGISTS

Radiology Events and Learning

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Standards for Radiology Events and Learning Meetings

The full document is now available available at www.rcr.ac.uk/publication/standards-radiology-events-and-learning-meetings. This set of standards outlines the key areas that should be considered when setting up and running radiology events and learning meetings.

Standard 1 – Clinical engagement:
All radiologists should attend a minimum of 50% of departmental radiology events and learning meetings (REALMs) and should contribute at least one case per year to their REALM.

Standard 2 – Organisation of meeting:
A minimum of six REALMs per year should be held in and facilitated by each trust. These may involve the whole radiology department.

Standard 3 – The chair:
The chair of REALM should be appointed and remunerated fairly by the trust and should be able to demonstrate duties performed and output. This should be recorded in the job plan as an ‘additional NHS responsibility’.

Standard 4 – The notifier:
The radiologist who has detected a discrepancy or clinical incident (the notifier) has certain duties to record this which all radiologists have, and these should still be carried out regardless of whether or not the discrepancy or clinical incident is submitted to the REALM for anonymous discussion.

Standard 5 – The cases:
The cases in a REALM should be anonymised and discussed for the purposes of education only. The REALMs should operate alongside but completely separately from candour, serious untoward incident (SUI), disciplinary or legal processes.

Standard 6 – The documentation:
Standard emails should be sent to the radiologists involved in the submitted cases prior to discussion. Learning points from the cases discussed should be summarised and disseminated. Attendance and contribution should be recorded and distributed for appraisal.

Standard 7 – Feedback and reflection:
Participating radiologists are encouraged to perform private reflection on the cases discussed. The chair is encouraged to identify patterns of errors and target teaching accordingly.

Standard 8 – The culture:
The chair should ensure a culture of respectful sharing of knowledge with no blame or shame.

Standard 9 – Links with the RCR:
The REALM chair of each trust should be identified to the RCR’s Radiology Events and Learning (REAL) Panel as a contact point for exchange of views and with the aim of establishing an inclusive national network of individuals with an interest in and experience of radiology events and learning. The chair of the REALM should ensure submission of at least one case per year for consideration for publication in the REAL Newsletter.
When a cancer masquerades as normal anatomy

An elderly woman presented to the emergency department with thoracic back pain and ‘pleurisy’ on a background of chronic obstructive pulmonary disease. A posterioranterior (PA) chest radiograph (CXR) (Figure 097A) demonstrated a small nodular opacity projected over the right lower zone (over the breast shadow), which was reported as likely to represent a nipple shadow. A CXR with nipple markers was advised to confirm this. This CXR (Figure 097B) demonstrated that the opacity broadly corresponded with the nipple marker and therefore the opacity was reported as a nipple shadow. A lateral radiograph was also performed on which the opacity could not be visualised.

The next day the patient had a CT pulmonary angiogram (CTPA) (Figure 097C) after a blood test showed a raised d-dimer. The CTPA demonstrated a 12 mm spiculated lung nodule in the right lower lobe corresponding with the opacity reported as a nipple shadow on the chest radiographs. The patient was referred to the respiratory physicians and lung multidisciplinary team meeting (MDTM), with subsequent positron emission tomography-CT (PET-CT) demonstrating avid fluorodeoxyglucose (FDG) uptake within the nodule, giving a calculated risk of malignancy of 75% (according to the Herder model) but no evidence of metastases.

Reporter’s comments

- In retrospect, the opacity, in part, extended beyond the lateral border of the nipple marker.
- It did not display classical appearances for a nipple shadow, including the classical sharp lateral border.
- No similar opacity was seen on the contralateral side.

Lessons learned

Characteristics of nipple shadows have been described by Miller et al and consist of ‘some or all’ of the following criteria:

- Bilateral and symmetrical
- ‘Fuzzy margins’ with a radiolucent halo
- Sharp lateral but poorly defined medial margin
- Characteristic location (in the area of the fifth or sixth anterior ribs in males, or near the bottom of the breast shadow in females).

The nodule was not present on a very recent previous radiograph; true nodules should not appear so rapidly. When using nipple markers, they should be taped down to the skin fairly tightly, with the nipple in a central location with respect to the marker itself. As with many examinations, if there is uncertainty as to the interpretation, a repeat or alternative test should be sought. Fortunately for this patient she had a CT the following day and therefore she came to no harm.

Further comments from the REAL panel

Normal nipples can mimic a lung cancer on CXR and small lung cancers can masquerade as a normal nipple shadow. This pitfall type case is best presented at the local REALM for group learning and knowledge sharing and we thank the radiology team members for sending this case in so that we can disseminate the learning to a wider audience.

References

Case 098

Should we routinely look for abdominal aortic aneurysms when doing ultrasound in elderly males?

An elderly man with a background of cerebrovascular accident and previous cholecystectomy, non-smoker and fairly independent was admitted due to repeated falls and head injury. Full blood count (FBC) and urea and electrolytes (UE) were normal, C-reactive protein (CRP) was mildly raised at 24. He had acute on chronically raised liver function tests (LFTs) for which he had a liver ultrasound (US) two years previously which showed normal findings of hepatobiliary system, spleen, pancreas and kidneys. A repeat abdominal US was performed (Figure 098A) which showed a 5.5 cm abdominal aortic aneurysm (AAA). A subsequent CT scan (Figure 098B) confirmed an AAA with an associated posterior thickened sac and scalloping of the vertebrae. The patient was referred to the vascular surgeons who reported a large, expansile, palpable, non-tender abdominal mass on examination. A diagnosis of mycotic aneurysm was considered by the referring team because of the raised CRP, associated mass and erosion of the vertebrae, but this diagnosis has not been confirmed to the REAL panel and the images shown here may also be consistent with a non-infected chronic aneurysm.

Reporter’s comments

Main causes

- On a previous routine ultrasound of the biliary system, the aorta was not examined.
- Clinical examination did not detect the aneurysm initially.

Lessons learned

- In male patients over 65, should the opportunity to examine the aorta be taken when an ultrasound of the abdomen is requested for other indications?
- In patients with raised CRP and leukocytosis, the aorta could be considered in the checklist when searching for a source of sepsis.
- Features to suggest the rare but important diagnosis of mycotic aneurysm would be rapid interval growth, gas within the aneurysm, positive blood cultures or ongoing swinging pyrexia and high inflammatory markers.
- The erosion of the vertebral bodies can be seen due to pressure from AAA and the scalloped vertebral bodies here are well corticated implying chronic pressure effect.

Further comments from the REAL panel

This is a good case for the REAL archive to highlight the importance of considering vascular pathology with correct identification of an unsuspected AAA in an elderly patient.

There is currently a UK national screening programme for AAA with men offered ultrasound screening at age 65. The epidemiology of AAA is interesting as the rates of AAA in this age group are lower than previously predicted from historical data due to lower smoking rates and better control of hypertension. Prevalence has reduced from 5.0% in 1991 to 1.3% in 2015 (Gloucestershire AAA Screening programme). In current practice the majority of patients coming through for treatment for AAA are in an older age group (70–80 years of age in many parts of the UK) and there is some debate about whether screening should be extended to an older age. The prevalence of AAA is much lower for women and routine screening is not offered.

Ultrasound assessment of abdominal aortic size is easy and quick to perform during an abdominal ultrasound examination with technical limitations due to patient size and bowel gas in a minority of patients. It could be argued that all male patients from at least the age of 65 should have the aorta included on an ultrasound examination of the abdomen. The current size threshold to consider treatment of an AAA is 5.5 cm, however, those patients with aortic diameter >3 cm will require enrolment in a surveillance programme; the interval between scans dependent on size of the aorta.

I know from personal experience that even very large AAA are not identified on clinical examination (probably not considered by examining doctor) and that radiology will often be the first to identify these patients so this is a very instructive case.

References

A male patient had recently presented with an unprovoked pulmonary embolism (PE). A CT abdomen and pelvis was requested to exclude occult malignancy as a cause for the PE. A standard portal venous phase CT abdomen and pelvis was performed using a Philips Brilliance iCT 128 slice scanner (Figures 099A–D).

On review of the images, the aorta and inferior vena cava (IVC) are seen to be missing from the level of the diaphragm to their bifurcations within the pelvis. The coeliac axis and superior mesenteric artery (SMA) are normal in appearance, but their origins are not seen. The iliac vessels were all normal in appearance. These findings were interpreted as an atretic aorta with possible collateral vessels or a vascular malformation replacing the IVC. There was a previous MRI lumbar spine which shows a normal aorta and IVC although this was not commented upon in the CT report. As a result of the CT, the patient was referred to vascular surgery and underwent further abdominal imaging with MRI. This showed a normal aorta and IVC.

The CT images and raw data were reviewed by Phillips, with a view to manipulate the imaging to find the aorta and IVC, however, these attempts were unsuccessful. Their conclusion is that the patient moved during the CT acquisition in such a way as to make the aorta and IVC disappear. This is an unusual artefact which has not been previously reported in the literature.

### Reporter’s comments
- Has patient movement led to a loss of the aorta and IVC on these images?
- Lack of comparison with previous imaging led to inappropriate additional investigations and specialist referral.

### Lessons learned
- Movement artefact can cause normal anatomy (and presumably pathology) to disappear. This has led to an awareness of the potential artefact within our department.
- Furthermore, comparison with previous imaging is essential. The previous MRI lumbar spine showed that the aorta was not congenitally atretic.
Further comments from the REAL panel

Thank you for taking the time to send in this perplexing case – we too found ourselves scratching our heads. Reviewing old imaging will often clarify any queries and we should all try and routinely bring up the old imaging. Sometimes we forget to, other times we may not see the relevant scan type if the patient has multiple studies and sometimes picture archive and communication system (PACS) retrieval fails.

Have any of our readers experienced similar mystery disappearing organs? We would be grateful if you could shed some light on this case and suggest ways it could be avoided in the future.

This case also highlights the interesting phenomenon of investigating PEs with CT scans to screen for cancer. The National Institute for Health and Care Excellence (NICE) published guidance on investigating unprovoked thrombo-embolic disease in 2012. They advised ‘consider’ CT of the abdomen and pelvis in such cases. ‘Consider’ is often interpreted as ‘do’ by doctors. This has contributed to an increased demand for CT. We understand this specific recommendation may soon be reversed as up-to-date level one evidence reports limited value in performing CT screening studies in asymptomatic patients with no clinical signs of occult malignancy and normal blood tests.

References
1. www.nice.org.uk/guidance/cg144/chapter/Recommendations
   (last accessed 10/2/20)
Case 100
Spotlight on: Four common pitfalls in neuroradiology and how to avoid them in MRI

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Neuroradiology is susceptible to many of the errors inherent to all radiology subspecialties, many of which are heuristic and include busy work lists, multiple trainees and frequent interruptions and distractions.

Another shared ‘minefield’ is perceptual errors including edge-of-field misses, which in cranial imaging is often focused on the skull base such as incidental parotid lesions (Figure 100A); and our susceptibility to these misses can be increased secondary to satisfaction of search failures (Figure 100B).

The key to minimising such misses is having awareness and a thorough, but personal system of review.

Many practitioners advocate an active or conscious avoidance of any obvious pathology until this stepwise review has been completed.

An advantage of cranial imaging is that in some ways it is a sophisticated version of spot the difference. We all have two cerebral hemispheres which should appear the same, the difficult part is often not in identifying an abnormality but rather deducing which side is the abnormal one. This, however, leaves us vulnerable to missing subtle abnormalities within the midline, such as within the corpus callosum (Figure 100C) or those pathologies which are bilaterally symmetrical (Figure 100D–F).

As with the edge of field pathology, many of these errors can be negated by having awareness and a robust system of review, but one should not underestimate the value of experience. That is to say, embrace those acute lists in CT or MRI, filled with normal scans which are becoming more common and that consultant and trainee alike get frustrated with as that collective database of normality will help avoid the errors above.

An exciting part of neuroradiology is how many different sequences are available within our diagnostic arsenal, the number of which seems to be constantly increasing. Unfortunately, in parallel given the fiscal constraints of working within the National Health Service, there is increasing pressure on those responsible for selecting these sequences to truncate scans to improve patient throughput.

A: Coronal T1 weighted sequence shows a lesion in the left parotid gland missed on three consecutive follow-up scans for a previously treated pituitary lesion.

B: Coronal T1 and axial T2 weighted sequences demonstrate another left parotid lesion, likely missed due to the more obvious and relevant left frontal metastasis.

C: Axial T2-weighted and fluid attenuation inversion recovery (FLAIR) sequences demonstrate very subtle midline single abnormality and expansion of the splenium thought to be lymphoma.

D: FLAIR sequence demonstrates bilateral signal hyperintensity within the caudate and anterior lenticular nuclei (compared with normal cortex) – subsequently confirmed as Creutzfeldt-Jakob disease (CJD)

E: Axial T2-weighted image demonstrating advanced cerebellar atrophy.

F: Axial gradient recall echo (GRE) sequence in the same patient as Figure 100E demonstrating marked signal dropout around the cerebellar folia in keeping with superficial siderosis.
Spotlight on: Four common pitfalls in neuroradiology and how to avoid them in CT

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Thank you Dr Saunders for a great article summarising some common pitfalls in MRI reporting, many of which are not exclusive to neuroradiology, illustrated by these representative examples. These key principles, encompassing satisfaction of search (Figure 100G), easily missed perceptual errors due to abnormalities in the midline (Figure 100H) and symmetrical abnormalities (Figure 100J) can also be applied to CT head reporting as the following CT examples demonstrate.

Finally the edge of field and satisfaction of search principles should be extended to include localiser images in both CT and MR (Figure 100K).

100G: Satisfaction of search in a 45-year-old male presenting with right-sided weakness. The reporter correctly identified an acute left middle cerebral artery (MCA) territory infarction with loss of grey–white matter differentiation and low density involving the left insula cortex and hyperdense distal left MCA in keeping with in situ luminal thrombus. However they did not spot the abnormality at the skull base, careful review of which later revealed a hyperdense crescentic rim to an expanded left internal carotid artery (ICA) in keeping with a left ICA dissection as the aetiology of the infarction. This was later confirmed on CT angiogram.

100H: Midline abnormalities: missed fourth ventricular tumour in child with vomiting. CT head in a young boy presenting with vomiting. On the unenhanced CT (Hi) and (Hii) an iso/mildy hyperdense mass (double arrow) in the fourth ventricle was missed. The post-contrast images (Hiii) demonstrated heterogenous enhancement of the mass filling the fourth ventricle. There is also early dilatation of the temporal horns of the lateral ventricles (single arrow) in keeping with early developing obstructive hydrocephalus.

100J: CT symmetrical and midline abnormality head in a middle-aged patient presenting with headache and vomiting. This unenhanced CT head demonstrated symmetrical abnormal low density of both thalami (Ji) and zoomed in (Jii), which are grey matter structures and should be similar density to the rest of the deep grey structures. Further review (Jiii) and (Jiv) demonstrates the cause; hyperdensity in the confluence of the internal cerebral veins and straight sinus in keeping with deep venous thrombosis.

100K: This final case demonstrates a multifocal neoplastic intrinsic lesion missed on the localiser sequences of the patient’s MR. The localiser was not reviewed and additionally the mini cross reference localiser inset to the routine sequences also demonstrated the abnormality.
Scenario 5

A middle aged teacher with a three-month history of a cough is diagnosed with an upper lobe apical lung cancer on CXR. A PET-CT study confirms a 3 cm mass with contralateral mediastinal nodal disease and a solitary adrenal metastasis. The patient had a CT base of skull and neck six months earlier for a persistent sore throat. The CT was reported as normal at the time. When the chest physician sees the patient in clinic the patient asks if this cancer couldn’t have been seen on the skull and neck CT he had six months previously. The physician brings up the scan images in clinic. In retrospect, the scanogram included the upper lobes of the lungs and clearly demonstrated a 2 cm apical mass on the most caudal aspect of the image. The mass was not captured on the other neck CT images as the most inferior slice only just included the upper lobe apices. The chest physician looks at the scanogram and tells the patient in clinic that she could clearly see this abnormality and will contact the radiology department. She writes to you as lead chest radiologist to ask you whether a radiological error has occurred.

What would you do next?

Questions for REAL readers to discuss:

Should the chest physician have told the patient in clinic that she could clearly see the abnormality on the earlier scan?

What do you tell the chest physician and how do you do this (for example, by email, meeting in person or at the multidisciplinary team meeting)?

Do you have a system in your department to decide whether a radiological error has taken place? Or to differentiate between radiological discrepancies and radiological errors?

Are radiologists expected to examine a scanogram and localisers as well as the CT slices for incidental abnormalities? (See also Figure 100K in this issue.)

Where do the radiologist and the trust sit medico-legally?

If the patient asks to speak to a radiologist what do you do?