CASE OF THE MONTH

Beware the cardiac shadow!

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A 44-year-old man, with a history of injection drug misuse, presented with pyrexia and a 1 week history of a productive cough with rusty-coloured sputum. There were clinical signs of a right-sided pneumonia. A deep venous thrombosis of the right leg was also suspected, with needle marks evident in the right groin, and the possibility of a pelvic or abdominal source of sepsis was suggested.

A chest radiograph on admission (Figure 1) was reported as showing right lower lobe consolidation. A CT scan of the abdomen was performed on the same day. This showed bibasal consolidation (Figure 2) and demonstrated a sinus tract passing from the skin to the right femoral vein. Thrombus in the right femoral vein extended via the common iliac vein to the inferior vena cava (IVC), with intravenous (iv) pockets of gas evident (Figure 3 and 4).

Despite antibiotic therapy, the patient remained pyrexial with persisting ooze from the right groin, and a repeat CT scan of the abdomen was performed a few days later. Thrombus was again noted in the femoral veins, with iv gas no longer identified. Cavitating foci of consolidation were apparent in the lung bases and suggestive of pulmonary abscesses secondary to septic emboli.

An additional and important abnormality was present on the repeat CT scan. This was also subsequently identified on the previous examination in retrospect. What is it?

Findings

Projected over the cardiac shadow on the chest radiograph is a 2 cm linear metallic density, consistent with a

Figure 1. Chest radiograph taken at the time of admission.

Figure 2. Axial slice through the lung bases in the abdominal CT scan.

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broken needle fragment (Figure 5, windowed and zoomed in on the needle). Inverting the window settings on the workstation renders the needle more visible (Figure 6, zoomed in on the needle). On the repeat CT scan, the needle is again seen to be implanted in the right ventricular myocardium. There was no history of previous vascular intervention or surgery, hence this was considered to represent a migrated broken needle fragment from injection drug misuse.

Discussion

The heart shadow is a critical review area on the chest radiograph. Diligence is required to maximise the chance of detection of lesions such as retrocardiac lung cancers because small tumours adjacent to the heart can be easily overlooked [1]. External artefacts may also be projected over the heart shadow. In extremely rare cases, intrathoracic yet extracardiac foreign bodies (such as retained surgical gauze [1]) or intracardiac foreign bodies may also manifest in this way on the chest radiograph. Venous embolism of bullets to the right heart has been reported following penetrating vascular trauma [2, 3], with the same mechanism postulated to have caused needle (from acupuncture and iv drug use) or iatrogenic device (such as fractured venous catheter) migration to the heart [4–6]. Needles have also been documented within the left side of the heart and in the pulmonary arterial circulation, presumed secondary to direct penetration rather than an embolic phenomenon [3].

External artefacts on the chest radiograph are often encountered in a clinical setting, particularly in bed-bound patients who may have a number of monitoring leads or oxygen tubes, for instance. If an unexplained metallic density projected behind the heart shadow is identified when the patient is still in the imaging department, attempts should be made to exclude the possibility of the density being an artefact. If this has been ruled out, a lateral chest radiograph may be appropriate to help localise the abnormality.

According to Actis Dato et al [3], management of intracardiac foreign bodies should be tailored to the individual. If symptomatic, removal is necessary regardless of location. If asymptomatic, removal is mandatory only if diagnosed immediately post-injury. Manifestations of intracardiac foreign body include cardiac tamponade, arrhythmia and fever, particularly if infective endocarditis develops. The needle was not considered to be the cause of symptoms in this case, with numerous alternative reasons for the patient's pyrexia (including pulmonary abscesses, deep venous thrombosis/thrombophlebitis and infected needle-tract sinus). The duration of implantation in the right ventricle was unknown. Following discussion with cardiothoracic surgeons, operative intervention was deemed to be too high-risk, therefore a decision was made to leave the needle *in situ*. The patient improved and was subsequently discharged. He remained well for 6 months after this episode. Nevertheless, this case should stimulate reporting radiologists to seek migrated needle tips in patients known to use iv drugs. Manual adjustment of window settings (including inverting the settings) is a quick and easily employed tool for increasing the conspicuity of abnormalities on the chest radiograph,

Figure 3. Axial CT at the level of the groins demonstrating a sinus tract (arrow) towards the right femoral vein which contains thrombus.

Figure 4. Axial CT slice at the level of the iliac veins showing thrombus and pockets of gas within the right external iliac vein (arrow).

Figure 5. The cardiac region from the admission chest radiograph, with window manipulation to more readily demonstrate the needle fragment.

Figure 6. The cardiac region from the admission chest radiograph with the needle rendered more conspicuous by inverting the window settings on the monitor.

and the authors consider that this should be performed routinely when reporting such radiographs, although this is of particular importance when faced with a drug misuse patient presenting with sepsis.

This case provides a further important educational point relating to CT scan interpretation. High densities relating to the heart are not uncommonly encountered in everyday radiological practice in the form of pacemaker leads, dense coronary artery or valvular calcification. Such densities may easily be overlooked or misinterpreted. This is particularly important in abdominal CT scans, in which only a small area of the heart is visualised, as in this case. The thin slice images of the heart in this patient showed the needle as an apparent “coiled catheter/pacemaker lead tip” (Figure 2) rather than a real needle, owing to the metallic streak artefacts. This artefact should be recognised, and examining thick slice reformats (Figure 7) or manipulating the window settings on the workstation may be necessary to enable a confident diagnosis to be made. A quick review of the patient’s clinical history or recent chest radiograph would easily exclude catheters and pacemaker leads from the differential.

Figure 7. Coronal thick slice reformat of the CT abdomen demonstrating the linearity of the needle which is embedded in the right ventricular myocardium.

References

1. Unverdorben M, Bauer U, Oster H, Kraska H, Vallbracht C. A surgical gauze appearing as a retrocardiac mass in a patient after coronary artery bypass surgery. *Eur J Radiol* 1999;29:273–75.
2. Bining HJS, Artho GP, Vuong PD, Evans DC, Powell T. Venous bullet embolism to the right ventricle. *Br J Radiol* 2007;80:e296–98.
3. Actis Dato GM, Arslanian A, Di Marzio P, Filosso PL, Ruffini E. Posttraumatic and iatrogenic foreign bodies in the heart: Report of fourteen cases and review of the literature. *J Thorac Cardiovasc Sur* 2003;126:408–14.
4. Kim YJ, Kim JY, Choi BW, Nam JE, Kim TH, Choe KO. Right ventricular acupuncture needle embolism detected on coronary computed tomography angiography. *Circulation* 2006;114:e623–6.
5. Ngaage DL, Cowen ME. Right ventricular needle embolus in an injecting drug user: the need for early removal. *Emerg Med J* 2001;18:500–1.
6. Di Carlo I, Fisichella P, Russello D, Puleo S, Latteri F. Catheter fracture and cardiac migration: A rare complication of totally implantable venous devices. *J Surg Oncol* 2000;73:172–3.