Ann Acad Med Singap 2021;50:660-1
https://doi.org/10.47102/annals-acadmedsg.2021101

A linear density on imaging: Non-contrast CT as a useful localisation method

A 37-year-old man presented to the emergency department after breaking a hypodermic needle while injecting his right groin. Significant past medical history included intravenous drug use and epilepsy.

A radiograph of his right groin was performed (Fig. 1), demonstrating a metallic linear density projected over the right ischium suggesting a needle fragment foreign body, which was not visible or apparent on clinical examination. The fragment was not removed due to patient factors, and the patient was discharged with prophylactic antibiotics.

Seven years later, the patient presented again to the emergency department following a seizure due to non-compliance with anti-epileptic medication. A chest radiograph (Fig. 2) was performed.

Upon reviewing the chest radiograph, a non-contrast computed tomography (CT) scan of the thorax (Fig. 3) was requested to investigate further.

Fig. 1. Right frontal hip radiograph at first presentation.

What do Figs. 1, 2 and 3 demonstrate?

A. Acute pulmonary embolism
B. Imaging artefact
C. Needle embolisation to the heart
D. Needle embolisation to the lung
E. Presence of a charm needle

The chest radiograph (Fig. 2) shows a subtle linear density projecting over the right cardiac shadow. A repeat hip radiograph confirmed that the previously sited needle was no longer visible at the right groin. The non-contrast CT (Fig. 3) demonstrates a metallic linear foreign body density within a subsegmental branch of

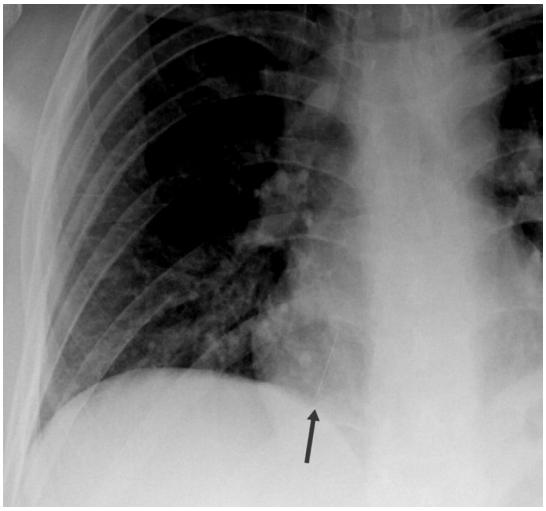

Fig. 2. Frontal chest radiograph. Arrow indicates a thin linear density over the right cardiac shadow.

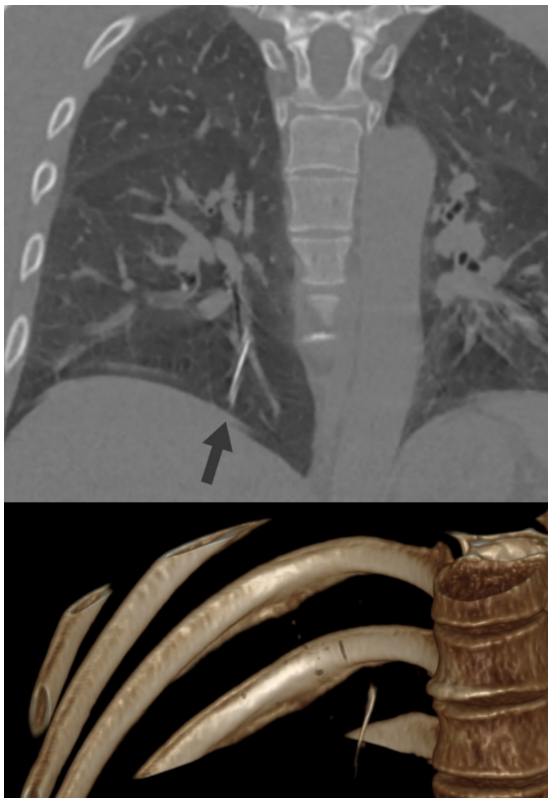

Fig. 3. Top panel: non-contrast computed tomography (CT) scan of the thorax in the coronal plane. Arrow indicates a linear density. Bottom panel: 3-dimensional volume rendered image from the CT of the thorax showing the linear density. (Colour figure available online.)

Answer: D

the right lower lobe pulmonary artery. This likely represents the migration and embolisation of the needle fragment from the right groin to the lung. There is blooming susceptibility artefact on the CT, a phenomenon caused by metallic density, resulting in the needle appearing larger than its actual size. The oblique position of the needle on the initial hip radiograph had caused it to appear shorter than its length on the CT scan.

Cardiothoracic surgeons' opinion was that removal of the foreign body would require surgery such as wedge resection or a right lower lobectomy. The patient did not opt for treatment and was discharged without planned follow-up.

Other causes of linear densities on X-ray radiographs and CT include artefact, iatrogenic or other foreign body material, and charm needles. Artefact, in this case, is highly unlikely given the persistent presence of the linear opacity on different modalities (radiographs and CT scan). The diagnosis of acute pulmonary embolism requires a CT pulmonary angiogram, i.e. a contrast-enhanced study to look for filling defects in the opacified pulmonary arteries. A non-contrast CT is a suitable protocol for troubleshooting the location of foreign bodies in the thorax. Contrast medium would have likely obscured the needle fragment within the pulmonary arterial branch from view, therefore attention must be paid to avoid performing the wrong imaging protocol. A chronic calcified pulmonary embolus may be concurrent and difficult to differentiate from an embolised needle tip or other foreign body in the pulmonary arteries. Increasing the window width on the CT, known in practice as "windowing", typically enables metallic density to be differentiated from high attenuation entities such as calcification.

Charm needles, or "susuk", are not commonly seen on imaging outside of Southeast Asia. These are talisman subcutaneously placed in the face or other body parts, and may form part of the differential for a linear density on imaging in the appropriate context. They are believed to enhance beauty and youth[1] and may be used as traditional medicine by some communities in Southeast Asia.

The radiograph appearances could have been attributed to a subcutaneous charm needle in a Southeast Asian context. Direct charm needle migration has been reported, though it occurred through the skull and into the brain.[2] Indeed, such cases are extremely rare, with their presence on imaging generally considered a benign entity. Eliciting a good clinical history from the patient, with consideration of cultural practices and background could exclude the presence of a charm needle.

Needle breakage by intravenous drug users is not an uncommon occurrence. However, needle embolisation to the lung or heart is rare and infrequent in literature.[3] Once migration to the thorax has occurred, the course of events somewhat depends upon the final location of the needle.

Reported complications include inflammatory mass formation requiring lung wedge resection, pneumothorax following migration from the heart via the mediastinum,[4] infective endocarditis, cardiac perforation and tamponade.[1]

Therefore, it is important to localise with CT whether the needle fragment lies within the heart or the lung, as chest radiograph appearances may be misleading.

Clinical management will depend on patient factors and willingness for intervention. However, most cases of needle embolisation to the lung are expected to follow a benign course,[3] and follow-up will depend on local practices.

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