Caudal fluoroscopy to guide venous access for pacemaker device implantation: should this now be standard practice?

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ABSTRACT
We describe a technique that uses both posterior-anterior and caudal fluoroscopy to achieve venous access for pacemaker device implantation. A significant advantage of this technique is the ability to clearly demarcate both the anatomy of venous drainage and the lung border. We would encourage all centres to adopt this technique as a safe approach to venous access.

INTRODUCTION
The subclavian (extrathoracic or intrathoracic) vein is used for venous access in at least 40% of cardiac rhythm management device implants.1 It courses from the lateral border of the first rib to the sternum and its trajectory adjusted initially to a steeper or shallower course. If access is still not achieved, the operator should return to the PA view and aim the needle more cranial or caudal but still towards the first rib/clavicle intersection; there should be a low threshold in performing a contrast venogram. If an inadvertent arterial puncture is performed then the needle should be withdrawn and a more inferiorly directed attempt made following haemostasis.

In patients with existing leads undergoing lead revisions or device upgrade, in whom the risk of complications are higher, the caudal view may also facilitate a safer puncture of the subclavian vein.

TECHNIQUE OF COMBINING PA AND CAUDAL FLUOROSCOPY TO ACHIEVE VENOUS ACCESS
This technique can be used with any conventional incision (deltoidorcal groove, horizontal or oblique). A standard puncture needle attached to a 5 mL syringe is placed on top of the puncture being aspirated, aiming for the landing zone anterior to the thoracic cage outline (white box in figure 1D) and avoiding entering the thoracic cavity. If venous access is not obtained on first pass, the needle should be retracted until it is superficial and its trajectory adjusted initially to a steeper or shallower course. If access is still not achieved, the operator should return to the PA view and aim the needle more cranial or caudal but still towards the first rib/clavicle intersection; there should be a low threshold in performing a contrast venogram. If an inadvertent arterial puncture is performed then the needle should be withdrawn and a more inferiorly directed attempt made following haemostasis.

In this Clinical Practice report, we describe our experience of combining PA and caudal fluoroscopy to achieve subclavian vein access.

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problematic in patients who either have a large body habitus or have altered thoracic cage anatomy (eg, patients with kyphoscoliosis or those with chronic obstructive lung disease with significant lung hyperinflation). In this situation, operators may choose to puncture the subclavian vein over the first rib using fluoroscopy in the PA projection. This technique is entirely dependent on being able to clearly visualise the patient’s ribs on fluoroscopy, which can be challenging in some patients, particularly the elderly. Furthermore, in using the PA approach to puncture the subclavian vein over the first rib, many operators will choose a steep angle (perpendicular to the chest wall) to minimise any drift in the superior/inferior directions, which could lead to a puncture beyond the boundaries of the first rib and hence a pneumothorax. However, accessing the subclavian vein at a perpendicular angle can theoretically increase flexion stress on the lead.6 The caudal view improves visualisation of the first rib and lung borders (figure 1C) and permits a shallower angle of entry into the subclavian vein theoretically reducing the risk of flexion damage to the lead. Finally, performing the venous puncture in the caudal view removes the operator’s hand from the field of view, reducing direct radiation exposure.

CONCLUSION
Combining PA and caudal fluoroscopic views while obtaining venous access for device implants may reduce the risk of pneumothorax.