

When performing central venous catheterization, generally puncture is attempted using a 21G micropuncture needle and a 0.018" microwire and then the puncture site dilated up to the catheter diameter to insert a larger diameter catheter. Accidental arterial puncture can occur even during US-guidance procedure. After an accidental arterial puncture, if the puncture site is dilated up to the catheter diameter without recognizing that it is an arterial puncture, it can result in a serious complication requiring surgery or stent-grafting. To prevent these catastrophic complications, it is important to recognize arterial puncture and stop the procedure without dilating the puncture site to a larger diameter.

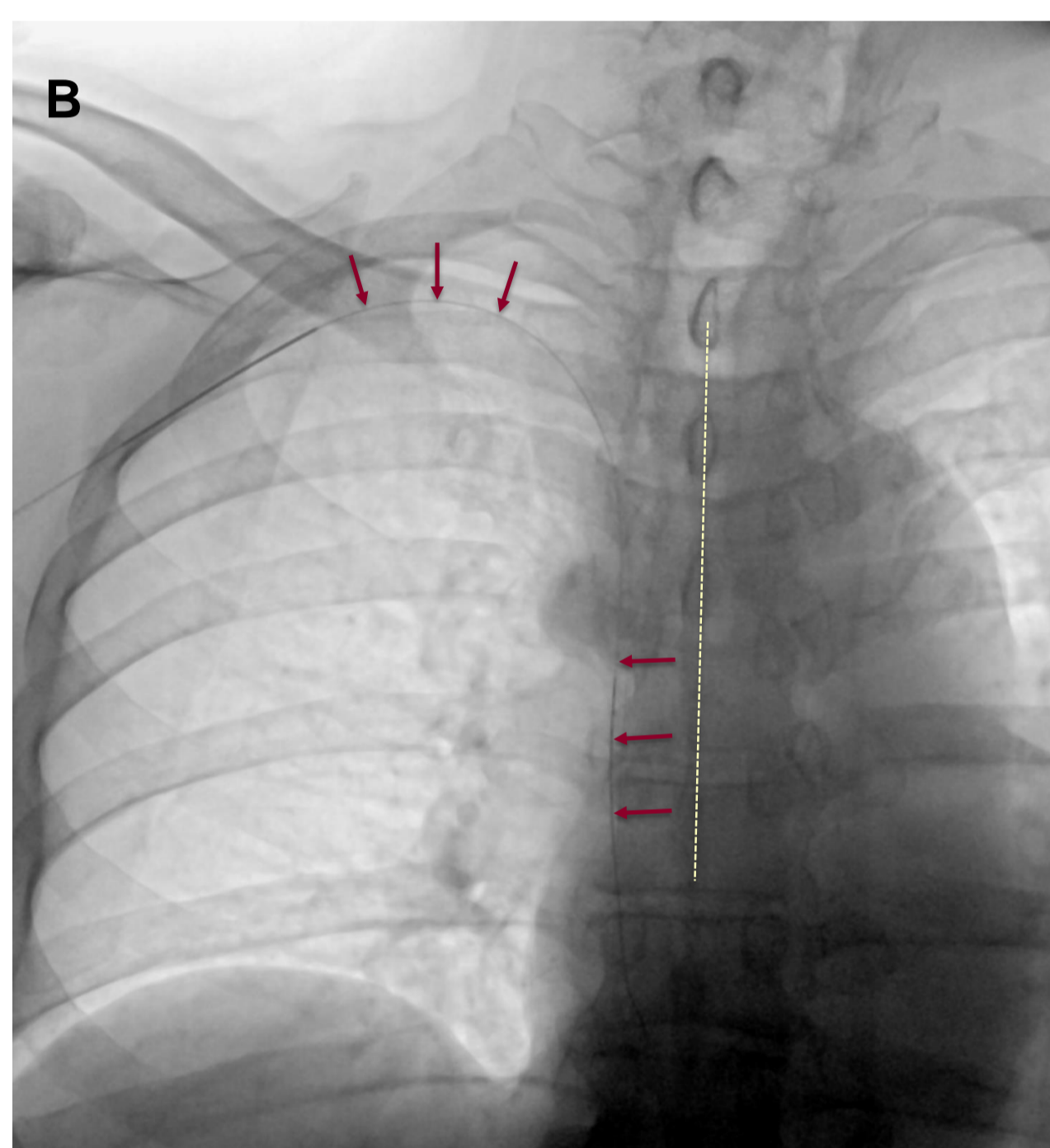
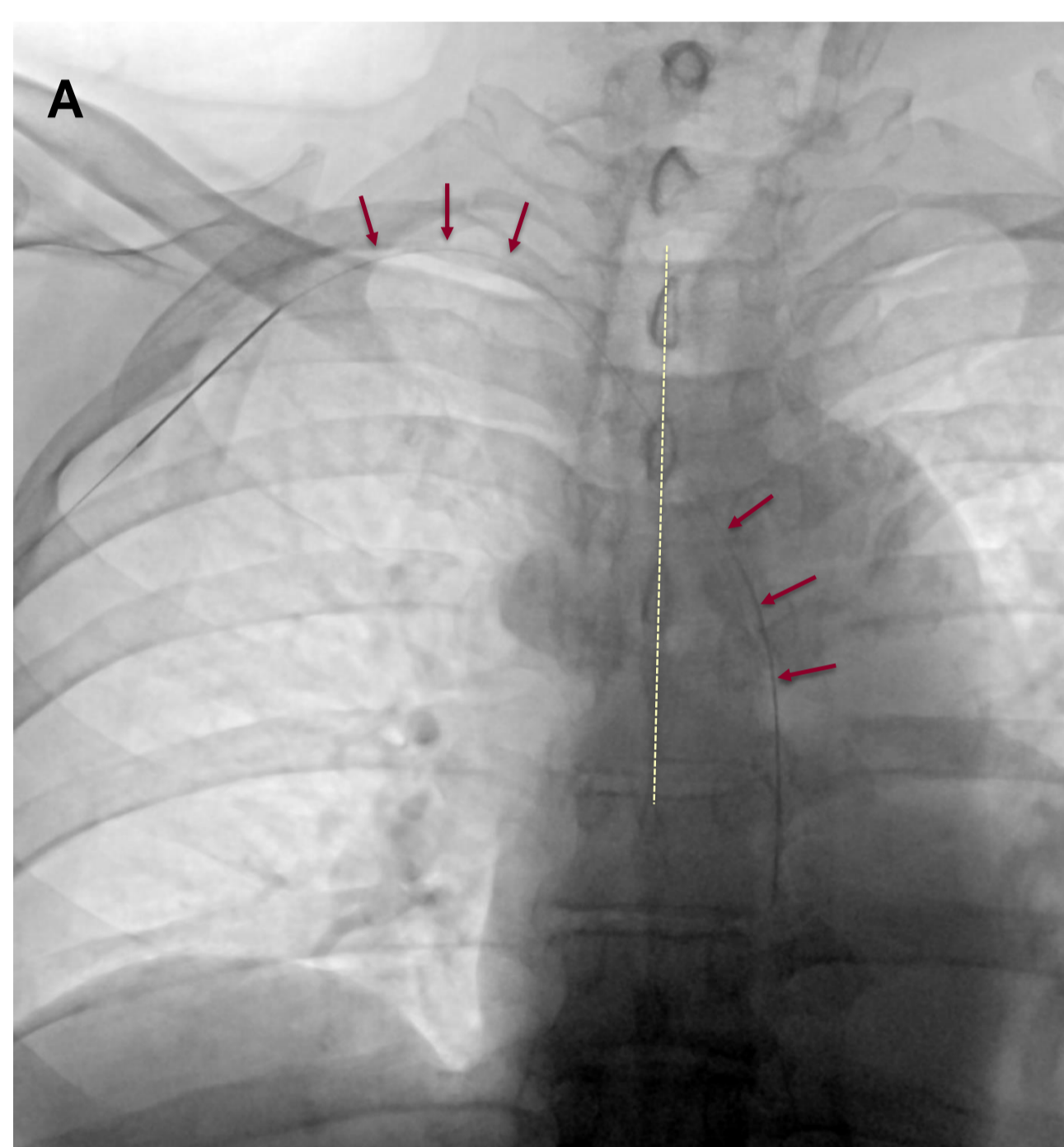
We evaluate warning signs indicative of an arterial puncture during axillary vein access for implantation of the totally implantable venous access port (TIVAP) under fluoroscopic guidance and evaluate techniques for re-accessing the axillary vein.

## ✓ Warning signs of axillary arterial puncture

- Guidewire passes supraclavicularly (97.4%)
- Guidewire locates to the left side of midline
- U-shaped rotation of guidewire near the aortic valve

## ✓ Re-access techniques to the axillary vein after initially puncturing axillary artery

- Secondary puncture under US guidance after withdrawal of the instrument and manual compression (23 cases, 60.5%)
- Venipuncture with a second needle using the first needle and wire as landmarks while keeping them in the artery (12 cases, 31.6%)
- Slightly pulling the needle tip from the artery to the vein and then pushing the wire directly into the venous lumen (2 cases, 5.3%)
- Fluoroscopy-guided secondary puncture during intravenous administration of contrast in the forearm for venous collapse due to hematoma (1 case, 2.6%)



Radiographs obtained during TIVAP procedure, it is possible to distinguish whether it is an arterial puncture or venipuncture by the position and the direction of guidewire.

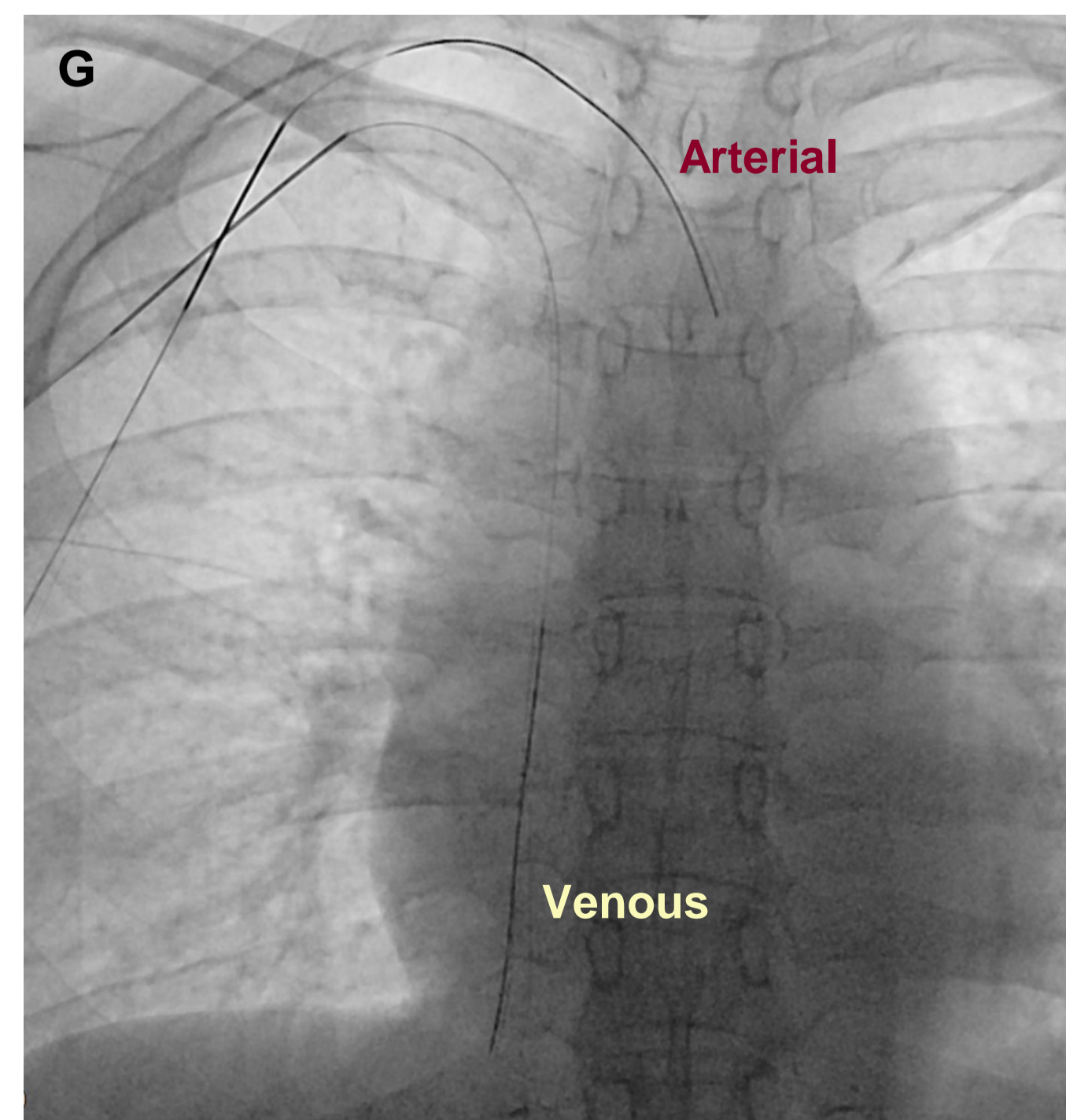
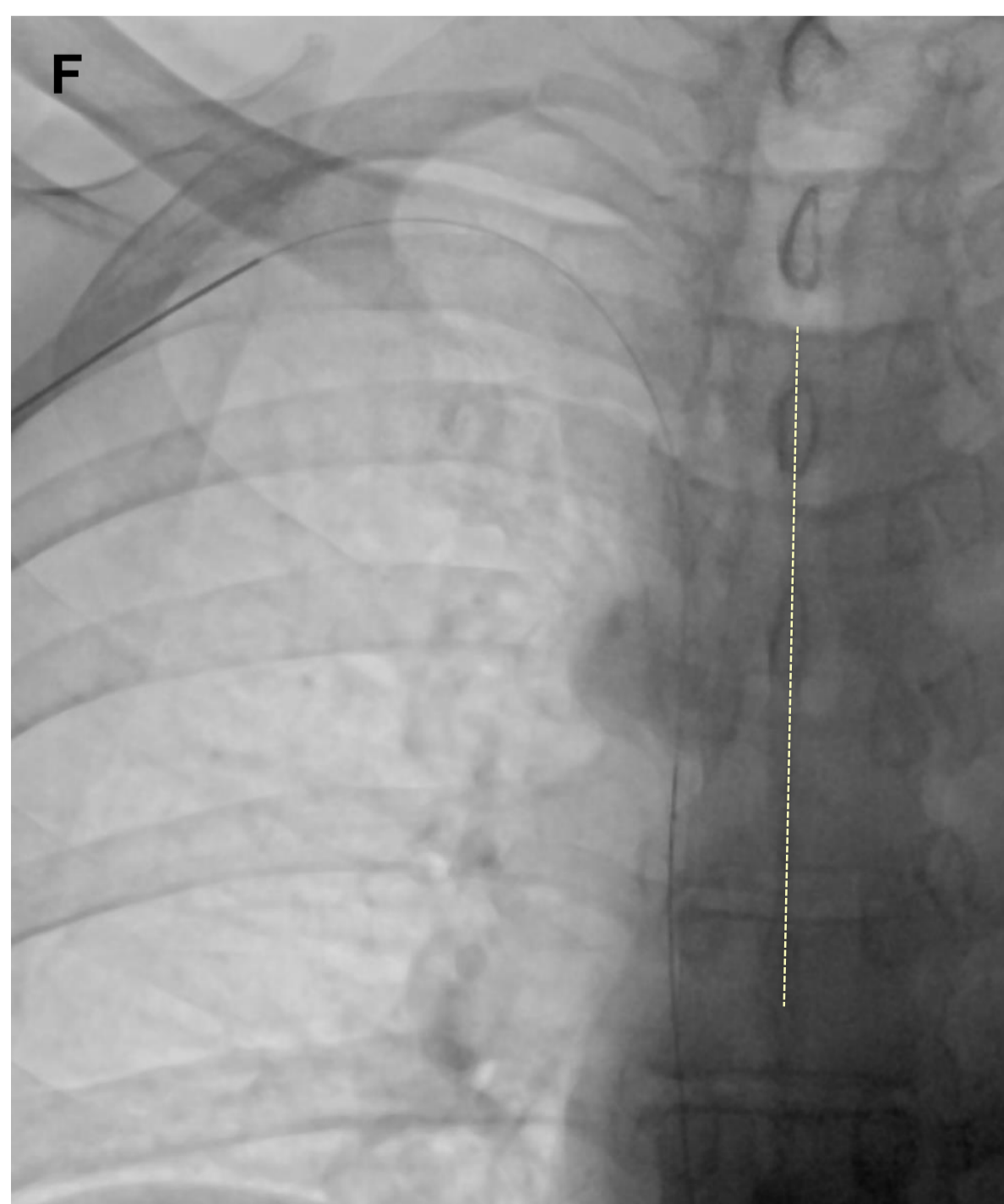
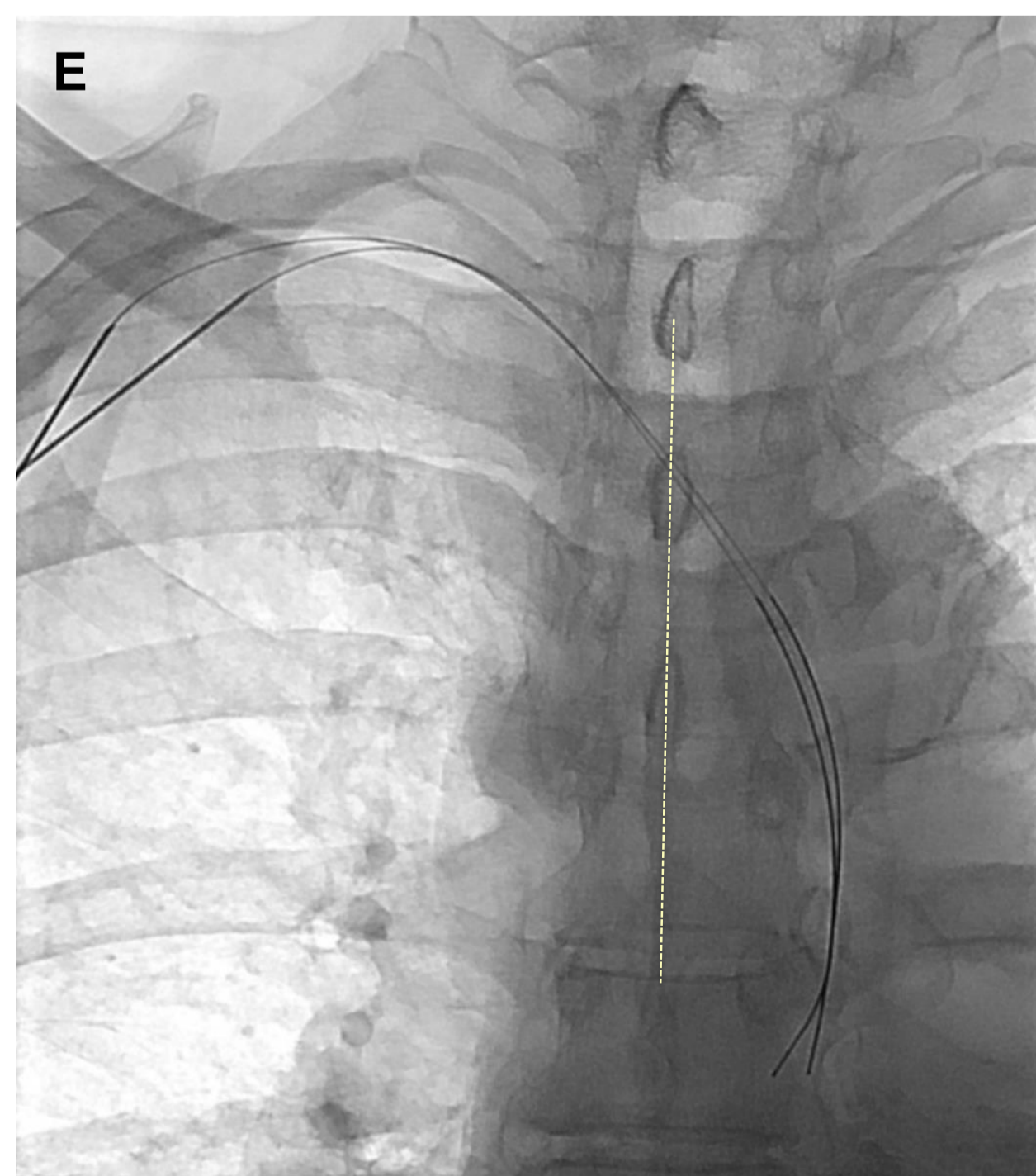
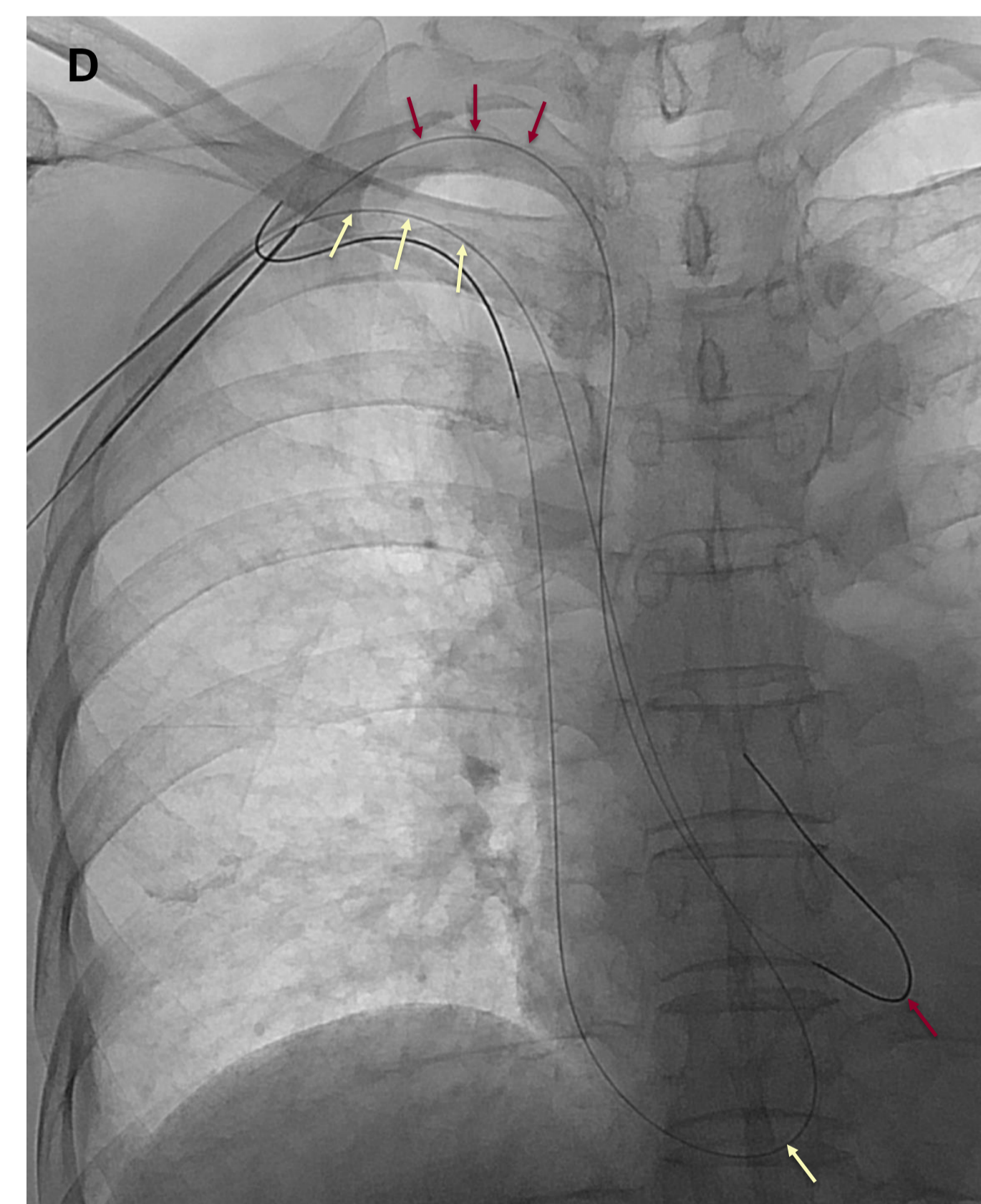
A) Arterial puncture can be recognized by the guidewire passing above the clavicle and the guidewire being located to the left side of midline (yellow line).

B) In case of **venipuncture**, the guidewire **do not passes above the clavicle** and the guidewire locates at the right side of midline (within the SVC).

Radiographs obtained during TIVAP procedure, this is another finding that differentiates arterial puncture from venipuncture.

C) The guidewire passes above the clavicle and makes U-shaped rotation near the aortic valve (red arrow).

D) Re-access technique to the axillary vein after initially puncturing axillary using a second needle with the first needle and wire as landmarks while keeping them in the artery. The guidewires in the arterial and venous lumen show different courses and different shapes within the heart. The venous guidewire shows U-shaped rotation at the right atrium (yellow arrow), while the arterial guidewire shows U-shaped rotation near the aortic valve (red arrow).



E,F) In this patient's case, after two arterial punctures, hemostasis was achieved with manual compression, and then venous re-access was performed. G) Venous re-access performed using the first needle and wire as landmarks while keeping them in the artery. This radiograph clearly demonstrates the different courses of guidewires between the arterial and venous punctures.