



Procedural Ultrasound
Chapter 2

ULTRASOUND GUIDANCE FOR CENTRAL LINE PLACEMENT



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Ultrasound guidance for central line placement

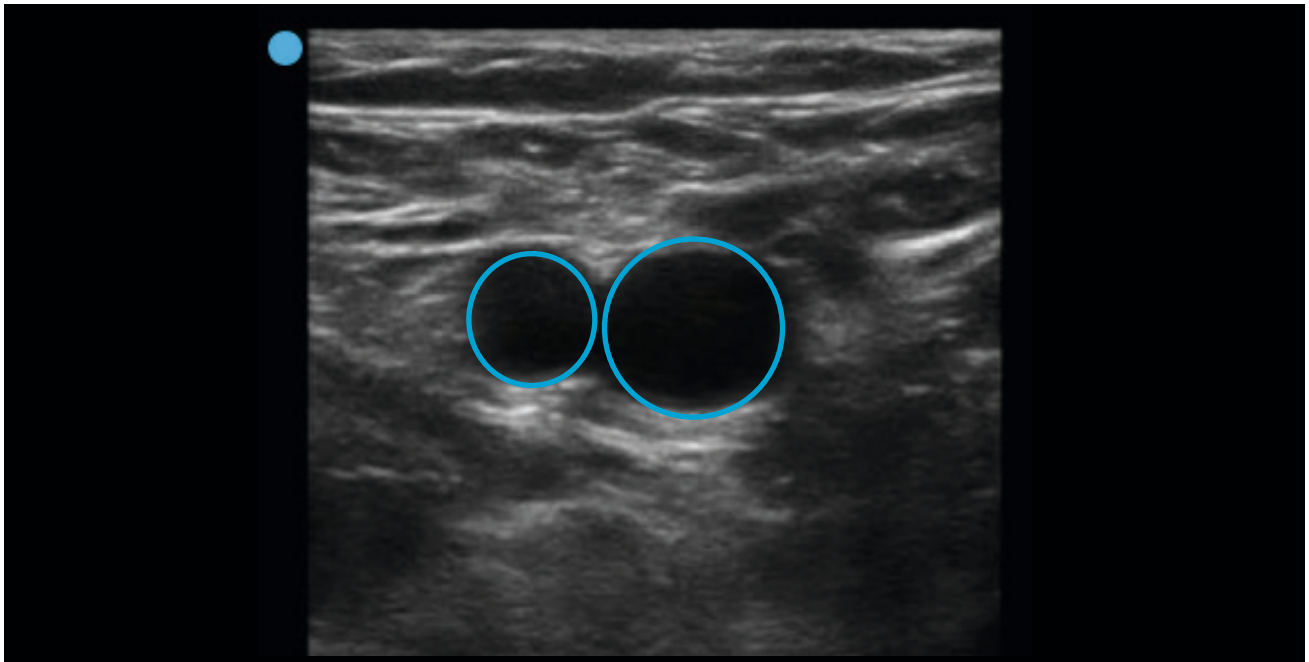
DIFFERENTIATING BETWEEN ARTERIES AND VEINS

Artery

- Round
- Pulsatile
- Not compressible
- Thick wall
- Pulsatile flow

Vein

- Oval
- Not pulsatile
- Compressible
- Thin wall
- Undulating flow

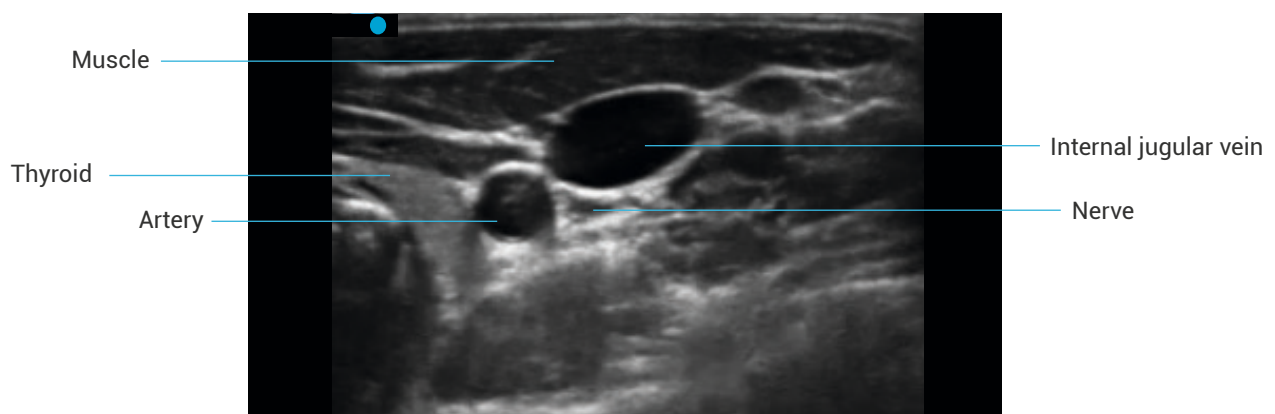


These principles are important to remember because there can be anatomic variation on what is classically taught for artery and vein location.

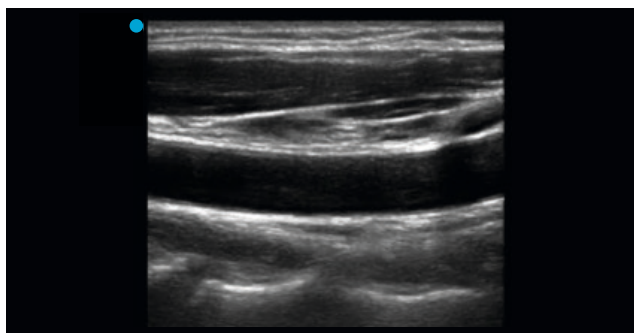
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IMAGING THE LATERAL NECK

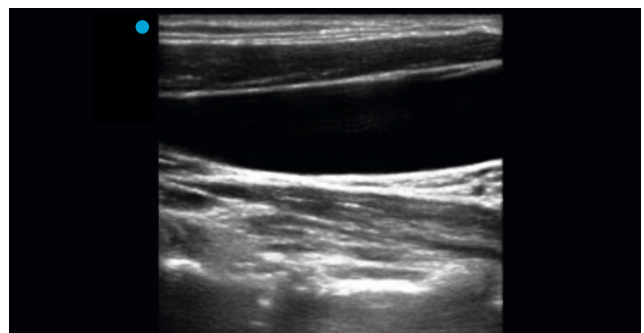
There are several structures that you will encounter when performing ultrasound to guide an internal jugular central line. Here is a picture of the right internal jugular vein in transverse axis.



Here are views of these same vessels in the sagittal axis.



Carotid artery

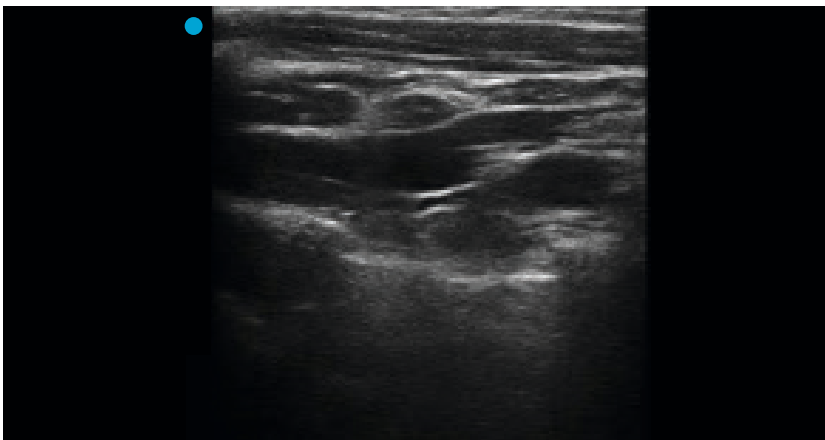
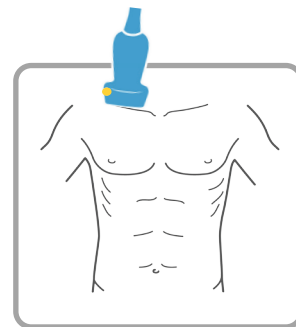
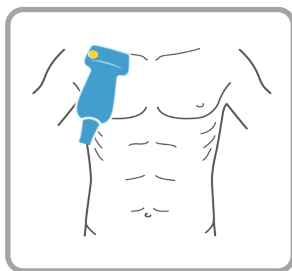


Internal jugular vein

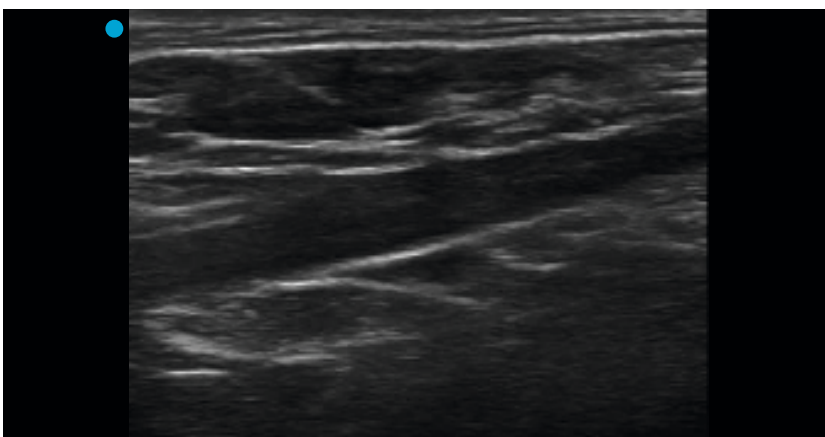
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IMAGING THE ANTERIOR UPPER CHEST

To place a subclavian vein central venous catheter, you can approach from above or below the clavicle. Most people find it easiest to use the long-axis approach here, which is also "in-plane". This is useful for keeping an eye on your needle to avoid a pneumothorax.



Infraclavicular long-axis



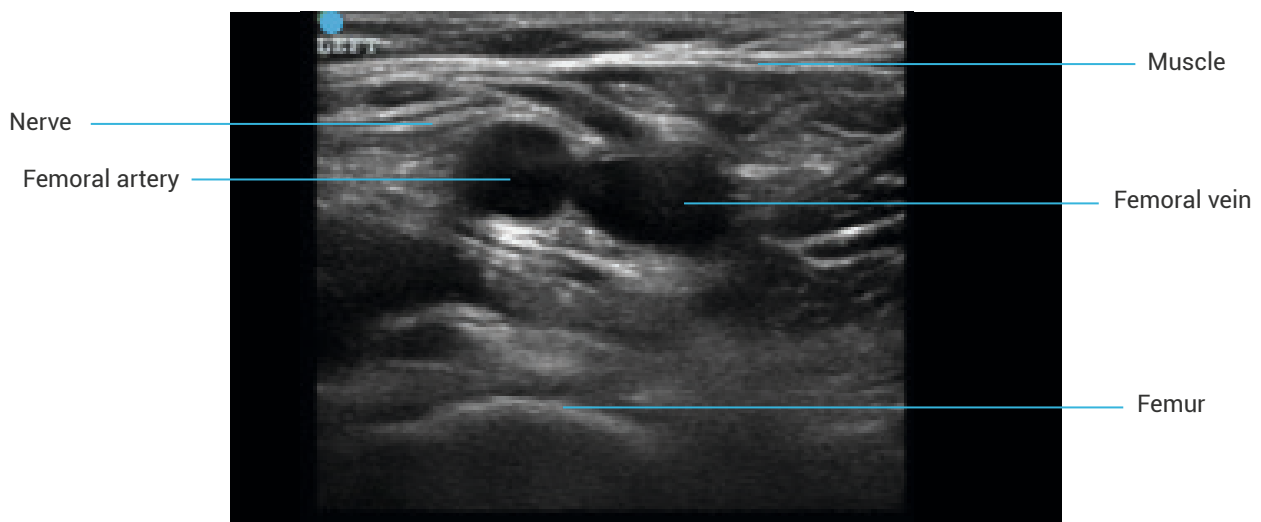
Supraclavicular long-axis
(must angle probe face anteriorly to get this view)

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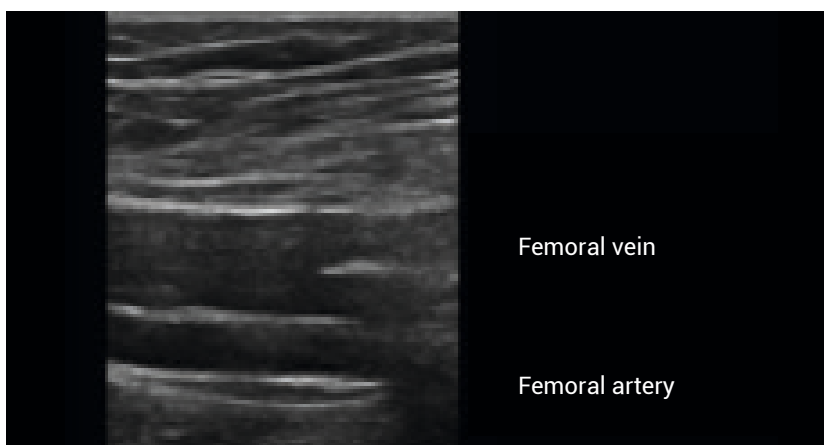
MASTERING THE ULTRASOUND ANATOMY OF THE GROIN

To place a femoral artery central line, it is important to know the structures in the groin.

Nerve, muscle, femoral artery, femoral vein, femur



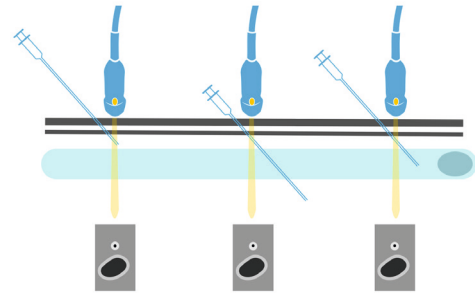
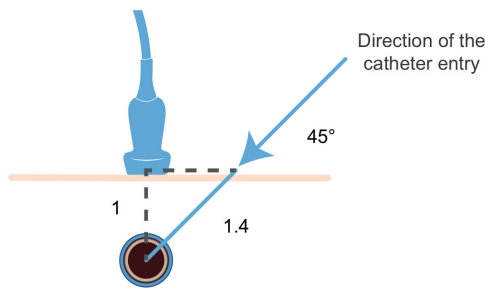
Here are those same vessels in the sagittal plane.



You can see the split of the common femoral vein into the femoral and the deep femoral veins.

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MASTERING ULTRASOUND GUIDANCE FOR CENTRAL LINE PLACEMENT



Ultrasound can give you an idea of the path to your target vessel.

Place your ultrasound probe perpendicular to the skin and try to center the target vessel on your screen. This means it is directly under the middle of your probe.

You can determine how long of a path your needle

will take.

The out-of-plane technique is easiest for many beginners but is difficult to keep a close eye on your needle tip. You could be fooled by seeing a part of the needle on ultrasound that isn't the tip.



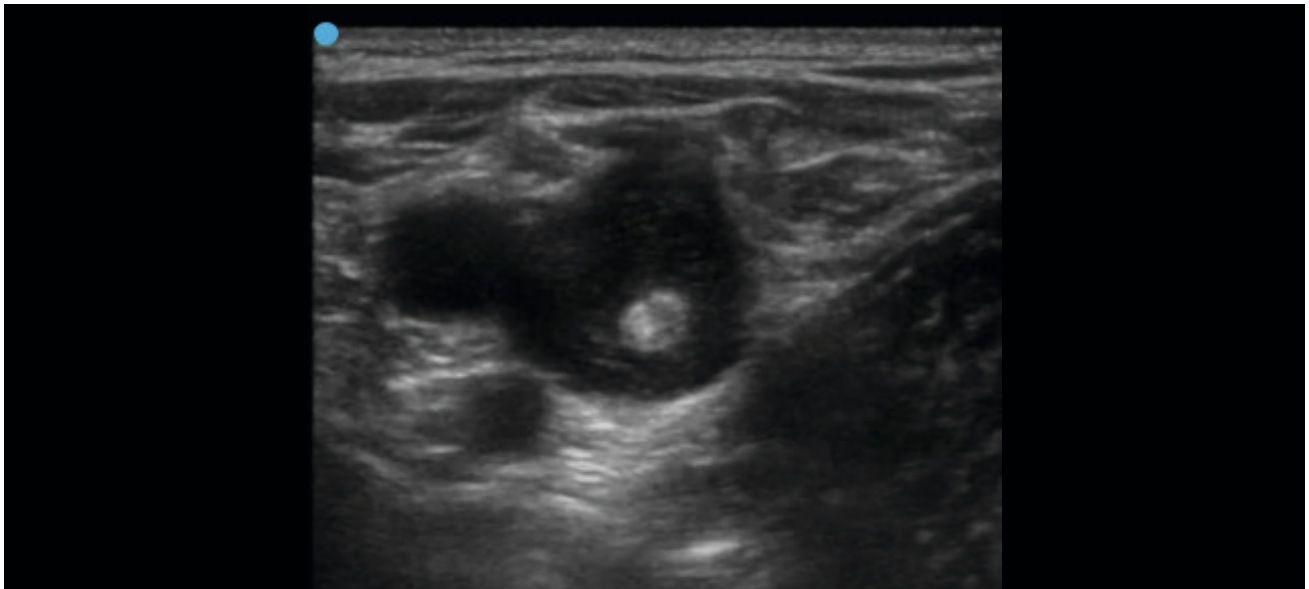
One last trick—look with ultrasound again, once the catheter or wire is in, to confirm you are in the right spot!

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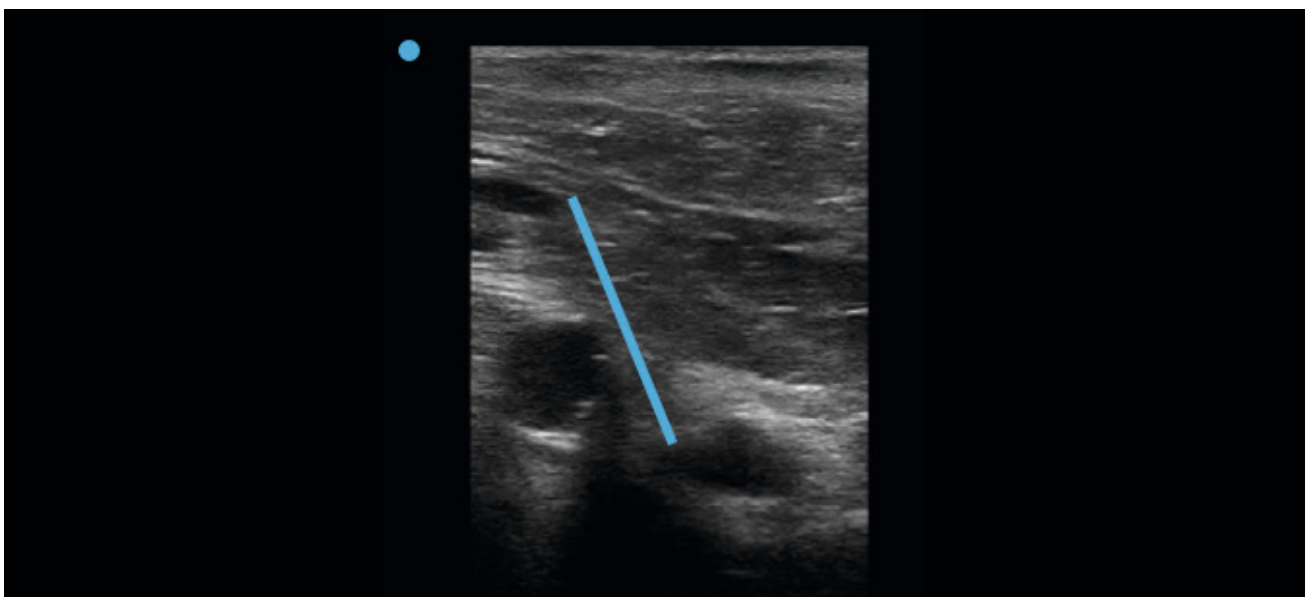
AVOIDING COMMON COMPLICATIONS

Ultrasound can help you avoid pitfalls in placing central venous catheters.

You can see clots.



You can keep an eye on your needle's path and make adjustments as needed. This operator is too close to the artery. They could center the vessel on the screen and have a better sense of what angle to approach.



FURTHER READING

Denys, BG, Uretsky, BF. 1991. Anatomical variations of internal jugular vein location: impact on central venous access. *Crit Care Med*. **19**: 1516–1519.

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Powell, JT, Mink, JT, Nomura, JT, et al. 2014. Ultrasound-guidance can help reduce adverse events during femoral central venous cannulation. *J Emerg Med*. **46**: 519–524.

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