

Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist

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TECHNIQUE

Ultrasound-Guided Venous Access for Arm Cases

Marie E. Miranda, RN

In the cardiovascular lab, a right heart catheterization requires venous access, but sometimes it is not easy to gain access, which often needs a deft hand and finely tuned skills. I have been a vascular access nurse for 21 years, placing ultrasound-guided intravenous (IV) lines, midline, and peripherally inserted central catheters (PICC lines). Recently, I showed one of our staff interventionalists, Dr. Morton Kern, how to gain easy access to any vein. He said he learned something very helpful and it was worthy of sharing with a larger audience. Following are my thoughts on how best to perform ultrasound-guided venous access.

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RENAL DENERVATION

4 Cases: Treating Uncontrolled Hypertension With the Paradise™ Ultrasound Renal Denervation System (uRDN)

Surabhi Madhwal Atreja, MD, FACC, RPVI;

Aravinda Nanjundappa, MBBS, MD;

Wissam Gharib, MD, FACC, FSCAI, and Jordan King, MPAS, PA-C;

Vamsee Yaganti, MD, MA, FACC, FSCAI



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NEW DEVICES

DynamX Bionductor: A Paradigm Shift in Percutaneous Coronary Intervention?

Dean J. Kereiakes, MD, FACC, MSCAI



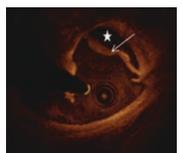
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INTRAVASCULAR IMAGING

Intravascular Optical Coherence Tomography for the Diagnosis and Treatment of Peripheral Arterial Disease

Mehmet Cilingiroglu, MD; Thomas Milner, PhD; Ibrahim Halil Inanc, MD; Deniz Mutlu, MD; Kostas Marmagkiolis, MD; Cezar Iliescu, MD

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Ultrasound-Guided Venous Access for Arm Cases

Marie E. Miranda, RN

Vein Structure

In my opinion, by comparison, accessing an artery is easier. The arterial vessel wall is thicker, more stabilized by surrounding tissue, and not easily collapsible. When access is attempted, the artery does not tend to move or dodge your needle tip as much as with venous access. The radial artery is generally superficial, allowing for easier access, which is not always the case for venous access.

The vessel wall of a vein is thinner and not as supported by surrounding tissue, which allows the vessel to move around and dodge your needle tip. Since the venous system has a low pressure, the vessel is easily collapsible. Sometimes just the weight of the ultrasound probe is enough to collapse the vessel and make it unnoticeable (Figure 1). Similarly, just the pressure of the needle tip pushing on the top vessel wall can collapse the wall and make accessing the center of the vessel impossible.



Figure 1. Ultrasound screen with image of vein, shown via our Sonosite echo machine. The large superficial vein is easily seen at the top of the screen. Other veins and the brachial artery can also be displayed. Veins are non-pulsatile and easily identified by their compressibility. The veins are also more easily seen after a tourniquet is applied above the elbow.

The veins of the upper arm can be tricky in that they are not in the same spot on everyone. I have often noted that people under 200 pounds tend to have a very small or almost non-existent cephalic vein. People over 200 pounds can have vessels as deep as 3-4 centimeters from the

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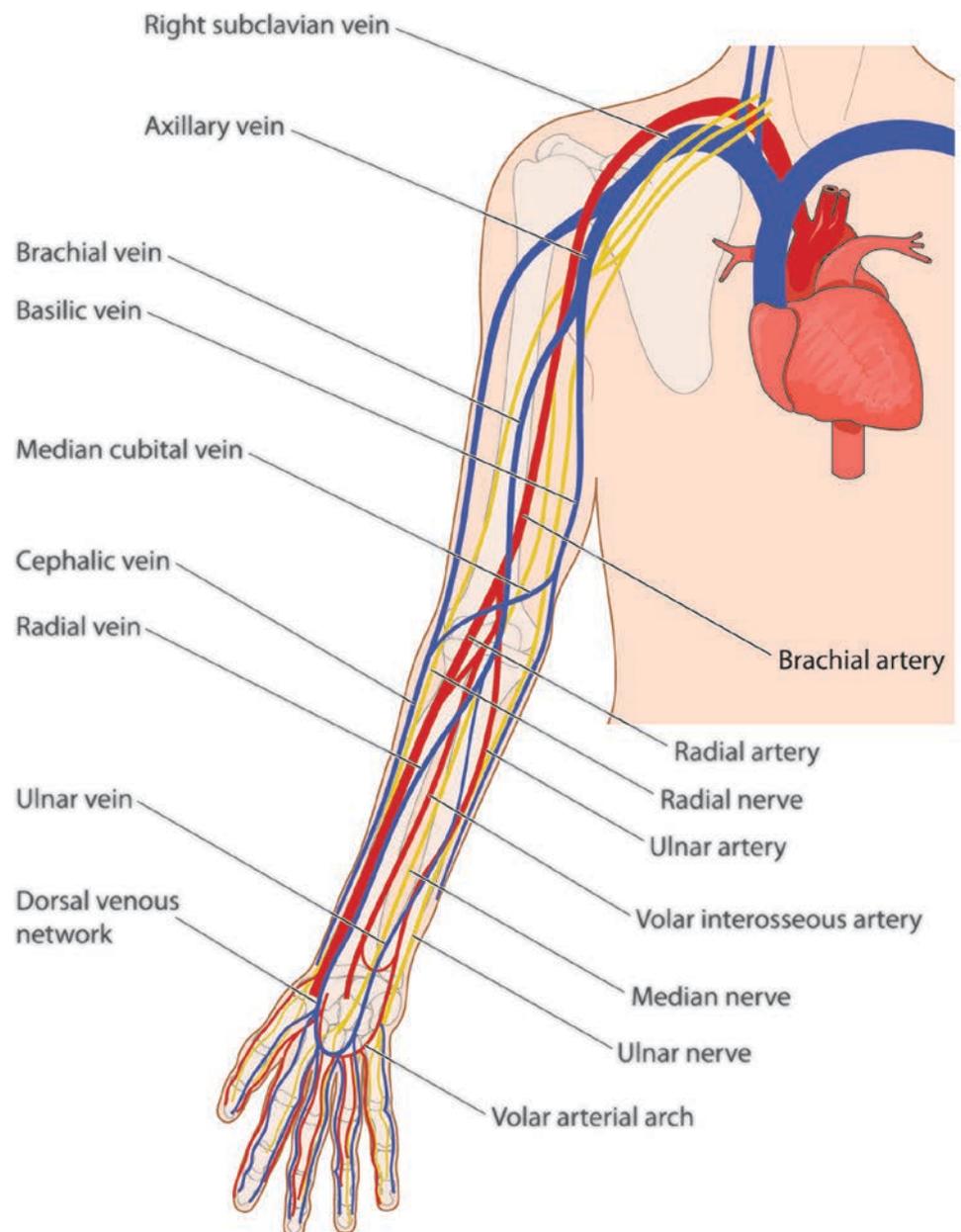


Figure 2. Venous anatomy of the arm.



Figure 3. Positioning of fingers holding the ultrasound transducer.

skin's surface. The two brachial veins take a corkscrew trajectory around the brachial artery up the arm, compounded by the fact that the brachial nerve is always in close proximity and often in the way. Some operators may go right for the basilic vein because it is usually superficial without pesky nerves or arteries in the way. Positioning the arm is pivotal in successful basilic access. It is near-impossible to get the arm in good position and also to have the patient able to hold that position for any length of time. The basilic vein tends to be low on the inner arm, requiring the angle of access to be almost perpendicular to the arm (Figure 2).

Angiocath Versus Micropuncture Needle

In general, the use of an IV catheter (like an Angiocath [BD], consisting of a needle and cannula) to gain upper arm venous access with ultrasound guidance can be difficult. Once the bevel is inside the vein, you will get blood return, but that does not mean the catheter material is in the vein lumen. The needle's bevel extends 2 mm past the IV cannula tip, so not only the bevel, but also the catheter material needs to be seated inside the vessel. After successful access, the needle's entrance angle needs to be lowered to allow the catheter material to slide in without getting

caught on the vessel wall, potentially causing extravascular cannulation and access failure. The micropuncture needle is thin, easily seen, and positioned using ultrasound, and it is something many prefer.

The Ultrasound-Guided Method for Venous Access in Detail

There are several different ways to access a vessel, but the most common among vascular access nurses is Modified Seldinger Technique (MST). The first step in MST is to use ultrasound guidance to visualize the vessel. The vessel should be assessed by tracking several inches above and below the desired access point. This ensures there are no valves or bifurcations that could misdirect the wire. Using the compression check (compressing the vessel with the ultrasound probe) will help to identify an artery versus a vein, will show if the wall of the vessel is thin or thick, and/

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Commentary: Ultrasound-Guided Venous Access for Arm Cases

By Morton J. Kern, MD

I was struggling to get access with Angiocaths (BD) in the deeper and more medial veins. Sometimes even seemingly easily accessible veins could not be easily cannulated with the Angiocath. Marie showed me her micropuncture technique and it has now become our 'go-to' method.

Furthermore, I agree with Marie in telling us that the micropuncture access technique (Modified Seldinger Technique) utilized by most vascular access nurses has been proven successful for years. Adapting this technique for use in the cardiac catheterization lab should increase venous access success with minimal attempts and improved patient outcomes. Thanks, Marie, for making this better known to me, the cath labs, and operators.

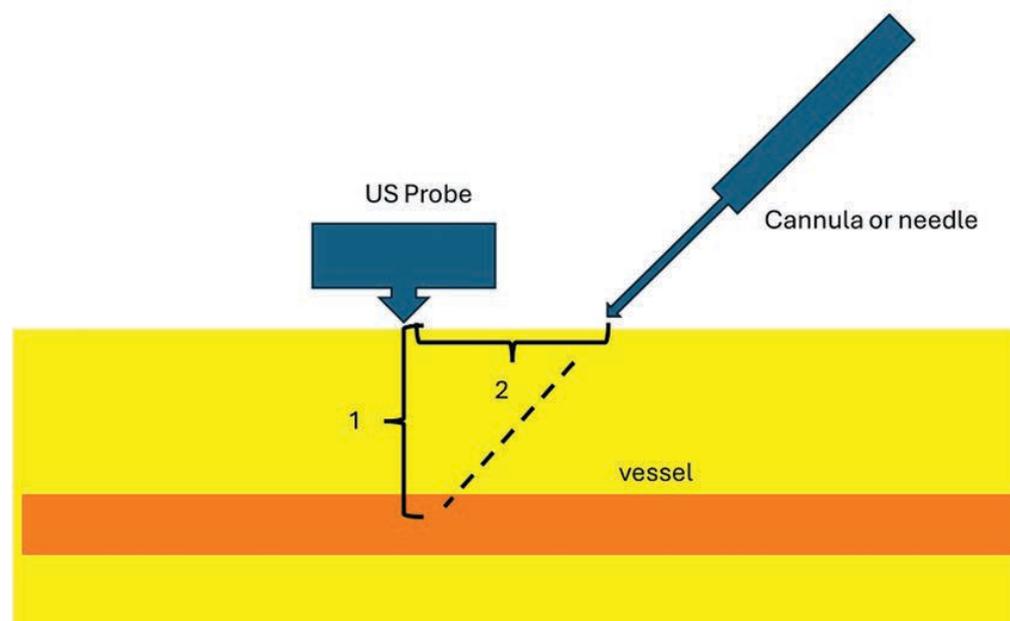


Figure 4. Needle entry distance. US = ultrasound transducer; 1 = depth to vein; 2 = distance from centerline of transducer. 1 should equal 2 for a 45-degree angle of entrance.



Figure 5. (Left panel) Positioning of the arm in anticipation of right brachial vein access. The ultrasound transducer is on the vein with the needle positioned to advance. The tourniquet is tightened on the arm. (Middle panel) Wire being introduced into the micropuncture needle. (Right panel) Micropuncture access is followed by imaging throughout the procedure.

or if there are any deep venous thrombosis/clots present.

Holding the probe is a huge part of successful access. The probe should be held low with your first 3 fingers, while the pinkie and ring finger should gently lie on the patient's arm (Figure 3). This will allow you to hold the weight of the probe and just have it lightly kiss the skin. Holding too high up on the probe and/or with too much pressure will collapse the vein and can distort the depth of your vessel. Both factors contribute to failed access.

Once the access point is confirmed, a needle is introduced with the goal of getting the bevel tip to enter through the center of the vessel. In general, the needle should be advanced the same distance behind the ultrasound probe as the vessel is deep. For example, if the vessel is 1 cm deep, the needle should access the skin 1 cm before the ultrasound (Figure 4). This ensures the needle tip will drop at the depth of the vessel within our ultrasound's field of view. Seeing the bright needle tip under the ultrasound is essential, as it enables you

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to achieve the correct angle to get into the vessel center.

After visual ultrasound and blood return confirmation, the needle should be held steady and firm, keeping in mind not to advance the needle inadvertently. The floppy side of your wire should slowly advance into the needle about 4 cm. In my personal practice, I drop the needle angle down slightly to advance the stiff part of the wire. If the needle angle is too steep, the wire's transition from floppy to stiff can bump the needle out of the vessel, causing inadvertent wire advancement outside the vessel. Once the wire is advanced with ease about 4-7 cm, the needle can be removed. If the needle does not come out easily, the needle's angle can be dropped slightly down, closer to the skin. You should never need to use any force to remove the needle; using force could cause the wire to shear off under the skin. If the needle seems stuck and an attempt to decrease the angle does not work, always withdraw the needle and wire together, until the wire comes out with ease. Once the needle is removed from the vein leaving the wire, a sheath can be advanced over the wire, allowing access for the right heart catheter (Figure 5).



Figure 6. Marie E. Miranda, RN, and Dr. Morton Kern.

Final Thoughts

I hope this discussion helps our colleagues in the cath lab to gain easy arm vein access. ■

Acknowledgements. With deep appreciation, I would like to thank Dr. Kern for this opportunity.

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