

A Challenge in Ergonomics in the Cath Lab: Left Ulnar Catheterization “Don’t Use My Leg”

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Ulnar arterial access for cardiac catheterization is an infrequently used approach compared with radial or femoral access. Globally, the radial artery approach is the most favored, because of its safety profile¹, and easy access and hemostasis. Radial access for cardiac catheterization and percutaneous coronary intervention also has been shown to provide cost savings² and increased patient satisfaction³. However, ulnar artery access can provide a reasonable alternative. Typically, patients that have known peripheral arterial disease (CAD) with 3-vessel coronary artery bypass graft (CABG) surgery, hypertension, hyperlipidemia, severe peripheral arterial disease, and previous ischemic stroke. She was also a two pack-per-day smoker for 55 years. Her bypass grafts include a saphenous vein graft (SVG) to the diagonal branch, another SVG to the obtuse marginal artery, and the left internal mammary artery (LIMA) to the left anterior descending (LAD) artery. If an ulnar access site is chosen,

Higher rates of failure with the ulnar artery are likely attributable to a learning curve among operators. Hemostasis for the ulnar artery is also somewhat more problematic, because there is no bony prominence underneath to compress the vessel, although radial artery occlusion and ulnar artery occlusion occur with similar frequency.⁶

ultrasound assessment should be used to ensure adequate sizing. A meta-analysis comparing radial and ulnar approaches showed similar efficacy and safety; however, higher puncture rates and access crossover occurred in the transulnar arm (n=2744).⁵ Higher rates of failure with the ulnar artery are likely attributable to a learning curve among operators. Hemostasis for the ulnar artery is also somewhat more problematic, because there is no bony prominence underneath to compress the vessel, although radial artery occlusion and ulnar artery occlusion occur with similar frequency: in the order of 7% to 8%, when evaluated early by vascular ultrasonography following coronary procedures.⁶ There are small studies suggesting that

ipsilateral ulnar access after failed radial access is safe, probably due to an extensive collateral network in the hand.⁷ Despite some challenges, there are scenarios where ulnar provides a satisfactory alternative to radial or femoral approaches.

Case Report

A 68-year-old female presented to our cath lab from her private cardiologist’s office due to a positive stress test. She had a history of coronary artery disease (CAD) with 3-vessel coronary artery bypass graft (CABG) surgery, hypertension, hyperlipidemia, severe peripheral arterial disease, and previous ischemic stroke. She was also a two pack-per-day smoker for 55 years. Her bypass grafts include a saphenous vein graft (SVG) to the diagonal branch, another SVG to the obtuse marginal artery, and the left internal mammary artery (LIMA) to the left anterior descending (LAD) artery.

According to our patient, she had been having exertional chest pain for a month, prompting a visit to her cardiologist’s office. She was only able to exercise for 4 minutes, and the nuclear images showed a moderate to severe inferior wall defect that had significant but incomplete resolution with rest, which was consistent with ischemia.

While prepping our patient for her diagnostic angiogram,

she was found to have barely palpable radial pulses bilaterally. The patient also was adamant about wanting the catheterization to be done from the upper extremity and specifically indicated “don’t use my leg.” Ultrasound revealed a small left radial artery with poor flow by Doppler. Therefore, the left ulnar artery was assessed and cannulated under ultrasound guidance. Her angiogram showed her distal left main to have a calcified 80% lesion, chronic total occlusion (CTO) of the proximal LAD, luminal irregularities of the left circumflex, and a 100% CTO of the right coronary artery. Her two vein grafts were completely occluded, but her LIMA to LAD was patent. No intervention was performed during this procedure.



Figure 1. Left ulnar artery cannulated with sheath angled laterally towards radial artery.

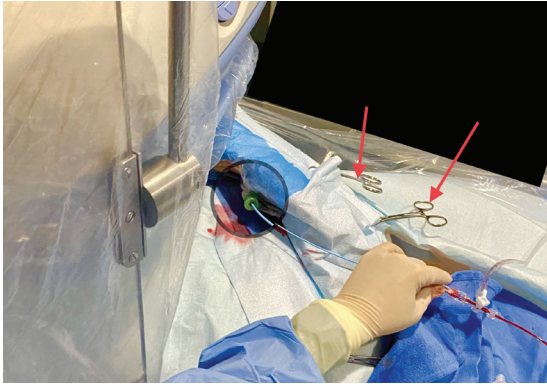
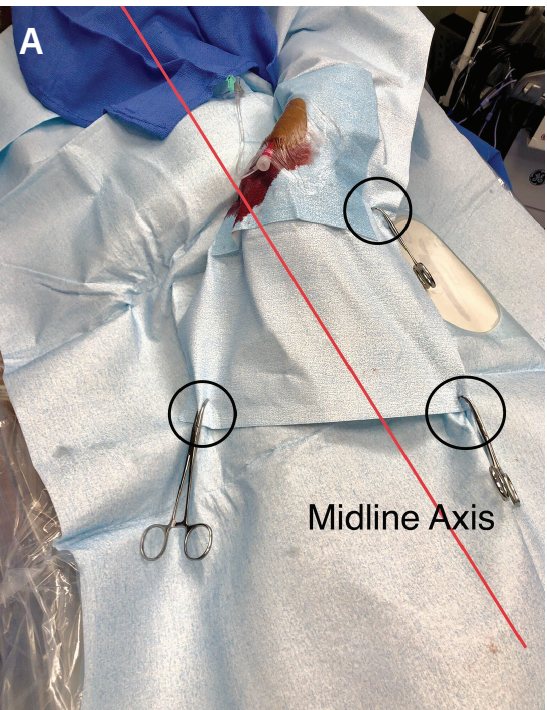


Figure 2. Radial Access Sleeve (Tesslagra Design Solutions) secured to body drape with lateral towel clamps for adequate visualization of sheath hub.

Setup

The prep and ergonomic setup in this case are almost identical to our conventional left radial setup, which uses a “peek-a-boo” technique. The peek-a-boo technique is a sheath withdrawal technique for operators who work on the right side of the patient; it gives adequate visualization of the hub of the sheath to the operator when the arm is brought across the patient’s body.⁸

1. Place a standard swivel board on the patient’s left side, with the arm abducted from body. Have patient raise their arm and place a sterile half-sheet or sterile gown over the arm board (a folded sheet can be placed on the arm board before application of the sterile half sheet to allow for hyperextension of the wrist). This helps with patient comfort and increases the operator’s chances of first-entry access.
2. While the patient’s arm is raised, attain circumferential sterility with a Radial Access Sleeve (Tesslagra Design Solutions) and create a seamless sterile field.
3. Cannulate left ulnar artery.



4. After access (preferably using a 16 cm sheath), leave 6-7 cm outside the body and secure down with tegaderm so that the hub of the sheath projects towards the radial artery or in a lateral direction (Figure 1). Withdraw one-third to one-half of the sheath and meticulously secure down.
5. Approximate the sheath’s hub to the midline of the patient and clamp down the medial side of the Radial Access Sleeve (the one closest to the operator) to maintain position throughout the procedure (Figure 2). Additionally, a secondary clamp on the lateral side (furthest from the operator) is especially helpful, due to the location of the ulnar artery.
6. Further secure the arm by buttressing it into place with a Cobra Board (TZ Medical) to eliminate the arm “drifting” away from the operator.

Ergonomic Considerations

Due to the medial location of the ulnar artery, ergonomics become significantly more difficult than that of a conventional left radial approach with the peek-a-boo technique or a distal radial procedure (Figure 3). The left hand and arm have a propensity to pronate when adducting from the side during a catheterization. This pronation of the left hand/arm makes an operator’s life difficult for a radial procedure and is amplified with an ulnar procedure. The hub of the sheath becomes “hidden” in the drapes and forces an operator to frequently rotate the hand/wrist in order to access the sheath.

By withdrawing the sheath and pulling it towards the radial artery, the operator is allowed a satisfactory line of sight with the hub when the left arm is adducted. Keep in mind, for taller patients, 125 cm catheters may be needed to accommodate longer limbs and/or tortuous anatomy. It is important to adequately clamp the lateral side of the Radial Access Sleeve down to keep the hand supinated somewhat in order to maintain site of the hub, and allow the operator to push and pull the catheter.

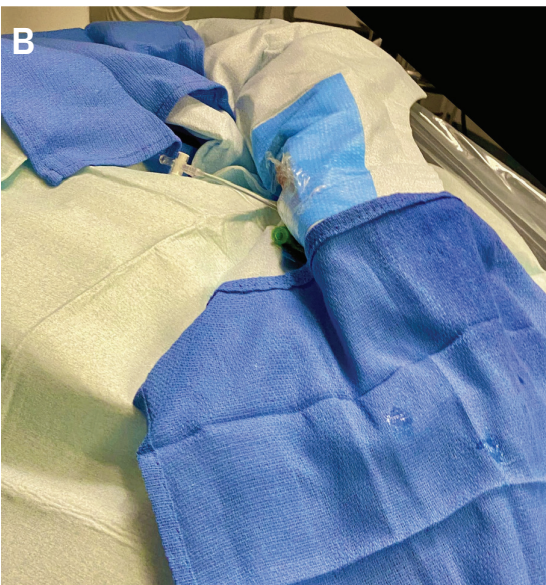


Figure 3A-B. Ergonomic comparison between left distal radial artery and left ulnar artery. (A) Left distal; (B) left ulnar.

This is crucial with an ulnar procedure to provide proper ergonomics for the operator. With a dedicated equipment, proper technique, and attention to detail, the operator can complete the procedure with relative ease while simultaneously creating a comfortable environment for the patient (Figure 4).

Conclusion

Although the ergonomics of an ulnar procedure are still not at the level of radial or femoral approaches, applying the techniques and setup described in this case help to make an ulnar approach more operator-friendly, and offers another option for patients and interventionalists when all other options seem exhausted.

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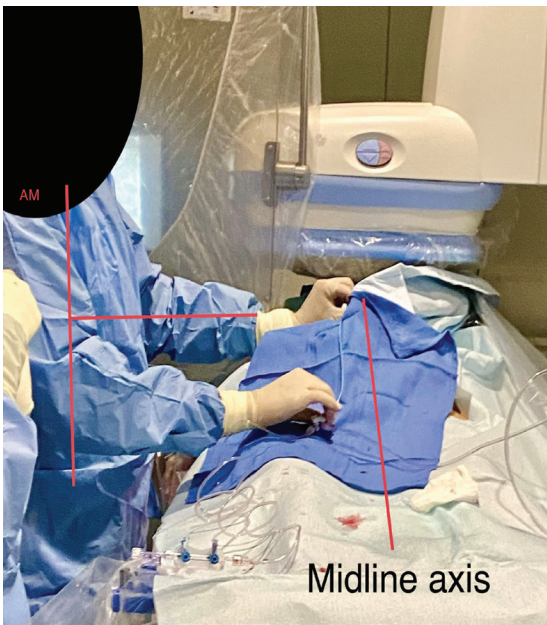


Figure 4. Operator ergonomics. Erect operator with comfortable hand position.

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Disclosures: Richard Casazza reports he is Director of R&D for Tesslagra Design Solutions. Drs. Miller and Verma report no conflicts of interest regarding the content herein. The authors can be contacted via Richard Casazza, MAS, RT(R) (CI) at all4ugq@aol.com or on Twitter at @Tesslagra.