

WHAT WOULD YOU DO?

Radial Access for the Evaluation of Bypass Grafts

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CASE PRESENTATION

A 62-year-old woman presented with cardiovascular risk factors, including diabetes mellitus, hypertension, and hyperlipidemia. She had end-stage renal disease and was on dialysis via a left arteriovenous fistula (AVF) that had required revision twice in the past 5 years. The last repair was performed 1 week previously, resulting in the patient dialyzing through a temporary double-lumen silicone dialysis catheter in the right subclavian vein. She had established coronary artery disease and underwent coronary artery bypass grafting (CABG) with a left internal mammary artery (LIMA) graft to the left anterior descending (LAD) artery, a saphenous vein graft (SVG) to the obtuse marginal (OM) branch, and an SVG to the right posterior descending artery (RPDA) 10 years earlier. She was admitted with a non-ST-segment elevation myocardial infarction (NSTEMI) with ST-segment depression in the anteroseptal leads. An echocardiogram demonstrated moderately impaired left ventricular (LV) systolic function with an ejection fraction of 35% and global hypokinesis.

Accordingly, she was taken to the catheterization laboratory for urgent coronary angiography and possible percutaneous coronary intervention (PCI). She received a loading dose of 300 mg of aspirin and 600 mg of clopidogrel orally. Access was achieved in the right radial artery given the fistula on the left forearm. After achieving access, 5,000 units of heparin were administered intra-arterially along with verapamil and nitroglycerine. A 6-F Judkins right (JR) 4 catheter was used to engage the native right coronary artery, the SVG to RPDA, and the stump SVG to the OM branch. A 6-F Judkins left (JL) 3.5 catheter was used to engage the native left main coronary artery. Multiple projec-

tions were obtained. The catheter exchanges were performed over a 0.035-inch Glidewire Advantage guidewire (Terumo Interventional Systems). At this point, it was vital to image the LIMA because of the changes in the electrocardiogram and LV dysfunction. It is notable that the aortic arch was mildly calcified.



How do you study grafts in your post-CABG patients who present with an acute coronary syndrome? Does cardiac CTA play a role in NSTEMI?

Dr. Rao: This is a very interesting case. Before addressing the specific questions, it's important to note a few things. Given the ST-segment changes and the reduced ejection fraction, this is a very high-risk patient. It's important to note that the case description indicates ST-segment depression in the anterolateral leads. ST-segment depression is not localizing, so using this to focus attention on the anterior wall circulation is not necessarily appropriate. Having said that, it is important to perform invasive risk stratification. In our lab, post-CABG patients generally undergo cardiac catheterization via the left radial artery. Patients with bilateral mammary grafts are generally approached via the right radial artery because it is technically more challenging to cannulate the right internal mammary artery from the left compared with cannulating the LIMA from the right radial. Cardiac CTA can be very valuable in post-CABG patients because it can obviate LIMA angiography.

Dr. Nolan: In the absence of active persistent myocardial ischemia (manifested as ongoing ischemic chest pain and/or dynamic electrocardiogram change with or without hemodynamic compromise), I would aim for

initial medical stabilization followed by CTA to evaluate the native and graft vessels. If this indicated a complete vessel occlusion as the culprit, I would aim for optimal medical therapy. If there were a tight obstructive lesion identified in a patent vessel, I would consider PCI. If the CT was equivocal, I would consider catheter-based angiography.

Dr. Shah: CTA is a fantastic way to evaluate grafts in patients, especially at an institution where it is easy to obtain and one that has optimized their protocol to use low contrast. Although I generally prefer CTA in post-CABG patients to evaluate grafts, in the setting of a likely type 1 NSTEMI, I will go straight to cath.



Which access do you prefer to use in patients who are on dialysis with an AVF: femoral or radial?

Dr. Nolan: This is a complex decision that needs to be individualized. These patients are heavily dependent on dialysis fistulas, usually in the arm. They are also at high risk of femoral vascular complications, which may be life-threatening. In most circumstances, I would aim for upper limb access to avoid a major femoral access issue.

In my opinion, the best approach would be an ultrasound-guided distal radial puncture in the contralateral arm to the dialysis fistula. I would then employ liberal vasodilators, full anticoagulation, and downsized catheters (4 F for diagnostic studies, if possible; 5 F for PCI, if possible), followed by active patent hemostasis. This approach stands the best chance of preserving the more proximal upper limb vessels for future fistula formation while minimizing the risk of an access site complication. In a patient with a history of multiple failed fistulas, ultrasound-guided femoral access should be considered.

Dr. Shah: Patients on dialysis are at very high risk for bleeding and access site complications. Therefore, I prefer to use radial artery access in these patients and will often go in the side contralateral to the arm with the AVF. However, in this case, the patient has a left-sided AVF and a pedicled LIMA to LAD artery in the setting of electrocardiogram changes in the LAD artery territory. This requires cannulation of the LIMA via the right radial artery, which may be difficult in the setting of tortuosity and result in longer procedure times. Although I am comfortable cannulating the LIMA from the right radial and would likely take the radial approach, I do not

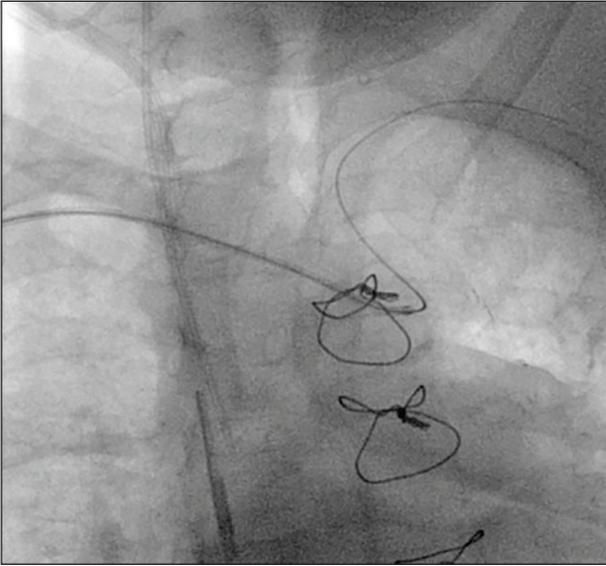


Figure 1. The hydrophilic guidewire in the left subclavian artery.

think it is unreasonable to perform the procedure via the femoral artery. If the procedure is performed femorally, I would strongly encourage the adjunctive use of ultrasound when achieving access. Ultrasound increases the chances of successful access on the first attempt and decreases the risk of access site bleeding complications. It also allows you to avoid the calcium that is often diffusely present in dialysis patients and increases your chance of using a vascular closure device for hemostasis.

Dr. Rao: In general, we use the radial artery in the arm opposite the one with the dialysis fistula. However, if there is no access in that arm, we will use the femoral approach with ultrasound guidance for arterial access.

? Which catheters, wires, and maneuvers do you recommend to engage the LIMA from the right radial access?

Dr. Shah: I will generally use a 5-F internal mammary (IM) catheter (torque upward to engage the ostium of the left subclavian artery) and a 1.5-mm, J-tip, 0.035-inch hydrophilic wire to navigate the left subclavian artery. I am careful to leave a bit of my wire out of the catheter when possible so that I am not necessarily “scraping” the arch when attempting to cannulate the ostium of the left subclavian. Once the wire is distal, it may be fixed in place by bending the elbow or inflating a blood pressure cuff if needed. There is a small chance the 5-F IM catheter will still not track over the wire, and in those cases, the catheter may be exchanged for a softer 4-F catheter. Occasionally, in cases of severe tortuosity, I will need an angled-tip hydrophilic wire (carefully watching under fluoroscopy) or a stiff-body 0.018- or 0.014-inch wire to navigate the left subclavian. If a 0.018- or 0.014-inch wire is needed, I’ll position the wire

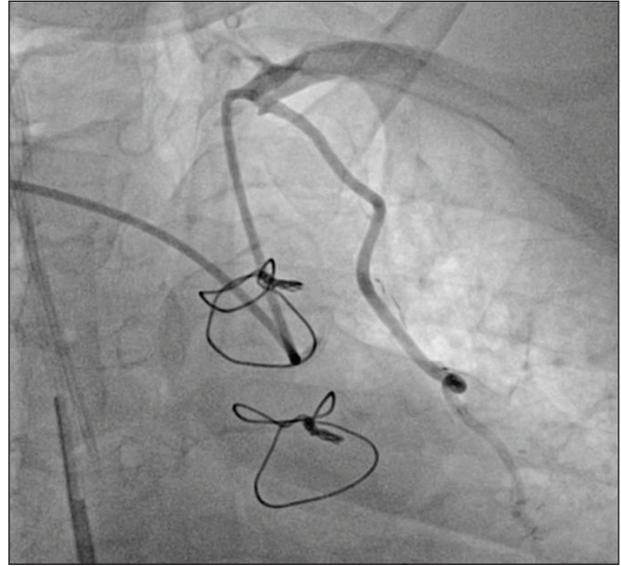


Figure 2. The JR 4 catheter engaging the LIMA.

as distally as possible in the left arm (fixed as previously described) and use a microcatheter to get into the body of the left subclavian before exchanging out for an IM catheter over a J-tip, 0.035-inch wire with a stiffer body.

Dr. Rao: This is a good skill to have, and several approaches can be used. One can use the Tiger shape of the Optitorque diagnostic catheter (Terumo Interventional Systems), a JL 4, or an Amplatz left 2 catheter to engage the left subclavian artery. The catheter can be advanced into the descending aorta and then pulled back with counterclockwise torque. Another option is the SIM1 or SIM2 catheter, advanced into the ascending aorta and then advanced to have the catheter tip engage the left subclavian artery. Once the left subclavian artery is engaged, a polymer-jacketed, 0.035-inch wire with a smooth transition (eg, Glidewire Advantage) is advanced into the brachial artery. The patient is then asked to flex the left arm, effectively securing the distal end of the 0.035-inch wire and creating a “rail” on which to advance an IM diagnostic catheter. The IM catheter is then advanced distal to the origin of the LIMA, the wire is removed, and the IM catheter is gently rotated



To watch the videos associated with this case, please view this article on our website at www.citoday.com.

counterclockwise. The rotation will gradually withdraw the catheter, and it is important to not pull the catheter because it has a tendency to “jump” back into the left subclavian. Just torquing the catheter counterclockwise will rotate and withdraw it until it intubates the LIMA.

Dr. Nolan: In this case, options are limited due to spasm. In the absence of important spasm, I would aim to cannulate the origin of the left subclavian artery with a JL 3.5 and then advance a long wire into the distal left arm arteries. The JL catheter can then be removed over the wire and a LIMA catheter can be inserted to image the graft. Many other catheters can be employed in a similar fashion.



Would you select a different catheter for the percutaneous intervention?

Dr. Rao: We tend to use standard guiding catheters for PCI, extra backup shapes for the left coronary, and Judkins or Amplatz curves for the right coronary artery. Amplatz or multipurpose curves can be used for PCI of SVGs.

Dr. Nolan: I would make this decision based on the performance of the diagnostic catheter. If there were selective intubation, I would use a LIMA guide. With a catheter that was not selectively engaged in the LIMA ostium, one option is to wire the graft and aim to deploy a guide extension into the proximal LIMA. Alternatively, different configuration catheters can be tried, such as a JR 4 or a Tiger shape Optitorque. The disadvantage of trying different catheters is that multiple laborious catheter exchanges are required, and extensive catheter manipulation may be required with a concomitant risk of catheter-induced dissection.

Dr. Shah: I usually use an IM guide catheter for the LIMA.

APPROACH OF THE MODERATOR

For stable angina, we usually perform cardiac CTA, which allows us to examine the native arteries and grafts with a total of 50 mL of contrast. It also allows us to strategize and plan any PCI. However, in individuals such as this patient with an NSTEMI and electrocardiographic changes in the anteroseptal leads, the thrombolysis in myocardial infarction score is high. Therefore, we proceeded with coronary angiography. Given the history of an AVF that required repair twice, we opted to proceed with coronary angiography via the right radial artery. Because the aortic arch was mildly calcified and only mildly tortuous, we were able to negotiate the left subclavian artery with relative ease using

a 0.035-inch angled Glidewire Advantage guidewire (Figure 1). Because the patient developed spasm, we chose not to exchange to another catheter and used the JR 4 catheter for the native right coronary artery (Figure 2) and all the grafts, including the LIMA. There was clear diffuse disease progression in the native LAD artery. We discussed intensifying medical therapy and more aggressive dialysis to stabilize her LV function, but we decided against it due to changes in the electrocardiogram and spasm. Videos 1 and 2 reveal the anatomy defined during catheterization. Videos 3 through 5 illustrate how we negotiated the left subclavian artery and the subselective LIMA angiogram. ■

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