



**PHYSICIAN**  
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## ACCESS SITES

- Femoral: Used 80% to 90% of the time.
- Upper extremity: Used 10% to 20% of the time due to caudal angulations of the artery.

## DIAGNOSTIC DEVICES USED

### SHEATH SIZES

6-F sheath.

### FLUSH DIAGNOSTIC CATHETERS

6-F sheath pigtail catheter. Note: 4-F, 5-F, or 6-F catheters are acceptable; however, a 6-F catheter has the largest internal lumen and provides better psi tolerance for contrast injection.

### SELECTIVE DIAGNOSTIC CATHETERS

6-F internal mammary guiding catheter. Other options include a 6-F hockey stick guiding catheter, or a 6-F RDC1. The advantage of the 6-F guiding catheter is that it has thinner walls with a large internal lumen and soft tip, so that once the catheter is in place, it can be used for the procedure as well. It also has more substance and is easier to manipulate than the smaller catheters.

### DIAGNOSTIC GUIDEWIRES

.014-inch steerable guidewire with short transition (3 cm). Hydrophilic guidewires should only be used when having difficulty crossing the renal ostium. Because of their aggressive tip, there is considerable risk of dissection or perforation. Once this wire has been used to accomplish access, it should be changed out for a different wire with a less-aggressive tip.

### DIAGNOSTIC NOTES

- The pigtail flush diagnostic catheter should be placed at the apex of the left kidney for ideal imaging. The purpose of the pigtail view is to identify how many kidney arteries are present (frequently more than one supplies each kidney). Note: the right kidney is usually lower; by placing the catheter at the top of the left

kidney, one is more likely to capture both kidneys and their respective blood supplies.

- If the patient has already had a renal angiogram, the angiographer can skip the picture with the pigtail to save contrast to minimize the likelihood of contrast nephropathy.
- For patients who are suspected to have in-stent restenosis, the operator can look for the already-expanded stent in the renal ostium as a marker, and save the contrast that would normally be required by a flush aortogram at the renal level.
- The tip of a 6-F internal mammary catheter is angulated downward; it easily engages the renal artery once it is positioned from above.
- One should never push a catheter up from below the renal arteries because plaque in the aorta below the renal arteries can be easily “snowplowed” into the renal ostium if one is not extremely careful. This can result in total closure of the renal artery or embolization with loss of renal function.
- Once the selective diagnostic catheter is in the renal ostium, a small dose of diluted contrast is all that is needed to obtain good visualization of the kidney. It is very important to see the entire kidney before and after the procedure. Microembolization during this procedure is not uncommon, and visualization of the entire kidney will enable complete evaluation at the end of the procedure to verify that no macroembolization has occurred. Hand injections of diluted contrast (eg, 70% dye, 30% heparinized saline) will usually be adequate for visualizing the renal anatomy. In heavier patients, larger doses or a higher concentration may be necessary. If cine angiography is being used, more contrast is required for peak opacification.

## INTERVENTIONAL DEVICES USED

### INTERVENTIONAL GUIDEWIRES

A .014-inch guidewire is recommended for use with a rapid exchange or monorail balloon; guidewire diameter is determined based on guiding catheter and balloon compatibility; the 6-F guiding catheter requires a 4-F balloon, which requires use of a .014-inch wire.

### INTERVENTIONAL SHEATHS OR GUIDE CATHETERS

The 6-F guiding catheter utilized for the diagnostic procedure can be used for the interventional procedure (ie, a coaxial system is already in place).

### PTA BALLOONS

4-F monorail or rapid exchange system. The balloon length should be 1.5 cm, 2 cm, or 3 cm. Balloons longer than this (eg, 4 cm) may be used, however, they may create an unnatural torque on the renal artery and ultimately cause spasm or even dissection.

### STENTS

Balloon-expandable. Renal artery stents range in length from 12 mm to 20 mm. Make sure that the renal ostium is covered by the proximal portion of the stent. It is not uncommon for the proximal stent to extend back into the aorta by 1 mm to 2 mm.

### OTHER DEVICES

Embolic protection devices have been used experimentally in the renal arteries; however, they are not currently recommended. If the operator decides to use embolic protection, the operator must be certain that there is adequate distance beyond the stent and the capture device. This will prevent the disastrous complication of the protection system becoming engaged in the deployed stent.

### INTERVENTIONAL NOTES

- One must be very diligent to keep the tip of the guidewire within view at all times during the procedure because a guidewire perforation can occur and can be devastating. A perforation can happen with any guidewire, but it is particularly of concern when a hydrophilic guidewire is used.
- In some cases, the rapid exchange system can be used with a balloon-expandable stent as a primary stent procedure. However, if the ostium is extremely tight, the

lesion may need to be predilated before the secondary stent procedure.

- The use of a coaxial system (guiding catheter) permits the operator to easily deliver the balloon and stent with less risk of misplacing or losing the stent.

### IMAGING

The ideal imaging system incorporates digital subtraction techniques; however, this is not always possible. Cine filming may be utilized, but the radiation dose and the amount of contrast required for visualization is greater. I prefer to run the table myself. The technician is present to help with device preparation, cleaning, exchanges, and to keep the case constantly flowing. By controlling the table myself, there is less radiation exposure (I only use fluoroscopy when I decide that we are in the correct position), and it is very efficient ergonomically. Economy of motion is critical in these cases, and one does not want to get bogged down waiting for device preparation. The operator should always be one or two steps ahead in the procedure, which will permit the technician to prepare the next device exchange.

### OTHER MATERIALS USED:

#### CONTRAST

- 70% contrast, 30% heparinized saline (eg, 1,000 units heparin per liter of saline)
- 50% contrast solution mixed with heparinized saline may be used in thin patients to conserve on the amount of contrast used.
- An experienced operator can often complete the entire procedure using 50 mL of contrast or less. ■