



PHYSICIANS

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Equipment used for renal artery intervention can vary on a case-to-case basis. Outlined below is the technique we use most commonly, and represents a “cookbook” approach.

ACCESS SITES

- The femoral approach is utilized in approximately 95% of cases.
- Occasionally, upper-extremity access may be used in case of caudal take-off of the renal artery.
- It is preferable to introduce the sheath, as well as catheters, over a .035-inch steerable nonhydrophilic guidewire because the abdominal aorta is likely to have significant atheromatous disease and such a wire is less likely to be traumatic.

DIAGNOSTIC DEVICES USED

SHEATH SIZES

6-F, 23-cm-long sheath, preferably with a radiopaque tip.

FLUSH DIAGNOSTIC CATHETERS

5-F Omniflush or tennis racquet catheter. The catheter should be configured in the infrarenal abdominal aorta to minimize the likelihood of renal atheroembolism. The pig-tail catheter is less favorable because it results in a somewhat more cephalad contrast injection, which could opacify the superior mesenteric artery and, therefore, obscure visualization of the renal arteries.

SELECTIVE DIAGNOSTIC CATHETERS

- 4-F to 5-F, 80-cm-long, JR4 diagnostic catheter.
- Alternative catheters:
 - Internal mammary catheter
 - Renal double curve catheter
 - Sos catheter (for difficult angulation)

Note: The diagnostic catheter should preferably be introduced through the guiding catheter, which enables subsequent atraumatic engagement with the guiding catheter over the diagnostic catheter using the “telescoping technique” for proceeding with intervention. Occasionally, a .014-inch steerable guidewire is used to wire the renal artery prior to performing selective angiography. This tends to hold the catheter in place and prevents the diagnostic catheter from backing out during injections. It also allows for convenient subsequent intervention. Hydrophilic

guidewires should only be used when difficulty crossing the renal ostium is encountered due to their aggressive tip and risk of dissection or perforation. Once the wire has been used to accomplish access, it should be exchanged for a different wire with a nonhydrophilic tip.

DIAGNOSTIC NOTES

- The Omniflush diagnostic catheter should be placed at the level of the first lumbar vertebra (L1) for optimal imaging (ie, the top of the Omniflush catheter is placed at the superior margin of L1). The aortogram gives an idea about the configuration of, and the presence of pathology in, the aorta. It identifies the number and location of renal arteries on either side and allows appropriate catheter selection. This may be skipped if a previous aortogram/renal angiogram is available for review.
- Abdominal aortography should be performed using 20 mL to 25 mL of contrast diluted ~70:30 using digital subtraction angiography.
- Great care should be exercised in manipulating a catheter in the region of the renal artery ostium to minimize the likelihood of atheroembolic complications.
- Once the selective diagnostic catheter is in the renal ostium, a brisk injection of a small dose of diluted contrast is all that is needed to achieve good visualization of the renal arteries. Imaging should be continued until the nephrogram is seen in its entirety.

INTERVENTIONAL DEVICES USED

INTERVENTIONAL GUIDEWIRES

.014-inch guidewires are recommended; 180-cm-long wires are adequate because of rapid exchange, or less commonly, 80-cm-long over-the-wire balloons catheters and stents, are generally used.

GUIDING CATHETERS

- 6-F, 65-cm, hockey stick guiding catheter (to be advanced over the diagnostic catheter and the .014-inch wire).
- Alternative catheters:
 - Internal mammary artery (IMA guiding catheter)
 - JR4 guiding catheter
 - Renal double curve guiding catheter
 - Multipurpose guiding catheter

PTA BALLOONS

Monorail (Rx) balloons are preferred. Alternatively, over-the-wire balloons with an 80-cm-long shaft may be used. Generally, balloons between 3.5 mm to 4 mm in diameter and 15 mm to 20 mm in length for predilatation. Smaller-diameter balloons may be required for initial dilatation for subtotal occlusion. Over-the-wire balloons may be useful for exchanging wires, especially if the initial wire used was one with a hydrophilic tip (although these wires are generally to be avoided).

Postdilatation balloon sizes vary depending on the size of the artery/stent; however, it is a good idea to have balloons between 4 mm and 8 mm in diameter available (it is important to bear in mind that many 8-mm balloons do not fit through a 6-F guiding catheter).

STENTS

Balloon-expandable stents are used, generally between 12 mm and 20 mm in length. Although stents with open-cell designs have more flexibility, those with closed-cell designs are preferred because they provide the more radial strength at the renal ostium. In most cases, it is essential to ensure complete coverage of the renal ostium. It is not uncommon for the proximal stent to extend back into the aorta a few millimeters.

DISTAL PROTECTION DEVICES

Embolic protection devices may be used. Whether they should be used routinely for all renal interventions has not yet been determined, and trials evaluating this are currently underway. However, it is useful to have a mono-

rail version of the device available. An adequate landing zone must be ensured. Keep in mind that coronary distal protection devices may not be large enough to ensure vessel apposition.

PHARMACEUTICALS

- Nitroglycerin to treat vessel spasm.
- N-acetyl-cysteine and sodium bicarbonate for prevention of contrast-induced nephropathy.

CONTRAST AGENTS

- Iopromide
- Iodixanol
- Carbon dioxide
- Gadolinium

An iodinated contrast agent diluted to two-thirds strength is sufficient for good visualization of the renal arteries. Carbon dioxide and/or gadolinium may be used as contrast agents to minimize iodinated contrast use in patients with compromised renal function. It must, however, be noted that these agents do not quite provide the quality of images produced using iodinated contrast use. Another alternative is to use a 1:1 combination of gadolinium and an iodinated contrast agent. Carbon dioxide is a reasonable option for performing initial aortography to identify the number and location of renal arteries. All of these alternatives, however, result in a compromise in image quality. ■