PHYSICIAN
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ACCESS SITES

•Synthetic bridge graft: Access facing venous outflow.

•Native AV fistulae: Access distal in the fistula facing toward arterial inflow.

(FISTULAGRAM) DIAGNOSTIC DEVICES USED

ACCESS EQUIPMENT

• 18-G angiocath or 5-F micropuncture set.
• Connect to an extension set.

IMAGING

I perform my procedures in an outpatient center and therefore use a mobile C-arm with 1-k resolution for the fistulagram to determine level of flow through the fistula.

CONTRAST

The kidneys of the dialysis patients are already compromised, therefore I use a solution of 30% nonionic contrast diluted with 70% heparinized saline.

DIAGNOSTIC NOTES

• Direction of access depends on the clinical symptomatology.
• Fistulagram is conducted from the arterial anastomosis to the heart.

INTERVENTIONAL DEVICES USED

SCENARIO I: Decreasing Function of the Graft/Fistula

INTERVENTIONAL GUIDEWIRES
.035-inch hydrophilic nitinol guidewire.

INTERVENTIONAL SHEATHS OR GUIDE CATHETERS
Sheath:
- Diameter: 5 F to 6 F facing arterial outflow; 6 F to 7 F facing venous outflow
- Length: 5 cm to 6 cm
- Radiopaque markers
- Catheter: I rarely use a catheter for these procedures, but when I do, I use a 5-F, angle-tipped catheter with a radiopaque tip.

PTA BALLOONS
I use a high-pressure angioplasty balloon with a balloon length of 4 cm and a catheter length of 75 cm. The balloon diameter should be sized to 100% of the stenosis.

STENTS
I occasionally use self-expanding nitinol stents oversized by 2 mm.

OTHER DEVICES
Inflator for the balloon.

INTERVENTIONAL NOTES
- If there is an elastic stenosis, I may stent after consultation with the surgeon or referring nephrologist, followed by angioplasty.
- It is essential to determine the cause of the decreased function of the graft. Possible causes include poor arterial inflow, poor venous outflow, anastomosis issues, or, in the case of native fistulae, side branches may be absorbing flow and need to be surgically ligated or embolized.

SCENARIO II: Clotted Graft

INTERVENTIONAL GUIDEWIRES
.035-inch hydrophilic nitinol guidewire.

INTERVENTIONAL SHEATHS OR GUIDE CATHETERS
For clotted graft procedures, I use two sheaths:
Sheath #1:
- 5 F to 6 F facing arterial outflow; 6 F to 7 F facing venous outflow
- Length: 5 cm to 6 cm
- Radiopaque markers

Sheath #2:
- Diameter: Depends on the diameter of outflow stenosis; sheath size is dictated by balloon size.
- I rarely use a catheter for these procedures, but when I do, I use a 5-F, angle-tipped catheter with a radiopaque tip.

PTA BALLOONS
I use an embolectomy (Fogarty) catheter to remove the platelet plug.

For the stenosis, I use a high-pressure angioplasty balloon with a balloon length of 4 cm and a catheter length of 75 cm. The balloon diameter should be sized to 100% of the graft/fistula where the stenosis is located.

STENTS
I occasionally use self-expanding nitinol stents oversized by 2 mm.

OTHER DEVICES
- Mechanical thrombectomy device or thrombolytic agent to remove clot. Choice of device is a matter of preference and includes Fogarty balloon, power-assisted thrombectomy devices (either wall contact or nonwall contact), or thrombolytic agents.
- Inflator for the balloon.

OTHER MATERIALS USED
- Thrombolytics: When using thrombolytics, I use 2 mg of tPA for grafts and 2 mg to 4 mg of tPA for native fistulae.
- Contrast: The kidneys of the dialysis patients are already

compromised; I use a solution of 30% nonionic contrast, 70% heparinized saline.

INTERVENTIONAL NOTES

Declot Procedure

- Access in the arterial limb, facing the venous outflow.
- Traverse to the end of the graft.
- Perform a diagnostic venogram to the heart.
- Angioplasty outflow stenosis.
- Thrombectomize the graft using a mechanical device or thrombolytic.
- Gain secondary access in the venous limb, facing toward the arterial anastomosis.
- Use embolectomy balloon to remove the platelet plug, then angioplasty the arterial anastomosis, if warranted.
- Perform follow-up fistulagram to confirm patency.
- If there is an elastic stenosis, I may stent after consultation with the surgeon or referring nephrologist, followed by angioplasty.

SCENARIO III: New Catheter Insertion

ACCESS SITES

5-F micropuncture to gain access to the jugular vein with ultrasonic guidance.

INTERVENTIONAL GUIDEWIRES

.035-inch stiff hydrophilic nitinol guidewire advanced into IVC if possible.

INTERVENTIONAL SHEATH OR GUIDE CATHETERS

- 14-F to 16-F, dual-lumen, tunnel-cuffed catheter, or
- Valved peel-away dialysis sheath when needed.

INTERVENTIONAL NOTES

- Dialysis catheter tip is inserted into the right atrium.
- Flow should be greater than 400 mL/min.
- Venogram PTA performed as needed.
- Prophylactic antibiotics

IMAGING

I perform my procedures in an outpatient center and therefore use a mobile C-arm.

SCENARIO IV: Catheter Revision

INTERVENTIONAL NOTES

- If there is no sign or history of infection, we give prophylactic antibiotics and prep the existing catheter.
- Dissect the catheter from the subcutaneous tissues and pull cath partially out over a stiff hydrophilic wire and perform a superior vena cavagram.
- PTA stenosis or fibrin sheath.
- Place a new catheter through the tract, placing the tip in the right atrium.

SCENARIO V: AV Fistula Maturation

INTERVENTIONAL NOTES

- Access fistula with a 5-F micropuncture set distally facing the arterial anastomosis with ultrasound if needed.
- Dilate the arterial anastomosis and anastomotic limb and any intrafistula stenoses with a high-pressure balloon.
- Embolize side branches if needed after stenoses have been resolved.
- Multiple interventional sessions may be necessary to promote maturation of a fistula and the patient must be educated in this respect. ■