

CASE REPORT

An Anastomotic Technique for Small Arteries in Arteriovenous Graft Creation

BY MATTEO TOZZI, MD

A 35-year-old African woman presented to our institution with stage 4 chronic kidney disease and HIV-related nephropathy. Comorbidities were hypertension and dyslipidemia. In April 2016, she was admitted to our hospital for an acute abdomen. X-ray imaging documented pneumoperitoneum, and CT scan raised suspicion of a bowel perforation due to acute diverticulitis. Intravenous broad-spectrum antibiotic, anti-inflammatory, and hydration therapy were started immediately. Abdominal cavity exploration confirmed the descending colon perforation, which was treated successfully with segmental resection and immediate recanalization. Unfortunately, the postoperative course was characterized by rapid deterioration of her residual renal function.

PROCEDURE

The patient's compromised clinical conditions and medical history necessitated the nephrologists perform a joint evaluation with an anesthesiologist and vascular surgeon. An early cannulation arteriovenous graft creation was decided as a better option than a central venous catheter for urgent hemodialysis. Preoperative ultrasound examination documented a small, calcific artery (2.2 mm radial artery diameter) and a suitable venous network (4.3 mm average cephalic vein diameter). Locoregional anesthesia was performed with axillary brachial plexus block. A radio-antecubital forearm loop was created with a 6 mm polytetrafluoroethylene graft with CBAS Heparin Surface (GORE® ACUSEAL Vascular Graft) 18 days after the segmental resection and recanalization.

Because of the small caliber of the artery, a modified anastomosis (Varese technique) was performed (Figures 1 and 2) to reduce the anastomosis area and, consequently, the risk of steal syndrome. Operative time was 45 minutes, and exiguous blood loss (approximately 35 mL) was registered. No intraoperative complications were seen, and the patient started hemodialysis through the graft the day after implantation. Postoperatively, she started antiplatelet therapy with 100 mg of acetylsalicylic acid and 75 mg of clopidogrel per day. The patient was discharged after 2 days (postoperative day 20). Follow-up was closely conducted with clinical and ultrasound examination every 10 days for the first month and monthly thereafter.

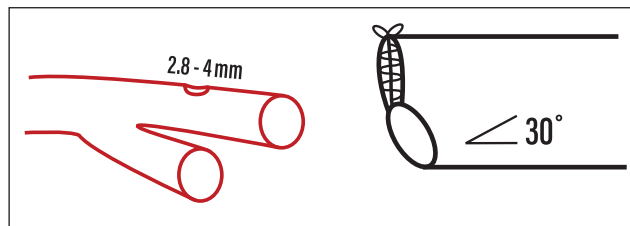


Figure 1. Arterial anastomosis (Varese technique): obliquely cutting the graft and suturing the straight part to obtain an opening of approximately 30° and 3 to 4 mm. Arteriotomy is performed with a 2.8 to 4 mm arterial punch, depending on the diameter of the vessel, and sutured with the parachute technique.

RESULTS

At the end of August 2016, after 3 months of hemodialysis, the patient suffered from severe posthemodialysis hypotension, and consequently, a graft thrombosis was registered. The patient was immediately admitted to our department. Ultrasound examination confirmed the clinical diagnosis but documented a significant increase in the diameter of the antecubital vein, the whole arm cephalic axis (average diameter, 6.4 mm), and the brachial and radial arteries (4.3 mm at the anastomosis site). Locoregional anesthesia was performed with axillary brachial plexus block, and 1 g of prophylactic vancomycin was administered intraoperatively. During the intervention, the graft was completely and gently removed, and a native fistula was created through a side-to-side anastomosis (approximately 4 mm) between the same radial artery and antecubital vein site as the prior graft anastomosis (Figures 3 and 4). Adequate hemostasis was performed to avoid bleeding during the subsequent hemodialysis conducted 4 hours after surgery to correct the electrolytic imbalance. Postoperatively, antiplatelet therapy with 100 mg of acetylsalicylic acid per day was continued preventively. The flow rate documented on the cephalic vein at discharge was 1,200 mL/min. In March 2017, after 6 months, the fistula was still functioning normally.

DISCUSSION

The idea of a prosthesis used as a bridge to vessel maturation in native fistulas is not new¹; however, early cannulation grafts have radically changed the perspective on bridge treatments. While a conventional graft needs

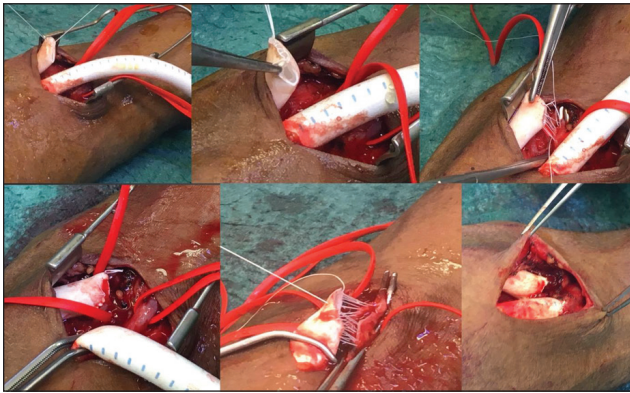


Figure 2. Forearm loop with the GORE® ACUSEAL Vascular Graft in the radio-antecubital vein.



Figure 3. Harvesting of the prosthetic loop after maturation of the basilic and cephalic veins in the upper arm.

at least 2 weeks before puncturing, an early cannulation graft permits an immediate cannulation, allowing the maturation of venous vessels and avoidance of central venous catheter placement.¹ The presented case emphasizes how accurate planning for vascular access does not need to start with the old paradigm of fistula first to achieve the same goal through use of allogenic material. Although this method appears to be intricate with multiple surgical interventions required, it is linear, allows the preservation of vascular assets, and avoids future central venous catheter-related complications.

In our department, we have also used an alternative technique. In the case of unsuitable cephalic veins, our target becomes the basilic vein, which can be transposed

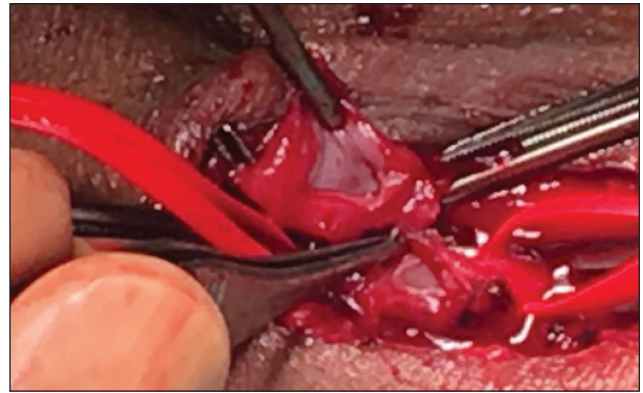


Figure 4. Side-to-side anastomosis in the radio-antecubital vein for proximal native fistula.

after maturation. Graft removal must be scheduled only after basilic vein—first cannulation (three-stage technique).

Additionally, the presented case documents another characteristic of the bridge approach: the aptitude to increase the diameter of small or calcific arteries. In fact, as reported in the literature, blood steal produced by the fistula induces an arterial hypertrophy.² Consequently, we started to set up temporary prosthetic access with a modified anastomosis to reduce the risk of arteriovenous access ischemic steal in the subsequent definitive fistula. The modified anastomosis technique (Varese technique, Figure 3) gave us encouraging results. Creation of an early cannulation graft with a standard 6 mm prosthesis on small vessels can prevent technical difficulties associated with the high risk of arteriovenous access ischemic steal. ■

1. Aitken EL, Jackson AJ, Kingsmore DB. Early cannulation prosthetic graft (Acuseal) for arteriovenous access: a useful option to provide a personal vascular access solution. *J Vasc Access.* 2014;15:481-485.

2. Miller GA, Hwang WW. Challenges and management of high-flow arteriovenous fistulae. *Semin Nephrol.* 2012;32:545-550.

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