Leg Ulcer as a Complication of a Posttraumatic Tibial Arteriovenous Fistula Treated by Endovascular Approach With Stent-Graft Placement

Martín Rabellino, MD, Sergio Shinzato, MD, Javier Aragón-Sánchez, MD, PhD, Oscar Peralta, MD, Ricardo Marenchino, MD, and Ricardo García-Mónaco, MD, PhD

Abstract

Endovascular treatment of posttraumatic arteriovenous fistulae (AVFs) in the lower extremities by means of covered stent-grafts is widely accepted, and many cases have been reported in the iliac-femoral region. However, few reports exist on the treatment of infrapopliteal AVFs, with or without a pseudoaneurysm, using this method. The authors present this case report dealing with a patient who had undergone a tibial and peroneal open fracture in his left limb 34 years ago. He developed a leg ulcer as a consequence of AVF between the tibialis posterior artery and vein, which resulted in venous insufficiency. The condition was treated by the endovascular approach with the placement of a stent graft. Total healing was achieved over a period of 3 months. Angio-CT was performed, showing stent-graft patency 6 months after the endovascular procedure.

Keywords

posttraumatic arteriovenous fistula, stent-graft, endovascular surgery, venous ulcer

Case Report

A 56-year-old man sought consultation in our department for posttraumatic AVF in his left leg. He had undergone a work accident 34 years ago resulting in a complex open tibial and peroneal fracture. He underwent multiple surgical interventions consisting of wound debridement, osteosynthesis, and skin grafts, and the wound finally healed. He remained asymptomatic for 34 years. Then, 7 months before the consultation, he had undergone trauma on the internal side of his left leg and developed 2 hard-to-heal ulcers, which were complicated with tibial osteomyelitis. Cultures were taken and were positive for *Staphylococcus aureus*. He had undergone a tibial and peroneal open fracture in his left limb 34 years ago. He developed a leg ulcer as a consequence of AVF between the tibialis posterior artery and vein, which resulted in venous insufficiency. The condition was treated by the endovascular approach, with the placement of a stent graft.

Corresponding Author:
Javier Aragón-Sánchez, Hospital La Paloma, Diabetic Foot Unit, C/Maestro Valle, 20, 35005 Las Palmas de Gran Canaria, Canary Islands 35002, Spain
Email: javiaragon@telefonica.net
Antibiotic treatment was implemented with ceftriaxone 2 g once per day and rifampicin 300 mg twice per day for a period of 3 months. An antibiotic-coated intramedullary nail was placed and the bone infection was apparently cured. However, the skin lesions did not show good evolution despite good wound care. Clinicians suspected that a vascular problem could be the cause of this poor evolution, and Doppler ultrasonography was carried out, which diagnosed the existence of AVF beneath the ulcerated areas. Two ulcers draining serous discharge were located on the internal side of the limb in the scarred area. Pigmentation, stasis dermatitis, hair loss, and lipodermatosclerosis were apparent as signs of venous insufficiency during the physical examination (C6 of the CEAP classification).11

Digital subtraction angiography confirmed the diagnosis and showed the following findings: lateral-lateral AVF established between the posterior tibial artery and vein and communicating to the deep vein system and to the superficial veins located beneath the ulcers (Figures 1A and 1B). No pseudoaneurysm was found. The tibial posterior artery was selectively canulated. Images showed only 1 point communicating the artery and the vein, and we decided on the endovascular approach to exclude the AVF using a stent graft. The contralateral approach was chosen. A 6 Fr catheter was guided to the popliteal artery, and a 0.014 wire was used. A balloon-expandable stent-graft (3 × 26 mm², Jostent GraftMaster, Abbott Vascular Devices Abbott Park, Illinois, USA) was placed in the tibial artery covering the AVF (Figure 2A). After the placement of the stent-graft, a leak was detected, providing evidence that the AVF persisted. The balloon was newly inflated using a higher pressure (12 atm), which was insufficient for closing the AVF (Figure 2B), although the flow through the AVF was decreased (Figure 2C). A new 4-mm balloon was used to seal the proximal two thirds of the stent-graft (Figure 2D), and the AVF was definitively closed (Figures 2E and 2F).

Following the endovascular procedure, the patient started antiplatelet therapy with acetylsalicylic acid (100 mg/d) indefinitely and clopidogrel (75 mg/d) for 3 months. No bandaging was used during the postoperative period. Healing followed a good course (Figure 3A), and epithelization was achieved over a period of 3 months (Figure 3B). An angio-CT was performed 6 months after the endovascular procedure and showed stent-graft patency (Figure 3C).
Discussion

Clinical signs of posttraumatic AVF frequently develop immediately after injury. However, they have been reported weeks, months, or years after the episode of trauma. It is very difficult to ascertain whether the trauma 34 years prior or recent orthopedic surgery was the cause of the AVF in the present case. The clinical signs of chronic venous insufficiency are likely to be a long-term evolution of the fistula, which was evident after the development of osteomyelitis. Even though a chronic ischemic leg ulcer was reported in a patient who had previously experienced a gunshot in the thigh 18 years before, most posttraumatic AVFs are asymptomatic and are detected accidentally. We cannot be sure that the trauma was the origin in our patient. Furthermore, it has been reported that 93.7% of AVFs are diagnosed in the first 6 months after injury.

Two options exist for treating these lesions in infrapopliteal vessels: surgery or the endovascular approach. The location of the AVF and scar tissues as a consequence of the trauma and/or surgery may complicate surgery because vascular or nervous damage may occur. For this reason, we prefer to use the endovascular approach. Embolizations with coils, plugs, or the placement of stent-grafts are different endovascular options. Percutaneous coil occlusion in large high-flow fistulae may enable coil embolization to the pulmonary circulation. We decided on the stent-graft placement procedure because the posterior tibial artery remains patent. That would not have been possible using plugs or coils. We are aware that thrombosis and late luminal loss caused by intimal hyperplasia formation potentially leads to insufficient long-term patency rates. If this were the case, we would have to decide what new treatment would be required according to the presence of symptoms.

Stent-grafts have been widely used for treating above-the-knee AVFs. However, few reports have been published dealing with endovascular treatment of infrapopliteal posttraumatic AVFs without a pseudoaneurysm. Peeters...
et al\textsuperscript{7} used balloon embolization in the peroneal artery, and Halabi and Kandzari\textsuperscript{6} used a stent-graft in a large posttraumatic infrapopliteal AVF. Spirito et al\textsuperscript{1} published a case report dealing with a pseudoaneurysm of the anterior tibial artery associated with an AVF. A stent-graft was used in this case, and complete patency of the anterior tibial artery, successful thrombosis of the pseudoaneurysm, and nonvisualization of the AVF could be declared 1 year after the procedure.\textsuperscript{1} In our case, AVF remained closed 6 months after the endovascular procedure.

In conclusion, a balloon-expandable stent-graft is a feasible option in cases of AVF in the infrapopliteal circulation. Healing of the ulcer as a consequence of venous insufficiency was easily achieved after closing the AVF.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

References