Endovascular treatment of a post-traumatic tibial pseudoaneurysm and arteriovenous fistula: Case report and review of the literature

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Here we report a rare case of a 74-year-old man with a pseudoaneurysm of the anterior tibial artery and a concomitant arteriovenous fistula (AVF). The patient was admitted because of increasing pain following the formation of a large mass located in the anterior mid-portion of the calf after a moderate non-penetrating blunt trauma. A polytetrafluoroethylene-covered stent was placed over the origin of the pseudoaneurysm, with complete exclusion of the pseudoaneurysm and disappearance of the AVF. One year after the procedure the mass had completely disappeared and the vascular anatomy of the calf is well preserved. (J Vasc Surg 2007;45:1076-9.)

Post-traumatic pseudoaneurysms are not a rare event in military facilities during periods of armed conflicts,[1,2] but are infrequently seen in the civilian health care system. Pseudoaneurysms and concomitant arteriovenous fistula (AVF) are associated with bone fractures, penetrating or high-injury blunt trauma,[3,4] sport activities,[5,6] and, less frequently, after orthopedic injuries.[7-9]

The therapeutic strategy before the endovascular era included artery ligation or reconstruction with autologous material, external compression,[10,11] coil embolization, or echo-guided thrombin injection.[12] The endovascular approach for peripheral arterial lesions with covered stents has permitted a less traumatic anatomic reconstruction of such lesions. Parodi et al[13] and Marin et al[14] have described the treatment of complex peripheral lesions with satisfactory results for arterial injuries of the arms and the neck. To the best of our knowledge, the endovascular treatment of a post-traumatic pseudoaneurysm in the tibial artery associated with AVF has not been previously reported.

CASE REPORT

A 74-year old tree feller was admitted 2 months after a moderate nonpenetrating blunt trauma of the right lower extremity because of increasing pain following the formation of a large mass located in the anterior mid-portion of the calf (Fig 1). On palpation a pulsatile mass effect was evident.

Careful duplex scan examination revealed the presence of a post-traumatic pseudoaneurysm and a concomitant AVF. Three-dimensional computed tomography (CT) scanning and selective angiography confirmed the presence of a pseudoaneurysm of the anterior tibial artery associated with an AVF (Fig 2, *A* and *B*).

Fig 1. Appearance of the right calf mass *(white arrow)* at hospital admission.

The anterior tibial artery distal to the pseudoaneurysm, the posterior tibial artery and the peroneal artery were perfectly patent.

The plan was to proceed to an endovascular intervention. Under local anesthesia, a 7F introducer sheath was inserted through an ipsilateral antegrade approach into the right femoral artery. A contrast angiography was performed with a straight-flush catheter. The anterior tibial artery was selected with a 0.014-inch guidewire over passing the arterial lesion, and the patient was systemically heparinized with 5000 units of unfractionated heparin. A 4-mm × 26-mm polytetrafluoroethylene-covered stent (Graft Master JOSTENT, Abbott Vascular Devices, Abbott Park, Ill) was deployed over the origin of the AVF and the pseudoaneurysm. Multiple angiographic views confirmed the complete exclusion of the pseudoaneurysm and AVF with a well-preserved blood flow into the anterior tibial artery. Immediately after the procedure, the angiographic control showed the complete exclusion of the pseudoaneurysm and the disappearance of the AVF (Fig 3, *A*).

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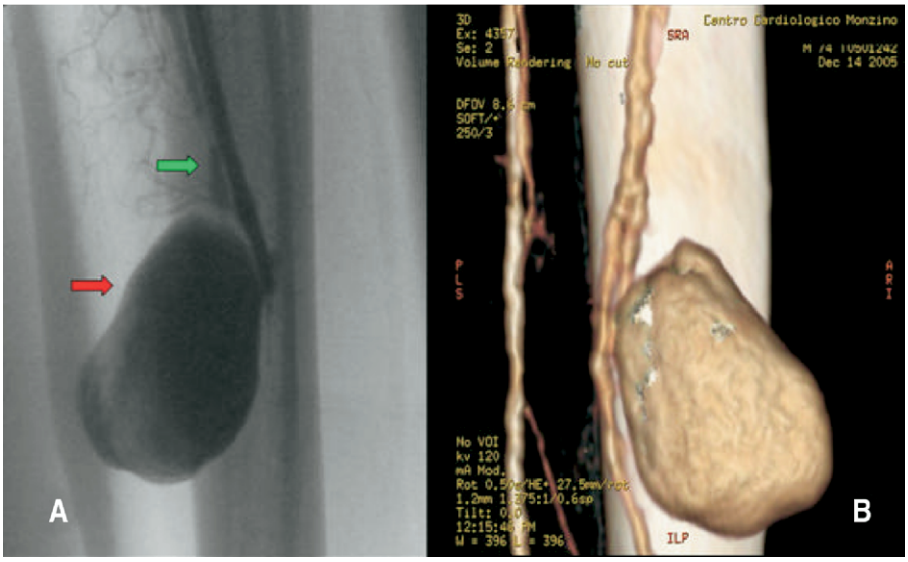

Fig 2. A, Contrast angiography shows the pseudoaneurysm *(red arrow)* and the arteriovenous fistula *(green arrow)*. **B,** Three-dimensional computed tomography of right calf vascularization.

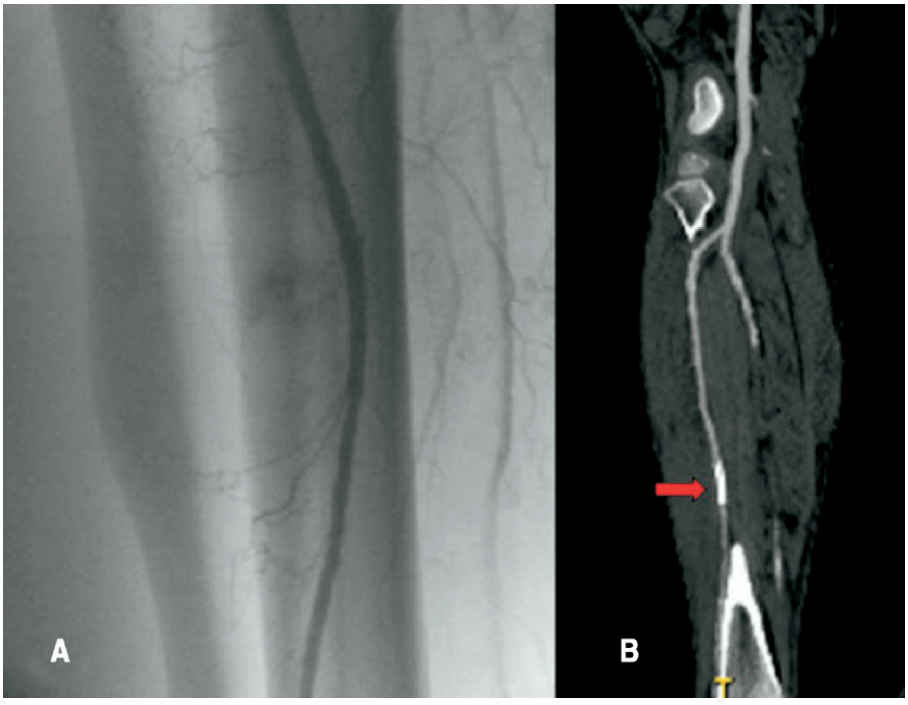

Fig 3. A, Angiographic early reinvestigations after stent placement. The pseudoaneurysm and the arteriovenous fistula have been completely excluded. **B,** Three-dimensional computed tomography scan shows complete patency of the anterior tibial artery 6 months after the procedure. The *red arrow* shows the patent stent in situ.

At discharge, the mass was still present in the right calf without pulsatile effect, and the patient reported a significant pain reduction. Double antiplatelet therapy with ticlopidine (250 mg/d) and acetylsalicylic acid (300 mg/d) was administered to the patient for 1 month, followed by long-term acetylsalicylic acid therapy.

Six months after the procedure, the patient was completely asymptomatic, with complete disappearance of the mass. Three-dimensional CT-scan confirmed complete patency of the anterior tibial artery, successful thrombosis of the pseudoaneurysm, and nonvisualization of the AVF (Fig 3, *B*). These findings remain unchanged 1 year postoperatively.

Table. Literature overview of different treatment options for post-traumatic infrapopliteal pseudoaneurysm or arteriovenous fistula, or both

Reference	*Year*	*Artery injured*	*Lesion*			*Treatment*
			AVF	*PSA*	*PSA + AVF*	
Skudder[6]	1999	Tibial		2		Artery ligation
Halabi[24]	2005	Infrapopliteal	1			Covered Stent
Rosa[4]	2003	Peroneal			1	Coil embolization
De Roo[15]	2004	Anterior tibial		1		Covered stent
Hebrang[21]	2001	Peroneal artery		1		Catheter occlusion
Ray[23]	2006	Anterior tibial			1	Thrombin injection
Wolford[20]	2001	Anterior tibial			1	Coil embolization
Kurihashi[18]	1994	Peroneal			1	Direct surgical repair
McIvor[19]	1988	Peroneal		1		Direct coil embolization
Peeters[22]	1991	Peroneal	1			Balloon embolization
Albrecht[25]	2004	Peroneal			1	Coil embolization + surgery

AVF, Arteriovenous fistula; *PSA,* pseudoaneurysm.

DISCUSSION

This is the first report, to the best of our knowledge, of an endovascular treatment with a covered stent of a post-traumatic pseudoaneurysm with associated AVF of the lower extremity. De Roo et al[15] described the treatment of an iatrogenic isolated pseudoaneurysm of the anterior tibial with a covered stent, with satisfactory mid-term results. This strategy in our patient allowed the complete healing of the pseudoaneurysm, together with a complete and persistent exclusion of the AVF 1 year after the procedure.

In the literature, the combined endovascular treatment of pseudoaneurysm and concomitant AVF has been reported for different large arterial territories, including iliac, subclavian, and carotid arteries.[16,17] Good early and mid-term results have been described.

To treat pseudoaneurysms or AVF of the anterior tibial artery, the surgical approach has been preferred even recently, with direct ligation of the injured vessel or reconstruction of the vessel wall.[6-18] Other less-invasive options for the treatment of tibial pseudoaneurysm included direct or transfemoral embolization with coils,[19,20] closure with transluminal temporary occlusion of the pseudoaneurysm neck or balloon embolization,[21,22] and direct thrombin injection (see Table).[12,23-25]

Although these strategies have been reported to allow a less-invasive pseudoaneurysm thrombosis and subsequent AVF closure, the theoretic advantage to achieve these goals of maintaining vessel patency has to be taken into consideration. Infrapopliteal stents have been shown to have not negligible reocclusion rates in atherosclerotic patients. Nevertheless, their use in a post-traumatic setting without impaired distal runoff seems justified, even for such peripheral lesions. If the results are confirmed by larger experiences, we believe this strategy represents a suitable treatment for pseudoaneurysms of the crural arteries.

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