Traumatic arteriovenous fistula. Endovascular resolution

Fístula arteriovenosa de origen traumático. Resolución endovascular

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ABSTRACT

Vascular trauma is present in approximately 10% of all lesions affecting the extremities. The inadequate management of these lesions causes serious consequences such as death or loss of limb functionality. Vascular lesions due to firearms are one of the leading causes of the appearance of arteriovenous fistulas. This is the case of a 76-year-old male patient with a past medical history of gunshot wound to his right calf. The patientpresented to his GP 6 months after sustaining the trauma due to claudication at 100 m, pain, and coldness at rest. Additional methods were used to finally achievea diagnosis of arteriovenous fistula that was resolved via endovascular approach. The medical literature was reviewed to update the information on this regard.

Keywords: *gun wound, vascular trauma, arteriovenous fistula.*

RESUMEN

Los traumatismos vasculares se encuentran presentes en aproximadamente el 10% de todos los traumatismos que afectan a las extremidades. El manejo inadecuado de estos ocasiona consecuencias funestas como la pérdida de la vida o de la función de la extremidad. Las lesiones vasculares por arma de fuego constituyen una de las principales causas de la aparición de fístulas arteriovenosas. Se presenta el caso de un paciente de sexo masculino de 76 años, con antecedentes de herida por arma de fuego en pantorrilla de miembro inferior derecho, que consultó a los 4 meses del traumatismo a su médico de cabecera por presentar claudicación a 100 m, dolor y frialdad en reposo. Mediante métodos complementarios se realizó el diagnóstico de fístula arteriovenosa, resolviendo dicha comunicación de manera endovascular. Se revisa la literatura con el objetivo de actualizar la información al respecto.

Palabras clave: *fístula arteriovenosa, herida de arma de fuego, stent forrado.*

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CLINICAL CASE

This is the case of a 76-year-old male patient with hypertension, dyslipidemia, and diabetes type II. The patient is a heavy smoker (2 cigarette packs/month for the last 60 years), with asymptomatic severe aortic stenosis at the follow-up, and with unmonitored use of medication (vidagliptin, metformin, atorvastatin, valsartan) who presented to his general practitioner with right lower limb claudication at 100 m, pain, and coldness at rest. The patient complains of right calf trauma due to gunshot wound of 4-month evolution. The clinical examination revealed coldness at palpation and lack of popliteal and tibial pulses, presence of murmur and fremitus in the popliteal region. The Doppler echocardiography of the limb revealed these findings: presence of high-velocity continuous blood flow in the right popliteal artery middle third draining into the homolateral popliteal vein compatible with arteriovenous fistula (AVF), distal to it, and low-velocity blood flow in the tibial/peroneal territory.

The selective arteriography performed on the right lower limb revealed patent internal and external common iliac arteries without lesions, and patent deep and common femoral arteries without significant lesions. Patent superficial femoral artery with presence of severe diffuse atheromatous disease predominantly in its distal middle third (**Figure 1**). Patent popliteal artery with communication towards the popliteal vein, presence of gunshot and splinter wound, and slow ectatic flow in the tibial/peroneal territory (**Figure 2**).

The heart team decided to perform endovascular treatment through the revascularization of the superficial femoral artery using a 6.0 mm x 100 mm self-expandable stent (**Figure 3**) and seal of the AVF with a 5.0 mm x 30 mm covered stent. Before the covered stent implantation, the fistulous path was found by inflating a coronary balloon that confirmed the transient closure of the AVF (**Figure 4**). The procedure was performed successfully and eventless, and the patient was discharged 48 hours later on vidagliptin, metformin, atorvastatin, valsartan, aspirin, and clopidogrel.

In the serial follow-up performed 3, 6, and 9 months after hospital discharge, the patient confirmed he was feeling good and with no symptoms. Also, he required no hospitalization and was never admitted to the ER with any associated symptoms. Currently, he performs daily aerobic physical exercise without limitations. The control Doppler echocardiography performed at the 6-month follow-up confirmed the closure of the AVF, and normal velocities were reported in the tibial/peroneal territory.

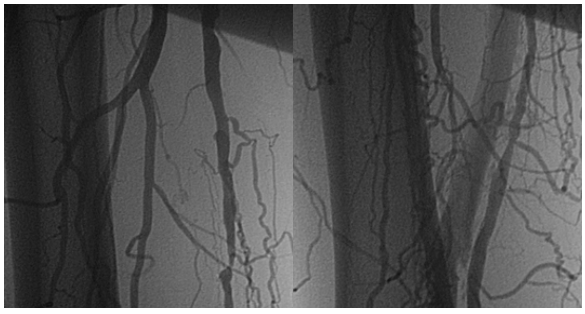

Figure 1. *Patent superficial femoral artery with presence of severe diffuse atheromatous disease predominantly in its distal middle third. Patent popliteal artery with communication towards the popliteal vein and superficial femoral vein.*

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DISCUSSION

Currently, vascular trauma is a problem of public health worldwide.[1,2] The growing violence, increasing use of firearms by civilians in the cities, rising speed limits, and labor accidents have all increased the incidence rate of vascular trauma.[3,4] Eighty per cent of the cases occur in arteries of the extremities, basically lower limb arteries; seventy per cent of the cases correspond to males between 15 and 42 years old in reproductive age. The rate of major amputations is between 10% and 15% and the rate of permanent sequelae due to bone or soft-tissue injuries is somewhere between 20% and 30%.[3,4]

It is common knowledge that in some types of penetrating trauma, even in the presence of early bleeding, if the trauma is not major, it can be said that the blunt or sharp object causing the trauma «has not touched» the blood vessels; that is why in injured patients, internal injuries can go unnoticed. Therefore, although a hypovolemic hemodynamic change may have not occurred, the possibility of vascular laceration «contained» by underlying tissues should always be ruled out. Or else, that the double vascular lesion has produced a communication called «arteriovenous fistula» (AVF).[5,6]

AVFs cause local and general effects in the physiology of cardiovascular apparatus that are directly associated with the size and location of the communication. Ischemia is among the local effects reported and it is directly correlated with the location and diameter of the fistula; cardiac mass effect is due to non-functional or dysfunctional vascular proliferation in the region affected while hyperemia—also associated with the size of communication—triggers distal venous hypertension and venous insufficiency. An increased cardiac output and an increased cardiac function with secondary hypertrophy are among the central or systemic effects reported depending on the diameter of the fistula and its proximity to heart. There are times that AVFs do not present as such, but are accompanied by aneurysmatic or pseudo-aneurysmatic dilatations.[7]

Overall, AVFs are described depending on their location in the superficial femoral territory (mainly) followed by the popliteal territory, the tibial/posterior territory, and the brachial region.[8]

The color Doppler ultrasound can be used to show the characteristics of the arterial and venous flow, the location of the fistula, and the size of the arteriovenous communication. The helical computed tomography scan can provide us with very useful images of the size and magnitude of the FAV. The arteriography should be selective in the artery damaged, and super-selective in the presence of fistula paths; in addition to being diagnostic, the arteriography can be the early treatment and, in some cases, the definitive treatment with the current endovascular methods.

Surgical treatment requires trained surgeons to control acute bleeding, perform wide incisions for the vessel proximal and distal control, for artery dissection with sufficient

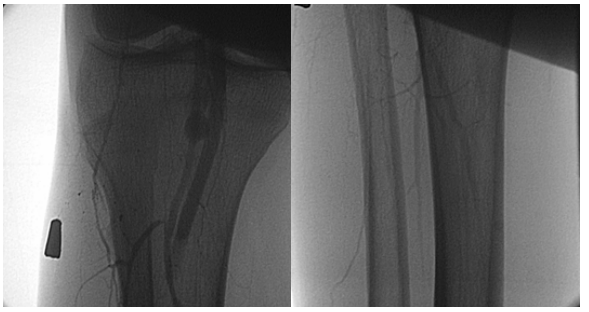

Figure 2. *Patent popliteal artery with communication towards the popliteal vein, presence of gunshot and splinter wound, and slow ectatic flow in the tibial/peroneal territory.*

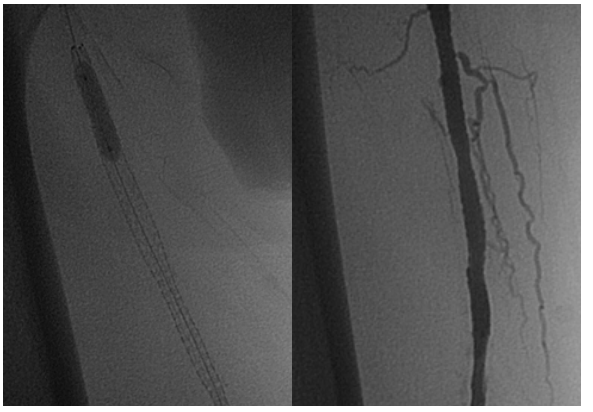

Figure 3. *Revascularization of the superficial femoral artery using a 6.0 mm x 100 mm self-expandable stent.*

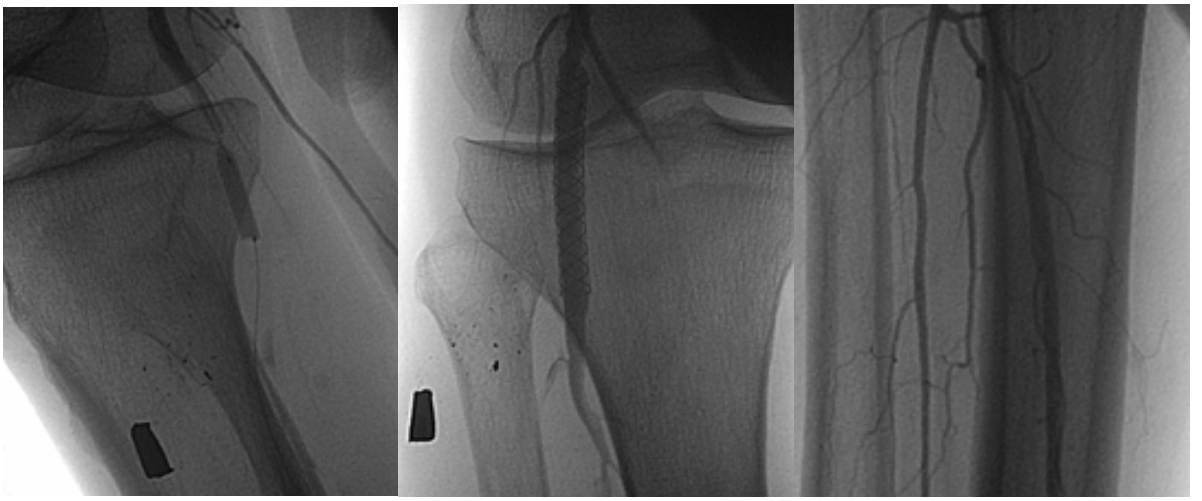

Figure 4. *Before the covered stent implantation, the fistulous path was found by inflating a coronary balloon that confirmed the transient closure. Afterwards, a 5.0 mm x 30 mm covered stent was implanted that closed the fistula and restored distal flow into the tibial/peroneal territory..*

amplitude, and for non-viable tissue extraction. The endovascular approach will vary, in each particular case, especially in hemodynamically stable patients with no signs of bleeding at that time. In post-acute phase AVFs, prognosis changes dramatically after the implantation of covered stents or endoprostheses.

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