Management of pseudoaneurysm of the leg: is Color Doppler US enough?

G. Pagliariccio ^{a,*}, R. Catalini ^b, L. Giantomassi ^b, A. Angelini ^a

^a Department of Vascular Surgery, Azienda Ospedali Riuniti Ancona, Italy

^b Department of Vascular Medicine, Azienda Ospedali Riuniti Ancona, Italy

KEYWORDS

Pseudoaneurysm;
Color Doppler Us;
Embolization.

Abstract The authors describe two clinical cases showing that Color Doppler Ultrasonography (US) examination is effective and sufficient in the presence of a clinical suspicion of pseudoaneurysm. In cases of iatrogenic damage and post-traumatic lesions, US provides an easy and accurate diagnosis depicting the location and the morphology of the false aneurysm. The patient can thus be referred to appropriate treatment without undergoing further diagnostic examinations. Moreover, regardless of the performed treatment, Color Doppler US is an efficient non-invasive diagnostic tool in the follow-up.

Sommario Gli autori evidenziano, attraverso la descrizione di due casi clinici, come una gestione con Eco Color Doppler sia efficace ed esaustiva in presenza di un sospetto clinico di pseudoaneurisma. La metodica ultrasonografica permette, sia con una genesi iatrogena che post traumatica, una diagnosi agevole e precisa sia per quello che riguarda la sede che la morfologia del falso aneurisma, permettendo di indirizzare il paziente verso il trattamento più indicato senza necessità di ulteriori esami diagnostici. Inoltre, indipendentemente dal trattamento effettuato, l'Eco Color Doppler garantisce un efficiente follow-up mantenendo la peculiarità di essere una metodica non invasiva.

© 2010 Elsevier Srl. All rights reserved.

Introduction

Pseudoaneurysm of the lower limb is a clinical event which sometimes occurs. An arterial catheterization can cause a false aneurysm in about 6% of cases [1]. Other less frequent causes may be intra-arterial treatment procedures (<1% after angioplasty or stenting) [2], arterial

reconstructive surgery (1%–5% of prosthetic femoral anastomosis procedures) [3] or a traumatic event. It is characterized by a localized hematoma showing a persistent communication with an artery. In daily practice, these clinical symptoms often cause suspicion of pseudoaneurysm which can be confirmed by Color Doppler US so that the patient can start appropriate treatment. Non-invasive techniques, such as CT angiography or MR angiography, are currently proposed for diagnostic integration, but these methods involve several disadvantages compared with US. Color Doppler US is furthermore required to ensure the success of certain therapeutic procedures such as

* Corresponding author. via Rosselli 3, 60019 Senigallia, Ancona, Italy.

E-mail address: gpagliariccio@yahoo.it (G. Pagliariccio).

embolization with thrombin injection [4]. After this treatment also the follow-up is generally carried out using US, which has proved sufficiently accurate. In this paper the Authors present two cases of false aneurysm of different origin (post-traumatic and iatrogenic) pointing out that Color Doppler US examination provided a correct and complete assessment before therapy and in the follow-up after treatment.

Case 1

A 37-year-old male patient had an ankle joint distortion which was treated with a plaster cast; he was told to avoid lifting or carrying weight. Ten days later acute pain occurred at the level of the ankle and the patient therefore went to the emergency department of the Regional Hospital. The plaster cast was removed revealing ecchymotic suffusion on the outside of the ankle and a pulsating perimalleolar mass. Color Doppler US of the lower limb showed a hematoma of $1.5 \times 0.8 \times 1.3$ cm fed by the interosseous perimalleolar artery (Fig. 1). Angiographic examination subsequently confirmed the presence of distal pseudoaneurysm downstream of the perforating artery (Fig. 2). At the same session selective distal embolization of the vessel feeding the pseudoaneurysm was successfully carried out by positioning of metal microspirals. The procedure was carried out successfully and the peripheral perfusion was preserved (Fig. 3). After this procedure, the pulsating mass and the pain gradually disappeared. Color Doppler US of the lower limb evidenced embolization of the perimalleolar portion of the anterior interosseous artery. The hematoma had disappeared and presence of microspirals within the lumen of the treated vessel was depicted (Fig. 4). The examination also showed a good blood flow through the peripheral anterior and posterior tibial artery. Follow-up at 12 months confirmed the good outcome of the procedure.

Case 2

A 75-year-old woman had for many years suffered from peripheral vascular disease in both legs. The patient's

Fig. 1 Case 1: Color Doppler US evidencing a pseudoaneurysm affecting the tibio-tarsic region.

Fig. 2 Case 1: Angiography showing a pseudoaneurysm affecting the anterior branch of the interosseous artery.

clinical history included arterial hypertension treated with telmisartan, type 2 diabetes mellitus treated with metformin and past surgical treatments (appendicectomy, hysterectomy). The patient complained of disabling intermittent claudication in the lower right leg. Angiography was therefore carried out showing critical stenosis of the right superficial femoral artery and steno-occlusion of the anterior tibial artery. At the same session, angioplasty of the anterior tibial, popliteal and superficial femoral arteries was carried out with a good angiographic outcome. Six days later, a pulsating mass and hemorrhagic suffusion occurred in the right pretibial region. The patient underwent Color Doppler US which revealed the presence of a pseudoaneurysm affecting the anterior tibial artery (Fig. 5). Angiography was therefore repeated revealing the presence of a pseudoaneurysm due to a little hole located distal to the ankle joint affecting the anterior tibial artery (Fig. 6). Percutaneous revascularization of the anterior tibial artery was therefore carried out to exclude the pseudoaneurysm by positioning of a stent-graft. Final arteriography showed patency of the anterior tibial artery (Fig. 7). Subsequent Color Doppler US examination of the right leg confirmed complete exclusion of the pseudoaneurysm thanks to the stent (Fig. 8) showing direct blood flow to the foot. The painful symptoms and pulsating swelling disappeared and subsequent clinical and Color Doppler US examinations (follow-up at 18 months) confirmed persistent patency of the anterior tibial artery and complete exclusion of the pseudoaneurysm.

Fig. 3 Case 1: Angiography performed after embolization showing complete exclusion of the false aneurysm and preserved peripheral patency.

Discussion

Pseudoaneurysm is sometimes difficult to diagnose due to the scarcity of symptoms. However, pseudoaneurysm in the lower limbs is often located near the skin, and clinical examination is therefore useful as it will generally reveal a pulsating mass or a hematoma which does not disappear over time. In addition to clinical examination, the patient's clinical history is required as the patient will often refer to an accident involving contusion or a penetrating object or a recent artery catheterization thereby directing the

Fig. 4 Case 1: Color Doppler US showing complete obliteration of the false aneurysm (the arrow indicates the previously positioned spirals).

Fig. 5 Case 2: Color Doppler US showing pseudoaneurysm in the pretibial region.

clinician towards an etiopathogenetic diagnosis. Next step is Color Doppler examination which is the diagnostic method of choice as it provides an accurate diagnosis defining the dimensions and the location of the false

Fig. 6 Case 2: Angiography showing pseudoaneurysm affecting the anterior tibial artery.

Fig. 7 Case 2: Angiography performed after positioning of the stent-graft showing complete exclusion of the false aneurysm and preserved peripheral patency.

aneurysm as well as the breach in the vascular wall which has caused it [5]. This diagnostic approach seems to be sufficient also to plan appropriate management of the pseudoaneurysm. Additional non-invasive diagnostic examinations such as contrast enhanced CT angiography or MR angiography may be performed to obtain a better diagnostic definition, but the above cases show that these diagnostic examinations are not necessary as all the information required for the treatment was obtained at Color Doppler US. The use of angiographic examination seems to have been completely abandoned in this diagnostic phase as it does not provide additional information while exposing the patient to the risk linked to arterial catheterization and the use of contrast agent. Treatment of pseudoaneurysm must be carried out soonest possible as a delay in treatment can cause potentially serious complications (bleeding,

Fig. 8 Case 2: Color Doppler US showing complete obliteration of the false aneurysm and regular patency of the stent-graft.

peripheral microembolization with ischemia of the limb, skin ulcer, compression of adjacent neurological structures, etc.).

Treatment options are varied, but surgery has for many years yielded the best results also considering the duration of the results over time. However, surgery is considered as a seriously invasive treatment.

Numerous other techniques are currently being applied [1] such as compression therapy with or without US guidance, US-guided injection of thrombin [4], transarterial embolization and *endovascular stent-graft exclusion* [6]. All these techniques are minimally invasive and yield an excellent therapeutic result without exposing the patient to surgical trauma.

In the recent years, particularly two techniques have been developed: US-guided compression and US-guided injection of thrombin directly into the pseudoaneurysm lumen. Both techniques are minimally invasive, easy to perform and inexpensive; they do not require hospitalization and do not expose the patient to particular risks. US guidance is essential in these therapeutic methods in order to obtain a good result and to avoid local complications.

Critical reviews of the literature [5] propose compression of the aneurysm as the first therapeutic approach (also without US guidance). If this treatment fails, embolization with thrombin is recommended. Surgery and other forms of therapy seem to be reserved for cases in which the above mentioned minimally invasive procedures do not prove useful or if they cannot be carried out. The choice of technique depends on various circumstances: the anatomical site and diameter of the false aneurysm, the patient's characteristics (general clinical condition, anticoagulant therapy, etc.), peripheral vascular bed, clinical complications (local pain, peripheral neurological symptoms, edema due to venous compression, etc.) [2]. US Color Doppler allows identification of the most appropriate therapeutic strategy. In the first case presented in this paper, US examination revealed the origin of the pseudoaneurysm affecting the interosseous artery and the integrity of the plantar vessels thus indicating that embolization of the false aneurysm was possible without causing foot ischemia. Transarterial embolization with spirals was preferred,

rather than direct puncture with thrombin injection, as it was feared that the thrombin might migrate to the peripheral arterial vessels.

In the second patient, color Doppler US showed the false aneurysm of the anterior tibial artery which was the only patent peripheral artery able to feed the vascularization of the limb. The patency could therefore not be sacrificed, so it was decided to treat the pseudoaneurysm by positioning a stent-graft which excluded the false aneurysm thereby maintaining the patency of the vessel.

After treatment, the successful outcome of the procedure was assessed by US examination. US is in fact a valid tool in the follow-up as it is able to confirm complete obliteration of the false aneurysm and good peripheral perfusion; US is furthermore repeatable and easy to perform. Also in the present case, contrast enhanced examinations were not necessary as Color Doppler US provided the same diagnostic information as CT angiography and MR angiography without using contrast agent or exposing the patient to ionizing radiation.

Conclusions

It can therefore be concluded that Color Doppler US allows a safe management of numerous patients with pseudoaneurysm of the lower limbs. This method provides an optimal diagnostic definition and is essential in some treatments, such as compression therapy and thrombin

injection. It furthermore provides a precise and accurate therapeutic indication and accurate assessment of the outcome.

Conflict of interest statement

The authors have no conflict of interest.

References

- [1] Imsand D, Hayoz D. Current treatment options of femoral pseudoaneurysms. *Vasa* 2007 May;36(2):91–5.
- [2] Labropoulos N, Giannoukas AD, Volteas SK, al Kutoubi A. Complications of the balloon assisted percutaneous transluminal angioplasty. Review article. *J Cardiovasc Surg* 1994;35: 475–89.
- [3] Szilagyi DE, Elliott Jr JP, Smith RF, Reddy DJ, McPharlin M. A thirty year survey of the reconstructive surgical treatment of aortoiliac occlusive disease. *J Vasc Surg* 1986;3:421–36.
- [4] Kang SS, Labropoulos N, Mansour MA, Michelini M, Filliung D, Baubly MP. Expanded indications for ultrasound-guided thrombin injection of pseudoaneurysms. *J Vasc Surg* 2000;31: 289–98.
- [5] Tisi PV, Callam MJ. Treatment for femoral pseudoaneurysms. *Cochrane Database Syst Rev* 2009 Apr 15;(2). CD004981.
- [6] Katsanos K, Sabharwal T, Carrell T, Dourado R, Adam A. Peripheral endografts for the treatment of traumatic arterial injuries. *Emerg Radiol* 2009 May;16(3):175–84. Epub 2008 Oct 22. Review.