Pseudoaneurysm of Femoral Artery Associated with Iatrogenic Arteriovenous Fistula

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Introduction

In endovascular procedures, whether diagnostic or interventional ones, the most common site of arterial access is the femoral artery[1]. Currently, the frequency of these procedures has been increasing, but without resulting in an increased incidence of post-procedure complications[1]. The main complications include arterial pseudoaneurysm, hematoma, infection, and arteriovenous fistula[1], significantly increasing the morbidity of these patients. Treatments may be conservative, or invasive procedures, whether surgical, percutaneous, both for pseudoaneurysms and for arteriovenous fistulas. The simultaneous occurrence of PSA and AVF is an extremely rare condition[2]. It has been rarely reported in the literature. The objective of this study is to report a case of femoral pseudoaneurysm with arteriovenous fistula associated after endovascular procedure and its therapeutic approach.

Case Report

This study reports the case of a 68-year-old patient, male, affected by systemic arterial hypertension and type 2 diabetes mellitus, who underwent ablation for atrial fibrillation, with right femoral artery puncture for the procedure. One week after the puncture, the patient developed hematoma and discomfort in the right femoral region. Color Doppler Ultrasound (CDU) revealed a large pseudoaneurysm (PSA) on a superficial femoral artery whose neck was approximately 0.5 cm (Figure 1) associated with arteriovenous fistula (AVF) between the superficial femoral artery and vein with two fistulous orifices. The proximal one was about 3 cm from the femoral bifurcation (Figures 2 and 3).

The patient was assessed by the surgery team that considered him unfit for surgery due to heart condition and use of anticoagulants. As the PSA was deeper, large and had a broad neck, treatment with thrombin injection

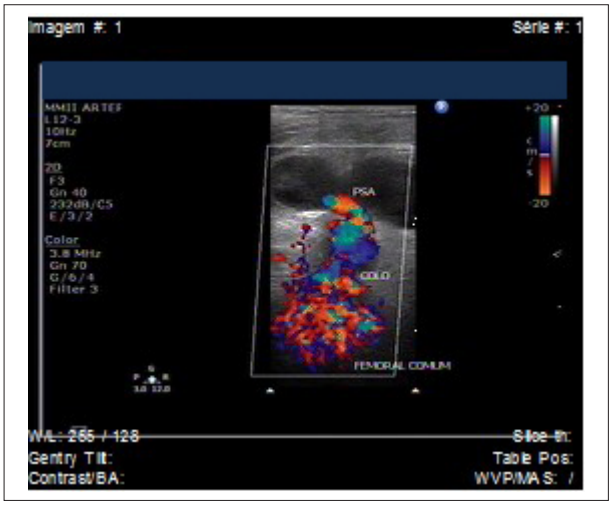

Figure 1 – *Arterial color Doppler showing the pseudoaneurysm (PSA) and the femoral artery neck.*

guided by CDU was chosen to close the PSA. At the end of the procedure, mixed materials (hypo and hyperechoic) was found inside, with no flow to the CDU (Figure 4). Compression bandaging was made and the patient was sent to the ward. A new echography was performed, which confirmed the success of the procedure. The patient was discharged on anticoagulation drugs.

To manage the AVF, clinical follow-up was chosen, as spontaneous closure was expected. After a three-month follow-up, there was no regression of AVF. Percutaneous treatment was chosen for correction purposes. Through the left femoral retrograde access (contralateral access), an aorta crossover was made and angiography was performed at the said site. Arteriography corroborated the CDU findings: two fistulous orifices in superficial femoral artery. The orifices were crossed over using MP catheter and 0.035″ guide wire and stenting was performed in the superficial femoral artery, occluding the fistula holes (Figures 5 and 6). The deep or common femoral artery was not affected. Control angiography showed occlusion of the fistula and patency of the stent. The patient recovered uneventfully and was discharged on the first day after the procedure.

The patient was referred for outpatient control with an assistant doctor and after 5 months of monitoring, the stent remained pervious, with complete resolution of the arteriovenous fistula.

Keywords

Hypertension; Diabetes Mellitus; Aneurysm, False; Femoral, Artery/lesions; Arteriovenous Fistula.

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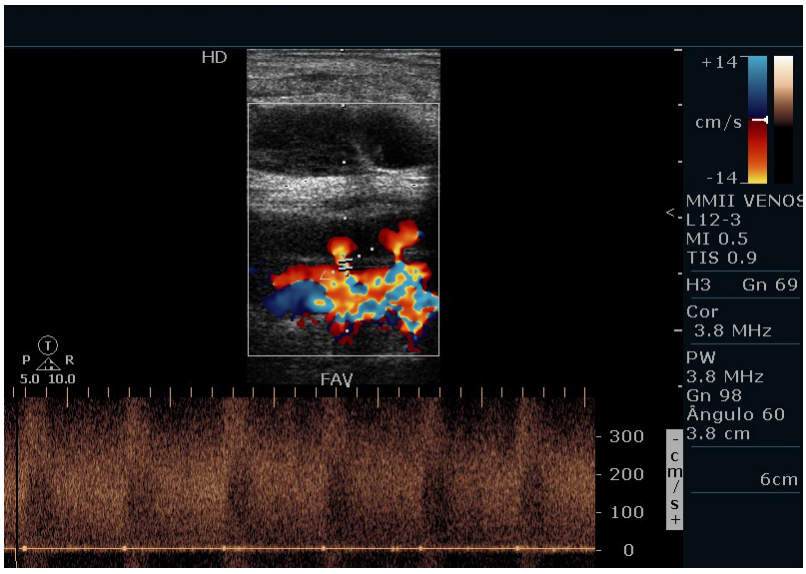

Figure 2 – *Pulsed Doppler showing pattern compatible with arteriovenous fistula.*

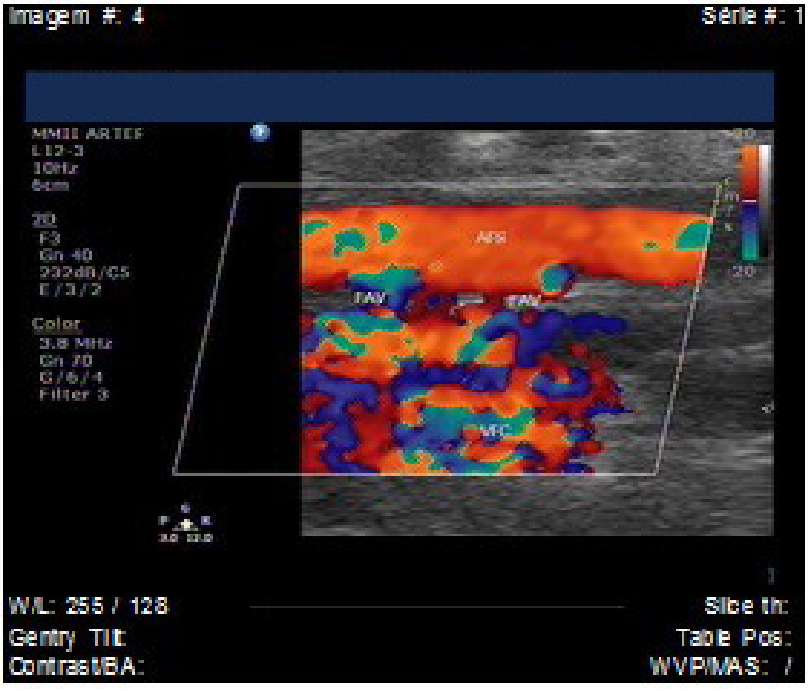

Figure 3 – *Color Doppler in longitudinal section showing 2 arteriovenous fistulas (AVF) between the superficial femoral artery (SFA) and the superficial femoral vein (SFV). CFV, common femoral vein.*

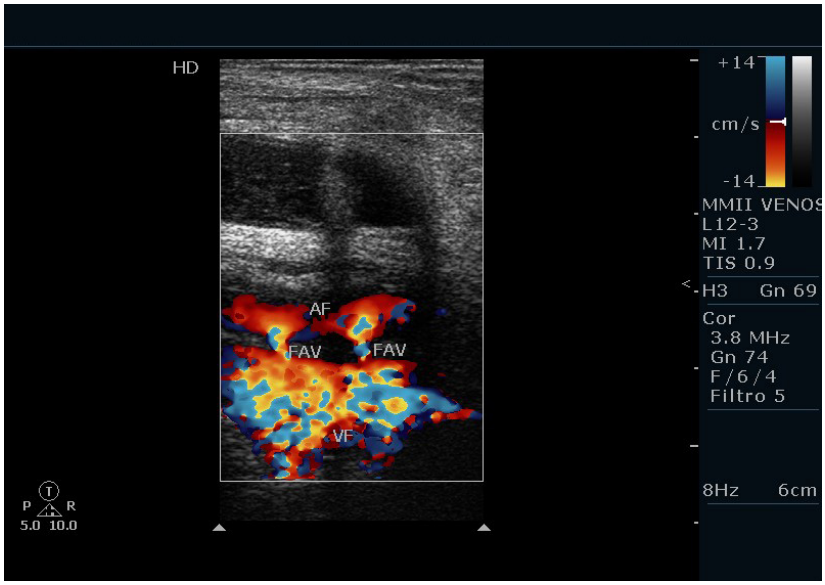

Figure 4 – *Color Doppler in longitudinal section of the pseudoaneurysm (PSA) with signs of thrombosis and hypoechoic and anechoic areas accompanied by 2 arteriovenous fistulas (AVF) between the superficial femoral artery and the femoral vein. CFA, common femoral artery.*

Figure 5 – *Arteriography showing the arteriovenous fistulas.*

Figure 6 – *After insertion of the stent demonstrating the correction of the arteriovenous fistulas.*

Discussion

Pseudoaneurysm and arteriovenous fistulas are complications of endovascular procedures. The incidences of these complications are from 2 to 8% and <1%, respectively[1,2]. The presence of femoral pseudoaneurysm concomitant with iatrogenic arteriovenous fistula is rare and its incidence is unknown[2]. The main risk factors for complications after endovascular procedures are age, female sex, coronary angioplasty, low arterial puncture, use of anticoagulants and antiplatelet agents and the doctor's puncturing experience[3].

Diagnosis of pseudoaneurysm and arteriovenous fistula is based on clinical history and physical examination, and it is confirmed by CDU[3-4]. The most common clinical findings are pain and edema in the groin area after endovascular procedure, both in pseudoaneurysms and in arteriovenous fistulas. Physical examination may reveal murmur, pulsatile mass and pain in the puncture area. The patient presented hematoma and discomfort in the right femoral region after right femoral artery puncture for a procedure. On physical examination, the patient presented murmur in the right femoral puncture site and reduced pulse in the right lower limb, leading to the suspected presence of pseudoaneurysm and arteriovenous fistula.

The main complication of pseudoaneurysm is rupture, which is related to the size of the aneurysm sac[3-4]. Other complications can be persistent pain and swelling around the affected area, distal embolization, skin ischemia and necrosis, infection and compression of adjacent vessels and nerves. The

treatment of pseudoaneurysm is indicated in patients with persistent pain and edema, distal embolization, skin necrosis, infection, compression of adjacent vessels and/or nerves, claudication, ischemia of the lower limbs or rupture, which is the most feared complication[4]. Small and asymptomatic pseudoaneurysms can be managed by conservative treatment, but in patients using anticoagulants, the chance of spontaneous resolution becomes smaller[5].

Among the types of treatment for pseudoaneurysm we can cite compression guided by CDU, thrombin injection guided by color Doppler, endovascular treatment with stenting and surgery[4,6]. Compression guided by CDU is the first choice in the management of patients with pseudoaneurysm. However, the success rate in patients undergoing anticoagulation ranges from 30 to 62%[6]. If this procedure is not tolerated by the patient and closure of the pseudoaneurysm does not occur, the next treatment of choice is thrombin injection guided CDU directly into the aneurysm sac.

Percutaneous injection of thrombin was first described by Cope and Zeit[7], guided by fluoroscopy. Kang et al. described the technique using CDU[4,6]. Of a minimally invasive nature, rapid and safe execution, eliminating the need for anesthesia or powerful analgesia, and high success rates have made thrombin injection guided by color Doppler an excellent alternative for the treatment of patients with pseudoaneurysm, especially in those with high risk for surgical repair or risk of failure with compression guided by color Doppler, such as the elderly, obese individuals and people with voluminous iatrogenic pseudoaneurysm and/or complex morphology[4-6]. Thrombin injection have success rates above 90%. Complications associated with thrombin injection occurs with low frequency, with isolated reports of cases of local infection, thrombosis and/or arterial thromboembolism and allergic reaction to thrombin. Thrombosis and/or arterial thromboembolism can be prevented by avoiding injection of thrombin next to or in the pseudoaneurysm cervix itself[6].

When treatment with thrombin injection guided by CDU is unsuccessful, the next indication is endovascular treatment with coated stenting. Surgery is indicated in cases where the pseudoaneurysm presents rapid expansion, hemodynamic instability, neuropathy, skin necrosis or ischemia, compartment syndrome or when percutaneous treatment fails.

Treatment with CDU-guided thrombin injection of pseudoaneurysms associated with arteriovenous fistula is controversial due to the potential risk of arterial thromboembolism or thrombosis[8,9]. Kang et al.[8] described their experience with pseudoaneurysm of femoral artery associated with arteriovenous fistula, and most of them had no direct connection between the pseudoaneurysm and the fistula. The clinical case of this study presents a pseudoaneurysm with no direct connection with arteriovenous fistulas, which required the therapeutic approach proposed, since the patient's cervix had a favorable size; there was no direct connection between the pseudoaneurysm and the arteriovenous fistula; and the correct application of the technique would be possible.

Iatrogenic arteriovenous fistulas are usually asymptomatic, being suspected by the presence of groin pain like those caused by pseudoaneurysm and on physical examination it may present murmur, tremor or pulsatile mass. Generally, arteriovenous fistulas do not require invasive treatment. Conservative treatment can be chosen, since in most cases it can be resolved spontaneously[9-11]. However, in those patients taking anticoagulants and antiplatelet agents, spontaneous resolution rate is small. The potential complications of arteriovenous fistulas may include high-output heart failure, aneurysmal degeneration of the artery and swelling in the limbs[2,11]. Because of these possible complications, invasive treatment of fistulas is indicated in the case of no spontaneous closure. The recommended treatments for arteriovenous fistulas can be CDU-guided compression, angioplasty with coated stenting and surgical correction[9,11].

Surgical correction of catheter-induced arteriovenous fistula is associated with risks of complications such as bleeding due to venous hypertension in arterialized venous site and groin infection. Furthermore, in cases of arteriovenous fistula, the surgeon often finds a tangle of vessels, making it difficult to identify the fistula tract and requires prior discontinuation of anticoagulants and antiplatelet agents[11].

Non-invasive treatments such as compression bandage and CDU-guided compression have been indicated as first-line treatment, but their effectiveness is limited because these patients are usually on anticoagulants and antiplatelet agents. Yet, the size of the fistula tract, whether short or long, may make transducer compression impossible.

Percutaneous treatment with stenting is an attractive option for arteriovenous fistula correction induced by catheter, as it reduces hospitalization time and offers a fast recovery. In most cases, arteriovenous fistulas arise from the superficial or deep femoral artery. These sites are far from the hip joint, thus protected from stent deformation and fracture[11].

The main disadvantage of endovascular treatment is the presence of injuries near the femoral bifurcation due to the risk of occlusion of the deep femoral artery or superficial femoral artery after stenting[11]. Stenting in the femoral artery is safe and effective, since most patients with iatrogenic arteriovenous fistula are at high surgical risk due to the use of anticoagulants and coexistence of heart disease[3,11].

Conclusion

The occurrence of femoral pseudoaneurysm associated with iatrogenic arteriovenous fistula is extremely rare. Treatment with thrombin injection and fibrinogen guided by femoral pseudoaneurysm ultrasound concomitant with arteriovenous fistula is possible, effective and safe, as long as the procedure is correctly performed. Percutaneous treatment with coated stenting in the arteriovenous fistula is also safe, effective and minimally invasive. Management in these cases should always be individualized, seeking the best treatment option.

Authors' contributions

Research creation and design: Azevedo ACCA, Barros MVL. Data collection: Azevedo ACCA, Taveira TS, Cristino MAB. Data analysis and interpretation: Azevedo ACCA, Taveira TS, Barros MVL, Cristino MAB. Manuscript drafting: Azevedo ACCA, Barros MVL. Critical revision of the manuscript for important intellectual content: Azevedo ACCA, Barros MVL, Cristino MAB.

Potential Conflicts of Interest

This study has no relevant conflicts of interest.

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Academic Association

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