Traumatic pseudoaneurysm of the superficial femoral artery associated with a spontaneously sealed arteriovenous fistula

**Ahmed Mohamed Elhassan Elfaki Osman,
Saif Eldin Mohammed Ali Ibrahim**

ABSTRACT

Introduction: Arteriovenous fistulas (AVFs) are abnormal connections between arteries and veins. They may be congenital or acquired through trauma. The most common site for traumatic AVF (TAVF) are the lower limbs, due to the femoral artery being a frequent site of procedures, e.g., femoral catheterization. The closure of these fistulae usually requires surgical intervention and ligation. Rarely, however, these TAVF may undergo spontaneous closure. To the best of our knowledge, no case was reported regarding spontaneous closure of a superficial femoral artery (SFA)-TAVF.

Case Report: A 23-year-old male presented with a one-month history of a right upper thigh swelling which occurred three days following a penetrating bullet injury. On examination, the entry wound was above the swelling and the exit wound was located on the posterior aspect of the right thigh. The popliteal and pedal pulses were absent. The aneurysm was pulsatile. Angiography showed pseudoaneurysm on the SFA. Intraoperatively, the anterior and posterior walls of the SFA were perforated and the anterior wall of the femoral vein was punctured and had a thrombus. The SFA repair was achieved by an inter-positioning autogenous graft. The femoral vein was left untouched. We report this case because of the spontaneously sealed AVF following a thrombus formation on the femoral vein.

Conclusion: Usually, TAVF occurs following an acute arterial injury, with penetrating injuries being the most common cause. The management of such presentations is surgical and fistula ligation is advocated. Rarely, TAVF seals spontaneously. In these cases arterial repair with or without venous repair is done.

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CASE REPORT

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pseudoaneurysm on the SFA. Intraoperatively, the anterior and posterior walls of the SFA were perforated and the anterior wall of the femoral vein was punctured and had a thrombus. The SFA repair was achieved by an inter-positioning autogenous graft. The femoral vein was left untouched. We report this case because of the spontaneously sealed AVF following a thrombus formation on the femoral vein. **Conclusion:** Usually, TAVF occurs following an acute arterial injury, with penetrating injuries being the most common cause. The management of such presentations is surgical and fistula ligation is advocated. Rarely, TAVF seals spontaneously. In these cases arterial repair with or without venous repair is done.

Keywords: Superficial femoral artery (SFA), Spontaneously sealed fistula, Arteriovenous fistula, Traumatic arteriovenous fistula (TAVF)

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INTRODUCTION

An arteriovenous fistula (AVF) is an anomalous linking between an artery and a vein. The connection may be congenital or acquired through a penetrating trauma [1]. The most common sites for traumatic AVF (TAVF) formation are the lower limbs, due to the frequent catheterization and sampling of the femoral artery [2]. The other common cause for TAVF is small caliber bullet

injuries [3]. The closure of these fistulae usually requires surgical intervention and ligation. Rarely, however, these TAVF may undergo spontaneous closure and surgery would, therefore, only require arterial repair with or without venous repair.

CASE REPORT

A 23-year-old male student presented to us with a one-month history of a right upper thigh swelling which grew gradually following a penetrating bullet injury to the upper thigh. After the injury, he did not receive any surgical intervention; instead, the wound was packed in the accident and emergency department. The swelling grew over one month to reach a size of a tennis ball (measuring roughly around 12x10 cm). It was associated with pain on the right foot. Tingling paresthesia was also noted on the same leg. The patient is a smoker.

On examination the patient looked well, comfortable, he walks with the help of crutches. No pallor or cyanosis were noted. His bilateral upper extremity and femoral pulses were regular and synchronous, as were his femoral pulses bilaterally. The left lower limb was normal with regards to musculoskeletal and neurovascular examinations. The swelling was located on the anteromedial aspect of the upper half of the right thigh, it was firm and pulsatile. The skin overlying the swelling was intact and there was an obvious granulation area on the center of the mass, measuring about 1x1 cm (bullet entrance). The popliteal, posterior tibial and dorsalis pedis pulses on the affected limb were absent on palpation.

A computed tomography angiography showed a pseudoaneurysm (Figure 1) on the right superficial femoral artery (SFA).

Intraoperatively, both the anterior and posterior walls on a 2-cm segment of the proximal SFA were perforated (Figure 2A, arrow) and the anterior wall of the femoral vein was also perforated, but was clogged by a thrombus (Figure 2B, arrow), which has sealed the AVF and prevented its formation. The perforated segment of the SFA was removed and an interpositioning saphenous vein graft from the contralateral limb (Figure 2C) was anastomosed. The femoral vein was left untouched and a closed suction drain was placed prior to closure.

Postoperatively, the patient was given IV antibiotics, low molecular weight heparin and pain killers. Aspirin was prescribed and early mobilization was encouraged. The suction drain was removed on second postoperative day. The postoperative period passed uneventfully, there were no signs of deep vein thrombosis and Doppler ultrasonography of the femoral vein showed no thrombus. The patient was discharged on aspirin.

On serial outpatient follow-up visits, the patient had a fully functional limb and no fistula connection between the artery and vein.

Figure 1: Computed tomography angiogram of the lower limbs showing pseudoaneurysm of the right SFA (red circle).

Figure 2: (A) Perforated anterior and posterior walls of the SFA (arrow), (B) Thrombus on the femoral vein (arrow), (C) Saphenous vein bypass graft of the SFA. The femoral vein was left untouched.

DISCUSSION

Regarding the spontaneous closure of AVF, Huber et al. described a case of a 67-year-old male who suffered a fall and presented with exophthalmos. He was diagnosed as carotid-cavernous sinus fistula (CCF), which was verified by CT scan and angiography. The fistula closed spontaneously prior to their intervention [4]. In another study, a 50-year-old male diagnosed with CCF, after a head trauma, had an orbital venography done after which his CCF spontaneously healed [5]. Kohgo et al. described a case of a female who had exophthalmos and carotid angiogram revealed, that she had CCF.

The CCF disappeared two months after it had been diagnosed [6]. Robert et al. reported a patient who had a femoral AVF that closed spontaneously. They said that spontaneous closure of AVFs is known and can occur by fibrous contractions and a thrombus formation around the fistula openings [7]. Another study, conducted by Benny et al., followed-up a patient with a large, idiopathic and symptomatic renal AVF clinic-radiologically, which eventually closed spontaneously without intervening [8].

The development of a TAVF is often a complication of acute arterial injury [9] and penetrating trauma accounts for as many as 90% of TAVF's, with the most frequent cause being bullet injuries —especially small caliber bullets [10]. In a retrospective study, conducted by Davidovic et al., 25 patients out of a total of 36 had TAVF and pseudoaneurysm that were related to combat [11]. In another study of 202 patients, the incidence of TAVFs due to penetrating trauma was 98% (68% stab wounds and 26% bullet injuries) and involvement of the lower extremities was 20%. Out of those 202 patients, 133 presented, and were treated, within one week of injury; the other 69 patients presented later (after one week up to 12 years). In 80%, restoration of arterial flow was conducted by autogenous reconstruction and venous injuries were ligated or had lateral sutures done [12].

A study conducted in 1978 concluded that penetrating stab and gunshot wounds were the most common etiologies for vascular injuries and the most commonly involved regions were the lower limbs (43%). In that same study, they advocated that repair of the venous injuries was to be attempted, especially in the lower limb injuries [13], but no time factor was given. As for this patient, the risks associated with thrombus removal and vein ligation were higher than if left untouched.

Dedican et al. reported a case of a male who developed a TAVF between the right femoral artery and vein, six years after a gunshot wound, who presented with cardiac symptoms and venous insufficiency of the affected leg [14].

Penetrating trauma of the arterial system occasionally results in pseudoaneurysm formation and is related to the delayed recognition of the arterial injury. The management of the pseudoaneurysm caused by trauma is complicated by the difficulties of injury localization and delayed diagnosis of the condition [15], as was the case with this presentation. Early preoperative angiography may help in early diagnosis of unapparent pseudoaneurysm/TAVF. Extensive venous injuries are more likely to be associated with arterial injuries, and the consequent development of venous hypertension after arterial repair should be kept in mind. If venous hypertension occurs, venous repair or short bypass of the injured vein should be attempted to decompress the venous hypertension [15], but so far, no signs of venous hypertension developed.

Angiography for penetrating wounds near major vessels with no physical findings that suggest vascular injury [16], but if it was done on initial presentation, the patient would not have gone through the complications of

a perforated vascular system one month later. As for the management of traumatic pseudoaneurysm which are symptomatic, expanding or associated with a hematoma formation, an operative approach is the advocated treatment [17].

The development of a traumatic arteriovenous fistula (TAVF) is often a complication of acute arterial injury [18] and penetrating trauma accounts for as many as 90% of TAVF's, with the most frequent cause being bullet injuries [19, 20]. Penetrating injuries of the vascular system are often amalgamated with AVF formation; early detection and proper treatment with AVF ligation is recommended. Sometimes, however, these fistulae may heal spontaneously without any intervention.

CONCLUSION

In this case report, the femoral vein was left untouched, although many literates support its repair. We argue that the recanalization fate of the thrombus that is bound to happen would ensure adequate venous flow.

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Author Contributions

Ahmed Mohamed Elhassan Elfaki Osman – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published
Saif Eldin Mohammed Ali Ibrahim – Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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