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Post-Traumatic Arteriovenous Fistulas: About Three Cases and Literature Review

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Abstract **Case Series**

Introduction: Post-traumatic arteriovenous fistulas (AVF) are abnormal communications between an artery and an adjacent vein secondary to trauma. Their management requires early diagnosis and appropriate treatment to avoid local and systemic complications. ***Material and methods:*** We report a retrospective study of three cases of post-traumatic AVF treated in the vascular surgery department of the Mohammed V Military Teaching Hospital in Rabat between January 2024 and December 2024. ***Results:*** Three patients were included (two men and a 2-year-old girl). Etiologies were: accidental trauma (horse fall, n=1), iatrogenic (catheterization in an infant, n=1) and stab wound (n=1). Locations were femoral (n=2) and humeral (n=1). All patients presented with thrill and murmur on clinical examination. Diagnosis was confirmed by CT angiography in all cases. Conventional surgical treatment allowed complete exclusion of fistulas with restoration of arterial continuity (end-to-end anastomosis in 2 cases, direct suture in 1 case) and venous repair. Postoperative outcomes were uneventful with symptom resolution. ***Discussion:*** Our results are consistent with literature data regarding male predominance, preferential lower limb involvement and effectiveness of surgical treatment. The role of endovascular treatment is discussed. ***Conclusion:*** Early diagnosis of post-traumatic AVF relies on rigorous clinical examination. Conventional surgical treatment remains the gold standard with excellent results.

Keywords: Arteriovenous fistula; trauma; vascular surgery; false aneurysm.

INTRODUCTION

An arteriovenous fistula (AVF) is an abnormal communication, either congenital or acquired, between an artery and an adjacent vein bypassing the distal capillary network [1]. This entity is always pathological and exposes the patient to numerous short-, medium-, and long-term complications, both local and systemic.

Traumatic lesions are the most frequent causes of acquired AVF, followed by aneurysmal lesions, infectious and neoplastic involvement [1]. Penetrating trauma from stab wounds (63%) or projectiles (26%) are predominant [2]. Iatrogenic pathology, related to the development of diagnostic and therapeutic procedures using arterial catheterization, has become a common cause [3].

Post-traumatic AVFs (PTAVF) affect, in descending order, the femoral vessels (30.8%), humeral vessels (19.2%), and axillary vessels (15.4%) [3]. They can develop early or several years after the trauma and are associated with a false aneurysm in 60% of cases [4].

Symptoms classically include a pulsatile mass, thrill, and systolo-diastolic murmur. Signs of venous stasis or distal ischemia are also described [2].

Through a retrospective study of three cases of PTAVF managed in the vascular surgery department of the Mohammed V Military Teaching Hospital in Rabat, we describe the epidemiological, clinical, paraclinical, and therapeutic characteristics of these lesions, comparing them with data from the literature.

MATERIAL AND METHODS

Study type

We conducted a retrospective descriptive study including all patients treated for post-traumatic AVF in the vascular surgery department of the Mohammed V Military Teaching Hospital in Rabat between January 2024 and December 2024.

Inclusion criteria

All patients presenting with an AVF of traumatic origin (accidental, iatrogenic, or due to

assault), diagnosed by imaging and managed in the department, were included.

Exclusion criteria

Patients with congenital AVF and those lost to follow-up during the study period were excluded.

Data collection

Data were collected from medical records: demographic characteristics (age, sex), medical history, traumatic mechanism, time to diagnosis, clinical presentation, paraclinical examinations, treatment modalities, and postoperative outcomes.

RESULTS

Patient characteristics

Our series includes three patients: two men aged 29 and 25, and a 2-year-old girl (Table 1).

Table 1: Demographic and etiological characteristics

Subject	Age/Sex	Time from trauma to diagnosis	Circumstances
1	29 years / M	4 hours	Horse fall (stab wound)
2	2 years / F	21 months	Iatrogenic (catheterization)
3	25 years / M	20 days	Stab wound assault

Clinical presentation

Clinical presentation varied according to the time to diagnosis (Table 2). A thrill and murmur were present in all patients. Acute upper limb ischemia with absent pulses was observed in patient 3, treated late (20 days). The 2-year-old child presented with hypertrophy of the left lower limb.

Table 2: Clinical presentation

Subject	Lesion	Clinical signs
1	False aneurysm of CFA + AVF CFA-CFV	Thrill + murmur, diminished pulses
2	AVF FA-CFV	Limb hypertrophy, murmur
3	False aneurysm of HA + AVF HA-HV	Thrill + murmur, absent pulses, acute ischemia

CFA: common femoral artery; CFV: common femoral vein; FA: femoral artery; HA: humeral artery; HV: humeral vein

Paraclinical examinations

CT angiography was performed in all patients (100%), confirming the diagnosis and specifying the lesional anatomy (Figure 1). Doppler ultrasound was performed in two patients (66%).

Figure 1: Lower limb CT angiography (Observation 1) showing a false aneurysm of the common femoral artery with early arteriovenous fistula between the common femoral artery and common femoral vein

Therapeutic management

All patients underwent conventional surgical treatment under general heparinization (Table 3, Figure 2).

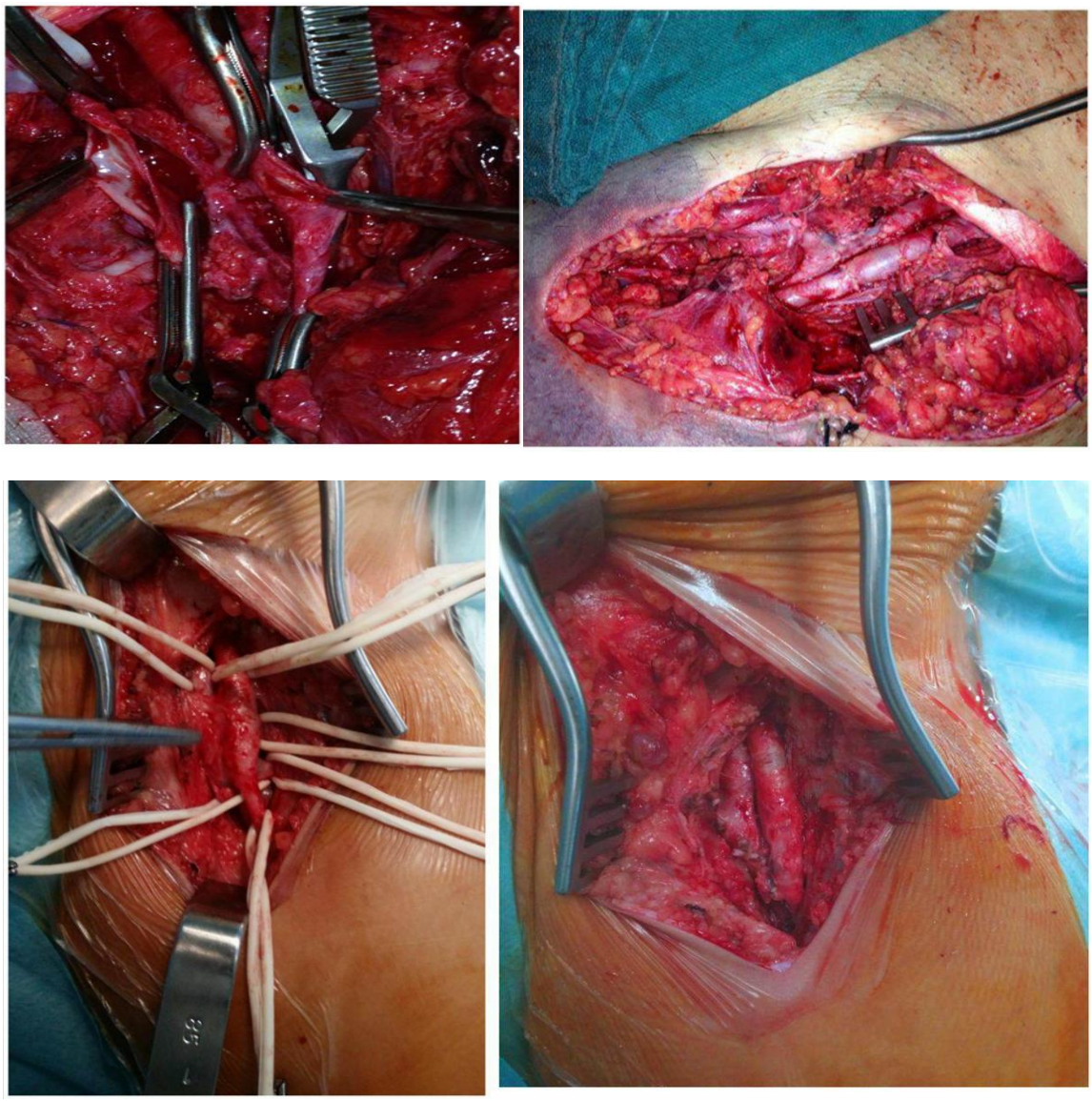

***Figure 2a and 2b: Intraoperative views (Observation 2) after dissection of the left Scarpa's triangle: visualization of the abnormal communication between the femoral artery and common femoral vein in the 2-year-old child. ***

Table 3: Surgical modalities

Subject	Surgical procedures	Arterial reconstruction
1	False aneurysm exclusion + AVF exclusion	End-to-end anastomosis
2	AVF exclusion	Direct suture (interrupted sutures)
3	False aneurysm exclusion + AVF exclusion	End-to-end anastomosis

Postoperative outcome

Postoperative recovery was uneventful in all patients, with disappearance of the thrill and recovery of distal pulses. The average hospital stay was 2-3 days. Antiplatelet therapy (Kardegic® 160 mg/day) was prescribed for one month. Follow-up at 3 months, 6 months, and 1 year showed favorable outcomes with regression of limb hypertrophy in the child and no recurrence.

DISCUSSION

Epidemiological characteristics

The mean age of our patients (19 years) is lower than that reported in large series (26-38 years) [2,3,5-8], probably due to the small sample size. Male predominance (66%) is consistent with the literature (60-100%) [2,3,5-8], explained by greater exposure to trauma.

Etiologies

Our series illustrates the etiological diversity of PTAVF: accidental trauma (33%), iatrogenic (33%), and stab wound (33%). Robbs *et al.,*[2] reported 98% penetrating trauma (63% stab wounds, 33% firearms) and 2% iatrogenic origin. Amrani *et al.,*[9] noted 75% iatrogenic origin in Belgium. This variability reflects sociocultural differences and the level of development of invasive procedures. In Morocco, stab wounds remain predominant, but iatrogenic causes are increasing with the development of endovascular procedures.

Topography

Lower limb involvement predominated in our series (66%), as in most studies [5,6,8]. The femoral pedicle is most frequently affected (17-30%) [5-7], due to its anatomical exposure.

Anatomopathological aspects

Two of our patients (66%) had an AVF associated with a false aneurysm, consistent with literature data (60%) [6]. This association results from the organization of the initial perivascular hematoma [10].

Time to diagnosis

Time to diagnosis varied considerably: 4 hours for acute trauma, 20 days for the stab wound, and 21 months for the iatrogenic AVF. Bokhabrine [3] reported a mean time of 5.4 months, while Amrani [9] noted 3 years and 5 months. High-flow AVFs generally present early, whereas iatrogenic or distal low-flow AVFs are discovered late.

Clinical presentation

Thrill and murmur were constant in our series, as in the literature (Table 4) [2,3]. Acute ischemia observed in one patient (33%) is more frequent in our series than in Bokhabrine's (7.6%) [3], possibly due to involvement of a main axis (humeral artery). The absence of congestive heart failure in our series (0% vs. 4% in Robbs [2]) is explained by relatively early diagnosis.

Table 4: Comparison of clinical signs with the literature

Clinical signs	Our series (n=3)	Robbs [2] (n=202)	Bokhabrine [3] (n=26)
Thrill	66%	5%	92%
Pulsatile mass	0%	18%	92%
Murmur	100%	33%	77%
Ischemia	33%	-	7.6%
Absent pulses	66%	5%	19%

Contribution of imaging

CT angiography was performed in all our patients (100%), whereas Bokhabrine [3] used it in only 7% of cases. This difference is explained by the increased availability of this examination and its superiority in studying false aneurysms [11]. Doppler ultrasound, performed in 66% of our patients, is a useful non-invasive examination but operator-dependent [12]. Arteriography, the historical gold standard, was not necessary in our series, as CT angiography provided sufficient lesional mapping.

Therapeutic options

All our patients were treated with conventional surgery, with AVF exclusion and restoration of vascular continuity (Table 5). This approach remains the gold standard [13]. Arterial repair was performed by end-to-end anastomosis (66%) or direct suture (33%), and venous repair by lateral suture (66%) or venous patch (33%).

Table 5: Comparison of surgical techniques

Technique	Our Series	Rich [6]	Kollemyer [7]	Robbs [2]	Bokhabrine [3]
AVF exclusion	**100%**	100%	81%	100%	100%
Arterial reconstruction					
– End-to-end anastomosis	66%	–	7%	20%	0%
– Direct suture	33%	7.2%	16%	19%	20.8%
– Venous graft	33%	10%	17%	27%	58.3%
Venous reconstruction					
– Suture	66%	30%	74%	43%	45.8%

Endovascular treatment with covered stents or embolization is an attractive alternative, particularly for lesions that are difficult to access or in patients at high surgical risk [14]. However, its long-term efficacy remains insufficiently evaluated [15].

Complications and follow-up

We observed no complications (death, hemorrhage, infection, recurrence, amputation) in our series, unlike large series where mortality ranges from 1.8% to 5.8% and amputation rates from 1.7% to 9% [2,6,7]. Postoperative monitoring in an intensive care unit is recommended due to the risk of acute heart failure

related to the sudden increase in systemic resistance after closure of a chronic AVF [16].

Study limitations

Our study has the inherent limitations of its retrospective nature and small sample size. However, it reflects the reality of this rare pathology in our context and allows a detailed analysis of the cases.

CONCLUSION

Post-traumatic arteriovenous fistulas are rare but potentially serious lesions, preferentially affecting young males. Their diagnosis relies on rigorous clinical examination looking for the pathognomonic thrill and murmur, complemented by imaging (CT angiography, Doppler ultrasound). Conventional surgical treatment with fistula exclusion and restoration of vascular continuity remains the standard, offering excellent results with a low complication rate. The development of endovascular techniques may broaden therapeutic options, particularly for complex lesions.

Conflicts of Interest

The authors declare no conflicts of interest.

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