



Late Complications of Civilian Vascular Injuries of the Extremities in Cameroon

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Received: 22 March 2021 / Accepted: 7 August 2021 / Published online: 31 August 2021
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Abstract

To describe the different presentations, diagnostic evaluations, management, and outcome of late complications of vascular trauma of the extremities (LCVTE) in civilian practice. All the patients with LCVTE who reported at the Yaounde General Hospital from January 2010 to December 2019 were included. Patients presenting with acute vascular injuries, neck vessel injuries, and iatrogenic lesions or late complications of vascular access for hemodialysis were excluded. All cases were evaluated with ultrasound and/or computer tomography and managed with various open vascular surgical techniques and their results were assessed. Fifteen patients with 17 LCVTE underwent various vascular repairs. There were 2 women and 13 men. The mean age was 30.28 years (median 22, range 8 months to 54 years). The time interval between injury and presentation in the hospital was 3 weeks to 15 years with a mean of 3 months (median 6 months). Penetrating injuries secondary to stabs were the commonest cause in 94.11%. Lower limb vessels were affected in 12/17 (70.58%), with the superficial femoral artery being the most frequently involved artery in 6 (35.29%) cases. Sixteen (94.11%) patients presented with pseudoaneurysm, 1 with solely traumatic arteriovenous fistula. Some pseudoaneurysms presented with complications such as infection (2 cases), bleeding (3 cases), and rupture with hypovolemic choc (1 case). The only non-vascular injuries associated were 1 brachial plexus injury and 1 fracture of the distal femur shaft. For the 15 lesions that underwent surgery, the most frequent surgical techniques used were simple suturing (66.66%) followed by resection and end-to-end anastomoses (26.66%). Unfortunately, one postoperative mortality was registered. After a follow-up from 6 months to 10 years, no late complications were detected (no recurrence, no wound infection). Only the patient with the brachial plexus injury ended up with a flail limb that did not improve and the patient with a femoral fracture with a shortening of the limb. Penetrating wounds secondary to stabs were the main injuries and pseudoaneurysm was the most common late complication. Ameliorating the management environment could reduce morbidity.

Keywords Vascular · Injury · Late complication

Introduction

Trauma is now the third leading cause of death and the number one killer of people younger than 45 years of age. Vascular injuries comprise 3% of all civilian traumas and continue to have significant associated morbidity and mortality in the twenty-first century [1]. In general, vascular injuries especially those of the extremities are considered uncommon probably due to their high lethality on the spot. If missed, or not properly and promptly managed, such

injuries can lead to limb loss or death [1, 2]. After initial assessment and resuscitation of patients, management per se usually consists of surgical repair. However, some patients due to many factors in our environment show up late with complications such as pseudoaneurysm, chronic venous diseases, arterio-venous fistulas, or associated non-vascular lesions. Reports on late complications of vascular trauma of the extremities (LCVTE) are extremely rare and the few encountered are mostly from military practice [3, 4] in Africa and Asia. With recent advances in diagnostic imaging and the emergence of endovascular techniques, it is essential to continuously report on management practices and their outcomes in vascular injuries of the extremities. We present here our analysis of the patients treated in the last 10 years in our institution. The clinical presentation,

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management, and outcome are outlined. To the best of our knowledge, this is the first report with such volume from a single center in civilian practice.

Methods

From January 2010 to December 2019, we retrospectively reviewed patients with LCVTE at the Yaounde General Hospital; a teaching hospital with facilities to perform vascular surgery. Data collections included demographic data, mechanism of injury, time prior to current management, initial management, pathology of the LCVTE, operative management, and outcome. The diagnosis of LCVTE was made by clinical suspicion supported by imaging for confirmation and delineation. The pathology of vascular injuries was done intraoperatively and the type of vascular reconstruction performed was recorded accordingly. Patients with late complications of neck vessel trauma and those with late complications of hemodialysis vascular access puncture were excluded. Descriptive statistics, including mean, median, standard deviation, frequency, and percentage, were used to describe demographic, injury, treatment, and outcome data. Demographic, injury, treatment, and outcome variables were compared between arterial injuries of the upper extremities and those of the lower extremities. This study was accorded institutional ethical approval by the local ethics committee of Yaounde General Hospital.

Results

Patients Characteristics

During the 10-year study period, 15 patients with 17 LCVTE were admitted in our department. Overall, 88 vascular trauma admissions occurred during this period, which yields a 19.31% incidence of patients with LCVTE presenting in our unit and requiring hospital admission.

There were 2 women and 13 men. The mean age was 30.28 years (median 22, range 8 months to 54 years). Two patients were less than 15 years old.

The time interval between injury and presentation in our hospital was 3 weeks to 15 years with a mean of 3 months (median 6 months). All the patients were initially managed in other institutions.

From their past medical history regarding the initial management, all except the lone patient with a close fracture had as initial management a superficial wound debridement and closure.

As far as etiologies and mechanisms of injuries are concerned, as presented in Table 1, fighting and domestic accidents leading mostly to stab wounds are the predominant situations. Only one patient was a victim of a gunshot injury.

The location of the different lesions is presented in Table 2. Most lesions (12/17) were located on the lower extremity.

The Type of Lesions After clinical evaluation, while doppler ultrasonography was adequate in establishing the diagnosis for all the patients, angio-CT was performed in 13 cases (76.47%). The lesions encountered are mostly

Table 2 Location of vascular injuries

Location	n	%
Upper limb		
Radial artery	1	5.88
Brachial artery	1	5.88
Axillary artery	1	5.88
Subclavian artery	1	5.88
Brachial vein	1	5.88
Lower limb		
Superficial femoral artery	6	35.29
Superficial femoral vein	2	11.76
Popliteal vein	1	5.88
Popliteal artery	3	17.64
Associated lesions		
Brachial plexus injury (main lesion: axillary artery injury)	1	5.88
Femur fracture (main lesion: femoral artery injury)	1	5.88

Table 1 Etiologies and mechanisms of injuries

		Mechanisms of injuries			
		Sharp n (%)	Blunt n (%)	Total n (%)	
Etiologies	Fight	- Knife/wood/cutlass	13 (76.47)	0	13 (17.47)
		- Gunshot	1 (5.88)	0	1 (5.88)
	Accidents	- Road traffic	0	1 (5.88)	1 (5.88)
		- Domestic or labor accident or iatrogenic	3 (17.64)	0	3 (17.64)
			16 (94.11)	1 (5.88)	17 (100)

pseudoaneurysms (PA) in 94.11% (16/17 cases) and one arterio-venous fistula (1/17 cases).

At presentation, all of them were giant pseudoaneurysms (more than 200% the normal diameter of the concerned vascular segment). One patient had also a combination of PA and arterio-venous fistula. Some PA presented with complications such as infection (2 cases) and bleeding (3 cases) like the patient presented in Fig. 1 and rupture with hypovolemic shock (1 case).

The case of an isolated AVF was a poplito-popliteal AVF which was a late complication 15 years after a gunshot injury with resulting severe chronic venous insufficiency at presentation (Fig. 2).

The associated non-vascular injuries were 1 brachial plexus injury and 1 fracture of the distal femur shaft (Fig. 1).

Surgical Management Concerning the surgical management, 2 patients, one with a subclavian artery pseudoaneurysm and one with a popliteal artery pseudoaneurysm, were lost from follow-up before surgical treatment. For the remaining 15 lesions who underwent surgery, simple suturing (66.66%) followed by resection and end-to-end anastomoses (26.66%) is the most frequent surgical technique used (Table 3). Regarding the patient with a popliteal arteriovenous fistula, a separation and reconstruction of the popliteal artery and vein by lateral sutures were done.

Regarding the outcomes, unfortunately, one postoperative mortality was registered. The patient with a ruptured PA died because of hemorrhagic complications before his admission into the operative room and lack of enough blood (group O negative) for massive transfusion although the surgery was successfully performed.

Among the 15 patients, 12 were followed for more than 1 year ranging from 6 months to 10 years (median 1.5 years). No late complication was detected (no recurrence, no wound infection); only the patient with the brachial plexus injury ended up with a flail limb that did not improve; and the patient with femoral fracture had a shortening of the limb.

Discussion

This study, which evaluated 17 LCVTE managed at a single center over more than 10 years, represents the largest review of such injuries to the best of our knowledge. Most reports deal with vascular trauma in the acute phase. Even in conflict areas, we have not found a report looking specifically at those late complications. In the few available data encountered from military practice, Kedir et al. in Ethiopia [3] presented patients with late presentation or in sub-acute phase whereas Siddipque et al. in Afghanistan [4] focused mainly on missed vascular injuries in multiple trauma patients.

Fig. 1 a, b Popliteal arterio-venous fistula 15 years after a gunshot injury showing the popliteal, femoral, and iliac veinous and arteriomegaly



(a)



(b)

Fig. 2 a, b Case of femoral artery pseudoaneurysm secondary to a femoral shaft fracture. The skin necrosis was already bleeding

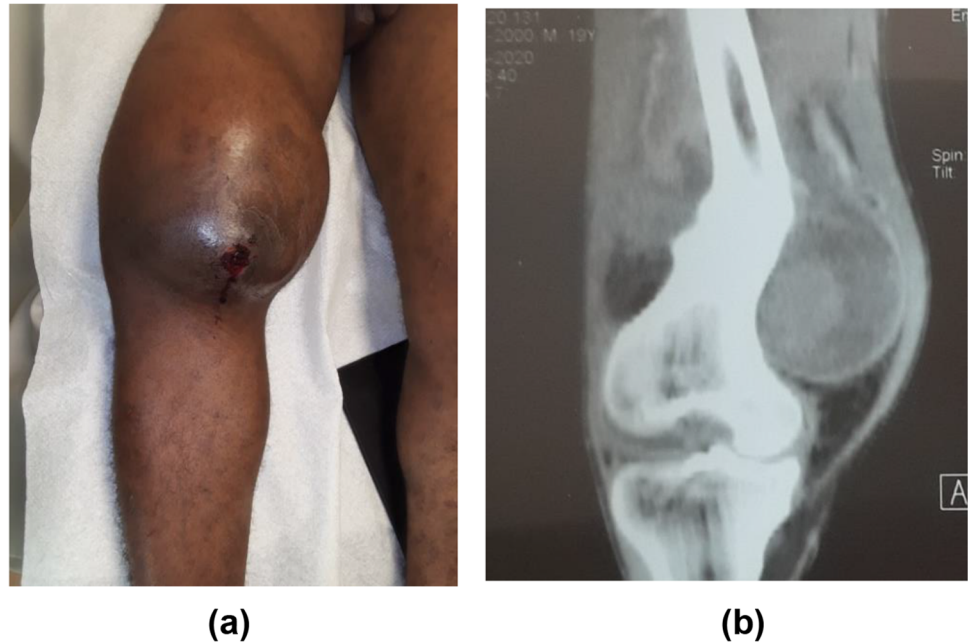


Table 3 Surgical techniques

Technique	<i>n</i>	%
Simple suture	6	66.66
End-to-end anastomosis	4	26.66
Bypass or vein interposition	3	20
Ligature	1	6.66
Suture with vein patch	1	6.66

A previous publication from our working group has described the etiology of vascular trauma of the extremities in our setting [2]. In the present report, the etiologies are almost the same notably fights and accidents. Due to the very low volume of cardiac catheterization in our setting, the iatrogenic causes are so rare that only one secondary to venous catheterization in an 8-month child is registered in this study. This contrasts sharply with western countries where iatrogenic pseudoaneurysms of the femoral artery are the most frequent vascular trauma [5].

This study shows that LCVTE are mainly pseudoaneurysms (94.11%). Unfortunately, there is no literature to compare this due to the paucity of published reports in civilian practice. In the pediatric population, where vascular trauma is very rare, a report from Serbia also reported pseudoaneurysm as the most frequent lesion after unrecognized vascular injuries (6). But in conflict areas in Africa or Asia, pseudoaneurysms were also the main lesions but with a lower proportion, 9/20 lesions in the work of Kedir [3] and 42.8% in the report of Siddique [4]. But the amount of arteriovenous fistulas is higher in war lesions precisely 9/20 [3] and 35.7% [4].

The time-lapse between injury and surgery was generally considerably ranging from 3 months to 15 years. This long period can be explained by many factors: First is the initial clinical presentation; those patients may have exhibited only soft signs or very mild hard signs [6] at the time of their injuries since patients with hard signs usually have just 2 issues of limb loss or have died if not promptly managed. Unfortunately, there is no data to support such an assertion since no previous study has focused on this particular aspect like in our study. The most obvious reasons for us are the lack of trained health care providers (we are 2 vascular surgeons for our country with more than 25 million inhabitants) and the geographical distances to meet a professional and the economic condition of most of our patients (lack of health insurance). Of course, this is the same situation in almost all sub-Saharan Africa and probably some other areas of the world.

The most common presentation was giant PA. The huge size of the PA also correlates with late presentation.

Our patients underwent open surgical repair with various types of reconstructions. No prosthetic graft was used. The neighboring superficial veins were retrieved for patch or interposition when needed (basilica or cephalic on the upper extremity and saphenous vein on the lower extremity). The main debate here would have been the possibility of endovascular repair in some cases. Most of those pseudoaneurysms were very huge with the risk of compression. Endovascular techniques through a mini-invasive approach do not address this risk [7, 8]. Giant aneurysms also carry a high risk of rupture. These lesions even though old still have a risk of residual infection. Therefore, inserting a stent or any artificial graft is risky. The patient with solely a

poplito-popliteal AVF was excluded from this option due to the known difficulties of stenting in articulation and the anatomical complexity of the fistula. Definitely, compared with open repair, endovascular surgery has unproven long-term durability versus autologous vein grafts that typically are of adequate size and readily available in the young patient population commonly afflicted by extremity trauma [7, 8].

For the non-vascular lesions, namely the brachial plexus palsy, surgical reconstruction was delayed by the neurosurgical team. The femoral fracture was already consolidated and non-amendable to surgery.

As outlined by other authors [3, 4, 7–9] and this is the case for our results, the long-term outcome of vascular reconstruction is uneventful.

The strengths of the study include the high patient volume for such rare lesions and analysis of a range of variables, including incidence and injury mechanism data, and injury management, which allowed for a thorough analysis of outcomes. Limitations are the inherent flaws associated with case series analysis.

Conclusion

Pseudoaneurysms secondary to stabbings are the most common late complications of vascular trauma of the extremities. They are not rare in low-income settings. Surgical management has good results. But early referral and the availability of more trained personnel are the way to reduce their incidence.

Author Contribution Both authors contributed to preparing the manuscript and patient management. MF finalized the manuscript and has the overall responsibility.

Data Availability The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics Approval and Consent to Participate This study was accorded institutional ethical approval by the local ethics committee of Yaounde General Hospital.

Consent for Publication The photos presented here received the consent of both patients.

Competing Interests The authors declare no competing interests.

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