

# Late Complications of Vascular Trauma of the Extremities in Civilian Practice: A 10 Year Experience in Cameroon

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## Research article

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# Abstract

**Background:** To describe the different presentations, diagnostic evaluations, managements and outcome of late complications of vascular trauma of the extremities (LCVTE) in civilian practice .

**Methodology:** 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 vessels injuries and iatrogenic lesions or late complications of vascular access for hemodialysis were excluded. All cases were evaluated with either ultrasound and or Computer tomography and managed with various open vascular surgical techniques and their results were assessed.

**Results:** Fifteen patients with 17 LCVTE underwent various vascular repairs. There were 2 females and 13 males. The age range was from 8 months to 54 years with a mean age of 30.28 . The time interval between injury and presentation in the hospital was 3 weeks to 15 years with a mean of 3 months.

Penetrating injuries secondary to stabs were the commonest cause in 94.11%. Lower limbs vessels were affected in 12/17 (70.58%), with 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 fistulae. 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 were 1 brachial plexus injury and 1 fracture of the distal femur shaft

For the 15 lesions who underwent surgery, the most frequent surgical techniques used were, simple suturing ( 66.66 %); followed by resection and termino-terminal anastomoses (26.66%)

Unfortunately one post operative mortality was registered. After a follow-up from 6 months to 10 years no late complications was detected (No recurrence, no wound infection). Only the patient with the brachial plexus injury ended up with a flail limb that didn't improve and the patient with femoral fracture with a shortening of the limb.

**Conclusion:** Penetrating wounds secondary to stabs were the main injuries and pseudoaneurysm was the most common late complication. Ameliorating the management environment could reduce the morbidity.

## 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 21st century. 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, 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 impression. But ultrasound was used and completed by angio CT in selected cases. The pathology of vascular injuries was done intraoperatively and the type of vascular reconstruction performed recorded accordingly. Patients with late complications of neck vessels trauma and those with late complication 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 an institutional ethical approval by the local ethics committee of the 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 females and 13 males. The age range was from 8 months to 54 years with a mean age of 30.28 years.

The time interval between injury and presentation in our hospital was 3 weeks to 15 years with a mean of 3 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 on table I, fighting and domestic accidents leading mostly to stab wounds are the predominant situations. Only one patient was victim of gunshot injury.

The location of the different lesions is presented in Table II. 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 pseudoaneurysms (PA) in 94.11% (16/17cases ) and one arteriovenous fistula (1/17 cases).

The PA were present in all limbs segment (11 for lower limb and 5 for the upper limb). At presentation, all of them were giant pseudoaneurysms (more than 200% the normal diameter of the concern vascular segment. One patient had also a combination of PA and arteriovenous fistula. Some PA presented with complications as infection (2 cases) bleeding (3 cases) as the patient presented on Figure 1 and rupture with hypovolemic choc (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 (Figure 1).

The associated non vascular injuries were 1 brachial plexus injury and 1 fracture of the distal femur shaft ( Figure 2).

**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 termino-terminal anastomoses (26.66%) were the most frequent surgical techniques used (Table III).

Regarding the outcomes, unfortunately one post operative mortality was registered. That patient with a ruptured PA died because of hemorrhagic complications before his admission in to the operative room and lack of enough (Group O negative) blood for massive transfusion although the surgery was successfully performed. After a follow-up from 6 moths to 10 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 didn't improve and the patient with femoral fracture with 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 Siddique et al in Aghanistan (4) focused mainly on missed vascular injuries in multiple trauma patients.

**Etiology** 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 contrast 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 paucity of published reports in civilian practice. In 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 The 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).

**Clinic** The time lapse between injury and surgery was generally considerable ranging from 3 months to 15 years. This long period can be explained by many factors. First the initial clinical presentation : those patients may have exhibited only soft signs or very mild hard sign at the time of their injuries since patients with hard sign usually have just 2 issues limb loss or dead . 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 of more than 25 millions inhabitants), 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 the 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.

**Treatment** Our patients underwent open surgical repair with various type or 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 risk of compression. Endovascular technique though a mini-invasive approach do not address this risk (7,8). Most of 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 popliteopopliteal AVF was excluded from this option due the known difficulties of stenting in an

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, the surgical reconstruction was delayed by the neurosurgical team. The femoral fracture was already consolidated and non amenable to surgery.

### *Outcome*

As outlined by other authors ( 3,4,6,7,8) and this is the case for our results, long term outcome of vascular reconstruction is uneventfully. The brachial plexus injury resulted in a flail limb that didn't improve.

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, injury management, which allowed for a thorough analysis of outcomes. Limitations are the inherent flaws associated with descriptive retrospective reviews.

## **Conclusion**

Pseudoaneurysms secondary to stabbings are the most common LCVTE. They are not rare in low income settings. Surgical management has goods results. But early referral and the availability of more trained personnel are the way to reduce their incidence.

## **List Of Abbreviations**

- AVF= arterioveinous fistula

- LCTVE= late complications of vascular trauma of the extremities

-PA= pseudoaneurysms

## **Declarations**

**Ethics approval and consent to participate:** This study was accorded an 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.

**Availability of data and materials :**The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

**Competing interest:** The authors declare that they have no competing interests

**Authors' contributions:** Both authors contributed to preparing the manuscript and patient management. MF finalized the manuscript and have the overall responsibility

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## Tables

Table I: *Etiologies and mechanisms of injuries*

			Mechanisms of injuries		
			Stabbings n(%)	Contusions n(%)	Total n(%)
Etiologies	Fight	- Knife /Wood/ cutlass	13(76.47)	0	13 (17.47)
		-Gunshut	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)

Table II : *Location of vascular injuries*

Location	n	%
<b>Upper Limb</b>		
Radial artery	1	5.88
Brachial artery	1	5.88
Axillairy artery	1	5.88
Sub clavial artery	1	5.88
Brachial vein	1	5.88
<b>Lower Limb</b>		
Superficial femoral artery	6	35.29
Superfial femoral vein	2	11.76
Popliteal vein	1	5.88
Popliteal artery	3	17.64
<b>Associated lesions</b>		
Brachial plexus injury	1	5.88
Femur fracture	1	<b>5.88</b>

Table III : *surgical techniques*



Technique	n	%
Simple Suture	6	66.66
Terminoterminal anastomosis	4	26.66
Bypass or vein interposition	3	20
Ligature	1	6.66
Suture with vein patch	1	6.66

## Figures



(a)



(b)

**Figure 1**

(a and b). Popliteal Arteriovenous fistula 15 years after a gunshot injury showing the popliteal, femoral and iliac venous and arteriomegaly.



**(a)**



**(b)**

**Figure 2**

(a and b): case of femoral artery pseudoaneurysm secondary to a femoral shaft fracture. The skin necrosis was already bleeding.