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Vascular Trauma of the Limbs at the Cnhu- HKM in Cotonou

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ABSTRACT

A rare feature in civil registries, vascular limb trauma is a serious injury that requires rapid and effective interaction between diagnosis and management. We report on the epidemiological, clinical and management aspects of these injuries in a context of working with limited resources. This was a retrospective, monocentric, descriptive and analytical study of 45 patients victims of vascular trauma of the limbs, between January 1, 2017 and June 30, 2022 at the CUTO-CR of the CNHU-HKM of Cotonou. Men were the majority in our series with a sex ratio of 6.5. The average age of the population was 33.71 years. Road traffic accidents were the most common occurrence with a 33.3% frequency. Vascular injuries from broken glass were the most common (40%). Upper limb vascular injuries were the most represented (65.46%) principally arterial lesions (67.27%). As major complications, five secondary amputations had to be performed for limb ischemia and we recorded one death. Vascular trauma of the limbs is a relatively rare entity in civil practice in Cotonou. Despite the time taken for the management far beyond the standards and limited resources, results were generally satisfactory.

Introduction

Vascular trauma is a serious injury that generally occur during armed conflicts and/or in civilian practice [1, 2, 3]. They represent a particular entity that is rare in civilian records but clearly on the rise nowadays due to an increase in assaults [1, 4]. Traumatic vascular injuries affect 80% of limbs [5, 6]. They affect both the functional prognosis of the limb downstream of the injury and the victim's vital prognosis (2,8-11). They therefore constitute medico- surgical emergencies requiring rapid and effective interaction between diagnosis and management [7, 8, 9].

In sub-Saharan Africa in general and in Benin in particular, very few studies have been devoted to this type of injury. This study aims to describe the epidemiological, clinical, therapeutic and prognostic aspects of vascular trauma of the limbs at the Centre National Hospitalier et Universitaire Hubert Koutoukou MAGA (CNHU-HKM) in Cotonou.

Methodology

We conducted an observational study, retrospective in the first phase and then prospective in the second, for over five years, from 1 January 2017 to 31 December 2022. Our cohort consisted of patients aged at least 15 years with one or more traumatic vascular lesions of the limb, who had a complete medical record. Patients presenting with a leg crush injury with a MESS score of 7 or more, as well as those who died before admission, who were not treated or were discharged against medical advice, were excluded from this study.

Non-probabilistic sampling was used, with exhaustive data collection from all patients admitted during the study period who met the inclusion criteria. Limb salvage was the primary outcome measure of this research. Epidemiological, clinical, paraclinical, therapeutic, evolutionary and prognostic data were collected from medical records and during patient reviews and analysed using Epi info software. Descriptive statistics were presented in their standard form, frequencies and percentages were determined for qualitative variables, and means and standard deviations were determined for quantitative variables.

Results

Epidemiological Aspects

During the study period, 66 patients were admitted for vascular limb trauma, but 45 met our inclusion criteria and therefore formed our cohort. The mean age in our study was 33.71 ± 12.58 years, ranging from 16 to 81 years. Vascular trauma of the limbs primarily affected young adults aged 15–44 years (Table I). In our series, 86.7% of patients were male, giving a sex ratio of 6.5. The largest socio-professional group in our cohort were craftsmen (60.02%), followed by civil servants (15.55%). Glaziers were the most numerous of the 24 craftsmen in our series (n = 7) (Figure 1).The aetiological circumstances found were road traffic accidents (33.33%), assaults and brawls (31.1%), accidents at work (24.4%) and domestic accidents (11.1%). The most common causes of injury were broken glass (40%), a motor vehicle (33.33%) and a bladed weapon (17.77%).

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Clinical and Lesional Aspects

Vascular lesions were located on the right in 23 cases and we recorded 02 cases affected bilaterally; the forearm was the limb segment most affected (30.91%) in our cohort and some patients had several vascular lesions on the same limb segment or on different limb segments (Table II). External bleeding was the mode of expression in 43 patients, the other two having closed lesions. Consequently, 12 patients (26.66%) presented with an unstable haemodynamic state at admission. Other clinical manifestations included the absence of a downstream pulse in 73.8% of cases, pale extremities in 45.0% of cases, and a capillary refill time of more than 3 seconds in 35.7% of cases. Limb ischaemia and tissue necrosis were present at admission in 6.6% of cases. With regard to paraclinical tests, no vascular imaging studies were carried out, but 26 patients were able to have standard X-rays of their limbs. Of the 55 vascular lesions identified, arterial injuries accounted for 67.27%, followed by arteriovenous wounds (29.09%) and venous wounds (3.63%). The ulnar artery (n = 13), the radial artery (n = 12) and the brachial artery (n = 4) were the most affected vessels. The lesions were mainly complete section wounds (81.81%) and lateral wounds (10.90%).

Therapeutic and Evolutionary Aspects

Twenty-nine (29) patients in our cohort received initial treatment at the scene of the trauma by applying a makeshift tourniquet; the average duration of application was 70 minutes, with extremes ranging from 60 to 90 minutes.

In 37 cases, treatment of the injuries was provided by an orthopedic surgeon, and in eight cases were managed by both by the vascular and orthopedic surgical team. The time taken for treatment was specified for 37 patients, most of whom had been treated over six hours after the trauma (Table III). The majority of cases involved vascular ligation, followed by simple vascular suture and anastomosis. There were also a few cases of bypass surgery (see Table IV). 33 patients underwent additional procedures, primarily plaster cast support (25 cases) or osteo synthesis using an external fixator (eight cases), for bone lesions related to the vascular wound.

Evolutionary data were collected for 36 patients, achieving a limb salvage rate of 86.1%. Complications included 5 cases of secondary amputation due to ischaemia and 1 case of death following postoperative sepsis.

Discussion

Traumatic vascular lesions of the limbs accounted for 1.54% of all musculoskeletal trauma cases at the Traumatology-Orthopedic and Plastic surgical unit during our study period. Therefore, these injuries are relatively uncommon in civil practice, as reported in the literature review [10, 11].

GENDER AND AGE

In our cohort, males predominated (86.7%) giving a sex ratio of 6.5. Our results are similar to those of Adama P. Dieng in 2018 in Dakar and L. Djoussouf in 2022 in Antananarivo, who found a male predominance, with respectively 88.8% with a sex ratio of 7.92 and 85.96% with a sex ratio of 6.12 [5,9]. This finding aligns with the results of previous studies in the literature review, in which the majority of patients with vascular trauma of the limbs were predominantly males. This male predominance is undoubtedly linked to a greater exposure of men to violent trauma and the practice of high-risk professions. The average age in our series was 33.71 years. The patients were therefore young, active adults. The same observation is made by several authors, notably Adama P. Dieng in Dakar, Nkomo B. in Yaoundé and Djoussouf L. in Antananarivo [5, 12, 9] who found the average age to be 27.8 years, 34 years and 34.12 years respectively. Generally speaking, traumatic vascular wounds of the limbs are the prerogative of young male subjects.

In civil practice, the aetiological circumstances of traumatic vascular injuries of the limb are assessed differently by the authors. For us, these were, in decreasing order, road traffic accidents (33.3%), work-related accidents (24.4%), brawls (20.0%), domestic accidents (11.1%) and assaults (11.1%). Similar results were found in the series by Alessio I. in Milan, Italy, Leclerc B. in France and Imane K. in Morocco [7, 13, 14]. The frequency of road traffic accidents in these authors' series was 48.1%, 52.8% and 60% respectively. On the other hand, for A. Krüger in South Africa [15] and Menzoian JO in the United States [16], assaults by firearm were the most frequently found circumstances in 99% and 74.44% of cases respectively. In the series by Adama P. Dieng in Senegal (38.3%), stabbings during fights were the most incriminated [12]. Although in our context work-related accidents were not the main circumstances of occurrence, broken glass was the most common causative agent (40%). This is related to the profession identified as being at risk of traumatic vascular lesions of the limbs in our series, that is to say glaziers (25.92%) who, without protection or safety measures, move around with their work equipment and products on the roads without any respect for the Highway Code.

SITE OF VASCULAR TRAUMA

Traumatic vascular lesions were more frequent in the thoracic limbs in our series. Our results are corroborated by data from Nkomo B. in Yaoundé (73.07%) and Adama P. Dieng in Dakar (81.3%) [5,12]. For D'Alessio I. in Italy and Menzoian J.O. in the United States, on the other hand, the majority of lesions were located in the pelvic limbs [7,15]. The main circumstances in which traumatic vascular injuries occur in our series, in particular road traffic accidents, suggest that the pelvic limbs are mainly affected. However, the profession of the victims, in particular glaziers and machinists, could explain the predominant involvement of the thoracic limb in our series. In fact, the transport of working materials by these workers was usually carried out in unsuitable conditions, particularly on motorbikes, which could explain the occurrence of vascular injuries of the upper limbs during road accidents.

NATURE OF VASCULAR LESIONS

Circumferential vascular wounds were the most common in our series (81.81%). Similar results were found in the series of Menzoian J.O. in the United States and Adama P. Dieng in Dakar [5,15]. On the other hand, in the series of L. Djoussouf, lateral vascular wounds were the most found [9]. The main wounding agents in our series, in particular broken glass and bladed weapons such as sharp objects, could explain this predominance of complete vascular sections found in our series. Most authors consider that a thorough paraclinical investigation, ranging from standard radiography to arterio graphy or angio scanner, is essential in the presence of a vascular lesion [5,4,6,17]. Unfortunately, in our series, among the imaging explorations, only standard radiography was performed and only in 26 patients (57.77%). While the urgent nature of the surgical exploration may partly explain this, the financial limitations for patients who must fully cover the expenses related to their care and the unavailability of certain emergency examinations such as Doppler ultrasound, arterio graphy and angiography largely explain this observation.

THERAPEUTIC ASPECTS AND EVOLUTION

The low participation of the vascular surgeon in the care of patients in our series could be explained by the insufficient

human resources in this specialty. Indeed, during our study period, the CNHU-HKM had only one vascular surgeon who could not be available every day for on-call duty. In addition, simple vascular sutures and vascular ligations are procedures that do not require the presence of a vascular surgeon. It should be noted that in the past, the various procedures on the vessels of the limbs were carried out by orthopaedics surgeons.

In our cohort, the majority of patients resorted to vascular ligation (52.72%). This could be explained by the relatively long admission time of patients in our series, which contraindicated revascularization, and the possibility of significant vascular supply, which was considered a reassuring factor.

The limb salvage rate was 86.1% in our cohort, slightly below those of Alessio [7] and Derbel [17] who found 90.4% and 96.8% limb salvage rates respectively. The 05 cases of amputation due to secondary ischemia are probably due to the revascularization delay which on average was greater than 6 hours. Of the 31 cases of limb rescue, 16 patients had functional recovery with sequelae related to the presence of associated nerve and/or osteoarticular lesions.

Conclusion

Traumatic vascular injuries of the limbs are serious and uncommon injuries in civilian practice in Cotonou. They occur more often in young male adults and are predominantly located on the upper limbs. Physical examination is fundamental, with imaging assessment being the weakest link in the diagnostic process in our context. Vascular ligation and simple vascular suture were the procedures most frequently performed. The overall outcome was satisfactory despite the long delays in treatment, most of which exceeded 6 hours.

Tables and Figures

Table I: Distribution of patients by age group

	Number	%
[16-25]	14	31.1
[25-35]	10	22.2
[35-45]	**14**	**31.1**
[45-55]	5	11.1
≥55	2	4.4
Total	45	100.0

Table II: Distribution of vascular lesions observed according to the traumatized limb segment

		Number	%
Limb thoracic	Arm	4	7.27
	Elbow	7	12.73
	Forearm	**17**	**30.91**
	Wrist	6	10.91
	Hand	2	3.64
Limb pelvic	Groin crease	1	1.82
	Thigh	2	3.63
	Knee	4	7.27
	Leg	9	16.36
	Ankle	2	3.64
	Foot	1	1.82
Total		55	100.0

Table III: Distribution of patients according to the time between the occurrence of the trauma and admission to the operating room

	Number	%
[1-6]	**4**	**10.8**
[6-24]	13	35.1
[24-72]	13	35.1
>72	7	18.9
Total	37	100.0

Table IV: Distribution of lesions according to the procedures performed

	Number	%
Simple vascular suture	14	25.46
End-to-end anastomosis	06	10.91
Autologous venous interposition	03	05.45
Bypass	03	05.45
Ligature	**29**	**52.73**
Total	55	100

ICONOGRAPHY

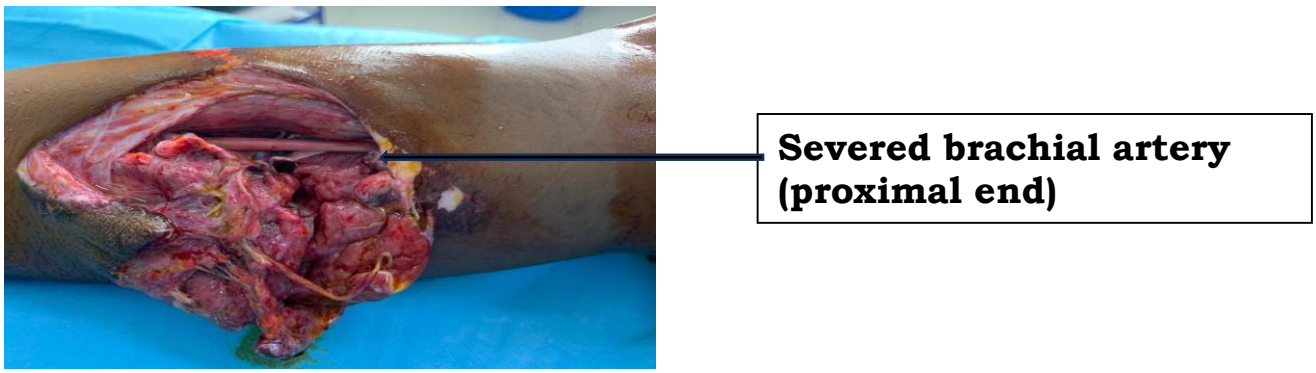

Image 1: Photographs of a complete section of the brachial artery

Image 2: Photographs of a simple vascular suture of a circumferential wound of the brachial artery

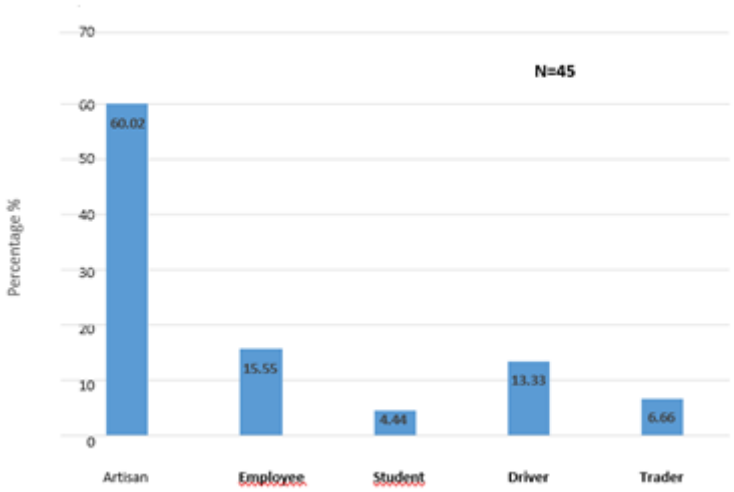

Figure 1: Distribution of patients by profession

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