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Thoracic Trauma: Epidemiological, Diagnostic, Therapeutic, and Prognostic Aspects at the University Clinic of Visceral Surgery of CNHU-HKM in Cotonou from 2017 to 2023

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Abstract | **Original Research Article**

Introduction*:** Trauma, due to its high frequency, constitutes a major public health concern. Thoracic injuries, in particular, hold significant importance because of their potential severity. The aim of this study was to assess the epidemiological, diagnostic, therapeutic, and prognostic aspects of thoracic trauma at the university clinic of visceral surgery of the National University Hospital Center Hubert Koutoukou Maga (CNHU-HKM) in Cotonou, from 2017 to 2023.Materials and Methods:*** This was a retrospective, descriptive, and analytical study conducted over a 7-year period, involving 122 patients treated for thoracic trauma. **Results:** During the study period, thoracic trauma accounted for 3.14% of hospital admissions. The mean age of patients was 38.23 years, with a sex ratio of 9.16. Road traffic accidents were the leading cause (63.1%), followed by assaults and fights (18.85%). Blunt chest trauma were more common. Chest X-ray was the most performed imaging, revealing hemothorax in 47.90% of cases and rib fractures in 39.50% as the most frequent injuries. Associated injuries included abdominal trauma (62.07%), limb injuries (27.59%), and cranioencephalic trauma (24.14%). The most common therapeutic approach was medical management combined with chest drainage (81.15%), which was usually sufficient to achieve a favorable outcome. The hospital mortality rate was 0.82%. ***Conclusion:*** Thoracic trauma cases are increasing at the university clinic of visceral surgery of CNHU-HKM, however the clinical outcomes remain favorable in most cases.

Keywords: Trauma, thorax, drainage, thoracic surgery.

INTRODUCTION

Trauma represents a significant public health issue due to its high incidence. Moreover, it is the leading cause of mortality among individuals under 45 years worldwide [1]. Thoracic trauma hold an important place due to their severity and account for 10 to 15% of traumatic emergencies [2]. In North America, 20 to 25% of trauma-related deaths are attributed to thoracic trauma [3]. In Senegal, the incidence rate of thoracic trauma in 2017 was 6.7%, with a mortality rate of 20.3% [4]. These trauma are primarily caused by road traffic accidents. Other etiologies such as assaults, falls, and sports or occupational accidents have also been reported.

In Benin, studies have been conducted on this subject, including two within our institution, the most recent dating back over 10 years. These studies reported a progressive increase in incidence, while mortality exhibited a concomitant decline over the years, suggesting improvements in patient management and clinical outcomes. Given this context, we deemed it necessary to reassess the current situation by examining the epidemiological, diagnostic, therapeutic aspects, and clinical outcomes of thoracic trauma.

MATERIALS AND METHODS

This study was conducted at the university clinic of visceral surgery of the national university hospital center Hubert Koutoukou Maga (CNHU-HKM) in Cotonou. This center serves as a clinical training facility for medical students and those specializing in medical and surgical fields. We performed a retrospective, descriptive, and analytical study over a 7-year period, from January 1st, 2017, to December 31st, 2023. It involved 122 patients treated for thoracic trauma. Cases of trauma or polytrauma not involving the thorax were excluded from the study. Additionally, patients with incomplete or unusable medical records

were excluded. The parameters analyzed included sociodemographic data, clinical and paraclinical data, diagnostic and therapeutic details, as well as patient outcomes.

RESULTS

During the study period, 122 cases of thoracic trauma were recorded, representing a hospital frequency of 3.14%. The age group between 20 and 30 years was the most represented, with a mean age of 38.23 ± 15.07 years. The age range extended from15 to 80 years. There was a marked male predominance (110 male patients), with a sex ratio of 9.16. Nearly all socio-professional categories were represented, with a majority of artisans and laborers accounting for 24.59%. Road traffic accidents were the main etiology, followed by assaults and fights in 18.04% of cases.

Table 1: Etiological distribution of chest trauma among patients

Etiology	Number of Cases (n=122)	Percentage (%)
Road Traffic Accident	77	63.11
Assault or Fight	23	18.85
Occupational accident	12	9.84
Domestic accident	08	6.55
Sports accident	01	0.82
Hunting Accident	01	0.82

Patient transportation was predominantly non-medicalized (95.08%), utilizing various means including non-medicalized ambulances for 61 patients (50%), firefighters vehicles for 45 patients (36.88%), and motorcycle for 10 patients (8.1%). Prehospital care was often lacking except for some intravenous line placements. Less than half of the patients (40.98%) were admitted within 6 hours of injury. Upon admission, the observed clinical features included thoracic pain in almost all patients (95.08%), dyspnea and bleeding each observed in 20.49% of cases.

Table 2: Distribution of functional manifestations in patients with chest trauma

Clinical Symptoms	Number of Cases (n=122)	Percentage (%)
Thoracic Pain	116	95.08
Dyspnea	25	20.49
Bleeding	25	20.49
Hemoptysis	2	1.64
Coughing	2	1.64
Abdominal pain	1	0.82
Initial loss of consciousness	1	0.82

76.23% of our patients presented with blunt thoracic trauma, whereas twenty-nine patients had open chest trauma. Chest X-ray was the most performed imaging. It was conducted in 119 patients.

Table 3: Distribution of patients according to imaging

Imaging	Number of Cases (n=122)	Percentage (%)
Chest X-ray	119	97.54
Thoracic CT Scan	15	12.29
Thoracic Ultrasound	05	4.10

Regarding injury assessment, rib fracture was the most frequent chest wall lesion, observed in 39.50% of cases. Hemothorax was the most common type of pleural injury, occurring in 47.90% of cases, followed by pneumothorax in 35.29%. Both conditions co-occured in 24.36% of cases. Thoracic trauma was associated with other injuries in 29 patients, most frequently with abdominal trauma (62.07%), limb injuries (27.59%) and cranioencephalic trauma (24.14%). In cases of thoracic trauma with polytraumatic patients, which accounted for 18.9% of cases, cranioencephalic trauma was the most common life-threatening condition.

All patients received medical treatment, and chest drainage was required in 99 of them (81.15%). Thoracotomy was performed in 8 patients (6.6%), with intraoperative repairs for pulmonary wounds in 37.5% and diaphragmatic injuries in 25% of cases. Clinical outcomes were favorable in 115 patients (94.2%). Seven patients experienced complications, with infectious pneumonia being the most common, occurring in 28.6% of cases. Other complications included pyothorax, chylothorax, thoracic wound infection, respiratory distress, and shock. We reported one death, resulting in a hospital mortality rate of 0.82%.

DISCUSSION

Our hospital frequency of 3.14% is higher than those reported by Ouendo in 1987 [5] (0.53%) and Tévoèdjré in 2014 [6] (1.04%) at the same hospital. This can be partly explained by the overall population growth in the country, particularly in the Atlantique and Littoral departments, and on the other hand by the expansion of the vehicle fleet, which has led to an increase in road traffic accidents with a subsequent increase othoracic trauma. The mean age of 38.23 years is consistent with the literature, where it ranges between 33 and 43 years [7, 8]. Young adults represent a significant proportion of our population; they constitute the major socio-professional group and the most active economically and in sports, which increases their exposure to various traumas and accidents. Furthermore, it is important to emphasize that this subpopulation often exhibits reckless behaviors that may increase their vulnerability to injuries. Male predominance has been frequently reported in literature. Ouendo [5] documented a sex ratio of 7, while Potlabathini *et al.,*[7] in India in 2016 reported a sex ratio of 18. Men often exhibit a propensity for risky behaviors, such as reckless driving, contact sports, or involvement in hazardous activities, which heightens their susceptibility to accidents. Additionally, many men are employed in physically demanding or high-risk occupations, such as construction, manufacture, or transportation, further increasing their exposure to accidents leading to thoracic trauma. For example, in our societal context, taxi drivers (automobile and motorcycle) are exclusively male, thereby increasing men's exposure to road traffic accident, the primary cause of thoracic trauma in our study. This high frequency of thoracic trauma related to road traffic accidents has been reported by several authors. Horst *et al.,*[9] in Germany in 2017 found that 64.7% of cases were due to road traffic accidents, while Ahmad *et al.,*[10] in Saudi Arabia in 2019 reported 86.9%. This high prevalence of road traffic accidents can be explained by several factors: the expansion of the vehicle fleet leading to intensified traffic flow, non-compliance with traffic regulations, and lack of regular vehicle inspections. Moreover, insufficient sensitization campaigns combined with uncivil behavior reflects a lack of awareness of safety rules. The consumption of alcohol and psychoactive substances impairs cognitive and motor functions. In industrialized countries with well-developed road infrastructure, other causes such as falls and assaults have been reported. The most represented socio-professional group in our study was artisans and laborers. This may be explained by the relatively low educational level within this population group, leading to poor knowledge of basic road safety rules. Furthermore, this same group is often involved in activities requiring frequent handling of tools, which, due to their hazardous nature, can cause thoracic trauma, particularly during occupational accidents or fights, thereby increasing the risk of chest injuries in this subpopulation. The admission delay after trauma was less than 6 hours in less than half of the patients, indicating that most patients unfortunately still do not understand the importance of seeking hospital care as early as possible. Regarding patient transportation, 95.08% were non-medicalized, a rate higher than that reported by Niang *et al.,*[4], who found 66% non-medicalized transport. This difference can be attributed to the absence of prehospital medical services in many african countries. In Benin, except for the Emergency Medical Assistance Service (SAMU), ambulances generally do not provide medicalized transportation. Thoracic pain was the most frequently reported symptom, followed by bleeding and dyspnea. These findings are consistent with those reported by Hama *et al.,*[8] and Richard *et al.,*[11]. It can be explained by the pathophysiological mechanism whereby thoracic trauma induces intense pain, leading to reflex hypoventilation through inhibition of respiratory movements. This hypoventilation results in hypoxia, initially responsible for the onset of dyspnea. Subsequently, internal hemorrhage, frequently observed in these patients, produces intrathoracic fluid collections (such as hemothorax), which may compress the pulmonary parenchyma and impair gas exchange. Furthermore, in cases of massive bleeding, hypovolemic shock may occur, worsening dyspnea by reducing cardiac output and compromising tissue perfusion.

Chest X-ray was the most performed imaging, serving as the first-line examination in our setting due to its speed, simplicity, availability, and ability to detect major abnormalities. The high rate of its use is therefore consistent with standard clinical practices. Thoracic CT scan was performed in only 12.30% of patients. The limited use of CT in our context may be due to the unavailability of the equipment in the emergency waard of CNHU-HKM and the high cost of the procedure.

Blunt thoracic trauma was the most common type, accounting for 76.23% of cases, compared to 54.5% reported in Gabon [11] and 69.2% in Niger [8]. However, some authors have reported a predominance of open chest trauma [12,13]. This predominance of chest contusion is mainly due to thoracic trauma by road traffic accidents in our context.

Lesions assessment revealed hemothorax and rib fractures as the most frequent injuries. Indeed, thoracic trauma is often associated with rib fractures and hemothorax due to the high-impact force involved. Rib fractures commonly occur in high-energy trauma, such as road traffic accidents, whereas hemothorax results from vascular rupture causing blood accumulation in the pleural cavity. These injuries are therefore common and explain their predominance in our study as well as in those by Tévoèdjré [6] and Hama *et al.,*[8]. Abdominal trauma was most frequently associated, followed by limb injuries. In contrast, other studies have reported limb trauma as the predominant extrathoracic injury, followed by cranioencephalic trauma [8,11]. Thoracic trauma frequently occurs in the context of high-impact

accidents, such as road traffic collisions or falls from height, often resulting in multiple injuries. Differences in findings between studies may be explained by geographic, social, and economic contexts. In some regions, limb injuries may be more common due to a higher incidence of road accidents involving motorcyclists, domestic accidents, or interpersonal violence, whereas in others, road traffic accidents or industrial trauma may lead to a higher frequency of cranioencephalic and abdominal injuries. In cases of polytrauma, the most frequent life-threatening injury affecting our patients was cranioencephalic trauma.

All patients received care. Medical treatment was provide using multimodal analgesia consisting of paracetamol, nefopam, and ketoprofen. Given the severity of respiratory conditions, hemodynamic, respiratory, and transfusional support was often necessary. Chest drainage was performed in 81.15% of cases in this study. This rate is comparable to those reported by several authors [4, 8, 12]. The high frequency of chest drainage can be explained by the prevalence of fluid and gas collection in our study. Eight patients (6.55%) underwent thoracotomy; this rate is lower than those reported by Richard *et al.,*[12] with 14.5%, Hama *et al.,*[8] with 49.5%, and Tévoèdjré [6] with 31.2%. The frequency of thoracotomy varies depending on clinical and diagnostic criteria adopted in each study. The decision to perform thoracotomy often depends on the severity of injuries, the patient's hemodynamic instability, and response to other treatments such as chest drainage.

Overall, the clinical outcome was favorable in 94.21% of cases. The complications observed in our series primarily included infectious pneumonia, followed by pyothorax, shock, chylothorax, respiratory distress, and superinfection of a thoracic wound. Infectious pneumonia is the most commonly reported complication in literature [4, 8, 14]. This favorable outcome observed in the majority of cases could be attributed to rapid and appropriate medical management, as well as the quality of postoperative care. Effective treatment of thoracic trauma, early and appropriate use of antibiotics, and rigorous monitoring may have played a major role in reducing severe complications.

We report a single case of death, resulting in a hospital mortality rate of 0.82%. This rate is lower than the 7.87% and 3.1% reported by Ouendo in 1987 [5] and Tévoèdjré in 2014 [6], respectively, in the same ward. In addition, numerous studies in the literature report much higher mortality rates. For example, Richard *et al.,*[12] in Gabon found a rate of 5.5%, Hama *et al.,*[8] in Niger observed 12.5%, and Niang *et al.,*[4] in Senegal reported 20.3%. This decrease in thoracic trauma mortality over time in the same ward may be explained by improvements in the technical platform of the university clinic of emergency assistance, the university clinic of visceral surgery, and the presence of thoracic and cardiovascular surgeons.

Conclusion

Thoracic trauma are frequent at the university clinic of visceral surgery of CNHU-HKM, predominantly affecting young adult males. Road traffic accidents and assaults are the main etiologies observed in this study. Blunt thoracic trauma represents the majority of cases. Prehospital care is virtually nonexistent in our context despite the presence of several mobile emergency and resuscitation units. Although mortality related to thoracic trauma was low in this study, it is essential to implement measures to improve road safety, prehospital emergency medical services, and access to healthcare for the population.

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