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Humeral Shaft Fractures: Epidemiological, Clinical and Therapeutic Aspects at Kati University Hospital

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Abstract **Original Research Article**

The aim of this study was to describe the epidemiological, clinical and therapeutic aspects of humeral shaft fractures in the Orthopedics and Traumatology Department of Kati University Hospital. It was a descriptive study with retrospective data collection from January 1, 2023, to December 31, 2023, including all patients presenting with a traumatic humeral shaft fracture treated and followed for at least 12 months. These fractures represented 2.33% of traumatic injuries. The mean age of patients was 40.1±16 years, with a male predominance (ratio : 2.3). Road traffic accidents were the main etiology (55%). These were exclusively closed fractures. These fractures were simple (AO/OTA Type A) in 45.2%. Midshaft fractures were the most frequent (42.9%). Radial nerve injuries were found in 11.9% of patients, dominated by neurapraxia (9.5%). These fractures occurred in the context of polytrauma in 23.7% of cases. Conservative treatment was predominant (59.5%), using a cast in 23.8% (n=10). Surgical treatment was used in 40.5%. The screwed plate was the most used implant (23.8%, n=10). The evolution was marked by joint stiffness (7.5%), delayed union (5%), and infection (5%). Bone union was achieved between 3 to 6 months in 39 cases (92.8%). Outcomes according to the Stewart and Hundley score [9] were good (35.7%), very good (33.3%), or poor (12.0%). Humeral shaft fractures are common in our department. They require rigorous, early, and individualized management, including appropriate follow-up and rehabilitation.

Keywords: Fractures, Humerus, Epidemiology, Therapeutic, Kati.

INTRODUCTION

Humeral shaft fractures are defined as breaks in the humerus in the region between the inferior border of the pectoralis major insertion superiorly and that of the brachialis muscle inferiorly [1, 2]. They are common traumatic injuries. They are the third most frequent type of shaft fracture of long bones and represent 1 to 5% of all fractures [1-4]. They can occur at any age and primarily affect young people after high-energy trauma and elderly osteoporotic individuals after low-energy trauma [1,5]. The diagnosis is most often straightforward, based on clinical evidence and mainly confirmed by radiography [1-5]. The management of humeral shaft fractures remains controversial [5-8]. In resource-limited countries like ours, conservative treatment is the preferred approach for the majority of fractures. Surgical treatment is justified in cases of orthopedic treatment failure, unacceptable deformity, neurovascular injury, ipsilateral elbow fracture, polytrauma, or pathological fracture [1-5]. Humeral shaft fractures most often have a favorable outcome. However, they can be subject to complications that may compromise the functional prognosis of the affected limb.

Several studies have been conducted on this pathology. The present study aims to describe the epidemiological and clinical aspects, as well as the therapeutic modalities, of humeral shaft fractures in the Orthopedics-Traumatology Department of the BSS University Hospital (BSS) in Kati.

MATERIAL AND METHODS

This was a single-center descriptive study with retrospective data collection. It covered a period of 12 months, from January 1, 2023, to December 31, 2023. All patients with a traumatic humeral shaft fracture treated in the Orthopedics and Traumatology Department

of Kati University Hospital and followed for at least 12 months were included in this study. Not included were patients treated for pathological fractures or other humeral shaft pathologies, as well as patients lost to follow-up. Fractures were classified according to the Müller Classification of long bone fractures (AO/OTA). Treatment was orthopedic or surgical, supplemented by rehabilitation (figure 1 and 2). Bone union was assessed by the absence of pain, no mobility at the fracture site, with the presence of a unifying bone callus between the bone fragments. Nonunion was diagnosed when bone healing failed more than six months post-trauma and required surgical revision. Postoperative infection was considered in the presence of cardinal signs of inflammation, including purulent drainage from the wound and a positive cytobacteriological examination. The modified Stewart-Hundley score [9], was used to assess anatomical and functional outcomes. Data on age, gender, etiology, fracture characteristics, therapeutic approaches, and outcomes were collected. These data were analyzed using SPSS v26 software.

Ethical considerations: This study was conducted in accordance with the Good Clinical Practice (GCP) protocol and the principles of the Declaration of Helsinki. The investigators observed complete anonymity of the information obtained during the study. This information was used solely for research purposes.

Figure 1: Fracture complexe AO/OTA type 12B1-2

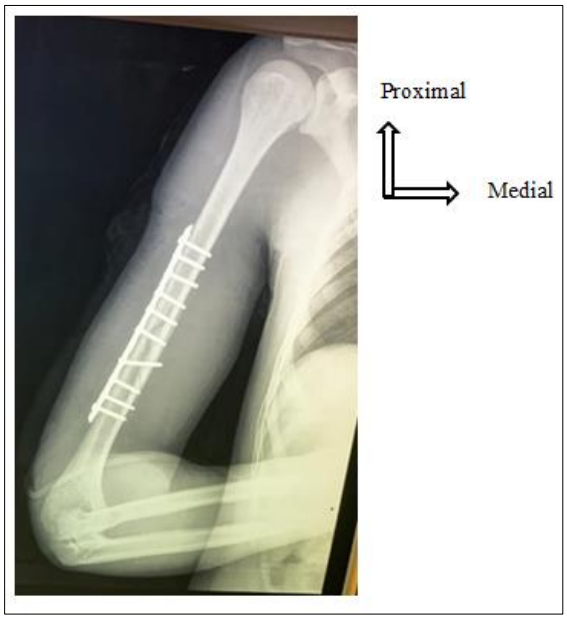

Figure 2: Screwing Plate Fixation

RESULTS

During the study period, 1717 consultations were conducted in our Department, among which 42 humeral shaft fractures were diagnosed in 40 patients, representing a frequency of 2.33%. There were 28 men (70%) and 12 women (30%), for a sex-ratio of 2.3. The mean age was 40.1±16 years (range 17–75 years). The age group of 20 to 39 years was predominant (50%). Road traffic accidents were the main etiology, accounting for 55% of cases (Table I). Direct trauma was the most common mechanism (80%). The right upper limb was the most often affected (54.7%, n=23). The fractures were bilateral in 2 cases (4.8%). Three-quarters of the patients were admitted in the month following the trauma (75%). Clinically, pain and functional impairment were almost always present (95% and 87.5%, respectively). General signs included anemia (12.5%, n=5), hypovolemic shock (7.5%, n=3), and altered consciousness (5.0%, n=2). Arm deformity was observed (85%), associated with shortening in 30% of cases. These were exclusively closed fractures. These fractures were simple in 45.2% and involved the middle third of the humerus (42.9%), the distal third (26.2%), or the proximal third (21.4%). Nerve injuries (radial nerve) were found in 11.9% of patients, mostly neurapraxia (9.5%). These fractures occurred in the context of polytrauma in 23.7% of cases. Associated injuries were dominated by head and facial trauma (9.5%) (Table II).

Table I: Characteristics of fractures

Characteristics		**Number**	**Percentage**
Affected limb			
Right		23	54,7
Left		17	40,5
Bilateral		02	04,8
Etiology			
Road traffic accident		22	55,0
Domestic accident		14	35,0
Brawl		04	10,0
Mechanism			
Direct		32	80,0
Indirect		06	15,0
No specified		02	05,0
Fracture location			
Proximal third		09	21,4
Midle third		18	42,9
Distal third		11	26,2
Bifocal		04	09,5
Müller classification (AO/OTA)			
A		19	45,2
B		15	35,7
C		08	19,1
Associated injury			
Head and facial trauma		04	09,5
Spinal and pelvic trauma		03	07,1
Chest and abdomen trauma		03	07,1
Ischemia		01	
Nerve injury	Neurapraxia	04	09,5
	Axonotmesis	01	02,4

Treatment was orthopedic in 59.5% or surgical in 40.5% of cases (Table II). The mean length of hospital stay was 8.7 ± 6.9 days, ranging from 2 to 24 days. Half of the patients were hospitalized for less than one week (50%). No complication were noted in 30 cases (75.0%). Complications included joint stiffness (7.5%), delayed union (5%, n=2), and infection (5%, n=2). Bone union was achieved between 3 and 6 months in 39 cases (92.8%) (Figure 3-5). Evaluation according to the Stewart and Hundley score [9], showed that 69.0% of patients had a good or very good outcome. The other patients presented fairly good and poor outcomes in 19,0% and 12% respectively.

Table II: Therapeutic Method of fractures.

Therapeutic Method		Number	Percentage
Conservative (orthopedic treatment)	Hanging cast	10	23,8
	Brachio-palmar cast	06	14,3
	Plaster splint	05	12,0
	Scarf elbow to body	04	09,5
Surgical	Screwing plate	10	23,8
	Intramedullary nailing	03	07,1
	Kirchner-wire fixation	03	07,1
	Amputation	01	02,4
Total		42	100

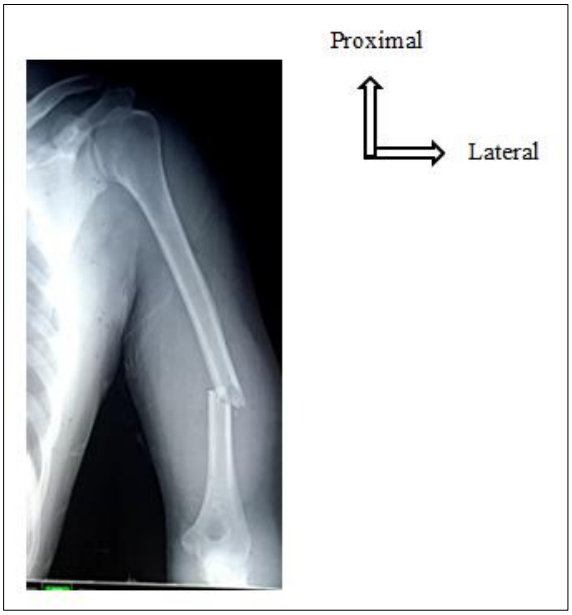

Figure 3: Fracture AO/OTA type A3

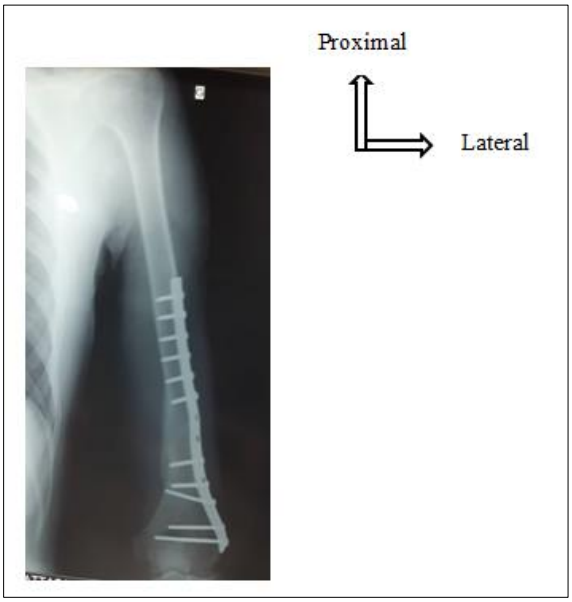

Figure 4: Bone union after Screwing Plate Fixation

DISCUSSION

Humeral shaft Fractures are common injuries [5]. In the literature, they represent 1 to 5% of all fractures of the musculoskeletal system [3-11]. This study found a frequency of 2.33%. Men were affected in 70% of cases, with a average age of 40.1 ± 16 years. Young subjects aged 20 to 39 years were the most affected. This finding has been reported by several

studies [8-14]. In our context, this segment of the population is the most active, as it constitutes the workforce. Furthermore, it represents a significant proportion of road users. Nevertheless, a female predominance of these fractures, due to greater longevity and/or significant osteoporotic fragility after menopause, has been reported [5-16]. Road traffic accidents represented the main etiology of this injuries (55%). This finding is shared by Rohimpitiavana H. *et al*., [10], Ouédraogo S. *et al*., [8], and Abiome R. *et al*., [12], who found 51.22%, 69.8%, and 83% of humeral fractures related to road traffic accidents, respectively. These results fall within the African context, where unsafe roads, disregard for traffic laws, and the widespread use of motorcycles without protective gear contribute to high-energy trauma. At the global level, particularly in developed countries, the circumstances are different. According to a literature review conducted by Court Brown and Caesar, simple falls were responsible for the majority of humeral fractures, particularly in the elderly [17]. This contrast clearly illustrates the role of socioeconomic and demographic factors in the observed injury profile. In our series, the direct mechanism accounted for 80% of cases. This predominance is consistent with the high-energy traumatic origin observed in our region.

The semiology of displaced humeral fractures is fairly unambiguous. In our series, 95% of patients presented with significant pain and 87.5% with total functional impairment of the affected limb. These almost constant signs constitute classic clinical warning signs of displaced humeral fractures [12-17]. They are associated with deformity in 85% of patients. European studies confirm that a deformity visible on inspection is present in more than 80% of displaced fractures [13, 14]. Midshaft fractures were the most frequent (42.9%). This predominance of midshaft fractures is well documented [7-12]. Simple fracture (AO/ATO Type A) were in the majority (45.2%). Ouedrago S. *et al*., [8], and CH. Kardali *et al*., [7], also found a predominance of simple fractures in their studies with respective proportions of 54.7% and 61.84%. Complex fractures (AO/OTA types B and C) generally occur during high-energy trauma. They accounted for 35.7% and 19.1%, respectively, in this study. These fractures occurred in the context of polytrauma in 23.7% of cases, reflecting the severity of the traumatic mechanism. Radial nerve paresis is the most common neurological injury in long bone fractures, with an incidence of 7% to 17% for long bone fractures [5]. In this study, 11.9% of patients had a radial nerve injury. These injuries were primary (traumatic) or secondary (consecutive) to the surgical approach. They were neurapraxias in 9.5% of cases. Complete recovery from such injuries is the norm in 88% of cases [5]. This recovery was observed in all patients within variable timeframes. Regarding vascular injuries, one patient developed limb ischemia secondary to traditional treatment. This practice of medicine without a scientific basis, common in our societies, is the cause of many complications and delays in consultation in our context.

The treatment of humeral shaft fractures is a controversial subject [5-8]. The decision between conservative or surgical treatment is based on several factors. Residual deformities resulting from conservative treatment are well tolerated and without clinical repercussions [5]. Therefore, conservative treatment is prefered [5-10]. In our series, it accounted for 62.5% of cases. This choice also aligns with local healthcare conditions in our context. On the other hand, a multicenter study conducted by Rafael Serrano *et al*., found a surgical conversion rate of 29%, with nonunion being the most frequent reason for intervention after failure of conservative treatment [18]. Surgical treatment allows for a more reliable anatomical reduction and earlier mobilization. It provides very favorable conditions for early functional recovery, particularly in active patients [17]. Our study indicates that 37.5% of patients underwent surgical treatment with a screwed plate as the predominant implant (23.8% n=10). In the literature, the screwed plate is more commonly used for the fixation of humeral shaft fractures [7-19]. It allows for maintaining an anatomical and stable reduction of the fracture. However, the plate presents the disadvantages of open reduction and internal fixation, in addition to the risk of radial nerve injury encountered with the lateral approach to the arm [8]. Intramedullary nailing and Kirchner-wires fixation were important in the therapeutic arsenal for humeral shaft fractures [6-15]. The Amputation performed in one patient in this study represents the only feasible alternative in the cases of ischemia (gangrene) consecutive to traditional treatment.

The outcome was favorable, with bone union achieved between 3 and 6 months in 39 cases (92.8%). This bone-union rate is identical to that of Ouedrago S. *et al.*, [8]. Abiome R. *et al*., [12], found bone union in 90% of surgically treated patients and 84.6% of orthopedically treated patients. Joint stiffness (elbow, shoulder) was the predominant complication (7.5%, n=3 cases). It was consecutive to prolonged immobilization imposed by orthopedic treatment. Early rehabilitation and rigorous monitoring may necessary to prevent this stiffness. Infection was observed in 2 cases (5%). It resolved favorably after targeted antibiotic therapy. According to a cohort study, the infection rate was higher (3.5%) in cases of surgical treatment [20]. These infections complicate healing and may require repeated interventions or prolonged antibiotic use. The union delay (5%) in our series remains limited. On the other hand, Abiome R *et al*., [12], reported a nonunion rate of 10% in operated patients. International studies indicate variable nonunion rates between 5% and 23.2% depending on the location, fracture stability, treatment method, and patient age [8-20].

Functional outcomes assessed using the modified Stewart and Hundley score [9], were

satisfactory (good or very good) in 69% of cases and poor in 12%. These results differ from those of Ouedrago S *et al*., [8], who reported 66.67% and 21.43% of very good and good results, respectively. Internationally, Adams *et al*., [21], observed a functional satisfaction rate of 80% at one year in patients treated with intramedullary nailing. In Europe, Ekholm *et al*., [14], reported over 85% good results after conservative treatment, provided that the reduction was correct and the rehabilitation well conducted. Several factors could explain this difference in results, including: the lower frequency of surgical intervention in our study, the occurrence of complications, the sometimes prolonged delay in treatment in some patients, and the traditional first-line treatment in our contry.

This study presents limitations. Its retrospective nature makes it susceptible to bias and insufficient data. The small sample size reduces the statistical power of the study. Delayed consultation and discontinuation of medical treatment due to beliefs and the practice of traditional medicine could affect patient selection and outcomes. This also highlights the need for multicenter and prospective studies in our contry.

CONCLUSION

It emerges from this study that humeral shaft fractures account for 2.3% of all limb fractures. They most often occur in young, active individuals following high-energy trauma (motor vehicle accidents). Diagnosis is mainly clinical, confirmed by standard radiography. Conservative treatment remains relevant in our context. The outcome is most often favorable. However, complications such as radial nerve injury, joint stiffness, delayed union, or infections can occur. This implies the need for rigorous, early and individualized care, including follow-up in appropriate rehabilitation.

Conflict of Interest: None

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