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Epidemiology of Tibia plateau fractures in a Tertiary Hospital in South-West Nigeria

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Abstract

Introduction: Tibia plateau fractures which represents 1-2% of all fractures are uncommon injuries of the proximal tibia often resulting from axial compressive forces either alone or combined with varus or valgus stress on the knee joint. These injuries are of varied severity and are often associated with soft tissue injuries.

The purpose of this study was to ascertain the injury types or class, mechanism of injury and injuries associated with tibia plateau fractures in patients presenting for care in our institution.

Methods: An 8-year (2013-2020) retrospective investigation was carried out on consecutive patients with tibia plateau fractures who were managed at the University College Hospital, Ibadan in South-West Nigeria.

Result: During the period of study, a total of 32 adults had tibia plateau fractures with 84.4% males and 15.6% females and the 20-40 year age group were the most affected. The commonest mechanism of injury was from motorcycle accident and the left tibia plateau was the most frequently affected (68.8%). Isolated injuries were recorded in 53% of the patients, whereas 46.1% had varied associated injuries. Schaztker type VI was the most common injury, while types II and III were the least common. Chi square test revealed no correlation between fracture types and age (p-value0.653), as well as the type of treatment offered (p-value 0.112)and 59.4% had non-operative care. In addition, 46.9% had knee arthrofibrosis, whilst 21.8% still had knee pain after 8 years and 31.3% were lost to follow-up.

Conclusion: Our study showed that men in the 20-40 year age range are the most affected with Schatzker VI being the commonest type of tibia plateau injuries. There was no correlation between fracture type and age, as well as the treatment modality offered.

Keywords: *Fracture, Tibia plateau, Schatzker type*

Abstrait

Introduction: Les fractures du plateau tibial, qui représentent 1 à 2 % de toutes les fractures, sont des lésions rares du tibia proximal résultant souvent de forces de compression axiale seules ou combinées à des contraintes en varus ou en valgus sur l'articulation du genou. Ces blessures sont de gravité variable et sont souvent associées à des lésions des tissus mous. Le but de cette étude était de déterminer les types ou classes de blessures, le mécanisme de la blessure et les blessures associées aux fractures du plateau du tibia chez les patients se présentant pour des soins dans notre établissement.

Méthodes: Une enquête rétrospective de 8 ans (2013-2020) a été menée sur des patients consécutifs présentant des fractures du plateau du tibia qui ont été pris en charge à l'University College Hospital d'Ibadan dans le sud-ouest du Nigeria.

Résultat: Au cours de la période d'étude, un total de 32 adultes ont eu des fractures du plateau du tibia avec 84.4 % d'hommes et 15.6 % de femmes et le groupe d'âge 20-40 ans était le plus touché. Le mécanisme lésionnel le plus courant était un accident de moto et le plateau tibial gauche était le plus fréquemment touché (68.8 %). Des lésions isolées étaient enregistrées chez 53% des patients alors que 46.1 % avaient des lésions associées variées. Le type Schaztker VI était la blessure la plus courante, tandis que les types II et III étaient les moins courants. Le test du chi carré n'a révélé aucune corrélation entre les types de fractures et l'âge (p-value 0.653), ainsi que le type de traitement proposé (p-value 0.112) et 59.4 % avaient des soins non opératoires. De plus, 46.9 % avaient une arthrofibrose du genou, tandis que 21.8 % avaient encore des douleurs au genou après 8 ans et 31.3 % étaient perdus de vue.

Conclusion: Notre étude a montré que les hommes dans la tranche d'âge 20-40 ans sont les plus touchés, Schatzker VI étant le type le plus courant de lésions du plateau tibial. Il n'y avait pas de corrélation entre le type de fracture et l'âge, ainsi que la modalité de traitement proposée.

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Introduction

Tibia plateau fractures are uncommon proximal tibia injuries that range in severity from low-energy slightly displaced stable injuries to high-energy complicated fractures with considerable articular and metaphyseal comminution and soft tissue damage [1]. These fractures represent 1-2% of all fractures and approximately 8% of fractures in the elderly [2]. The combined incidence of a patient having a tibia plateau fracture with associated polytrauma on admission has been estimated at 16–40% [3–5]. The mechanism of these injuries include axial compressive pressures alone or in combination with varus or valgus load on the knee joint [6]. A thorough clinical history and imaging investigation are crucial in making a diagnosis. Anteroposterior, internal oblique, and external oblique views are useful plain radiographic examination [7]. However, the position and magnitude of the depressed fragments commonly found in these injuries are best determined using computed tomographic scan. The observation of the tibia epiphysis from numerous perspectives is occasionally possible using three-dimensional reconstruction of pictures, which provides for a better understanding and assist in treatment planning [8]. The two most common classification of tibia plateau fractures are those of Schatzker and the AO Group[9,10]. Schatzker classified tibia plateau fractures into six categories, which distinguishes between pure shearing, pure depression, and mixtures of these two mechanisms [11]. It also establishes a prognostic distinction between isolated lateral plateau and medial plateau fractures. Pure tibia plateau fractures, Schatzker types I, II, and III are frequently linked with low-energy injuries whilst types IV, V, and VI which are more severe and associated with considerable soft tissue damage result from high energy impacts [12]. Stable fixation and early painless joint movement are associated with a better prognosis, and any remaining articular incongruity or instability could lead to posttraumatic osteoarthritis, posing a threat to the knee's functional integrity [5]. The objective of this research was to provide a retrospective epidemiological study of tibia plateau fractures in a tertiary health institution.

Methods

The study was a retrospective hospital-based study to determine age, side of injury, gender, mechanism of injury, type of injury and injuries associated with tibia plateau fractures among trauma patients who presented at the Emergency Department of the hospital and who were subsequently managed in the Orthopaedic and Trauma department. The University College Hospital, Ibadan the premier teaching hospital in South West Nigeria is a 1000 bed referral center for the country.

All patients with clinical and radiologically diagnosed tibia plateau fracture who presented to the hospital between January 2013 and December 2020 were included in the study. The instrument for data collection was a predesigned proforma completed from the electronically stored data at the Orthopaedic and Trauma surgery Department. Following management subsequent follow-up was carried out at the surgical outpatient department of the hospital. The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 23.

The study was carried out in compliance with the standard requirements of the Ethics Committee of the University of Ibadan/University College Hospital Research Ethics Committee.

Results

A total of 32 patients with Tibia plateau fractures presented within this study period.

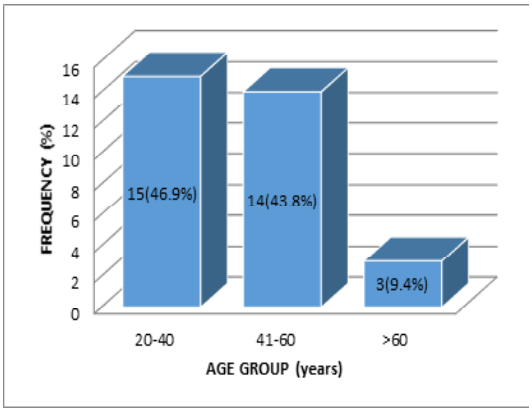

Figure 1: Distribution of age of the patients with Tibia Plateau Fractures

Figure 1 above showed that almost half (46.9%) of the patients were in the 20-40 year age group, whilst 43.8%were in the 41-60 age group and 9.4%were above 60years

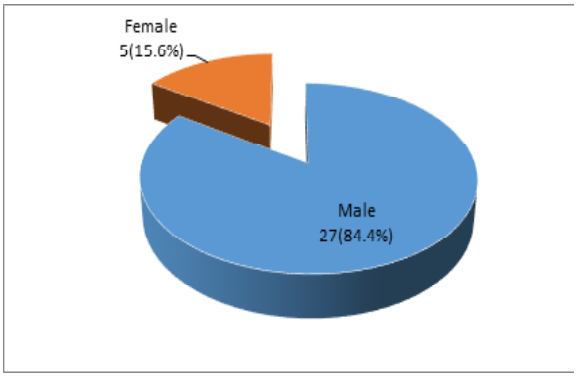

Figure 2: Sex distribution of the patients

Figure 2: above showed that over three-quarter 84.4%of the patients were males, while 5.6% were females.

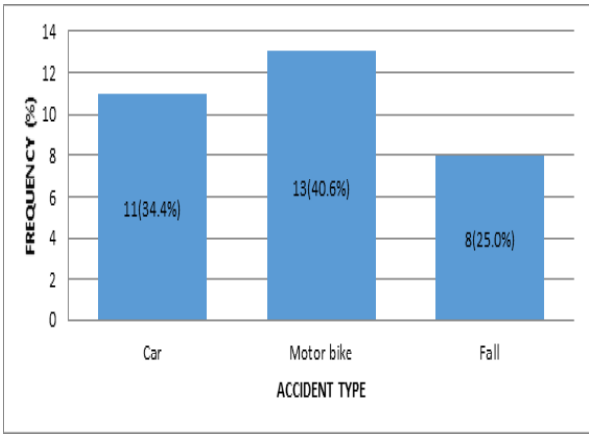

Figure 3: Distribution of accident type

Figure 3 above showed that majority (40.6%) of the accident types were due to motor bike crashes, followed by car (34.4%) crashes and pedestrian injuries account for 25.0% respectively.

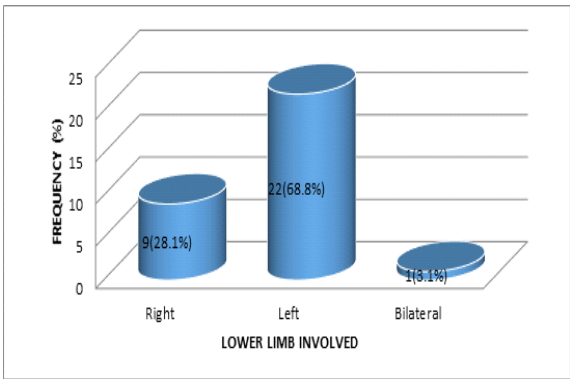

Figure 4: Distribution of lower limb involved in the accidents

Figure 4 above showed that over half (68.8%) of the fractures occurred in the left tibiae whilst right tibia plateau fractures accounted for 28.1% and in 3.1% the injuries were bilateral.

Table 1: Distribution of associated injury

Associated injury (n=32)	Frequency	Percent (%)
Abrasion	1	3.1
Bilateral femoral fracture	1	3.1
Cervical spine, head, blunt chest	1	3.1
Common peroneal nerve injury	1	3.1
Head injury, Femoral fracture	1	3.1
Lateral collateral rupture	1	3.1
Open ankle and femoral shaft fracture	1	3.1
Open Tibiofibular fracture	1	3.1
Pelvic fracture, Open Tibiofibular fracture, Calcaneal fracture	1	3.1
Scalp laceration	1	3.1
Segmental fibular fracture	1	3.1
Soft tissue avulsion	1	3.1
Closed Tibiofibular fracture	3	9.3
Nil	17	53.1
Total	**32**	**100.0**

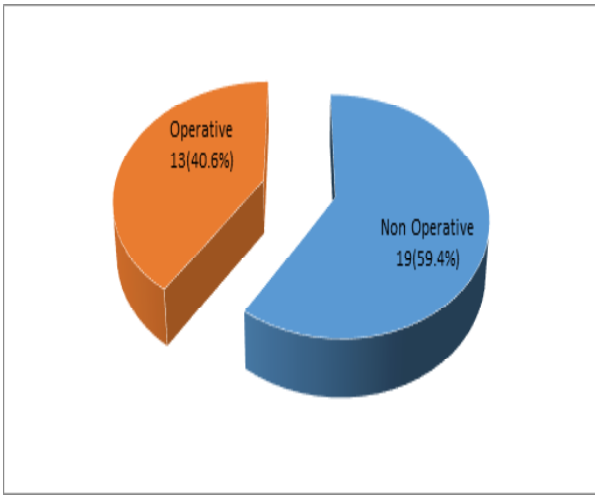

Figure 5: Distribution of treatment type

Figure 5 above showed that majority (59.4%) of the injuries were managed non-operatively as against 40.6% that were managed operatively.

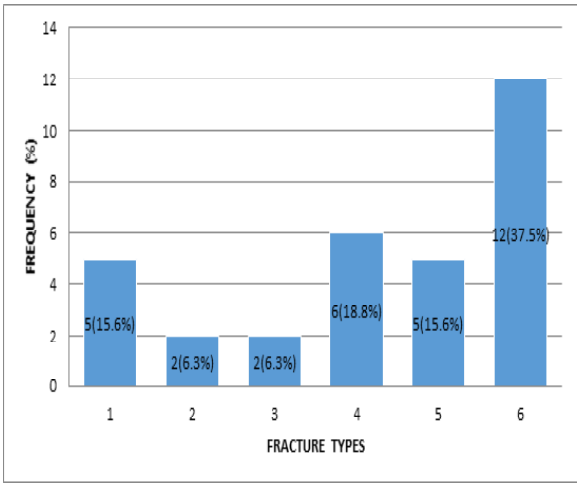

Figure 6: Distribution of fracture types using Schatzker classification

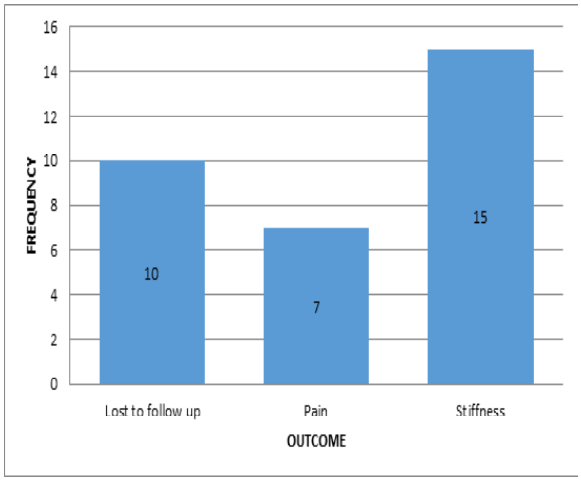

Figure 7: Outcome of management

Figure 7 above showed that almost half (46.9%) of the patients had knee stiffness from arthrofibrosis, 21.8% had persistent knee pain and 31.3% were lost to follow-up

Table 2: Relationship between Fracture type and Age

	Schatzker Fracture Type						Total		
	I	II	III	IV	V	VI			
Age group (years)								**7.756**	**0.653**
20-40	3(20.0%)	0(0.0%)	2(13.3%)	2(13.3%)	3(20.0%)	5(33.3%)	15(100%)		
41-60	2(14.3%)	2(14.3%)	0(0.0%)	3(21.4%)	1(7.1%)	6(42.9%)	14(100%)		
>60	0(0.0%)	0(0.0%)	0(0.0%)	1(33.3%)	1(33.3%)	1(33.3%)	3(100%)		
Treatment type								**8.922**	**0.112**
Non operative	3(15.8%)	2(10.5%)	1(5.3%)	6(31.6%)	3(15.8%)	4(21.1%)	19(100%)		
Operative	2(15.4%)	0(0.0%)	1(7.7%)	0(0.0%)	2(15.4%)	8(61.5%)	13(100%)		
Total	**5(15.6%)**	**2(6.2%)**	**2(6.2%)**	**6(18.8%)**	**5(15.6%)**	**12(37.5%)**	**32(100%)**		

Table 2 above showed that patients' age (p=0.653) and treatment type (p=0.112) both of which were not significantly associated with fracture type

Discussion

A total of 32 patients who presented to the University College Hospital, Ibadan with tibia plateau fractures over an 8-year period were evaluated and managed either operatively or conservatively. The small number of cases compared to other long bone fractures points to the rarity of these injuries. This is in consonant with other reports depicting tibia plateau fractures as uncommon injuries [2]. The male gender accounted for 84.4% of the cases in our study and this is similar to a study in a Chinese population, that found a male preponderance of 70% [13]**.** The 20-40 year old age group was the most affected (46.9%), followed by the 40-60 year old age group, and the least affected were patients aged over 60 years probably because they are less adventureful. Overall, the most common cause of these injuries was motorcycle crashes (40.6%), followed by car crashes (34.4%), and in 25% of the study population, various forms of falls were responsible for these injuries. The use of motorcycle as a means of intra-city transportation is rife in our environment and this may explain the findings in our study [14]. In addition, low-energy falls are the next most prevalent (22%) which is in contrast to the study by Schatzker *et al* [11]. The left tibia plateau was the most frequently affected, accounting for 68.8% of all injuries, followed by the right at 28.1% and bilateral affectation was

observed in 3.1%. Only 53% of the patients had isolated injuries, whereas 46.1% had varied associated injuries. Schaztker VI was the most common injury likely because majority of the injuries (40.6%) were high energy injuries emanating from direct impact of motor bike crashes, whereas types II and III were the least common.

Chi square test revealed no correlation between fracture types and age (p-value0.653), as well as the type of treatment obtained and the age of the patients (p-value 0.112). However, the study by He*et al* on geriatric age group showed that Schatzker II was the commonest injury type [15]. High-energy fractures are frequently treated in stages, with the goal of maintaining limb alignment while adverse soft tissue conditions are resolved. Despite the fact that more severe injuries required surgical care, the majority of our patients (59.4%) received non-operative care. This could be due to the fact that most of our patients could not afford the cost of investigations and surgery. In addition, the implants required in the management of these fractures were not readily available in our environment and some fracture forms and types with good alignment were managed successfully by non operative methods. However, there has been an institutional effort towards the provision of the required implants, capacity building in use of ring external fixators and Taylors spatial frames for the operative treatment of this fractures. Adults with poor overall health, fragile or less active patients along with those who had persistently infected skin, were managed with nonsurgical techniques [1]. Depending on the fracture type and the patient's characteristics, knee immobilizers, hinged knee braces, and casts were utilized to treat these injuries. However, the consensus of most authors is that in the case of a depressed fragment, it should be elevated and supported with bone graft [16].

In the English literature, the outcome of tibia plateau fractures is tethered on four factors: degree of joint depression, extension and separation of the fracture line of the tibia condyles, degree of comminution and metaphyseal and diaphysial dissociation, and integrity of the soft tissue envelope [9,17]. Joint depressions that result in incongruity or dynamic axial poor alignment of the joint as seen on varus or valgus stress radiographs of the joint have been shown to be associated with poor prognosis [18].

Conclusion

Tibia plateau facturesare uncommon and when they occur, men in the 20-44 year age group range are most commonly affected with Schatzker type VI being the commonest injury type. The injuries are often complicated by arthrofibrosis of the knee joint irrespective of the management modalities.

Limitation

The small number of patients from one center may not be a true representation of this injury in our environment, thus a multicenter study is strongly recommended

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