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ORIGINAL ARTICLE

Pattern of Orbital Fractures and their management in a Tertiary Level Hospital in Tanzania

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ABSTRACT

Background: Several studies on facial bone fractures have been carried out in Tanzania but none has specifically reported the pattern of bony orbital fracture. This study hence aimed to document the pattern, management, and outcome of orbital fractures at a tertiary health facility in Tanzania.

Methods: This analytical cross-sectional study was carried out for a year at Muhimbili National Hospital (MNH). All patients who had sustained facial bone fractures were recruited for the study. The questionnaire was designed to obtain patients' sociodemographic information and their clinical findings. The data were analysed using IBM® SPSS Statistics version 27

Results: Of the 372 patients with maxillofacial osseous injuries, 131 (35.2%) had orbital fractures. Their age ranged between 15 and 60 years with a mean of 32.22 ± 9.87 years. The floor of orbit (n=107, 81.7%) and lateral wall (n=90, 68.7%) were frequently affected by walls, similarly, the inferior rim (n=95, 72.5%) and lateral rim (n=76, 58.0%) were most affected. The zygoma was the most common concomitant fractured bone (n=65, 49.6%). Surgery was mostly (n=72, 55.0%) opted for the management of the orbital fractures.

Conclusion: Orbital bone fractures occur frequently and should always be suspected in polytrauma cases. Young individuals and males are more affected with road traffic crashes being the leading cause. The floor of the orbit is the most vulnerable anatomical location, and management depends on the complexity of the fracture.

INTRODUCTION

The bony orbit is formed from the frontal, zygomatic, maxilla, sphenoid, ethmoid, lacrimal, and palatine bones.[1] Due to its complex anatomical structure, it is one of the most susceptible parts of the face to injury (either isolated orbital fracture or in combination with other midface fractures).[2] Considering that orbital bone harbours important

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structures including the eye, orbital injuries therefore pose a serious threat to a patient's vision and ocular motility.[3]

The incidence of fracture to the orbit varies between 3% to 33% according to various studies, with males and young individuals being more affected, and the common causes include road traffic crashes, work-related accidents, sports, and assault.[3, 4, 5, 6, 7, 8, 9] Historically, both the manner and timing of management of orbital fractures pose challenges to surgeons[10], hence the decisions of whether to operate and which surgical approach to follow is based on the degree of dislocation, surgeon's experience, and treatment guidelines at the surgical centre.[7] Despite the management sequela of orbital fracture repair might include vision loss, diplopia, or global malposition.[7]

Several studies on facial bone fractures have been carried out in Tanzania[4, 5, 6] but none has specifically reported on the pattern of bony orbital fracture. Thus, there is a need to understand fracture patterns and risk factors of orbital fractures in Tanzania to provide surgeons with the knowledge that will aid in the appropriate diagnosis and management of these injuries. This study hence aimed to document the pattern, management, and outcome of orbital fractures at a tertiary health facility in Tanzania.

METHODS

This study was conducted a tertiary health facility in Tanzania under the regulations of the Declaration of Helsinki and approved by the institutional review board of the Muhimbili University of Health and Allied Sciences (Ref.No. DA262/293/01.C/1114). The administration of the MNH provided permission to conduct the study. It included consecutively all patients with bony orbital injuries between January 2022 and December 2022. The inclusion criteria were all patients with orbital fractures presenting within one week of injury. Patients with a history of orbital injuries or midface fractures in the past were excluded from the study.

Using a predesigned data collection sheet, documentation of all patients with verified orbital fractures following clinical evaluation by the maxillofacial surgeon at MNH, was performed. The information collected included age, sex, the nature of the injury, use of alcohol, use of illicit drugs, and the location of the orbital fractures. The computed tomography scans (axial, coronal, and sagittal views supplemented with 3D views) were utilized to verify the fractures (Figure 1). The CT scan was evaluated by the panel of oral and maxillofacial surgeons at the MNH supplemented by the radiologists' report. The orbital fractures were classified as the fractures of the floor, medial wall, lateral wall, roof, and/or rims.[11, 12] The management of the patient was according to the protocols and the standard operating procedures of the institute (MNH).

The data were analysed using IBM® SPSS Statistics (version 27, Armonk, New York: IBM Corp). Descriptive statistics were used for study variables (frequency, percentage, mean, and standard deviation for the numeric variable), and Chi-square test was carried out to assess factors associated with orbital bone fractures. The probability level of $\alpha < 0.05$ was selected for statistical significance. The age of the patient was grouped into 15-24, 25-34, 35-44, and 45+.

RESULTS

Patients Characteristics

During the study period, 372 patients presented with maxillofacial osseous injuries, of whom 131 (35.2%) had orbital fractures. Table 1 describes the characteristics of 131 patients with orbital fractures included in this study. Their age ranged between 15 and 60 years with a mean of 32.22 ± 9.87 years. About one-third (n=39, 29.8%) of patients reported having consumed alcohol use during the time of injury, and only 8 (6.1%) had reported being under the influence of illicit drugs before the trauma.

Table 1: Characteristics of patients with orbital fractures

Variable	Patients (n=131)	
Age groups (years)		
15-24	28	21.4%
25-34	58	44.3%
35-44	26	19.8%
45+	19	14.5%
Sex		
Male	125	95.4%
Female	6	4.6%
Aetiology		
Road Traffic Crash	113	86.3%
Assault/ interpersonal fight	7	5.3%
Sports	2	1.5%
Occupational Accident	3	2.3%
Fall	6	4.6%

The pattern of orbital fracture

There were slightly more unilateral orbital fractures (n=74, 56.5%) than bilateral orbital fractures (n=57, 43.5%). Of all the unilateral fractures, the right orbit was more affected than the left with 45 and 29 cases respectively. The orbital wall fractures occurred in all (n=131, 100%) patients, while orbital rim fractures occurred in 119 (90.8%) cases. Table 2 shows the frequency of fracture in various sites of the orbit.

Associated facial bone fractures

In the majority (n=111, 84.7%) of patients the orbital fractures had associated midface and/or frontal bone fractures, and the orbit was fractured in isolation in only 20 (15.3%) cases. The zygoma was fractured most frequently (n=65, 49.6%), followed by Lefort II fractures (n=47, 35.9%). Others were the Lefort III fractures (n=23, 17.6%), the frontal bone (n=22, 16.8%), and the naso-orbital-ethmoid (n=9, 6.9%).

Table 2: Frequency of fracture of various anatomical sites of orbit

Anatomical Site	Number of cases out of 131 patients (%)	
Orbital wall		
Superior/ roof	33	25.2%
Inferior/ floor	107	81.7%
Lateral	90	68.7%
Medial	36	27.5%
Orbital rim		
Superior	22	16.8%
Inferior	95	72.5%
Lateral	76	58.0%
Medial	66	50.4%

Management of the Orbital fractures

Surgical management of the orbital fracture entailing open reduction and internal fixation was done in 72 (55.0%) patients and the remaining 59 (45.0%) patients were managed conservatively. In 56 cases titanium miniplates were used and in 16 cases titanium orbital meshes were used. Conservative management included watchful waiting and medication.

Satisfaction with treatment outcome

A Majority (n=111, 84.7%) of patients were satisfied with the outcome of treatment offered to them. The dissatisfaction rate was 22.2% (n=16) and 6.8% (n=4) respectively for patients managed surgically and conservatively. The difference in dissatisfaction between the treatment options was statistically significant (p= 0.014). Figure 1 shows the main cause of dissatisfaction of the patient with treatment.

Figure 1: A 3D reconstruction of skull CT scan showing right orbital fracture. The fracture involves the lateral wall and rim, the inferior rim, and the floor of the orbit.

DISCUSSION

The frequency of orbital fractures among all patients with maxillofacial bone fractures included in this study was 35.2%. This ? gure is higher than previous reports from Tanzania[4,5,9], Germany[3], and India[1]. The differences in the incidence are attributed to the methodological differences in the studies and the classification of orbital fractures adopted in these studies. In this study, we adopted the AOCMF classification system[12], and we considered the walls and rims as separate entities.

Most of the patients were young adults and males, with the frequent cause of injury being road traffic crashes. These findings are concurrent with previous studies regarding facial bone injuries carried out in Tanzania[4, 5, 6], and elsewhere worldwide[11, 13, 14], however, the common cause in Korea[15] was falls, whereas in the United States of America[8] and in New Zealand[14] it was interpersonal violence. Several authors have suggested that young individuals and males are prone to facial bone injuries (including the orbit) due to their tendency to engage in higher trauma-risk activities such as road traf? c activities, aggressive behaviour such as physical assault, and higher chances of employment in occupations with more significant risks of trauma.[5,6,13,14]

In the present survey, unilateral orbital fractures were more common than bilateral ones, like the findings from elsewhere.[8,16] A plausible explanation for more unilateral fracture is that a high impact is needed to fracture both orbits at a given moment.[8] However, contrary to the findings of the previous studies[8, 11, 16] in our study, the right side was more affected than the left. This difference may be hypothesized to be due to the sociocultural policies of the different study areas. In Taiwan and the USA, most cases were assault related whereas in the current study, they were road traffic crashes. During the assault, most people right-handed tend to deliver blows on the left side of the victim, on the other hand, considering driving in Tanzania is on the left-hand side, during crashes, the right side of the victim is thus more exposed.

The orbital walls were more affected compared to the orbital rims. This was not coincidental considering the orbital rims are thicker and stronger.[8] In this study, the inferior wall (floor of the orbit), and lateral orbital wall were most affected similar to findings from Libya.[11] This can be explained by the fact orbital floor contains the largest open space and lacks support, and these walls are thin and frail, and impact around the orbit usually leads to fracture of these weaker areas.[1,17] In most patients, the orbital fractures had associated midface and/or frontal bone fractures. Considering the complex anatomical structure of the orbit (being made of several bones), the proximity of various midfacial bones to the orbit, coupled with the finding that most of the cases were caused by high impact force (road traffic crash), the occurrence of multiple facial bone fractures may not be coincidental.[2,18]

In the current study, most cases of orbital bone fracture were managed surgically. Generally, surgical management aims at preventing and correcting any functional and/or cosmetic problems related to the fracture, and not every orbital fracture requires surgical intervention since some fractures

do not lead to functional or cosmetic problems.[8] Despite the management, we noted that most of the patients who underwent surgical intervention were not satisfied with the outcome. These findings should not be misinterpreted as conservative management is superior to surgical intervention, but rather because conservative treatment was opted for simple fractures in most instances, and such fractures carry less risk of poor outcome. Complications of post-surgical management of orbital fractures have been documented in the literature.[1]

The setback of this study was that it was limited to one location for a year. The sample size was small despite the convenience sampling technique applied. Despite this limitation, the research paves the way for further studies and the findings could help surgeons make better diagnoses and treatment decisions for patients with orbital bone fractures.

CONCLUSION

Orbital bone fractures occur frequently and should always be suspected in polytrauma cases. Young individuals and males are more affected with road traffic crashes being the leading cause. The floor of the orbit is the most vulnerable anatomical location, and management depends on the complexity of the fracture. Therefore, the health facilities in low and middle-income countries should strive to develop institute-based guidelines for the management of orbital fractures that fits in their locality.

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