IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 10 Ser. 1 (October. 2024), PP 26-35
www.iosrjournals.org

Pattern And Occurrence of Orbital Fractures Associated with Midface Trauma – A Hospital Based Observational Study

Dr. Shahina K.T[1], Dr. Ravindran V[1], Dr Ravindran Nair K.S[1], Dr Soumithran C.S[1], Dr. Sandeep K.M[2], Dr. Abcish Krishnan[1], Dr Vinod Boda[1]

([1]Department of Oral And Maxillofacial Surgery, Government Dental College, Kozhikode -673008, Affiliated To Kerala University Of Health Sciences)
([2]Manipal College of Dental Sciences, Mangalore Affiliated To Mahe-575006)

Abstract:
Aims & Objectives*: To study the pattern and occurrence of orbital fractures associated with midface trauma and to assess the association of fracture pattern with etiology of orbital fracture.*
Methodology*: All midface trauma patients treated at the Oral and Maxillofacial Surgery Department of Govt Dental College Calicut between June 2019 and June 2020 were included. Plain radiographs and available CT scans were assessed by a senior maxillofacial surgeon to diagnose and evaluate orbital fractures. The etiology of fractures was recorded, and its correlation with orbital fracture patterns was analyzed. Clinical evaluation included assessing eye movements, enophthalmos, hypoglobus, palpebral fissure length, and alignment, as well as the presence of telecanthus.*
Results*: Out of 238 midface trauma cases, 147 had orbital fractures, comprising 139 males (58.40% of total, 94.56% of total orbit) and 8 females (3.36% of total, 5.44% of total orbit). Road traffic accidents were the primary cause (91 cases, 38.24%, 61.90%), followed by falls (35 cases, 14.71%, 23.81%). The most common fracture site was the lateral wall (105 patients, 71.43%), followed by the floor (55 patients, 37.42%).*
Conclusion*: The lateral orbital wall was the most frequently fractured site, likely due to its prominent position and susceptibility to direct impact. Conservative management was predominantly utilized. No statistically significant association was found between the etiology of trauma and fracture patterns*
Keywords*: Midface trauma, Orbital fractures, Road traffic accidents, Fracture pattern.*

Date of Submission: 22-09-2024 Date of Acceptance: 02-10-2024

I. Introduction

Fractures affecting the middle third of the facial skeleton can result in various injuries to nearby structures, with the severity dependent on the specific anatomy and the force direction [(1)].

Midface fractures are commonly caused by either blunt or penetrating trauma. Blunt trauma, such as from motor accidents, sports injuries, violence, work-related incidents, and falls, is more prevalent. Penetrating trauma includes injuries from firearms, stabbing, and explosions. Such trauma often involves both the soft tissues and the skeletal framework of the midface, including the maxilla, zygoma, orbit, and nasal bones.

Patients with midface trauma constitute a significant portion of cases seen in Oral and Maxillofacial Surgery Clinics. These injuries are associated with considerable morbidity, functional impairment, facial disfigurement, and substantial financial burdens. The incidence, patterns, and causes of midface fractures vary depending on factors such as geographical location, socioeconomic status, and the time period studied. In developing countries, road traffic accidents are the leading cause, whereas in developed nations, assaults predominate[2,19]. Injuries to the midface frequently involve damage to the orbit and surrounding structures, necessitating early detection and management to prevent ocular dysfunction[17].

The orbit is the bony cavity or socket of the skull in which the eye and its appendages are situated. The orbital complex is made up of a Roof, a Floor, Medial and Lateral Walls, a Base, and an Apex. The Roof (superior wall) is formed primarily by the orbital plate of frontal bone, and the lesser wing of sphenoid near the apex of the orbit. The Floor (inferior wall) is formed by the orbital surface of maxilla, the orbital surface of zygomatic bone and the minute orbital process of palatine bone. The Medial Wall is formed primarily by the orbital plate of ethmoid, as well as contributions from the frontal process of maxilla, the lacrimal bone, and a small part of the body of the sphenoid. The Lateral Wall is formed by the frontal process of zygomatic and more

posteriorly by the orbital plate of the greater wing of sphenoid. For the sake of clarity, the orbital fractures can be divided into four types: zygomatic complex fractures, isolated fractures of the orbital rim, isolated fractures of the orbital walls and complex comminuted fractures [1].

An orbital blowout fracture occurs when blunt force causes traumatic deformity to the orbital Floor or Medial Wall, usually from an object larger than the eye socket. These fractures can be classified broadly as Open Door (large, displaced, and comminuted) or Trapdoor (linear, hinged, and minimally displaced).

In pure orbital blowout fractures, the orbital rim remains intact, while impure fractures involve injury to the orbital rim as well.

Two main theories explain the mechanism of blowout fractures: Converse and Smith[4], and Smith and Reagan[3], who are known to have coined the term blowout fracture, described a hydraulic mechanism whereby hydrostatic pressure within the globe or orbital contents is transmitted to the orbital walls. while an opposing theory proposes that force against the robust orbital rim transmits energy to the more fragile orbital walls, resulting in a blowout fracture.

Plain radiographs, Computed Tomography (CT) and multiplanar high resolution CT are the most common techniques used for diagnostics [12].

Given the complex anatomy and critical structures involved, managing orbital fractures requires caution to avoid aesthetic and functional complications. Surgeons must navigate the intricate relationship between the orbits, eyes, muscles, blood vessels, lacrimal system, facial tissues, and nerves to achieve optimal outcomes. Understanding the orbit's anatomy is crucial for surgeons to minimize the risk of damaging vital structures during reconstruction.

The aim of this study is to investigate the pattern and incidence of orbital fractures in patients with midface fractures. The objectives include assessing the occurrence and various patterns of orbital fractures within this patient population, as well as examining the relationship between the pattern of orbital fractures and the etiology of trauma. Additionally, the study aims to explore any associations between the pattern of orbital fractures and the management strategies employed, along with their subsequent treatment outcomes. By addressing these objectives, the study aims to enhance understanding of the characteristics and implications of orbital fractures in the context of midface trauma, potentially informing more effective management strategies and treatment approaches for affected patients.

II. Material And Methods

An observational study was conducted at the Oral and Maxillofacial Surgery Department of Government Dental College, Calicut, from June 2019 to June 2020, involving quantitative and qualitative analyses of patients with midface trauma. The sample comprised all patients presenting with midface trauma, irrespective of etiology, with an average annual incidence of 350 cases at the institution. Inclusion criteria encompassed clinically and radiographically confirmed midface trauma, with or without orbital fractures. Exclusion criteria applied to patients unable to attend follow-up appointments or declining participation. Methodologically, patients were assessed upon presentation, and their radiographic imaging, including plain radiographs and CT scans, was reviewed by a senior maxillofacial surgeon for diagnosis and evaluation of orbital fracture patterns.

Etiology of the fracture was noted and its association with the pattern of orbital fracture was analysed. The association of pattern of orbital fractures with the management adopted was noted as conservative and operative. The association of pattern of orbital fractures with the management adopted and the treatment results was evaluated after 3 months review as unsatisfactory to very satisfactory using a scale of 1-10. The eye movements were evaluated clinically and enophthalmos and hypoglobus were evaluated as present or absent. Palpebral fissure length was noted as normal/reduced. Alignment of palpebral fissure was noted as straight/mongoloid/antimongoloid. Telecanthus was noted as present/absent.

Ethical clearance was obtained from the Institutional Ethics Committee at Government Dental College, Kozhikode, prior to commencing the study. Written informed consent and willingness to participate were obtained from all patients included in the study. A written informed consent and willingness to participate was obtained from all patients participating in the study.

Statistical analysis

Data collection for the study involved recording measurements in a predesigned and structured proforma, which were then stored in Excel format. Subsequently, the data was transferred to the Statistical Package for Social Science (SPSS Inc., Windows Release 18.0, Chicago, Illinois, USA) for analysis. The pattern and occurrence of orbital fractures in midface trauma patients were calculated and expressed as proportions, with descriptive analysis performed. Additionally, the association between the pattern of orbital fractures and etiology was examined using the Chi-square test.

III. Result

Incidence, Age and Sex

During the study period a total number 238 cases of midface trauma reported to the OP department of OMFS in which 215 (90.34%) were male and 23 (9.66%) were females. Patient's age ranged from 6 years to 80 years (average 35.49 years). The age of male patients ranged from 6 years to 78 years (average 34.99 years). The age of female patients ranged from 14 years to 80 years (average age 41.08 years). The peak incidence was in the 20-29 age group (84, 35.29%), followed by 40-49 age group (44, 18.49%), and the 30-39 age group (42, 17.65%). Only one patient reported in the pediatric age group. The peak age groups among male patients were 20-29 (76,31.93%) and that for females were also 20-29 (8, 3.36 %). There was an overwhelming male preponderance in all age groups. The overall male–female ratio was 9.3:1.

Etiology

Most of the midface trauma cases were due to Road Traffic Accidents (144, 60.50 %). The next cause was Fall (66, 27.73%). The rest of the cases were caused by Assault (12, 5.04%), Sports Injuries (7, 2.94%) and Others (9, 3.78%)(Table 1)

Etiology	Frequency	%
Assault	12	5.04%
Fall	66	27.73%
Others	9	3.78%
RTA	144	60.50%
Sports Injuries	7	2.94%
Total	**238**	**100.00%**

Table 1: Etiology

Road Traffic Accidents

Total number of RTA cases were 144 (60.50%) with 130 (54.62%) male patients and 14 (5.88%) female patients. Male female ratio of RTA cases was 9.29:1. Most affected age group was 20-29 with 64 (26.89%) patients followed by 30- 39 years with 26 patients.

Fall

Second etiological factor of midface trauma was Fall. 66 (27.73%) of the midface trauma cases were due to fall with 59 (24.79%) male patients and 7 (2.94%) female patients. Male female ratio of fall cases was 8.43:1. Most affected age group was 20-29 with 16 (6.72%) patients followed by 40-49 with15 patients.

Assault

The total number of assault cases was 12 (5.04%). All the 12 patients were male. The assault was all due to interpersonal violence. Most affected age groups were 30-39 and 40-49 with 6 (2.52%) patients and 5 patients respectively.

Sports injuries

The number of patients with sports injuries were 7 (2.94 %). All patients were male. Most affected age group was 20-29 with 4 (1.68 %) patients. The rest were in the age group of 10-19 (1.26%)

Other Causes

Other causes included train accidents, work place injuries etc., The number of other cause cases was 9 (3.78 %) with 7 (2.94%) males and 2 (0.84%) females. Male female ratio was 3.5:1. Most affected age group was 30-39 and 40-49 both groups having 3 (1.26%) cases each.

Orbit Fracture

During the study period out of the 238 midface-trauma cases 147 (61.76%) had fractures of orbit. In this 147 orbit fracture cases, 139 (58.40% of total and 94.56% of total orbit) were male and 8 (3.36% of total and 5.44% of total orbit) were female. The male female ratio was 17.37:1. Patient's age ranged from 16 years to 80 years (average 34.73 years). The age of male patients ranged from 16 years to 78 years (average 34.39 years). The age of female patients ranged from 24 years to 80 years (average age 42.50 years). Total of 160 orbits were involved in 147 cases of which 13 (8.84%) were Bilateral and 134 (91.16%) were Unilateral. Of the total 160 orbits 82 (51.25%) cases had fractures on the Left side while 78 (48.75%) cases had fractures on the

Right side. The highest incidence of orbital fracture was in the age group of 20-29 years with 51 (34.69%) patients followed by 31 (21.09%) cases in 30-39 years age group. No patients were reported in the age group 0-9. Males outnumbered females in all age groups.

Etiology

The major causative factor of orbital fracture was road traffic accidents with 91 cases, (38.24%, 61.90 %) followed by fall 35 (14.71%, 23.81 %). Assault, sports injuries and others accounts for 8 (3.36%, 5.44%), 7 (2.94%, 4.76%) and 6 (2.52%, 4.08%) respectively. All 7 (100%) patients sustained sports injury was affected with orbit fracture. In case of assault out of 12 patients 8 (66.67%) patients had orbit fracture. Similarly in case of other causes, out of 9 patients 6 (66.67%) had orbit fracture(Chart 1)

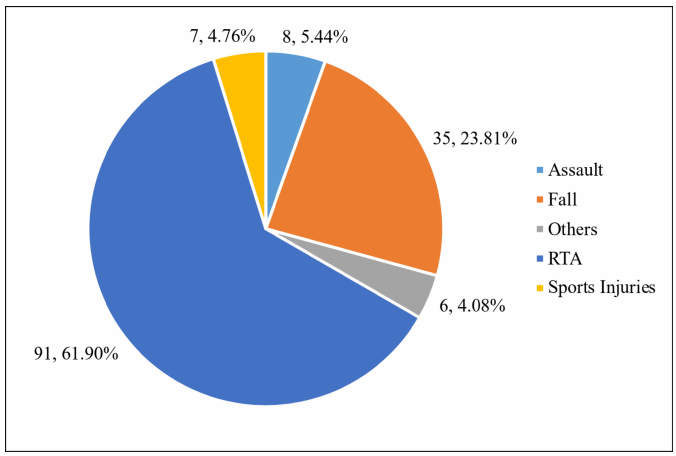

Chart 1: Etiology x Orbit Fracture

Out of 144 RTA cases 91 (63.19%) had fracture of orbit and in case of fall 35 (53.03%) had orbit fracture out of 66. The most common age group affected with orbit fracture in RTA was 20-29 with 38 (25.85%) cases and that of fall and sports injury were also the same age group with 9 (6.12%) cases and 4 (2.72%) cases respectively (table 2)

	Orbit Fracture					
	Absent		Present		Total	
Etiology	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Assault	4	33.33%	8	66.67%	12	100.00%
Fall	31	46.97%	35	53.03%	66	100.00%
Others	3	33.33%	6	66.67%	9	100.00%
RTA	53	36.81%	91	63.19%	144	100.00%
Sports Injuries			7	100.00%	7	100.00%
Total	**91**	**38.24%**	**147**	**61.76%**	**238**	**100.00%**

Table 1: Etiology x Orbit Fracture

Fracture Pattern

As regards to fracture distribution, 64 (43.54%) patients had isolated lateral orbital wall fracture. Isolated Floor fractures were seen in 20 (13.61%) patients followed by isolated Medial Wall and Roof fracture in 8 (5.44%) and 6 (4.08%) patients, respectively. In cases of multiple fractures, lateral orbital wall fracture combined with others was maximum in 44 (29.93%) cases. Most common combined fractures pattern was Lateral Wall + Floor fracture in 12 patients followed by Floor + Lateral Wall + Medial Wall in 11 patients.

When each orbital wall was examined separately; in 98 cases (66.67%), one wall; in 29 instances (19.72%), two walls; in 19 instances (12.93%), three walls; in 1 instance (0.68%), four walls were involved.

The most common fracture site was Lateral Wall in 105 (71.43%) patients followed by Floor in 55 (37.42%). In 37 (25.17%) of disruptions, the Medial Wall was affected, and 20 (13.61%) patients had fracture of orbital Roof.

Out of 55 patients with Floor fractures impure blowout fracture was most common with 54 (90%) cases, of which 60 Floor fractures identified. 5 (8.33%) patients had pure blowout fracture and 1 (1.66%) patient had impure blow in fracture. No pure blow in fractures were found.

Out of 147 patients with orbit fractures, 236 number of walls were fractured. Of which, Lateral Wall was fractured in 105 patients with 108 walls (45.76%), followed by Floor with 60 walls (25.42%) in 55 patients, Medial Wall with 46 walls (19.49%) in 37 patients, and the least frequently involved part was the Roof of the orbit with 22 walls (9.32%) in 20 patients(chart 2).

While analysing association of etiology and fracture pattern it was found that RTA resulted in more Lateral Wall fractures with 66 (41.51%) walls ,followed by Floor (40, 25.16%), Medial Wall(33, 20.75%) and Roof (20, 12.58%). Fall also resulted in the same sequence with 28, 11, 9, and1 walls respectively. Blowout fractures were mostly due to RTA (40, 66.67%) followed by Fall (11, 18.33%) and Assault (4, 6.67%)(Chart 3). Impure blowout fracture was the most common fracture pattern in all etiologies except in Sports Injury and Assaults where pure blowout was common.

In RTA 35 patients had isolated Lateral Wall fracture, 11 had isolated Floor fracture, 8 had Floor + Lateral Wall + Medial Wall fracture, 5 had isolated Medial Wall fracture.

In case of Falls 19 had isolated Lateral Wall fracture, 4 had isolated Floor fracture and another 4 had Lateral Wall + Medial Wall fracture.(table 4)

In Assault, 4 had isolated Lateral Wall fracture, 3 had isolated Floor fracture and 1 had Floor + Lateral Wall + Roof fracture.

In Sports Injuries 3 had isolated Lateral Wall fracture, 2 had isolated Floor fracture, 1 had Medial Wall fracture and 1 had Floor + Lateral Wall fracture.

There was no statistically significant association between etiology and fracture pattern (p value = 0.993) (Table 2)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.351[a]	52	.993
Likelihood Ratio	37.701	52	.932
Linear-by-Linear Association	1.554	1	.213
No of Valid Cases	147		
P value- 0.993			

Table 3: Chi-Square Tests

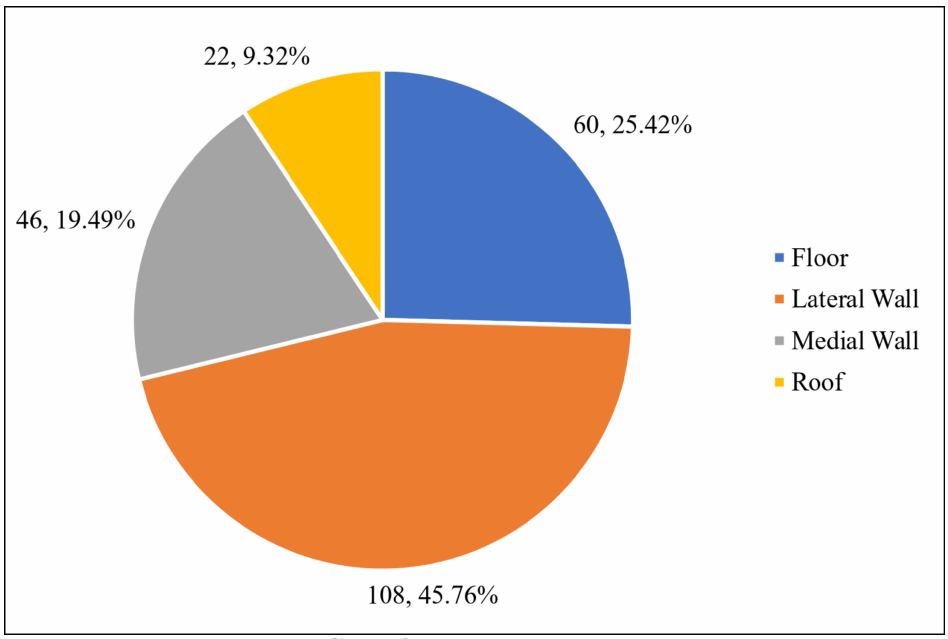

Chart 2: Fracture pattern

Fracture Pattern	Frequency	%
One Wall	**98**	**66.67%**
Floor	20	13.61%
Lateral Wall	64	43.54%
Medial Wall	8	5.44%
Roof	6	4.08%
Two Walls	**29**	**19.72%**
Floor + Lateral Wall	12	8.16%
Floor + Medial Wall	2	1.36%
Floor + Roof	1	0.68%
Lateral Wall + Medial Wall	10	6.80%
Lateral Wall + Roof	2	1.36%
Medial Wall + Roof	2	1.36%
Three Walls	**19**	**12.93%**
Floor + Lateral Wall + Medial Wall	11	7.48%
Floor + Lateral Wall + Roof	5	3.40%
Floor + Medial Wall + Lateral Wall	3	2.04%
Four Walls	**1**	**0.68%**
Floor + Lateral Wall + Medial Wall + Roof	1	0.68%
TOTAL	**147**	**100%**

Table 3: Fracture Pattern Distribution

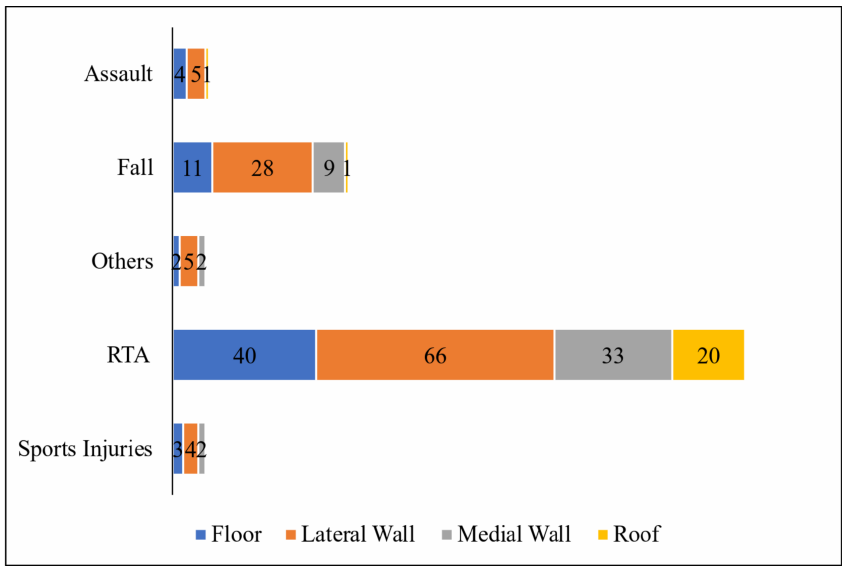

Chart 3: Fracture Pattern x Etiology

Management

Only 8 (5.44%) cases were treated surgically, of which all were RTA cases. 5 cases had Floor, Lateral Wall and Medial Wall frature together. 1 patient had bilateral lateral and Medial Wall fracture.1 patient had Floor and medial fracture and the remaining one had all walls fractured.

Treatment Results

Treatment results were calculated using a scale of 1 to 10. Out of 147 orbit fracture cases 139 (94.56%) patients had satisfactory treatment results, 7 (4.76%) had moderate satisfactory treatment results and 1 (0.68%) had unsatisfactory results. Only 3 patients in the surgical group had satisfactory treatment results. Rest had moderate satisfactoary treatment results.

Eye Movements

138 (93.88%) patients had normal eye movements, 9 (6.12%) had abnormal eye movements.

Hypoglobus

121 (82.31%) patients didn't have hypoglobus, 26 (17.69%) patients had hypoglobus.

Enophthalmos

112 (76.19%) patients with no enophthalmos and 35 (23.81%) patients had enophthalmos.

Palpebral Fissure Length
136 (92.52%) patients had normal palpebral fissure length and 11 (7.48%) had reduced palpebral fissure length.

Palpebral Fissure Alignment
139 (94.56%) patients had straight palpebral fissure, 5 (3.4%) had mongoloid and 3 (2.04%) had antimongoloid palpebral fissure.

Telecanthus
19 (12.93%) patients had telecanthus but 128 (87.07%) had no telecanthus.

IV. Discussion

Incidence

Different studies have shown that there are epidemiological differences in the etiology, type, and site of fracture and in-patient characteristics. The incidence of midface trauma in the present study was 238. In comparison with a study conducted in our own department in 2005 – 2006 by Ravindran V et al [18] there were 380 cases of midface trauma reported. So, on an average of around 350 patients are being managed for midface trauma in our hospital but following the start of COVID-19 lockdown a significant decrease in facial trauma was noticed in our center. A study conducted in our own department to assess the impact of COVID-19 lockdown measures on the burden of maxillofacial trauma cases by Dr Ikram Bin Ismail et al [22] shows a 50% reduction in midface trauma patients over 10 weeks period.

Age & Sex Distribution

The incidence of the higher frequency of midface fractures among males compared to females is a consistent finding in all previous studies. The male:female ratio in our sample was 9.3:1 and this finding is very high when compared other studies in India [20, 18, 8]. Cultural and socioeconomic factors play a significant role in gender distribution of midface injuries. This skewed ratio may be attributed not only to societal norms segregating women from certain activities but also to the higher number of male vehicle drivers, their involvement in more physical contact sports, and increased consumption of alcohol and drugs.

This study revealed that the peak incidence of midface fractures occurred in the 20-to-29-year age group, with mean age of 35.49 years. Many surveys of maxillofacial fractures reported the same results concerning age [20, 18, 8]. The possible explanation for this was this age group tends to be engaged in intense social interactions and has a higher rate of mobility, contributing to increased susceptibility to road accidents and interpersonal assaults.

Extremes of age are least affected. Only one patient was reported in the pediatric age group. A review of the National Trauma Databank, 2001 to 2005, identified 12,739 facial fractures among 277,008 pediatric trauma patient admissions [4.6%). The relative paucity of facial fractures in children—when compared with adults—has been previously demonstrated. The preponderance of elastic, cancellous bone and the high cranium-to-face ratio in children are responsible for this finding. Consequently , children are more likely to sustain skull fractures and brain injuries than facial fractures. Indeed, facial fractures are rare before the age of 5. Rowe [1], for example, reported that only 1% of all facial fractures occur in children 1 year old or younger. These results were echoed by other series, although the incidence may be underestimated, as these studies predate the use of routine computed tomography (CT) scans in craniofacial trauma.

Etiology

The primary causes of midface fractures in various studies encompass road traffic accidents, falls, violence, and sports-related injuries. In many developing nations, such as India, road traffic accidents remain the predominant cause [20, 18]. Our present study corroborates these findings, indicating that road traffic accidents account for 60.50% of all etiological factors, followed by falls at 27.73%. In the studies of Ravindran V et al [18], Anwar Bataineh [7], S. Iida [8], also gives the same sequence. In studies from most of the developed countries, interpersonal violence has become the major cause of maxillofacial trauma [25]. Muhammad shayyab [19] conducted a study to evaluate the trends in pattern of facial fractures between developed and developing countries over 2 time periods and found that Road traffic accident-related injuries had significantly decreased in developed countries and increased in developing countries over the two periods. However, assault-related facial injuries had significantly increased in developed countries and decreased in developing countries over the two periods. But Pranav Kapoor [13] reported that assault was most common etiology than RTA in south India. Cultural and socioeconomic characteristics have significant influence on the etiology of facial fractures.

Orbit fracture

Orbital fractures represent a significant portion, ranging from 10 to 25%, of all facial fracture cases. In our study, out of 238 midface fracture cases, a notably high proportion (61.76%) involved orbital fractures,

surpassing rates observed in other studies. Furthermore, the male-to-female ratio in our study was exceptionally high at 17.37:1 compared to existing literature. Among the 160 affected orbits, fractures were evenly distributed, with 51.25% occurring on the left side and 48.75% on the right. Most orbital fractures occur in males in their second decade of life [15]. In the present study also the highest incidence of orbital fracture was in the age group of 20-29 years with 51 (34.69%) patients followed by 31 (21.09%) cases in 30-39 years age group. No patients were reported in the age group 0-9. Our study revealed the most common age group to be affected as 20- 29 years old (34.69%). Most authors agree that by far the most commonly affected age group is the 20-40 years.

Etiology of orbit fracture

In our study, the primary cause of orbital fractures was road traffic accidents, consistent with findings from numerous previous studies. Specifically, road traffic accidents accounted for 61.90% of cases, followed by falls at 14.71% and assault at 3.36%. Sports injuries and other causes contributed to smaller percentages. But according to Elizabath Chiang et al [24], Miguel Cabalag [2], and Martin Gosau et al [16] assault was the most common etiology for orbit fracture. Hatton et al [9] highlighted sports injuries as a common cause of orbital fractures in both men and women, a finding supported by our study where all patients (100%) who sustained sports injuries experienced orbital fractures.

Distribution of Orbit Fractures

Fracture Pattern

There were 236 walls fractured, with the most common being lateral wall with 108 walls followed by floor with 60 walls, 46 medial walls and 22 roofs, the same sequence was reported by Selim Karabekir et al [17]that lateral wall was the most common fracture site.

From their study, Jank et al. [12] showed that the floor was by far the commonest site of orbital wall fractures. Elizabeth et al [24], Greenwald et al [5] also found that floor was the most common fracture site in their studies. But according to Juan Marcelo et al [25], Woo et al [23], and Halil Huseyin Cagatey et al [6] medial wall was the most common fracture site.

In our study, 64 (43.54%) patients had isolated lateral orbital wall fracture. Isolated floor fractures were seen in 20 (13.61%) patients followed by isolated medial wall and roof fracture in 8 (5.44%) and 6 (4.08%) patients, respectively. Study by Sahebaan Shabarwal et al [11] found that lateral wall is the most common isolated wall fracture followed by medial wall, floor, and roof. Kun Hwang et al [15] found that floor was the most common isolated wall fractured in his study.

While the lateral wall is typically regarded as the strongest among the four orbital walls, our study observed a higher prevalence of lateral wall fractures. This disparity may be attributed to the differing mechanisms of injury. In our cases, road traffic accidents (RTAs), particularly falls from bikes, were the primary cause, potentially resulting in lateral impact on the orbit due to the prominent position of the lateral wall. Conversely, in most referenced studies, injuries stemmed from interpersonal violence, with blunt force trauma sustained from the front.

When each orbital wall was analyzed individually, it was found that in 98 cases (66.67%), only one wall was affected, while two walls were involved in 29 instances (19.72%), three walls in 19 instances (12.93%), and all four walls in one instance (0.68%). The most common combined fracture pattern observed was lateral wall combined with floor fracture in 12 patients, followed by floor combined with lateral wall and medial wall in 11 patients. Study conducted by Manolidis et al [10], of the orbital walls, four walls were involved in 5% of cases, three walls in 17% and two in 30. In agreement with these findings, in our study, we found that the frequency of fractures involving more than one orbital wall was higher than that involving only one wall in 98 cases.

Tong et al [69] reported that patients with pure blowout fractures were often associated with physical assault, while impure fractures were linked to motor vehicle accidents, indicating lower-energy mechanisms such as punches or kicks for pure fractures, and higher-energy mechanisms such as motor vehicle accidents for impure fractures. Our study's findings are consistent with this observation, further supporting the relationship between mechanism of injury and fracture type.

Management

The management of orbital fractures poses significant challenges, as they can potentially compromise vision and globe position. Therefore, careful consideration is warranted when deciding between surgical intervention and observation. The decision to proceed with surgery is guided by clinical examination findings, orbital imaging results, and a thorough assessment of the risks and benefits associated with each option. 1/3rd to 2/3rd of the orbit fracture cases were treated surgically by most of the clinicians [5, 9, 25, 6]. Indications for surgical intervention can be categorized as immediate or delayed repair. Immediate repair, within 24 hours, is

deemed necessary for cases involving muscle entrapment or activation of the oculocardiac reflex. Relative indications for immediate repair include disruptions affecting 50% or more of the orbital floor. Delayed repair, within two weeks, is warranted for cases presenting with diplopia in lateral gaze, enophthalmos exceeding 2 mm, orbital dystopia exceeding 2 mm, or ocular motility dysfunction with neurologic causes ruled out. In our study, only 8 cases (5.44%) met the criteria for surgical intervention, and all of these cases were associated with road traffic accidents. The majority of cases were managed conservatively, as most patients did not exhibit absolute or relative indications for surgery.

Treatment results

Among the 147 cases of orbital fracture, treatment outcomes were satisfactory in 139 patients (94.56%) and moderately satisfactory in 7 patients (4.76%). Only one patient (0.68%) reported unsatisfactory results due to oculomotor nerve palsy resulting in ptosis. Notably, in the surgical group, only 3 patients achieved satisfactory outcomes, while the remaining had moderately satisfactory results. Conversely, conservatively treated patients reported higher satisfaction levels compared to surgically treated cases. This difference may be attributed to the fact that surgical intervention was reserved for cases with absolute indications, typically involving higher severity of injury, thus resulting in compromised function and aesthetics.

Ocular injuries

The reported incidence of ocular and adnexal injuries in patients with midfacial fractures ranges from 2.7 to 90.6% [21]. Enophthalmos was present in 24.5% patients followed by hypoglobus in 17.7%, telecanthus in 12.9%. Enophthalmos following facial trauma should always raise suspicion of an orbital wall fracture and a CT scan is advisable when plain X-rays are negative [21].Disruption of the medial canthal ligament results in traumatic telecanthus. In this study traumatic telecanthus was present in 12.9% of cases.

V. Conclusion

Orbital fractures, common in midface trauma, warrant thorough clinical and radiological assessments for prompt intervention. Our study predominantly involved male patients aged 16-78, with road traffic accidents being the leading cause. The lateral orbital wall was most frequently fractured, likely due to its prominent position and susceptibility to direct impact. Conservative management was predominant, and no significant association was found between etiology and fracture pattern. Understanding the epidemiology of orbital trauma is crucial for implementing preventive measures. Promoting road safety awareness through personal and public strategies may mitigate the occurrence of orbital fractures.

References

[1]. N.L Rowe And J.L. Williams – Rowe And Williams Maxillofacial Injuries Vol 1 - Second Edition.

[2]. Cabalag MS, Wasiak J, Andrew NE Et Al. Epidemiology And Management Of Max Illofacial Fractures In An Australian Trauma Center. Br J Plast Surg 2014; 67:183–9. 10.1016/J.Bjps.2013.10.022

[3]. Smith B, Regan Wfcabalag MS, Wasiak J, Andrew NE Et Al. Epidemiology And Management Of Max Illofacial Fractures In An Australian Trauma Center. Br J Plast Surg 2014; 67:183–9. 10.1016/J.Bjps.2013.10.022 Jr. Blow-Out Fracture Of The Orbit; Mechanism And Correction Of Internal Orbital Fracture. Am J Ophthalmol.1957;44(6):733–739.

[4]. Converse Jm, Smith B. Blowout Fracture Of The Floor Of The Orbit. Trans Am Acad Ophthalmol Otolaryngol. 1960 Sep-Oct;64:676-88.

[5]. Greenwald HS, Jr, Keeney AH, Shannon GM. A Review Of 128 Patients With Orbital Fractures. Am J Ophthalmol. 1974; 78:655–664.

[6]. Çağatay HH, Ekinci M, Pamukcu C, Oba ME, Özcan AA, Karşıdağ S, Retrospec Tive Analysis Of 132 Patients With Orbital Fracture. Ulus Travma Acil Cerr Derg 2013; 19:5.

[7]. Anwar B Bataineh,Etiology And Incidence Of Maxillofacial Fractures In The North Of Jordan,Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, And Endodontology,Volume 86, Issue 1,1998, Pages 31-35, ISSN 1079-2104.

[8]. S. Iida, M. Kogo, T. Sugiura, T. Mima, T. Matsuya,Retrospective Analysis Of 1502 Patients With Facial Fractures,International Journal Of Oral And Maxillofacial Surgery,Volume 30, Issue 4,2001,Pages 286-290,ISSN 0901-5027.

[9]. Hatton MP, Watkins LM, Rubin PA. Orbital Fractures In Children. Ophthalmic Plast Reconstr Surg. 2001 May;17(3):174-9.

[10]. Manolidis S, Weeks BH, Kirby M Et Al. Classification And Surgical Management Of Orbital Fractures: Experience With 111 Orbital Reconstructions. J Craniofac Surg 2002; 13:726–37, Discussion 38 10.1097/00001665-200211000-00002

[11]. Sahebaan Sabharwal; Suhas Prabhakar; Ramya Ravindran. A Prospective Study On The Incidence And Pattern Of Orbital Fractures And Ocular Complications In Two Wheeler Drivers Following Road Traffic Accidents In South India. Investigative Ophthal Mology & Visual Science April 2014, Vol.55, 5490.

[12]. Jank, S., Schuchter, B., Emshoff, R., Strobl, H., Koehler, J., Nicasi, A., … Baldissera, I. (2003). Clinical Signs Of Orbital Wall Fractures As A Function Of Anatomic Location. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, And Endodontology, 96(2), 149–153.

[13]. Kapoor P, Kalra N. A Retrospective Analysis Of Maxillofacial Injuries In Patients Reporting To A Tertiary Care Hospital In East Delhi. International Journal Of Critical Ill Ness And Injury Science. 2012 Jan;2(1):6-10.

[14]. Aljinovic Ratkovic, Naranda & Mutevelic, L.. (2007). Injuries Of The Eye And Ocular Adnexa In Midface Fractures. International Journal Of Oral And Maxillofacial Surgery - INT J ORAL MAXILLOFAC SURG. 36. 1076-1076. 10.1016/J.Ijom.2007.08.431.

[15]. Hwang K, You SH, Sohn IA. Analysis Of Orbital Bone Fractures: A 12-Year Study Of 391 Patients. J Craniofacial Surg. 2009;20(4):1218–1223
[16]. Gosau, M., Schöneich, M., Draenert, F.G. Et Al. Retrospective Analysis Of Orbital Floor Fractures—Complications, Outcome, And Review Of Literature. Clin Oral Invest 15, 305–313 (2011).
[17]. Karabekir H.S., Gocmen-Mas N., Emel E., Karacayli U., Koymen R., Atar E. K., And Ozkan N. (2012) – Ocular And Periocular Injuries Associated With An Isolated Orbital Fracture Depending On A Blunt Cranial Trauma: Anatomical And Surgical Aspects. Journal Of Cranio-Maxillofacial Surgery, 40(7).
[18]. Ravindran V. And Ravindran Nair K.S. (2011). – Metaanalysis Of Maxillofacial Trauma In The Northern Districts Of Kerala: One Year Prospective Study. Journal Of Maxillofacial And Oral Surgery, 10(4), 321–327.
[19]. Shayyab, M.; Alsoleihat, F.; Ryalat, S. & Khraisat, A. Trends In The Pattern Of Facial Fractures In Different Countries Of The World. Int. J. Morphol., 30(2):745-756, 2012.
[20]. Septa D., Newaskar V.P., Agrawal D. And Tibra S. (2014) – Etiology, Incidence And Patterns Of Mid-Face Fractures And Associated Ocular Injuries. Journal Of Maxillofacial And Oral Surgery, 13(2), 115–119.
[21]. Al-Ourainy I.A., Dutton G.N., Stassen L.F.A., Moos K.F., And EI-Attar A. (1991). – The Characteristics Of Midface Fractures And The Association With Ocular Injury: A Prospective Study. British Journal Of Oral And Maxillofacial Surgery, 29(5), 291–301.
[22]. Impact Of Covid-19 Lockdown Measures On The Burden Of Maxillofacial Trauma Cases – A Record Based Comparative Study Int J Oral Care Res 2021; 9:18-22
[23]. Shin, Jun Woo MD*; Lim, Jin Soo MD, Phd†; Yoo, Gyeol MD, Phd†; Byeon, Jun Hee MD, Phd An Analysis Of Pure Blowout Fractures And Associated Ocular Symptoms, Journal Of Craniofacial Surgery: May 2013 - Volume 24 - Issue 3 - P 703-707.
[24]. Chiang E, Saadat LV, Spitz JA, Bryar PJ, Chambers CB. Etiology Of Orbital Frac Tures At A Level I Trauma Center In A Large Metropolitan City. Taiwan J Ophthalmol. 2016 Jan-Mar;6(1):26-31.
[25]. Juan Marcelo Reyes, María Fernanda García Vargas, Jonathan Rosenvasser, María Asunción Arocena, Ana Josefina Medina, Jorge Funes. Classification And Epidemiology Of Orbital Fractures Diagnosed By Computed Tomography Rev. Argent. Radiol. 2013;77(2):139-146