www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v6i7.184

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Epidemiological Profile of Orbital Fracture in Orbital Trauma in a Tertiary Eye Care Centre in Kerala

Authors
Dr Awungshi Philamazan[1], Dr V. Sahasranamam[2], Dr Suresh Babu[3]
[1,2]Regional Institute of Ophthalmology, Thiruvananthapuram, Kerala
[3]Dept of Oral Maxillofacial Surgery (OMFS) Govt. Dental College, Thiruvananthapuram, Kerala, India
Corresponding Author
Dr V. Sahasranamam
Director, Regional Institute of Ophthalmology, Thiruvananthapuram, 695035, India
Phone Number: +91-9846020421, Email: *drsahasranamam@gmail.com*

Abstract

Purpose: *The objective was to study the epidemiological profile of patients who suffered orbital trauma and presented to a tertiary eye care centre, with an emphasis on variables like age, sex, economic status, type of trauma, anatomical sites of fractures and compare it with other studies in the literature.*

Materials and Methods: *This is a descriptive analysis of all patients presenting to Regional Institute of Ophthalmology and Department of Oral Maxillofacial Surgery (OMFS), Government Dental College, Thiruvananthapuram, Kerala, India with radiologically proven orbital fractures following orbital trauma from February 2015 to August 2016. Detailed informed consent and patient data were collected. They underwent detailed extra-ocular and slit lamp examination to assess visual acuity, peri-orbital changes, and ocular motility assessment along with posterior segment evaluation. Radiological findings were noted. Data was collected using a prepared proforma followed by either conservative or surgical treatment. The statistical analysis of the data was done using SPSS version 12.0*

Results: *Out of 120 patients, orbital trauma was more commonly seen in males (88.33%), between 16-35 years of age having the highest prevalence(50.83%) with road traffic accidents as the most common cause (55.83%). The most commonly seen radiological finding was lateral wall fracture (52.50%). 51.67% of the patients had no limitation of ocular motility. While among the ones who had ocular motility problems, elevation limitation was the most common one (35.83%). Diplopia was present in 10% of the patients. Single wall fracture was seen in 51.67%. Most of the patients were managed conservatively (89.17%). BCVA was more than 6/18 in 99 patients out of the 120. There was a statistically significant association between the age of the patient and the type of trauma sustained with the Pearson's Chi-square test and also significant association between presence of orbital floor fracture and entrapment of extra-ocular muscle/ soft tissue. It was also found by Pearson's Chi-square test that presence of diplopia and extra-ocular muscle / soft tissue entrapment had significant association.*

Conclusion: *In our study, it was concluded that orbital fractures mainly affects males from the lower socio-economic strata in their 3rd and 4th decades of life, with road traffic or motor vehicle accidents as the most common cause. The most common orbital wall involved is the lateral wall. Most of the patients were managed conservatively.*

Keywords: *orbital trauma, epidemiology, facial trauma, orbital fractures, diplopia, extra-ocular muscles, extra ocular motility.*

Introduction

Orbital wall fractures are a common result of orbital trauma. An orbital wall fracture may occur when the orbit is bluntly struck by an object with dimensions greater than the anterior orbital rim.

The incidence of isolated orbital fractures ranges from 4 to 16% of facial injuries[1].

Clinical presentations associated with orbital fractures vary in severity depending on the presence of ocular trauma and the location of the fracture. Fractures of the orbital wall may lead to limitation of ocular motility, diplopia, enophthalmos and altered sensation in the distribution area of the infraorbital nerve[2,3]. Symptoms include intraocular pain, diplopia, inability to move the eye and periorbital numbness. Clinical signs include periorbital oedema, ecchymosis, surgical emphysema, ptosis, limited ocular motility, enophthalmos, hypoesthesia and strabismus.

Orbital trauma can result in significant functional and cosmetic defects and hence can be significantly disabling[4].

Severe facial injuries may, in addition to psychological disorders, result in decreased productivity and increases the costs arising from the trauma. The group most affected, men of working age, commonly found in many studies, partly explains the impact on productivity [5]

The causes of ocular motility disturbance and diplopia are: entrapment of the extraocular muscles or orbital soft tissues, injury in the extraocular muscles, oedema or hemorrhage in the fat tissue within the orbit, and vertical deviation of the eyeball.[6] In short, ocular motility disturbance has two principal causes: functional disability of muscles due to the restriction by entrapment or paralysis of the extraocular muscles and limitation caused by nearby structures. However, it is difficult to identify the exact cause of the ocular motility disturbance.

It becomes necessary to assess the extent and severity of orbital trauma and severity of extraocular muscle involvement for deciding the timing of surgical intervention and possible late sequelae.

An orbital computed tomography-contiguous thin axial and coronal section is the gold standard for confirmation of diagnosis and to assess the extent and severity of orbital fracture.

Many surgeons immediately repair orbital floor fractures based on their demonstration by orbital computed tomography (CT). Other surgeons follow the post trauma course for development of vision-disabling diplopia or facial asymmetry. The advent of CT in the late 1970s and early 1980s produced a fairly uniform protocol that remains in widespread use: large fractures portending enophthalmos can be repaired within 2 weeks of the injury; small fractures are repaired if clinically significant diplopia does not resolve within 2 weeks of observation[7-10].

The management of orbital fractures can be conservative or surgical. Timing of surgery depends on severity of ocular signs and symptoms mostly. In addition, orbital injuries affecting vision and causing severe ocular motility dysfunction must be promptly recognized and a team approach is needed for its management.

By analyzing the data collected from all the patients, this study provides details regarding the prevalence, distribution and incidence of orbital fracture, the mode of injury, the type of fractures commonly seen, the clinical picture and the treatment given.

Research Design and Method

A descriptive hospital-based study was carried out to determine the demographics, aetiology, clinico-radiological features and management modalities among patients presenting with radiologically confirmed orbital fractures (n=120) to Regional Institute of Ophthalmology, Thiruvananthapuram, Kerala, India and and Department Of OMFS, Government Dental College, Thiruvanant-hapuram, Kerala, India. The duration of the study was from February 2015 to August 2016.

Patients with radiologically confirmed orbital fractures presenting to these two departments

within the study duration were included for the study. Those with open globe injuries, intracranial injuries, retained orbital foreign bodies were excluded from the study since our study was to analyse patients with pure orbital fractures. A detailed informed consent was obtained from all patients who were willing to be part of the study. The following data were obtained from each patient-age, sex, socio-economic status and modes of injury. Best corrected visual acuity for distance of the patients was assessed using Snellen's chart at a distance of 6m and Log mar chart.

Detailed external ocular examination was carried out to assess for presence of peri-orbital oedema, subcutaneous emphysema, ecchymosis and regularity of orbital rim. A slit lamp biomicroscopy examination of the anterior segment was performed. A slit lamp 90D biomicroscopy and indirect ophthalmoscopy examination of the posterior segment was carried out.Ocular motility was assessed for ductions, versions and vergences.

The ocular motility limitation was graded as follows [11] :Grade 0- full motility, Grade 1- 25% motility limitation, Grade 2- 50% motility limitation, Grade 3- 75% motility limitation, Grade 4- 100% or full motility limitation.

Diplopia charting was done for each patient using red green goggles. The diplopia was assessed for presence in either primary gaze (30 degree) or extremes of gaze (beyond 30 degree).A detailed assessment of the Computed tomography films of the orbit and paranasal sinuses for each patient was carried out to record the site of fracture and associated soft tissue and extraocular muscle involvement. After the initial clinical and radiological assessment, patients underwent either conservative or surgical management. The primary indication for surgery within first 2 weeks of trauma were diplopia in primary gaze, enophthalmos >2mm, extraocular muscle entrapment.

All data were coded and entered into Microsoft Excel for analysis. The statistical analysis of the data was done using SPSS version 12.0

Results

Table 1: Gender distribution

Sex	Count	Percent
Male	106	88.33
Female	14	11.67

Table 2 : Age distribution

Age	Count	Percent
<16	11	9.17
16-35	61	58.33
36-60	36	30
>60	12	10

The mean age was 35.008 +/- 15.192 years. The median age was 34 years.

Table 3: socio-economic distribution

Socio-Economic Status	Count	Percent
BPL	87	72.50
APL	33	27.50

Table 4: Modes of injury

Modes Of Injury	Count	Percent
RTA/MVA	67	55.83
Fall/Accidental	32	26.67
Assault	13	10.83
Occupational	5	4.17
Sports related	3	2.5

Table 5: Distribution according to BCVA

BCVA Logmar	BCVA Snellen's	Presentation
0.0-0.3	>6/18	99
0.4-1.0	6/18-6/60	18
1.1-1.8	5/60-1/60	1
1.9-3.0	CFCF-PL	2

The mean BCVA Logmar at presentation was 0.257 +/- 0.062.

Clinical features

All the patients in the study had periorbital oedema (100%)

85.83 % of the patients had ecchymosis (n=103),

49.17% of the patients had subcutaneous emphysema (n=59).

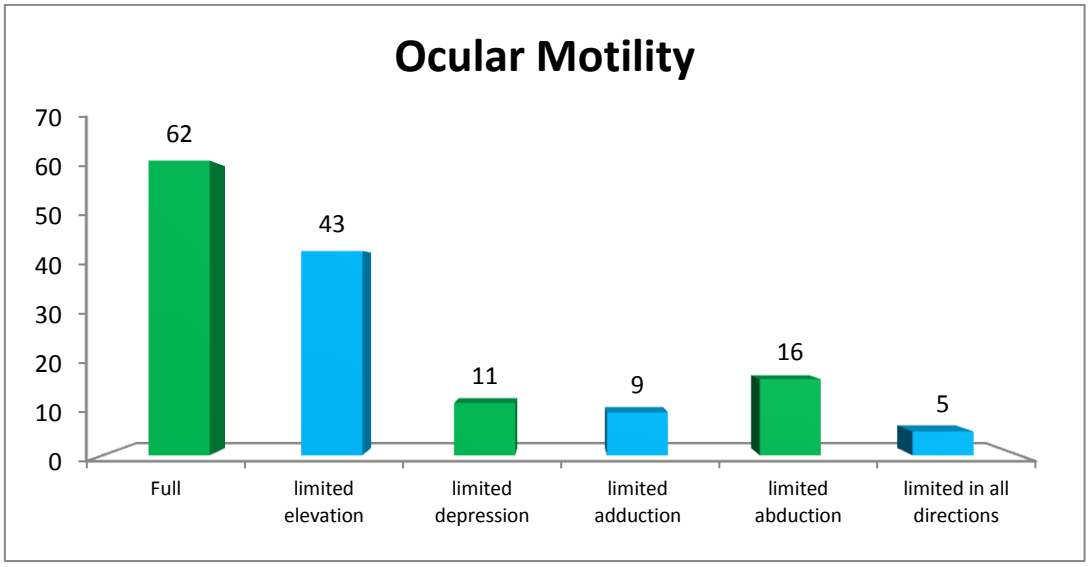

Figure 1 1: Distribution according to Ocular motility at presentation

The mean ocular motility grading at presentation was 1.085 +/- 0.223.

Diplopia

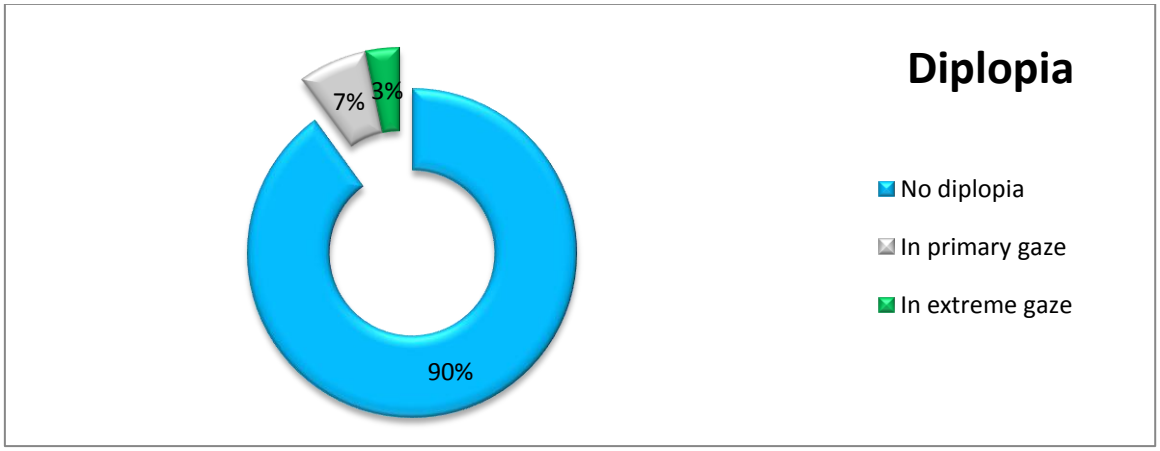

Figure 2: Distribution according to presence of Diplopia at presentation

Imaging details:

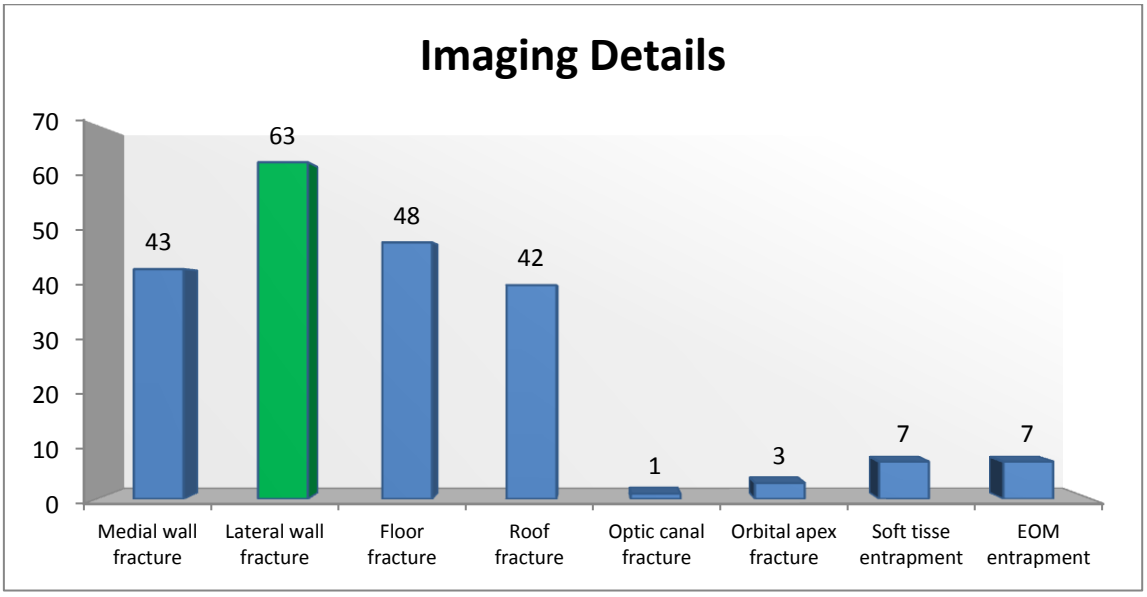

Figure 3: Distribution according to the wall fractured

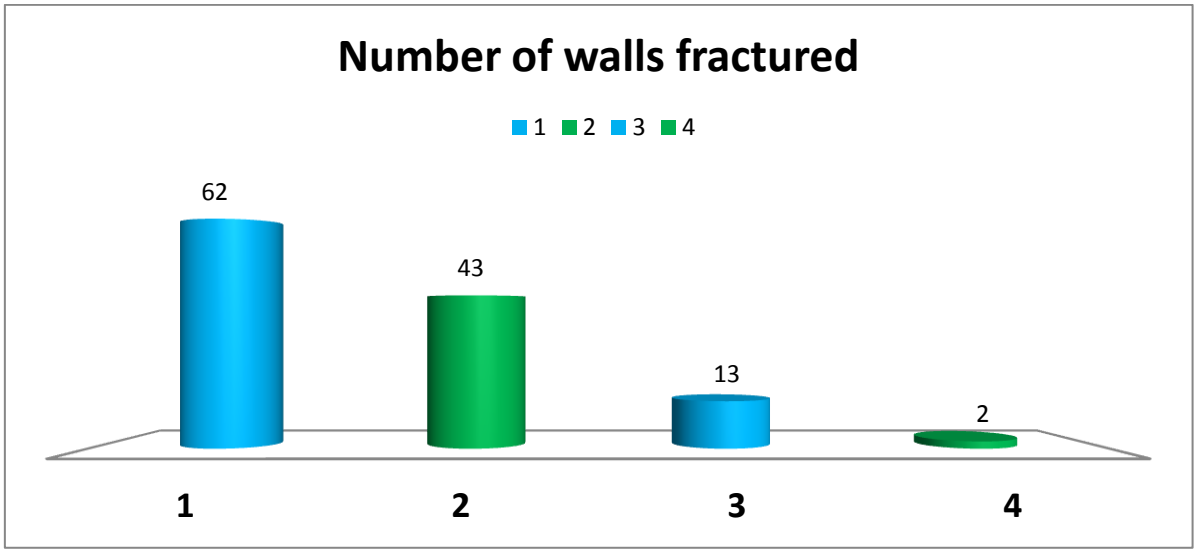

Figure 4: Distribution according to the number of walls fractured

Table 6: Distribution according to the association of each wall fracture with ocular motility limitation

WALL FRACTURED	COUNT	ELEVATION (PERCENT)	DEPRESSION (PERCENT)	ADDUCTION (PERCENT)	ABDUCTION (PERCENT)
Lateral wall	63	44.44	12.70	14.29	19.05
Medial wall	43	44.18	11.63	13.95	18.60
Floor	48	54.17	22.92	14.58	22.92
Roof	42	38.10	11.90	9.52	14.29

Table 7: Distribution according to Ocular motility limitation grading in orbital wall fractures

WALL FRACTURED	FULL MOTILITY	1.0-1.9	2.0-2.9	3.0-3.9	4.0
Lateral wall	45.03	20.63	20.63	22.22	3.17
Medial wall	48.84	20.93	18.60	6.98	4.65
Floor	33.33	16.67	35.42	8.33	4.17
Roof	47.62	9.52	19.48	21.43	2.38

Table 8: Distribution according to treatment

TREATMENT	COUNT	PERCENT
Conservative	107	89.17
Surgery	13	10.83

Statistical Analysis

There was a statistically significant association between the age of the patient and the type of trauma sustained with the Pearson's Chi-square test.

Table 9: Results of Pearson's Chi Square Test of Association Between Age and Trauma_Type

P value: 0.01602, Pearson's Chi Square statistics : 24.756 ,Degrees of Freedom (df): 12

		Trauma_Type											
		1.0		2.0		3.0		4.0		5.0		TOTAL	
		Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp
Age	1.0	3	6.1	6	2.9	1	1.2	0	0.5	1	0.3	11	11.0
	2.0	38	34.1	15	16.3	5	6.6	1	2.5	2	1.5	61	61.0
	3.0	21	20.1	9	9.6	5	3.9	1	1.5	0	0.9	36	36.0
	4.0	5	6.7	2	3.2	2	1.3	3	0.5	0	0.3	12	12.0
	TOTAL	67	67.0	32	32.0	13.0	13.0	5	5.0	3	3.0	120	120.0

Table 10: Cross tabulation for Age v/s Trauma type

Count of Age	Trauma Type					
Age	RTA/MVA	Fall/ accidental	Assault	Occupational	Sports	Grand Total
<16 years	3	6	1		1	11
16-35 years	38	15	5	1	2	61
36-60 years	21	9	5	1		36
>60 years	5	2	2	3		12
TOTAL	67	32	13	5	3	120

There was a statistically significant association between presence of orbital floor fracture and entrapment of extraocular muscle/ soft tissue with the Pearson's Chi-square test.

Table 11: Results of Pearson's Chi Square Test of Association Between Floor and Soft Tissue/EOM Entrapment

		Soft_Tissue/EOM_Entrapment					
		0.0		1.0		TOTAL	
		Obs	Exp	Obs	Exp	Obs	Exp
Floor	0.0	70	64.2	2	7.8	72	72.0
	1.0	37	42.8	11	5.2	48	48.0
	TOTAL	107	107.0	13	13.0	120	120.0

Table 12: Cross tabulation for Floor fracture v/s EOM / soft tissue entrapment

Count of floor	soft tissue/EOM entrapment		
Floor	absent	present	Grand Total
normal	70	2	72
fractured	37	11	48
TOTAL	107	13	120

There was a statistically significant association between presence of diplopia and extraocular muscle / soft tissue entrapment with the Pearson's Chi-square test.

Table 13: Results of Pearson's Chi Square Test of Association between Diplopia and Soft_Tissue/EOM Entrapment

		Soft_Tissue/EOM_Entrapment					
		0.0		1.0		TOTAL	
		Obs	Exp	Obs	Exp	Obs	Exp
Diplopia	1.0	101	96.3	7	11.7	108	108.0
	2.0	5	7.1	3	0.9	8	8.0
	3.0	1	3.6	3	0.4	4	4.0
	TOTAL	107	107.0	13	13.0	120	120.0

Table 14: Cross tabulation for Diplopia v/s EOM/ soft tissue entrapment

Count of Diplopia	Soft tissue/EOM entrapment		
Diplopia	absent	present	Grand Total
Absent	101	7	108
In primary gaze	5	3	8
In extreme gaze	1	3	4
TOTAL	107	13	120

Discussion

A comprehensive understanding of orbital fractures is necessary for the treating physician due to the functional and aesthetic deformities that often result. Studies have estimated that orbital fractures account for roughly 10 to 25% of all cases of facial fractures,[12,13,14] and, similar to all facial trauma, are most commonly seen in conjunction with assaults and motor vehicle accidents (MVAs).

Clinical and epidemiological ocular trauma studies have been described in the United

States[15,16] and other developed countries[17]. Information on its epidemiology from developing countries is also available, but the burden and pattern of injuries in developing countries are poorly known and not well studied. India still lacks complete eye injury statistics and authoritative epidemiological data.

Our study revealed a predominance of male patients with facial fractures corresponding to 88.33%, compatible with the literature including Palma et al, 78%, Falcon et al [18], 84%, and Macedo et al, 72.8%. This higher incidence in males may be linked to cultural and social factors, considering that the males represent most of the economically active population, exhibit more abuse of alcohol and drugs, practice more contact sports, are involved in the majority in traffic, and thus are more exposed to the factors responsible for facial injuries.

Our study revealed the most common age group to be affected as 16-35 years old (58.33%) Most authors agree that by far the most commonly affected age group is the 20-40 years. In a retrospective analysis of 132 patients with orbital fracture[19], the most affected age group was the 31-40-year-old age range (24.2%), followed by the age groups of 21-30 years (22%) and 11-20 years (22%). The age group also is in agreement with the findings of other authors such as Silva et al [20]. The age group of 21–30 years in their study corresponds to 36.2% of cases. This is because young people are more prone to violence and psycho-socio economic urban conflicts. It is understandable that violence occurs more among young people by their restlessness and risk taking behaviours, including traffic risks influenced by extremely fast behavioural and moral changes.

The commonest causes of facial fractures are motor vehicle crashes (MVCs), assaults, falls and sports injuries[21]. In a Swedish retrospective study investigating the injuries before the introduction of the seatbelt law in 1975, the main cause of zygomatico-orbital injuries was MVCs. In our study too, road traffic accidents accounted for 55.83% followed by fall (26.67%), assault (10.83%), occupational (4.17%) and sports related (2.5%).

Our study showed that 51.67% patients with orbital fracture had ocular motility disturbance. The most common restriction was of supra-duction, seen in 35.83% of the patients studied. According to the studies on the ocular motility disturbance in orbital fracture, Converse et al. [22] reported that 80% of orbital fracture patients had an ocular motility disturbance. Greenwood et al.[23] reported that 98% of orbital fracture patients had extra-ocular disability and 89% had diplopia. In addition, Kim and Won[24] reported that 100% of orbital fracture patients showed an ocular motility disturbance, 45% of whom suffered from supra-duction disturbance, 38% of whom suffered from supra-duction and abduction disturbance, and 17% of whom suffered from abduction disturbance.

In our study, review of radiology films revealed that lateral orbital wall fracture was the commonest, seen in 53% of the patients. This was followed by orbital floor fracture, seen in 40% of the patients.

In a study by Manana (Nairobi), orbital floor fracture was the commonest (75%) followed by lateral wall fracture (71%). From their study, Jank et al. (2003)[25] showed that the floor was by far the commonest site of orbital wall fractures. In a study by Sang Hun Lee et al (2005)[26] , according to the CT result, 15 patients (33%) had a fractured orbital wall in the medial position, 18 patients (40%) in the inferior, 11 patients (24%) in the medial and inferior position, and 1 patient (2%) in the inferior and lateral position . In another study Cağatay et al.[19] (2011) found that the commonest combination was that of the floor and the lateral wall (37.5%).

Lateral wall fracture was seen more commonly in our study probably because the mechanism of injury differed in these cases, most commonly being due to RTA with fall from a bike in which the impact might be on the lateral aspect of the orbit. In most of the other studies referenced the injury was due to interpersonal violence with blunt force being sustained from the front.

Conclusion

Orbital fracture is a common injury in orbital trauma. It is important to carry out a detailed clinical and radiological examination of each patient with orbital trauma for timely and appropriate intervention. It was concluded that patients of orbital fracture were mostly males, aged 16-35 years, victims of road traffic/motor vehicle accidents with most commonly fractured orbital wall being lateral wall. Most of the patients were managed conservatively. There was a statistically significant association between the age of the patient and the type of trauma sustained and also, between presence of orbital floor fracture and entrapment of extra-ocular muscle/ soft tissue. There was a statistically significant association between presence of diplopia and extra-ocular muscle / soft tissue entrapment with the Pearson's Chi-square test.

An understanding of the epidemiological factors in orbital trauma is paramount for planning preventive strategies. Adoption of personal and public strategies to create road safety awareness may prevent or reduce the incidence.

References

1. Jatania H. Spectrum of ocular changes after zygomatico-maxillary-complex and Orbital Fractures. Dissertation MDS Oral and Maxillofacial surgery, Rajiv Gandhi University of Health Science, Bengaluru, 2012 pp 1-4, 30-54.
2. Bains RA, Rubin PA. Blunt orbital trauma. Int Ophthalmol Clin. 1995;35:37–46.
3. Smith B, Regan WF., Jr Blow-out fracture of the orbit; mechanism and correction of internal orbital fracture. Am J Ophthalmol. 1957;44:733–739.
4. Long J, Tann T. Orbital Trauma. Opthalmology Clinics of North America. 2002; 15:253.
5. Girotto J A, Mackenzie E, Fowler C, Redett R, Robertson B, Manson P N. Long-term physical impairment and functional outcomes after complex facial fractures. Plast Reconstr Surg. 2001; 108(2):312–27.
6. Putterman AM, Stevens T, Urist MJ. Nonsurgical management of blow-out fractures of the orbital floor.Am J Ophthalmol. 1974;77:232–239.
7. Wilkins RB, Havins WE. Current treatment of blow-out fractures. Ophthalmology. 1982;89:464–466.
8. Dortzbach RK, Elner VM. Which orbital floor blowout fractures need surgery? Adv Ophthalmic Plast Reconstr Surg. 1987; 6:287–289.
9. Nathanson A, Matthis SP, Tengvar M. Diagnosis and treatment of fractures of the orbital floor. A ten-year retrospective study. Acta Otolaryngol Suppl. 1992; 492:28–32.
10. Hawes MJ, Dortzbach RK. Surgery on orbital floor fractures. Influence of time of repair and fracture size. Ophthalmology. 1983;90:1066–1070.
11. Rowe, F. J. Diagrammatic Recording of Ocular Motility, in Clinical Orthoptics edition 2012 , John Wiley & Sons, Ltd., West Sussex, UK: p 424-425
12. Erdmann D, Follmar K E, Debruijn M, et al. A retrospective analysis of facial fracture etiologies. Ann Plast Surg. 2008; 60:398–403.
13. Scherer M, Sullivan W G, Smith D J, Jr, Phillips L G, Robson M C. An analysis of 1,423 facial fractures in 788 patients at an urban trauma center. J Trauma. 1989;29: 388–390.
14. Kelley P, Crawford M, Higuera S, Hollier L H. Two hundred ninety-four consecutive facial fractures in an urban trauma center: lessons learned. Plast Reconstr Surg. 2005; 116:42e–49e.
15. American Academy of Ophthalmology and American Society of Ocular Trauma, Eye Injuries: Recent Data and Trends in the United States Available

at: http://www.aao.org/newsroom/guide/upload/Eye-Injuries-BkgrnderLongVersFinal-l.pdfAccessed 2008 July.

16. Tielsch JM, Parver L, Shankar B (1989) Time trends in the incidence of hospitalized ocular trauma. Arch Ophthalmol 107: 519–523 .
17. Raymond S, Jenkins M, Favilla I, Rajeswaran D (2010) Hospital-admitted eye injury in Victoria, Australia. Clinical and Experimental Ophthalmology 38: 566–571.
18. Falcão M FL, Segundo A VL, Silveira M MF. Estudo epidemiológico de 1758 fraturas faciais tratadas no Hospital da Restauração, Recife/PE. Rev Bras Cir Traumatol Buco-Maxilo-Fac.2005;5 (3):65–72.
19. Çağatay HH, Ekinci M, Pamukcu C, Oba ME, Özcan AA, Karşıdağ S, Retrospective analysis of 132 patients with orbital fracture. Ulus Travma Acil Cerr Derg 2013; 19:5.
20. Silva J JL, Lima A AAS, Torres S M. Fraturas de face: análise de 105 casos. Rev Soc Bras Cir Craniomaxilofac. 2007;10 (2):41–50.
21. Baumann A, Burggasser G, Gauss N et al. Orbital floor reconstruction with an alloplastic resorbable polydioxanone sheet. Intenational Journal of Oral and Maxillofacial Surgery 2002; 31:367-373.
22. Converse JM, Smith B, Obear MF, Wood-Smith D. Orbital blow-out fractures: a ten-year survey. Plast Reconstr Surg. 1967; 39:20–36.
23. Greenwald HS, Jr, Keeney AH, Shannon GM. A review of 128 patients with orbital fractures. Am J Ophthalmol. 1974;78:655–664.
24. Kim YI, Won IG. The Clinical Findings in 24 cases of orbital blow-out fracture. J Korean Ophthalmol Soc. 1993;34:1–6.
25. Siegfried J, Barbara S, Ru¨diger E, Heinrich S, Julius K, Alessandro N, Burghard N, Innsbruck. Clinical signs of orbital wall fractures as a function of anatomic location. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontics 2003; 96:149-153.
26. Sang Hun Lee et al. Ocular Motility Disturbances in Orbital Wall Fracture Patients. Yonsei Med J. 2005 Jun 30; 46(3): 359–367.