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FRACTURES OF THE MIDFACE: ETIOLOGY, INCIDENCE AND ASSOCIATED OCULAR INJURIES

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ABSTRACT

Objective: The aim of this study is to analyse different patterns of the midfacial fractures along with their etiology, incidence and associated ocular injuries.

Methodology: A retrospective study was conducted to include 60 patients with maxillofacial fractures who reported to Santosh Medical College and hospital, Ghaziabad in the past 1 year (2021-2022). Out of this 60 patients, 31 patients presented with midface fractures. Isolated nasal bone, zygomatic arch and mandibular fractures were excluded from the study. Detailed clinical examination with focus on extraocular and intraocular injuries was performed. Patients' demographic details, fracture etiology and periocular signs and symptoms were recorded to be analysed for the study.

Results: Out of the 31 patients who presented with midface fractures, majority were in second decade to fourth decade of life. 26 were males and 5 were females, with the median age of 26.4 yrs. RTA (road traffic accident) was the most common cause of injury. Majority of extraocular injuries which the patients presented with were periorbital edema (80%) and subconjunctival haemorrhage (70%). Zygomaticomaxillary complex fracture (58%) was most common fracture followed by isolated orbital fracture (16%) and Le fort II fracture (12%).

Conclusion: Maxillofacial trauma is commonly associated with Le Fort fractures, zygomaticomaxillary fractures and orbital fractures which may lead to grave ophthalmic injuries, and sometimes blindness. The need for detailed clinical examination including ophthalmologic consult is recommended for identification of ocular injuries so that active interventions can be immediately performed if necessary.

Keywords : Maxillofacial Injuries, Midface Fractures, Ocular Injuries

INTRODUCTION:

Maxillofacial surgeons are often the first to examine patients presenting with ocular injuries associated with maxillofacial fractures. Failure to diagnose these injuries may lead to disasterous consequences with varying degree of visual impairment. Proper and timely

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examination of the signs and symptoms which are predictive of these injuries can help expedite the ophthalmologic consult thus leading to timely interventions and preventing morbid ocular complications. Identification of ocular injuries is also prudent if the patient requires exploration and reconstruction of the orbit depending on the severity of the trauma. The decision of urgency for definitive ophthalmologic examination in midfacial fracture involving the periorbital region remains a challenge for the maxillofacial surgeons. [1]

Zygomaticomaxillary complex are the most common midface fractures and account for around 27% of all facial fractures. Road traffic accidents, assaults, falls, and sporting incidents are generally reported to be etiologic factors for these fractures.[2] Injuries to the zygomaticomaxillary complex generally affect the integrity of the orbital skeleton, and are frequently complicated by injury to the eyeball, which ranges between 2.7% and 90.6% in reported series.[3-8]

Maxillofacial surgeons often deal patients with orbital fractures associated with potential underlying intraocular and extraocular injuries. Presence of periorbital edema, associated neurological injuries, or patient noncompliance can hinder a definitive ophthalmic examination. Ocular injuries associated with orbitozygomatic fractures have potential sight-threatening consequences such as blindness, which need an urgent ophthalmology review so as to necessitate early intervention. Ocular injuries are easily detected by the referring emergency room physician or the examining maxillofacial surgeons, but subtle form of injuries may not be recognized by an inexperienced clinician.[8]

Pressure on the eye due to untreated orbital fractures can worsen the prognosis of the globe. Recognition of ocular injuries before any surgical intervention is important for medicolegal scenario, so as to acertain that the late surgical intervention of the fractures was not the cause of any permanent visual disturbance.[3] The main objective of this article is to analyse the incidence, etiology, and pattern of midfacial fractures and their associated ocular injuries in regional trauma centre in Ghaziabad.

MATERIALS AND METHOD:

A retrospective study was conducted on patients who reported with maxillofacial injuries to Santosh Medical College and hospital, Ghaziabad in the last 1 year (2021-2022). A total of 60 patients with maxillofacial injuries were screened and 31 patients who had sustained fractures of the middle third of the face involving the periorbital region were included in the study from the pool of patients. Detailed ophthalmologic examination was performed in conjunction with the ophthalmologists. The demographic information of the patients, etiology of injury, type of midface fracture (Table 1) and associated ocular injuries; extraocular and intraocular (Table 2) were recorded and analysed so as to collate the ocular findings with maxillofacial injuries.

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RESULT:

The gender distribution in this study for the subset of population with midface injury was 26 (83%) males and 5 females (17%) with the mean age of 26.4 years, majority being in the second to fourth decade of life. The most common etiological factor was RTA (83%) followed by fall (9%). The most common pattern of midface fracture was observed to be ZMC (58%) followed by isolated orbital (16%), Le Fort II (12%), Le Fort I (9%) and Le Fort III (6%) fractures.

As depicted in Table 2, the most common extraocular findings recorded were presence of periorbital edema with ecchymosis (80%) and subconjunctival haemorrhage (70%). 2 cases (6%) presented with restriction of ocular movement and enophthalmos was observed in 6 of our cases (19%). Lid laceration with tissue loss was seen in three patients for whom extensive oculoplastic procedure was planned. One patient reported with hyphema and retinal detachment contributing to vision loss and loss of pupillary reflex.

DISCUSSION:

Wide variation exists in the frequency of ocular injuries in patients presenting with fractures of the midfacial skeleton with reported incidence range of 2.7- 90.6 %.[3-8] Various studies have highlighted the epidemiological differences pertaining to causative factor, type and site of injury and patient characteristics. A brief review of literature on ocular injuries by different authors have been summarized and tabulated separately as minor ocular injuries and major ocular injuries in Table 3 and Table 4.

Higher incidence of maxillofacial injuries in male counterparts as compared to females is a finding which has been documented in previous studies. The male female ratio was also observed to be higher in our study. The same has been reported by Cavalcanti et al,[9] Cheema and Amin,[10] and Ugboko et al[11] which has been in concurrence with other studies from India. Our study reveal that the incidence of maxillofacial injuries occurred more in second to fourth decade of life with the mean age of 26.4 years. Similar results have been reported by Septa et al [12] and various other surveys in the literature.

Injuries may range in severity from minor such as subconjunctival haemorrhage to major including ruptured globe and retinal haemorrhage. The most common reason for ocular injury in our series of patients was RTA (road traffic accident), which were primarily because of the lack of use of seatbelts in case of four wheelers and helmets, in case of two wheelers. Jamal et al[3] recorded assault as the common cause of injury (56%) followed by fall and motor vehicle accidents (16%).[3] Our study supports the observations from the previous studies reporting RTA to be around 64% of all etiological factors. [12] This high frequency in the presence of stringent traffic rules and regulations can be attributed to unsuitable road conditions, violation of safety norms and codes with alcohol abuse. In our study, 15 patients

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were under the influence of alcohol at the time of incident. Similar observations were observed by Septi et al [12] who reported 33.5 % of patience under influence of alcohol.

Comminuted ZMC fractures are reported to have a higher incidence of visual sequelae (41%) as compared to other forms of midface injuries (15%).[4] In our case series, the incidence of zygomaticomaxillary complex fracture was also significantly higher (58%) as compared to other forms of midfacial fractures. Isolated orbital fractures occurred in 19% of cases.

The most common ocular injuries reported in our study were periorbital edema (80%) and subconjunctival haemorrhage (70%). This has compared similarly by the previous studies by Al Qurainy et al [4]. 83.5% of cases in a study by Septa et al has reported subconjunctival haemorrhage, 15 % enophthalmos and diplopia in 11.5 % cases.

Al Qurainy et al[4] in their study reported 19.8% of patients with midfacial fractures and diplopia, resolution of visual symptoms occurred within 6 months of injury with early surgical repair.[4] In our case series, diplopia occured in four of the cases which resolved after the periorbital edema subsided.

Loss of vision complicating midfacial fractures have been reported to occur in 0.3 to 3.5% cases in the literature.[3] This is caused by direct injuries to the globe, optic nerve or the visual pathway. Retrobulbar hematoma is an etiologic factor for blindness, which can occur in 10 to 15% of the midface fractures. Wood and Petro et al [13] also confirmed that ZMC fractures were the most common forms of injury complicated by blindness.[9] Blindness in one of our cases was associated with Le Fort III fracture and other anterior cranial fossa fracture. However, we recommend a thorough clinical examination of the periorbital and intraocular zones with an ophthalmologic consult (preferably preoperatively) in all patients with ZMC fractures on priority basis.

CONCLUSION:

Maxillofacial trauma is commonly associated with Le Fort fractures, zygomaticomaxillary fractures and orbital fractures may lead to grave ophthalmic injuries and sometimes blindness. Ocular injuries of various spectrum were recorded in this study, which are most commonly seen in different types of midface fractures, and ZMC fracture being the most common one. All the patients who have sustained maxillofacial trauma should be examined thoroughly for identification of ocular injuries so that active interventions can be immediately performed.

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Table 1: DEMOGRAPHIC DETAILS, MECHANISM OF INJURY AND TYPE OF MIDFACE FRACTURE.

S NO.	AGE	SEX	MECHANISM OF INJURY	TYPE OF MIDFACE FRACTURE
1.	21	M	RTA	Infraorbital rim
2.	22	M	RTA	ZMC
3.	45	F	RTA	Orbital floor fracture (pure blowout)
4.	35	M	RTA	ZMC
5.	24	M	RTA	ZMC
6.	27	M	RTA	Orbital floor fracture (impure blowout)
7.	40	F	RTA	ZMC
8.	40	M	Assault	Orbital floor fracture (impure blowout)
9.	22	M	RTA	Infraorbital rim
10.	22	M	RTA	Le Fort II #
11.	36	M	RTA	ZMC
12.	38	M	RTA	Le Fort II #, Orbital floor fracture (impure blowout)
13.	26	M	RTA	ZMC
14.	45	F	RTA	ZMC
15.	42	F	RTA	ZMC
16.	30	M	RTA	ZMC
17.	28	M	RTA	Le Fort I #
18.	24	M	RTA	Le Fort II #
19.	54	M	RTA	ZMC
20.	38	M	RTA	Infraorbital #
21.	32	M	RTA	ZMC
22.	35	M	RTA	Panfacial # (B/L ZMC, Le Fort II and Le Fort III)
23.	35	M	Fall	Frontal bone #, ZMC
24.	45	M	Fall	ZMC
25.	26	M	RTA	ZMC
26.	21	M	RTA	ZMC
27.	26	M	Fall	Le Fort I
28.	68	F	RTA	Le Fort I
29.	28	M	RTA	ZMC
30	47	M	RTA	ZMC
31.	38	M	RTA	Le Fort III, Anterior cranial fossa #

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*ZMC- Zygomaticomaxillary complex, B/L- Bilateral, RTA – road traffic accident, M- male, F- female

Table 2: OCULAR INJURIES:

Type of lesion	Clinical presentations	Number of patients (%)
Extraocular	Periorbital ecchymosis	80
	Subconjunctival hemorrhage	70
	Chemosis	32
	Ptosis	12
	Restriction of extra ocular movements (ophthalmoplegia)	6
	Enopthalmos	19.3
	Exopthalmos	0
	Infra orbital nerve paresthesia	35
	Diplopia	12
	Medial Canthal detachment	6.4
	Lacerations of eyelid	22
Intraocular	Optic nerve compression	0
	Retrobulbar hemmorhage	0
	Retinal detachment	3.2
	Hyphema	3.2

Table 3: % of patients with minor ocular injuries in midface fractures

Authors (year)	Ecchymosis (%)	Subconjunctival haemorrhage (%)	Corneal Abrasion (%)	Eyelid Laceration (%)	Micro Hyphema (%)	Commotio Retinae (%)	Exophthalmos (%)	Iris Sphincter Trauma or iridodialysis (%)	Enophthalmos (%)	Corneal foreign body (%)
Al-Qurainy et al (1991)[4]	-	69.4	0	2.8	-	1.1	-	0	8	-
Jamal et al	-	55	1	-	3	3	-	2	-	-

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(2009)[3]										
Rajkumar et al (2015)[10]	-	-	-	-	-	-	5	-	9.2	-
Chow J et al (2018) [1]	85	68	15	15	12	9	7	5	3	1
Johnson et al (2018)[2]	-	42	2.2	-	-	5.6	6.8	-	7.9	-
Dalband et al (2021)[11]	35	29.8	-	-	-	-	-	-	-	-

Table 4: % of patients with major ocular injuries in midface fractures

Authors	Retinal hemorrhage	Retrobulbar hemorrhage	Vitreous hemorrhage	Hyphema	Traumatic optic neuropathy	Vitreous detachment	Lens subluxation or dislocation	Choroidal effusion or hemorrhage	Retinal detachment	Retinal tear	Ruptured globe
Al-Qurainy et al (1991)[4]	-	1.5	-	1.4	2.5	2.5	-	1.1	-	-	-
Jamal et al (2009)[3]	4	-	-	2	-	-	-	-	2	-	2
Rajkumar et al (2015)[10]	-	1.6	-	-	-	-	-	-	0.8	-	-
Chow et al (2018)[1]	9	9	7	7	7	5	5	4	1	1	1

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Johnson et al (2018) [2]	-	0	0	1.1	1.1	-	-	0	0	-	0
Dalband et al (2021) [11]	-	-	-	-	7.6	-	-	-	-	-	2.8