

OCULAR INJURIES IN MID-FACIAL FRACTURES: A RETROSPECTIVE STUDY

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ABSTRACT

Purpose: Mid-face injuries are usually accompanied with loss of integrity of the orbital skeleton along with the subsequent affection of the visual apparatus. This study aimed to highlight the incidence of different eye injuries associated with mid-facial fractures and to accentuate the need of the maxillofacial surgeon to comprehend and approach the post-traumatic ophthalmic consequences.

Patients and methods: A total of twenty five patients suffering from mid-facial fractures and orbital involvement were included in this study from the departments of oral and maxillofacial surgery, faculties of Dentistry, Cairo University and MSA University. They were 22 males and 3 females with a mean age of 37 years. All the patients were subjected to immediate clinical and radiographic examination to evaluate the extent of the injury and its implications. An ophthalmologist was asked to further assess the eye apparatus to determine the exact ophthalmic complications. The collected clinical, radiographic and ophthalmic findings were recorded and analyzed.

Results: A dominating etiology of Road Traffic Accidents was found (64%) with a significant male predominance (88%). Mid-face trauma in the form of ZMC fracture was acquainted as the most common reason for ophthalmic problems (36%) followed by the direct orbital blow-out fractures (20%). A wide range of ophthalmic complications were recorded. Sub-conjunctival hemorrhage (92%) was the most common to occur followed by peri-orbital edema (84%) and lid ecchymosis and laceration (76%). A clinical complaint from sensory infra-orbital nerve paresthesia was documented (72%). Diplopia (48%) and Enophthalmus (24%) were encountered as the most severe types of complications with other non-significant occurrence of reduced vision (8%), retinal detachment (4%), corneal problems (8%) and traumatic hyphema (8%).

Conclusion: We concluded that it is a must to extend the maxillofacial surgeon's knowledge to include post-traumatic ocular injuries and their ophthalmic complications to complement an optimal patients' treatment outcome and to prevent disastrous ophthalmic repercussions following mid-face injuries.

KEYWORDS: Mid-face Fracture, ocular injuries, ophthalmic complications.

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INTRODUCTION

Orbital fracture usually occurs in patients presented with mid-facial trauma. Mid-face injuries responsible for ocular complications mainly included zygomatico-maxillary complex fractures, Le Forte II and III fractures and pure blow out fractures of the orbit⁽¹⁻²⁾.

The eye apparatus responsible for a vital role; vision, is naturally protected by the hard bony orbital rim and the soft orbital fat and muscles⁽³⁾. Despite this dual protection system, mid-face injuries accommodate for 68-95% ocular injuries with associated ophthalmic complications accounting for 19 million blind or reduced vision people worldwide⁽⁴⁾.

Several ocular injuries were reported in the literature⁽⁵⁻⁶⁾. Ophthalmic complications ranged from clearly apparent to the surgeon to hidden potentially dangerous complications which need meticulous examination. Thus, improper assessment may compromise the patient's vision with its consequent medico-legal repercussions.

These injuries may vary from mild sub-conjunctival hemorrhage to major globe rupture and loss of vision. This depends mainly on the type, site and magnitude of the incoming trauma. Although blindness is uncommon, it has been documented in the literature^(5,7).

Authors stated that repairing the fractures by surgery before the ophthalmic correction might further damage the visual outcome. Hence, thorough assessment and correction of the eye is mandatory before and after the surgical correction of the fracture⁽⁸⁾.

In this study, in an attempt to reach a more efficient management of the mid-face trauma and to prevent disastrous ophthalmic complications, ophthalmologists were integrated in the team in the process to diagnose missed post-traumatic complications.

PATIENTS AND METHODS

Twenty five patients were incorporated in this study from the departments of oral and maxillofacial surgery, Faculties of Dentistry, Cairo University and MSA University. They all had a displaced mid-facial fracture with orbital skeleton involvement which required surgical interference. An ethical clearance and a written consent were obtained from each patient.

Exclusion criteria:

- History of a pre-existing ophthalmic diseases or ocular disorders as glaucoma or retinal disorders.
- Infection and/or systemic diseases as Diabetes Mellitus.

Preoperative assessment:

History, Gender and cause of the trauma were recorded. The patients had a mean age of 37 years.

Immediate clinical examination was performed to evaluate the extent of the injury and its implications. The evaluation for ocular injuries included testing the ocular motility, papillary reaction to light and assessment of the sensory infra-orbital nerve.

The eye was further examined by an ophthalmologist to look for additional ophthalmic complications. Various tests were performed including the Snellen chart test for Visual acuity. Advanced diagnostic tests were applied as Retinoscopy, fundoscopy, fluorescent staining, slit lamp examination, Schiötz tonometer, and Hertel exophthalmometer. The findings of the maxillofacial surgeon and the ophthalmologist were documented.

Preoperative CT images were requested to identify the exact fracture sites and their effects on the eye. The collected clinical, radiographic and ophthalmic findings were recorded and analyzed.

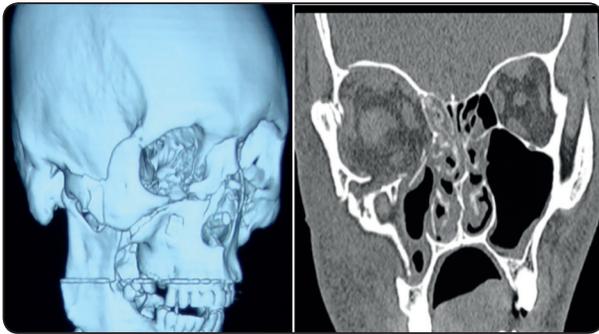


Fig. (1) CT images showing mid-face fractures associated with orbital fracture.

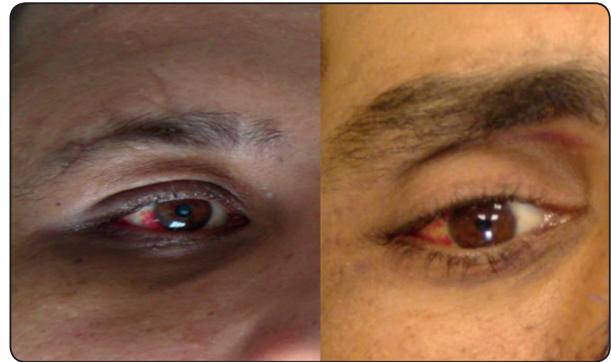


Fig. (2) Photographs showing sub-conjunctival hemorrhage.

RESULTS

A dominating etiology of Road Traffic Accidents (RTA) (64%) was found. Nine cases only (36%) were due to inter-personal violence. A male predominance of 88% (22 cases) was documented in opposition to only 3 female cases (12%).

Various types of mid-facial trauma were reported with the disruption of the ocular skeleton affecting the eye apparatus. ZMC fracture was acquainted for the most common reason for ophthalmic problems (36%). This was followed by the direct orbital blow-out fractures (20%). Fracture of the orbital rim (4%), Le Fort fractures (12%) and combination of the previously mentioned fractures (28%) were also found. (Table 1)

TABLE (1) presenting the incidence of mid-face fracture type.

	<i>Type</i>	<i>Number</i>	<i>Percentage</i>
1	ZMC fractures	9	36%
2	Pure blow out orbital fractures	5	20%
3	Fracture of the orbital rim	1	4%
4	Le Fort fractures	3	12%
5	Combination	7	28%



Fig. (3) Photographs showing lid edema and peri-orbital hematoma.

Blunt injuries of the globe were found in most of the cases (96%). Only one patient was presented with a penetrating globe injury (4%).

Various ophthalmic complications were recorded. Sub-conjunctival hemorrhage (92%) was the most common to occur. While peri-orbital edema or hematoma (84%), lid ecchymosis and laceration (76%) appeared to be the next common findings in most of the patients.

Eighteen patients (72%) complained from sensory infra-orbital nerve paresthesia. This was confirmed clinically with the two-point discrimination test.

Diplopia (48%) and Enophthalmus (24%) were encountered as the most severe types of complications. (Fig 4)



Fig. (4) Photographs showing Enophthalmus.

Other complications as reduced vision (8%), retinal detachment (4%), corneal problems (8%) and traumatic hyphema (8%) appeared non-significant in this study.

Along the entire study, the ophthalmologist further diagnosed minor complications missed by our (maxillofacial surgeon's) examination in eight cases (32%). These included corneal abrasion, lens subluxation and retinal detachment.(Table 2) (Fig 5)

TABLE (2) presenting the detected types of ocular injuries.

1	Blunt injury	9	Pain on ocular movements
2	Penetrating injury	10	Diplopia
3	Sub-conjunctival hemorrhage	11	Enophthalmus
4	Peri-orbital edema or hematoma	12	Retinal detachment
5	Lid ecchymosis or laceration	13	Traumatic hyphema
6	Infra-orbital nerve paresthesia	14	Reduced vision
7	Corneal abrasion or edema	15	Retro-bulbar hemorrhage
8	Proptosis	16	Vitreous hemorrhage

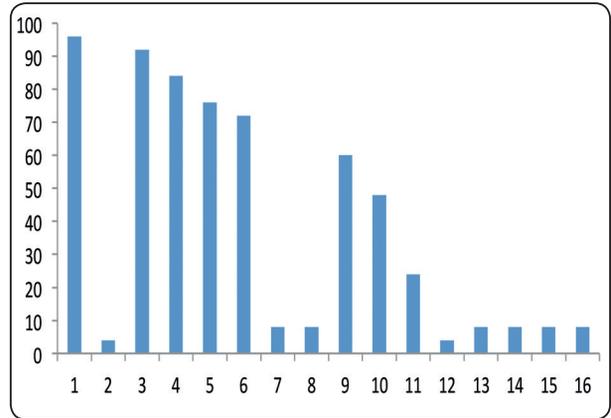


Fig. (5) A bar chart showing the incidence of ocular injuries in percentage.

DISCUSSION

Many studies were performed in attempt to link mid-face trauma to ocular injuries and their subsequent ophthalmic complications.

Different occurring statistics were recorded due to the non-standardized minor and major ophthalmic complications incorporated in the literature.

In this study, similar to *Magarakis*⁽⁶⁾, ZMC fractures were responsible for most of the ophthalmic problems (36%) followed by the direct orbital blow-out fractures (20%).

A male predominance of 88% was found with a high incidence cause of Road Traffic Accidents (64%). This came in accordance with *Patil et al*⁽³⁾ and *nabeela et al*⁽⁹⁾, which was normal considering the fact that a higher number of males are driving the vehicles than females. The second highest recognized cause was the inter-personal violence (36%); comparable to what was declared by *Roccia et al*⁽¹⁰⁾.

Various ophthalmic complications have been reported to occur due to ocular injuries associated with mid-face fractures, hence the lack of uniform classification in the literature.

However, authors agreed upon the necessity for rapid clinical assessment and interference to avoid further damage and visual compromise^(7,11).

The results of this study stated that sub-conjunctival hemorrhage was the most common occurring ophthalmic problem (92%) which was similar to *Mittal et al*⁽¹²⁾ and *Wilson*⁽¹³⁾ who agreed on its spontaneous resolution without any interference.

A high incidence of peri-orbital edema or hematoma (84%) and lid ecchymosis and laceration (76%) was recorded, comparable to all studies, which was normal to find due to the loose connective tissue around the eye. They are the first signs of trauma which in turn made the clinical examination difficult^(3,11).

Eighteen patients (72%) complained from sensory paresthesia of the infra-orbital nerve. This was due to the impingement of the displaced fractured segments on the supplying nerves.

Major complications as Diplopia (48%) and Enophthalmos (24%) were encountered in this study.

Diplopia due to edema resolved spontaneously within 7-10 days. However, Diplopia persistence due to ocular muscle entrapment or suspensory ligament attachment displacement varied according to the presented type and location of orbital fracture, and so, needed surgical interference and correction⁽¹⁴⁻¹⁵⁾.

On the other hand, Enophthalmos was due to the increase of the skeletal orbital volume after fracture. Hence, after resolution of the edema and hematoma, *Whitehouse et al*⁽¹⁶⁾ stated that every 1 cm increase of the skeletal orbital volume encountered 0.8 mm Enophthalmos.

In this study, non-significant number of other complications as reduced vision (8%), retinal detachment (4%), corneal problems (8%) and traumatic hyphema (8%) were recorded. This was analogous to *Rajkumar et al*⁽⁴⁾ and *Foroughi et al*⁽⁷⁾ who, nevertheless, stressed on the importance to address them and the morbidity of neglecting such complications.

Some ophthalmic injuries (32%) could have left undetected if not for the ophthalmologist's

experience and specialized equipment. Unfortunately, the maxillofacial surgeons' knowledge nowadays does not level up to explore hidden ophthalmic complications as an ophthalmologist. Hence, the integration of an ophthalmologist in the mid-face trauma team is mandatory.

CONCLUSION AND SIGNIFICANCE

This study delineated the need to extend the maxillofacial surgeon's comprehension of ophthalmic injuries in mid-face trauma patients to complement an optimal patients' treatment.

Such knowledge render the maxillofacial surgeon the experience in preventing missed ophthalmic complications and deciding the optimum timing for surgical intervention as some ocular injuries are time-sensitive.

Detailed preoperative ophthalmic tests' results should be documented for comparison of pre and post-surgical visual status for medico-legal concern.

Further studies concerning the relation between specific ocular complications to specific trauma pattern is recommended.

Most of the complications were fracture-dependent which resolved after surgical interference. The need to correlate pre and post surgical ophthalmic findings is evident.

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