

Original Article

Pattern of Ocular Involvement in Midface Injuries Seen at a Tertiary Care Hospital in Northern Nigeria

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INTRODUCTION

Trauma is an important and common cause of mortality and morbidity worldwide. Trauma to the oral and maxillofacial structures constitutes a management challenge due to its complex anatomy, relationship to specialized organs, and the threat to life. There are considerable variations in the etiology and

ABSTRACT

Aim: The aim of the study was to report the etiology, pattern, and spectrum of ocular injuries in patients with maxillofacial injuries seen at a tertiary care hospital in northern Nigeria. **Patients and Methods:** This is a retrospective evaluation of the etiology, spectrum, and treatment of ocular injuries seen in patients with midfacial fractures, who presented at Ahmadu Bello University Teaching Hospital, Shika-Zaria, Nigeria, a tertiary care hospital in northern Nigeria. Cases were seen at the oral and maxillofacial clinic for those presenting with midfacial fractures, whereas those presenting with ocular injuries due to midfacial injuries were referred from the ophthalmology department. Data were collected on their demographics, etiology of injuries, body part(s) involved, and treatment. **Results:** A total of 256 patients had midfacial injuries during the period, of which 219 patients had 357 associated ocular injuries. The age range was between 3 and 76 years. There were more males (83.8%) than females (16.2%), giving a male-to-female ratio of 5.2:1; the 21–30 years' age bracket was most frequently affected (38.4%). The predominant etiology of injuries was road traffic accidents (RTAs) (90.1%), followed by assault (4.9%). Zygomatic complex fractures (38.6%) and orbital wall fractures (24.7%) were the common midfacial injuries. There were 357 ocular injuries, giving a patient: injury ratio of 1:1.6, with subconjunctival hemorrhage (32.5%) and ruptured globe (20.0%) being common. Treatments performed were reduction and immobilization of midfacial fractures plus evisceration (32.0%), followed by reduction and immobilization of fractures alone (23.9%) and reduction and immobilization plus grafting of soft tissues (21.2%). **Conclusion:** Ocular injuries are quite common in patients with midfacial injuries, with a ratio of 1.6:1. RTA was the most common etiology, with zygomatic complex fractures as the most common midfacial injury. Subconjunctival hemorrhage was the most common ocular injury manifestation, with young adults (21–30 years of age) being most affected. Treatment often involved reduction and immobilization of midface fractures with evisceration and grafting of ocular tissues.

KEYWORDS: Etiology, maxillofacial injuries, ocular involvement, pattern, visual loss

spectrum of maxillofacial injuries based on sex, age, geographical location, and socioeconomic and seasonal

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factors.^[1] These also determine other body injuries associated with maxillofacial injuries. Midfacial injuries can occur in isolation or in combination with those of other facial bone, ocular, cranial-cerebral, orthopedic, and abdominal structures.^[2] In view of this association, they often require a multidisciplinary approach to management.^[3]

The midface includes the eyes, responsible for sight. Trauma adequate to fracture the midfacial bones could also hurt ocular structures. The prevalence of ocular injuries following fractures of the midface ranges from 1% to 57%; these estimates depend on the referral pattern, with ophthalmologists giving higher rates than other surgeons.^[4] Ocular injuries associated with those of the midface vary in severity from lacerations of the lids and abrasions of the cornea to sclera rupture, intraocular hemorrhages, dislocation of the lens, detachment of the retina, temporary blurring of vision, and permanent visual loss/blindness.^[5,6] Optic canal or nerve injury has been reported as the common cause of blindness in patients with maxillofacial injuries with an incidence of 0.32%–9%.^[7] Severe ocular injuries can threaten sight.^[7] Soft-tissue injuries to the eyelids and periocular region are grouped into contusions, abrasions, avulsions, punctures, and lacerations.^[8]

While road traffic accidents (RTAs) are the most frequent etiological factor for midfacial injuries in developing countries, in developed nations, assaults are the most frequent etiology.^[9,10] In the midface, zygomatic complex fractures are most often associated with ocular injuries.^[7] There are scant reports on ocular injuries associated with facial fractures, especially those of the midface, from developing countries. The last report on the pattern of maxillofacial fractures and concomitant injuries from our center was in 2005.^[2] It did not adequately deal with the pattern of ocular involvement in midfacial injuries. Therefore, the aim of this article was to evaluate the etiology, spectrum, and treatment of ocular injuries in patients with midfacial injuries seen at the foremost oral and maxillofacial care center in northern Nigeria between 2006 and 2017, with a view to comparing with relevant literature.

PATIENTS AND METHODS

A retrospective study of midfacial trauma patients with ocular involvement seen at the Oral and Maxillofacial Surgery and Ophthalmology Departments of Ahmadu Bello University (ABU), Shika-Zaria, Nigeria, between January 2006 and December 2017, was undertaken. Details of patients' biodata, etiology and type of midfacial injuries, type and mode of presentation of ocular injury, and treatment options were obtained from their hospital records. Details of patients who had ophthalmic assessment were also noted. All cases of ocular involvement had primary or secondary ophthalmological review depending on whether the patient was seen initially at the eye or maxillofacial surgery clinics. Data were analyzed using SPSS software version 16, Chicago, IL, USA. The results were presented as proportions. The research protocol was approved by the ABU Teaching Hospital Research Ethical Committee with reference code: ABUTH/HREC/w38/2020.

RESULTS

There were 256 patients with midfacial injuries, out of which 219 (85.5%) had 357 ocular injuries over the period of study. The patient-to-ocular injury ratio was 1:1.6. The age range was between 3 and 76 years. The 21–30 years' age bracket was most frequently affected ($n = 84$, 38.4%), followed by the 31–40 years' age group ($n = 52$, 23.4%). There were more males ($n = 183$, 83.8%) than females ($n = 36$, 16.2%), giving a ratio of 5.2:1. The etiological factors recorded for ocular injuries associated with midfacial injuries were mostly RTAs (90.1%) and assault (including gunshot 4.9%). Table 1 shows the age and sex distribution of cases according to the different midfacial trauma-related activities.

Ocular injuries were more often associated with midfacial fractures (93.3%) than soft-tissue injuries (6.7%), as shown in Table 2. Among fractures, those of the zygomatic complex were most common (36.6%), followed by those of the orbital wall (18.9%) and Le Fort Type I fractures (18.3%). Ocular injuries occurred mostly (38.6%) in association with zygomatic complex

Table 1: Aetiology, Age and Sex Distribution of cases of mid facial injuries seen at a Northern Nigerian tertiary hospital

Injury Mechanism	0-10	11-20	21-30	31-40	41-50	51-60	61-70	>70	Total
	M_F	M_F	M_F	M_F	M_F	M_F	M_F	M_F	
RTA	2 5	15 1	75 7	41 10	20 9	9 2	1 1	2 -	200
Assault	1 -	3 -	1 -	- -	3 -	2 -	1 -	- -	11
Fall	- 1	1 -	- -	- -	- -	1 -	- -	- -	3
Animal Injury	1 -	- -	1 -	- -	1 -	- -	1 -	- -	4
Burns	- -	- -	- -	1 -	- -	- -	- -	- -	1
Total	4 6	19 1	77 7	42 10	24 9	12 2	3 1	2 -	219

fractures, followed by orbital wall (24.7%) and Le Fort Type II fractures (15.0%). Table 2 shows the distribution of midfacial injuries responsible for ocular injuries. Out of 357 ocular injuries, there were more cases of subconjunctival hemorrhage ($n = 116$; 32.5%), followed by ruptured globe ($n = 73$; 20.0%) and periorbital hematoma ($n = 48$, 13.4%). The distribution of ocular injuries associated with midfacial injuries is shown in Table 3.

Table 4 shows the treatment modalities for ocular injuries associated with midfacial injuries in our study population. Complications were persistent enophthalmos seen in seven cases and persistent diplopia seen in one case.

Table 2: Distribution of Midfacial Injuries seen at a Nigerian tertiary hospital

Injuries	Frequency (% of total)	Associated ocular injuries (% of total)
Naso-orbital-ethmoidal fracture	12(2.5)	12(3.3)
Orbital wall fracture	89(18.9)	89(24.7)
Le Fort I fracture	86 (18.3)	11(3.0)
Le Fort II fracture	69(14.7)	54(15.0)
LeFort III Fracture	38 (8.1)	30 (8.3)
Zygomatic Complex Fracture	172(36.6)	142(38.6)
Fronto-Naso-Orbital Fracture	4 (0.8)	4(1.1)
Subtotal	470 (93.3)	342(95.8)
Craniofacial Soft Tissue injury	34(6.7)	15(4.2)
Total	504(100.0)	357(100)

DISCUSSION

Midfacial injuries are often associated with ocular injuries. In literature, between 38.7% and 95.7% of patients with midfacial fractures also have ocular injuries.^[4,6,11] In our study, 85.5% of the patients with midfacial injuries had ocular injuries, showing the importance of proper diagnosis of ocular injuries in patients with injuries to the midface. With respect to demographics, there were more males (83.8%) than females (16.2%), with most patients (38.7%) aged between 21 and 30 years of age [Table 1]. This agreed with most reports on ocular injuries associated with midfacial injuries.^[6,10,11] However, Politis *et al.*^[11] found the 41–50 years' age bracket as most affected (18.9%) in a Belgian study. The older age group in the Belgian study could be a reflection of the aging pattern of the population as compared to those in socioeconomically less developed economies. The most common cause of injury in this study was RTAs (91.3%) [Table 1]. This is similar but much higher than other reports where between 43.3% and 77.0% of midfacial injuries were due to RTAs.^[7,9-11] While the second most common etiology in our study was assault or interpersonal violence (IPV) (4.7%), followed by animal injury (2%) and falls (1.3%) [Table 1], most other studies^[7,9-11] reported falls (23.5%–32.0%), followed by IPV (6.9%–21.0%).

Fractures of the midface were more likely to have associated ocular injuries than soft-tissue injuries.

Table 3: Aetiology and Presentation of Ocular Injuries Associated with Midfacial Injuries Seen at a Nigerian Tertiary Hospital

Types of Ocular injury	RTA	IPV	A/ Injury	Fall	Burn	Total
Orbital injuries						
Periorbital hematoma	47	-	-	1	0	48(13.4)
Orbital Foreign Body	4	1	-	-	-	5(1.4)
Eyelid injuries						
Eye lid injury	58	4	4	4	-	67(18.8)
Injury levator/nerve(ptosis)	4	-	-	-	-	4(1.1)
Corneal Injuries						
Corneal laceration	3	-	-	-	-	3(0.8)
Exposure Keratitis	1	-	-	-	1	2(0.6)
Conjunctival Injuries						
Subconj. Haemorrhage	112	3	-	1	-	116(32.5)
Chemosis	2	-	-	1	-	3(0.8)
Ruptured globe	68	3	1	1	-	73(20.4)
Optic nerve injury	12	-	-	-	-	12(3.4)
Lacrimal sac injury/duct obstruc	3	-	-	-	-	3(0.8)
Extra Ocular muscles injuries						
Diplopia	8	-	-	-	-	8(2.2)
Telecanthus	12	-	-	-	-	12(3.4)
Abducent nerve palsy	1	-	-	-	-	1(0.3)
Total	335	11	5	5	1	357(100)

Table 2 shows that 93.3% of midfacial injuries that caused ocular injuries were fractures. Other workers did not distinguish soft-tissue injuries from fractures for comparison. In the midface, fractures of zygomatic complex (62.0%), followed by Le Fort II (27.0%) and orbital wall fractures (13.9%), were the most common causes of ocular injuries, according to Mohanavalli *et al.*,^[10] while Politis *et al.*^[11] found that those of the maxillary sinus (44.3%), followed by those of the orbital walls (23.6%) and zygoma (23.6%), were the common causes of ocular injuries. Table 2 shows that zygomatic complex fracture (38.6%), followed by those of the orbital walls (24.7%) and Lefort II fracture (15%), were commonly associated with ocular injuries. There appears to be a good association between orbital wall, zygomatic complex, and Le Fort II fractures with ocular injuries due to their proximity to each other.

Various ocular injuries with different degrees of severity are associated with midfacial fractures. Table 3 shows that subconjunctival hemorrhage was the most common ocular injury (32.5%), followed by ruptured globe (20.4%) and enophthalmos (14.0%). The proportion of subconjunctival hemorrhage in our study was much lower than 76.1%–83.5% found among Indian patients.^[9,10] In their series, Politis *et al.*^[11] found diplopia/restriction to eye movement (48.8%) as the most common ocular injury, followed by injuries to the globe and eyelid injuries (36% and 31.7%, respectively). These differences are attributable to the fact that RTAs in most developing countries such as Nigeria and India are due to car and motorized two-wheeler crashes.^[1,10] These are considerably of higher energy and impact than the preponderance of bicycle accidents in the Belgian report by Politis *et al.*^[11]

Concomitant occurrence of globe rupture and blow-out fracture of the orbit is a rare but severe occurrence.^[12-14] In Canada, Nagase *et al.*^[5] reported a 15% rate of ruptured globe, while in Australia and the USA, it was between 2% and 2.6%.^[15,16] Mittal *et al.*^[6] reported the incidence of transient or permanent loss of vision in relation to maxillofacial trauma as between 12.5% and 29.09%. In the present study, simultaneous [Figure 1a and b] occurrence of a blow-out fracture and a globe rupture was found in two patients (0.9%), as shown in Table 3. Diplopia is another complaint from patients with midfacial injuries and the incidence ranges from 1% to 74.5%.^[5,10-12,17] In this study, diplopia represented 1.2% of all ocular injuries, which was far at the lowest range of available reports. More studies from our environment are needed to validate this finding and possible reasons for its occurrence.

Table 4: Treatment performed for ocular injuries associated with mid facial injuries seen in a northern nigerian population

Procedure	Frequency	Percent
Reduction and Immobilization	53	23.9
Reduction and Immobilization plus exploration	47	21.2
Reduction immobilization, grafting	24	10.8
Suturing and grafting of eyelid	7	3.2
Exploration	5	2.3
Reduction, immobilization, evisceration	70	32.0
Reduction, immobilization, suturing of lacerations	12	5.4
Exploration plus evisceration	1	0.5
Total	219	100



Figure 1: (a) A male patient who was assaulted and sustained ruptured globe and orbital wall fracture together with soft-tissue injuries. (b) The same patient after treatment

Ptosis from trauma could be neural or mechanical in origin. Edema of the upper eyelid can cause a temporary mechanical ptosis, but ptosis resulting from nerve injury resolves slowly.^[7] In this study, it represented 1.1%, which was higher than the 0.1% found among US soldiers with midface fractures.^[16]

Optic nerve injury as reported in Table 3 was 3.4%, which compares favorably with the 3.0% from Australia^[12] but was lower than the 7.3% reported in Belgium^[11] and 15% reported in Canada.^[5] Telecanthus in this study was observed in 3.4% of the patients, which was lower than the 5% and 8.45% in India.^[9,10] Traumatic telecanthus is as a result of disturbance to the attachment of medial canthal ligament following naso-orbital ethmoid fractures or Le Fort Type III

fracture. This ligament, both anterior and posterior limbs, is attached to the anterior and posterior lacrimal crests of the lacrimal sac, respectively. Telecanthus is an indication of disruption of both the anterior and posterior limbs of the ligament.^[7]

In the present study, injuries to the eyelids constituted 18.8%, which was lower than the 31.7% recorded by Politis *et al.*^[11] This may be attributed to the fact that they had a small number of patients compared to the present study. Treatment in this study depended on the presentation and where necessary in conjunction with an ophthalmology team. All patients with ecchymosis were treated with eye ointment and eye drops, while the fractures were treated surgically. All orbital fractures were treated by the oral and maxillofacial surgeons, whereas the ocular injuries were handled by the ophthalmologists.

CONCLUSION

Oculo-orbital injuries were seen to be high in this study, and every patient with maxillofacial injuries must be thoroughly examined. RTA was found to be the most common cause and subconjunctival hemorrhage was the most common injury. Zygomatic complex fractures were the most common maxillofacial injuries associated.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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