

ORBITAL FRACTURES IN TWO-WHEELER ROAD TRAFFIC ACCIDENTS

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ABSTRACT

BACKGROUND

Road traffic accidents are common occurrence every day. With ever increasing new drivers and new vehicles especially high power two-wheelers, RTAs keep on increasing causing mild-to-severe bony injuries and trauma to eyes, the special organs of vision.

MATERIALS AND METHODS

Single centre, retrospective study. 75 two-wheeler RTA cases who came for eye injury evaluation were included and entered in a prestructured proforma.

RESULTS

Using datas collected, the orbital wall fractures were classified as medial, lateral, superior and inferior fractures and the most common fracture identified.

CONCLUSION

Fractures of all types involving the walls of orbit were noted in 2 wheeler RTAs. Fracture of lateral wall of orbit is more common in RTA especially with two-wheelers.

KEYWORDS

Road Traffic Accidents, Orbital Fractures, Lateral Wall, Inferior Wall.

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BACKGROUND

Road traffic accidents are common occurrence every day. With ever increasing new drivers and new vehicles especially high power two-wheelers, RTAs keep on increasing causing mild-to-severe bony injuries and trauma to eyes, the special organs of vision.

Eyeball is anatomically well protected inside bony orbit socket and covered anteriorly by eyelids with lashes, embedded in cushion of retrobulbar pad of fat behind. In spite of all of these protection, it is vulnerable to injuries.

Anatomically, the face is divided into 5 regions- nasal, orbital, zygomatic, maxillary and mandibular.

The orbital region is composed of 7 bones. Maxillary, zygomatic, frontal bones comprise the external orbital skeleton, while the internal orbit includes lacrimal, palatine, ethmoidal and sphenoidal bones.¹ The incidence and causes of orbital fracture vary widely in different regions of the world due to social, economical and cultural background, alcohol consumption, awareness about traffic regulations and law abiding nature of the citizens, the law

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enforcement of the specific region, education of people, etc.

Facial fractures are rare before the age of 5 as children are likely to get more of skull fracture and brain injury more than facial fracture. This is because, below the age of 5, there is less chance of children using two-wheeler even as pillion rider. The highest risk group are males especially young males who are riders of bikes.² Globally, road traffic accidents contribute for over 1.2 million deaths and more than 50 million hospital admissions (WHO 2012).^{3,4} Morbidity measured by DALY (Disease Adjusted Life Years) is estimated to be above 38 million for the year 2004. For every death, many more are hospitalised and hundreds seek emergency care with over 1,30,000 death annually. India has overtaken china and has the worst accident rate worldwide. This is mainly because of less use of helmet and more use of high cc engine bikes with less safety measures in India.^{5,6}

The Birmingham Eye Trauma Terminology (BETT)⁷

1. Open Globe- Full thickness eye wall wound present.
2. Closed Globe- No full thickness eye wall defect present.
3. Lacerating Injury- Open globe resulting from sharp force.
4. Penetrating Injury- Entrance wound, no exit wound.
5. Perforating Injury- Entrance and exit wound.



6. Intraocular Foreign Body- Entrance wound with foreign body in eye.
7. Contusion Injury- Blunt injury, no open globe.
8. Lamellar Laceration- Sharp force, partial thickness eye wall defect.

AIMS AND OBJECTIVES

To find out the most common type of orbital fracture in road traffic accidents involving 2 wheelers.

MATERIALS AND METHODS

Single Centre, retrospective study; 75 two-wheeler RTA cases who came for eye injury evaluation were included and entered in prestructured proforma. Information regarding time, location, type and mechanism of injury, vision, eye findings and diagnostic tests were recorded. Whenever necessary, x-rays and CT scan, which the patients had were utilised for the study. 72 patients were finally included in the study excluding the 3 patients who could not come for follow up. Patients who came to the OPD within a week of trauma were included in the study and history of injury while travelling in two-wheeler was obtained from the patient and checked with the attender. History of alcohol taken before the ride can be obtained from the patient, but could not be included in the study since using breath analyser and blood sample for alcohol could not be included in the study. Duration- October 2016 to March 2017.

Inclusion Criteria

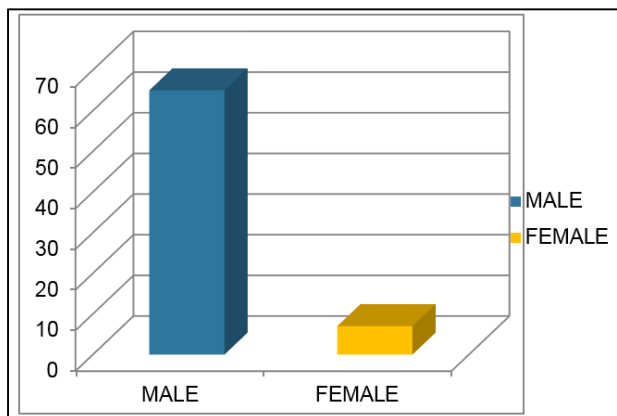
1. Patients who suffered road traffic accidents within 7 days, while riding two-wheeler including pillion riders.
2. Age group >10 years to <60 years.
3. Patients with no previous head injury.

Exclusion Criteria

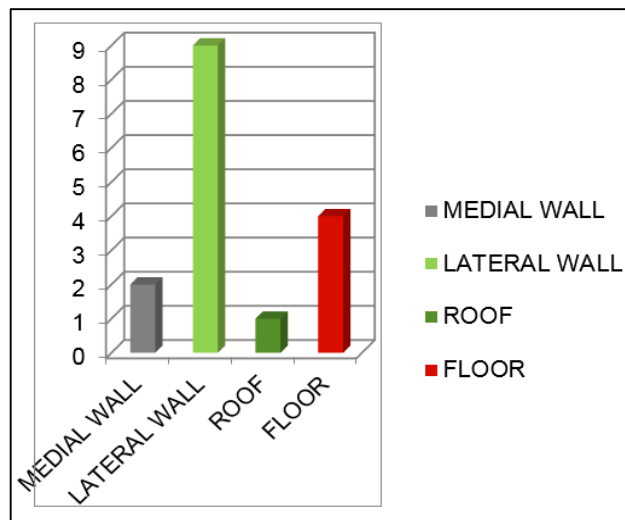
1. Head injuries and ocular trauma by modes other than RTA with two-wheeler.
2. Age <10 years to >60 years.
3. Previous history of head and ocular injuries.
4. Poor follow up by patients.

RESULTS

Male - 65, Female - 7.



Graph 1

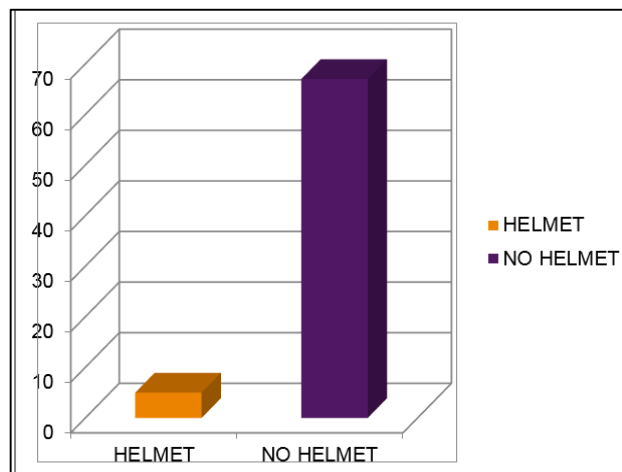


Graph 2

Of the 72 patients reviewed, 16 (22.2%) patients had orbital wall fractures.

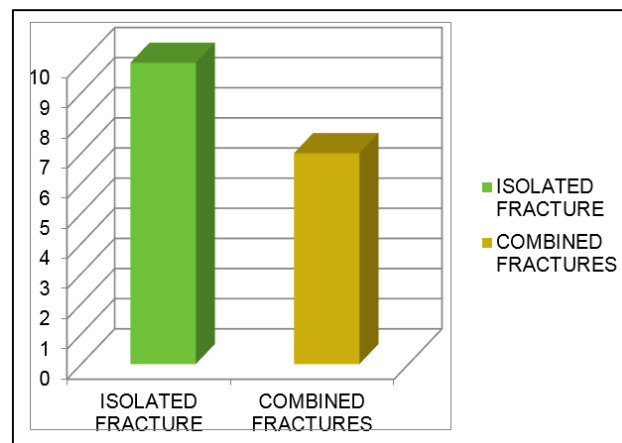
Of the 16, 2 patients (12.5%) had medial wall fractures, 9 (56%) had lateral wall fractures.

1 patient (6%) had roof fracture and 4 (25%) had floor fractures.



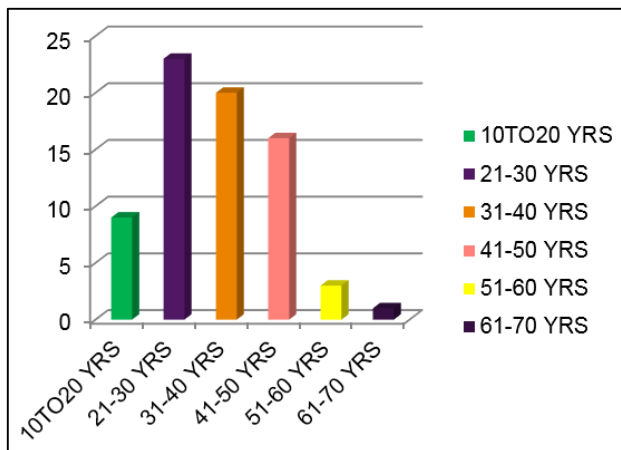
Graph 3

With helmet - 5, without helmet - 67.



Graph 4

Isolated fractures - 10, combined fractures - 7.



Graph 5

Age Group	Number of Patients
10 to 20 yrs.	9
21-30 yrs.	23
31-40 yrs.	20
41-50 yrs.	16
51-60 yrs.	3
61-70 yrs.	1

Table 1

Of the 72 patients, 23 (32%) belonged to the age group 21-30 years, 20 (28%) belonged to the age group 31-40 years, 16 (22%) belonged to the age group 41-50 years.

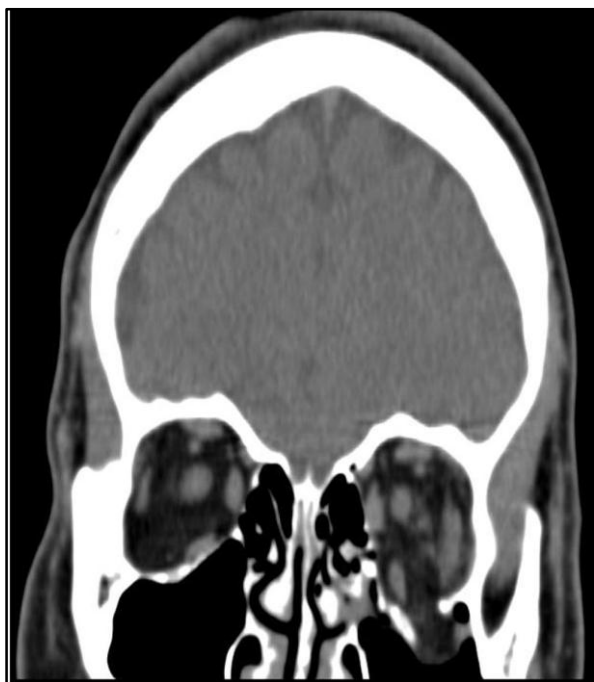


Image 1. Medial and Inferior Wall Fracture



Image 2. Inferior Wall Fracture



Image 3. Medial and Inferior Wall Fracture



Image 4. Medial, Lateral and Inferior Wall Fracture

DISCUSSION

Plain X-rays are valuable screening tool for the evaluation of orbital fractures and also intraocular and intraorbital foreign bodies. With the advent of CT and MRI, the plain film is used often for purposes other than rapid screen.

Computerised Tomography (CT Scan)-

CT scan is readily available in most hospitals and is ideal for imaging bony orbital structures. When used with 1.5-3.0 mm sections in the axial and coronal planes, it is superior to ultrasound in determining the size and location of IOFBs.

However, the intraocular structures are less well-imaged than with ultrasound. The scanning technique does not require contact with the ocular surface and so maybe used in patients with open globe injuries.

CT scanning is less expensive than MRI and unlike MRI, maybe safely used to image metallic foreign bodies. CT scan is generally contraindicated in pregnant patients.

Orbital Fractures

Orbital wall blow out fracture is of two types-

1. Pure blow out fracture, which does not involve orbital rim.
2. Impure blow out fracture involving the orbital rim and adjacent facial bones.⁸

A blow out fracture is caused by increase in orbital pressure by objects greater than 5 cm, such as fist or tennis ball.⁹ The most common fracture is floor of orbit along with thin bone covering the infraorbital canal. Medial orbital wall may also be fractured. The lateral wall and roof is usually able to withstand such trauma.

Blow Out Orbital Floor Fracture

Orbital floor fractures are classified into direct and indirect.

Direct forceful trauma on inferior rim result in zygomatic fractures involving zygomatic arch or its posterior articulation in addition to its lateral and inferior orbital rim. This three part zygomatic fracture is referred as tripod fracture.

In trap door type fracture- large fragment of medial portion of floor of orbit is fractured, but remains attached to lamina bar resembling a trap door.

In medial blow out fracture- disruption of floor of orbit occurs between infraorbital nerve and lamina bar.

In lateral blow out fracture, there is communication from the lamina bar to lateral wall.

Signs-

1. Periocular signs- Ecchymosis, oedema, subcutaneous emphysema.¹⁰
2. Infraorbital anaesthesia due to involvement of infraorbital nerve.
3. Diplopia due to-
 - a. Haemorrhage and oedema in orbit, which makes septa connecting inferior rectus and inferior oblique to periorbital to become taut.¹¹

- b. Mechanical entrapment of inferior rectus or inferior oblique in the fracture.
- c. Direct injury of extraocular muscle associated with negative forced duction test.
4. Enophthalmos.
5. Hypohaema angle recession, retinal dialysis.

X-Ray Paranasal Sinus-

Classic tear drop sign seen.

Caused by prolapse of orbital contents into maxillary sinus.

Corresponding maxillary sinus is hazy.

Hemosinus is common.

CT Scan-

Coronal view is useful in evaluating fracture and prolapsed orbital tissues.

Enophthalmos and diplopia develop mainly indirect or blow out floor fractures. Orbit is decompressed by blowing out the thin bones of floor. Small orbital floor fracture is more likely to cause entrapment due to trapdoor effect. Large fracture causes enophthalmos.

When nondisplaced, these fractures do not require fixation. Direct inferior rim fractures and tripod fractures rarely affect ocular motility.¹²

Surgery is indicated in patients with-

- a. Diplopia in primary gaze with muscle entrapment.
- b. Large floor fractures with enophthalmos >2 mm.
- c. Progressive numbness in infraorbital areas.
- d. Severe hypophthalmos.

Through various approaches including translid, infraorbital rim, subciliary, Caldwell luc, trans- conjunctival incision, periosteum elevated, entrapped tissues freed and fracture stabilised with autologous/alloplastic material.

Blow Out Fracture of Medial Wall

Most medial wall fractures are associated with floor fractures.

Types

Type 1- Pure medial wall fracture.

Type 2- Medial wall and floor fracture.

Type 3- Medial wall, floor and trimalar fracture.

Type 4- Medial, floor, maxillary, naso-orbital and frontal bones.

In type 1 fracture of medial wall, orbit is by assault. Other types are by RTA.

Visual disturbance common in type 1, 2, 3, but not in type 4.

Eye ball injury is more common in type 2.

Diplopia and enophthalmos is more common in type 2.

Fracture Lateral Orbital Wall

It is associated with fracture of zygoma and malar complex.

This fracture is common in adults.

This fracture should be suspected in severe facial injuries.

Fracture Roof of Orbit

This type of fracture is quite rare- Associated with falling on sharp objects or blow to brow/forehead.

Signs-

1. Haematoma of upper eye lid and periocular ecchymosis.
2. Inferior or axial displacement of globe.
3. Transmission of CSF pulsations.

Roof fracture is treated conservatively with IV antibiotics, surgical intervention only in the presence of complications like fracture of optic canal or frontal bone displacement.¹³

Traumatic Optic Neuropathy

Pupil should be assessed for traumatic optic neuropathy for the presence of RAPD. Colour vision and visual acuity are assessed.¹⁴

Damage to optic nerve maybe due to direct injury by fractured bone pressing over nerve or compression by haemorrhage. It may occur at intraocular, infraorbital, intracanalicular or chiasmal level.²

Indirect optic nerve trauma refers to optic neuropathies that follow closed head trauma. The posterior indirect optic nerve traumas, typically damage the intracanalicular segment. The 10 mm intracanalicular portion together with its meninges, the ophthalmic artery and sympathetic nerves are crowded tightly within bony canal.

The damage could be due to shearing force on optic nerve at optic canal where it is tethered to dural sheath or transmission of shockwaves through orbit.

Precautionary Measures

Road lanes should be painted with florescent paints for good visibility during night. Sign boards should be painted with florescent paints.

Screening the drivers for ocular ailments like refractive errors, diabetes, hypertension and hearing defects should be done periodically especially after 40 years.

Use of reflective-coated stickers at the back of the vehicles, specific type of horns for specific type of vehicles, stickers at the centre of head lamp to avoid glare are to be strictly followed.

Road traffic rules should be a part of the curriculum, school students should be educated to spread the message, media can be utilised for this.

Wearing proper helmets, safety goggles and seatbelts should become compulsory.

After the basic requirements are made available to the people, if people are found breaking the rules, strict laws should be used to punish the law breakers.

Monitoring traffic at night should be done. Drunken driving should be strictly monitored. More medical centres to give first aid, more tertiary centres to treat accidents are to be created.

The message of early treatment leading to better outcome should be spread among masses.

CONCLUSION

The incidence of road traffic accidents especially two-wheeler accidents is increasing with the increase in vehicle population in the past 20 years.

The age group involved in two-wheeler RTA is becoming younger since younger age groups are using more vehicles especially two-wheelers.

Fractures of orbital rim injuries occur in motorists with severe external injuries. They do occur even with less severe external injuries. Hence, there should be a severe suspicion of fracture in all patients with severe pain and defective ocular movements.

Fractures of all types involving the walls of orbit were noted in RTAs. Fracture of lateral wall of orbit is more common in RTA especially with two-wheelers.

Use of Helmet

Of the people driving two-wheelers, 7% were only wearing helmets, while rest of the 93% patients were not wearing any protective head gears. According to the study, patients who were not wearing helmets were more prone for grievous injuries mentioned before.

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