

Risk Factors and Visual Outcome after Surgical Repair of Open Globe Injuries in Gujarat Adani Institute of Medical Science, Bhuj

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Abstract

Introduction: The study aims to study the mechanism, type, site, size, severity of injury and to see the final visual outcome after surgical repair at the end of 3 months. *Material Methods:* It is a single centric prospective study done at tertiary care centre over 1 and half year with 150 patients. Parameters taken were age, sex, profession of the patient, visual acuity and final vision at 3 months, anterior and posterior segment evaluation, imaging when required. *Result:* Males were affected more (3.8:1) involving unskilled labourers and farmers (30.6%) and students (28%). Majority of these were caused by sharp objects (93.33%), stick followed by stone. 80% patients were brought within 24 hours. In this study majority (58.66%) patients had vision worse than 2/60 at presentation. It was also observed in this study that corneal laceration (50%) is more common compared to scleral laceration (32%) while 18% had a corneo-scleral laceration. Zone 3 injuries have the worst visual prognosis followed by zone 2 followed by zone 1. *Conclusion:* In our study factors associated ultimate with poor vision (<2/60) at 3 months were presenting visual acuity, extensive lid laceration (66.66%), relative afferent pupillary defect (96.14%), hyphaema (56.7%), vitreous loss (61.8%), retinal detachment (50%).

Keywords: Open Globe Injury; Ocular Trauma; Visual Outcome Post Trauma.

Introduction

Blindness due to ocular trauma is a serious problem in developing as well as developed countries. Ocular trauma is more important since it is a preventable public health problem worldwide. Incidence of blindness varies in different communities ranging from 0.2-1.0 percent. About half a million people in the world are blind as a result of eye injuries. About 30-40% of monocular blindness is due to ocular trauma [1,2].

Ocular trauma represents a significant workload for ophthalmic services and accounts for about 38% to 52% of all new patients presenting as ophthalmic emergencies. Road traffic accidents are the leading cause of ocular injuries in patients with major trauma. It is vital that all patients with major trauma are examined specifically for an ocular injury [3,4].

The cumulative incidence of ocular trauma

necessitating admission to hospital is estimated to be 8.14 per 100 000 population. Ocular trauma remains an important cause of avoidable and predominantly, monocular visual morbidity (visual impairment and blindness). Visual impairment in penetrating ocular trauma may be due to corneal scarring, hyphaema formation with glaucomatous complications, lens damage, vitreous hemorrhage, retinal tear, dialysis or detachment, hypotony, phthisis bulbi, optic nerve damage and endophthalmitis [5-7].

Our aim of this study is to see for the factors affecting the vision and subsequent visual outcome after surgical repair in cases of open globe injuries.

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Materials and Methods

Sampling Design

Present Study was conducted at Department of Ophthalmology, Gujarat Adani Institute of Medical Science, Bhuj, Kutch. 150 patients were selected from outpatient department emergency with trauma patients who fulfilled inclusion criteria and requiring medical or surgical intervention. Parameters studied were age, sex, profession of the patient, presenting visual acuity and final vision at 3 months (snellen's visual chart), anterior segment evaluation with slit lamp biomicroscopy, fundus visualization with +90 D lens/direct and indirect ophthalmoscope, +20 D lens, gonioscopy with goldmann 2 mirror gonioscope, intraocular pressure measurement with goldmann applanation tonometer (wherever applicable), ultrasonography B scan, radiograph, CT scan, MRI orbit (in relevant cases).

Inclusion Criteria

All patients with open globe injury with or without
Lid laceration
Hyphaema
Traumatic cataract
Subluxated or dislocated lens

Exclusion Criteria

Ocular surface foreign body
Optic nerve injury
Subconjunctival haemorrhage only
Chemical ocular injury

Closed Globe Injury

No full-thickness wound of eye wall. The cornea and the sclera are not breached through and through.

Open Globe Injury

Full-thickness wound of the eye wall. The cornea and/or sclera is breached through and through.

Closed globe is further classified as

1. Contusion

There is no wound of the eye wall. The damage (e.g., choroidal rupture) may be due to direct energy delivery or shock wave by the object, or due to changes in the shape of the globe (e.g., angle recession).

2. Lamellar Laceration

Lamellar laceration is partial-thickness wound of the eye wall. The wound in the eye wall is not "through" but "into" the eye wall. The Ocular trauma classification group has developed a classification system based on the Birmingham eye trauma terminology for open globe injuries.

The further classification of open globe injuries is as follows

A. Type (Mechanism of Injury)

1. Rupture-full thickness wound of eye ball caused by blunt object
2. Penetrating- full thickness wound of eye ball having only entrance wound
3. Intraocular foreign body
4. Perforating- has entrance and exit wound both caused by same object
5. Combined

B. Grade (Presenting Visual Acuity)

1. > 20/40
2. 20/50 to 20/100
3. 19/100 to 5/200
4. 4/200 - No light perception

C. Presence or Absence of Relative Afferent Pupillary Defect (RAPD)

1. Positive, relative afferent pupillary defect present (RAPD)
2. Negative, relative afferent pupillary defect not present

D. Zone (Location of Wound)

- I. Cornea
- II. Limbus to 5 mm posterior into sclera
- III. Posterior to 5 mm from limbus

Steps of Repairing an Open Globe Injury

1. Limbal paracentesis
2. Reposit the iris into the anterior chamber (in fresh cases)

This is best achieved through pulling the iris in rather than pushing through the wound.

3. Intracameral viscoelastics to restore the anterior chamber.
4. Thoroughly cleanse entrapped lens material and vitreous to leave the wound edges free.
5. Approach corneoscleral and scleral lacerations,

by first closing the corneal or distal portion and then examining the extent of the sclera portion by carefully removing the conjunctiva and Tenon’s capsule Then the uncovered part of the wound is closed.

6. Disinsert one of the extraocular muscles to visualize and repair a wound that extends posteriorly.
7. Once the eye is sealed, restore the intraocular pressure by injecting balanced salt solution.

Result

Out of 150, 119 patients (79.33%) were males while 31 (20.66%) patients were females The male to female ratio of the study was 3.8:1. Hence a male predominance was seen in the study.

Most of the ocular injuries were seen in patients in the age group of young adults. Image 1 shows patients between 11- 40 years age group contributed to 65.32% of the injuries The percentage of individuals of less than 10 years age was 17.33% while those above 40 years was

17.32%. Unskilled labourers and farmers (30.6%) and students (28%) contributed to highest victims of the open globe injuries. Less commonly affected were skilled labourer, pediatric age group (pre school),

(10.6% each), housewife and service holders. Majority of these were caused by sharp objects (93.33%) while the rest were caused by blunt objects.

Visual acuity at presentation is described in image 3. 58.66% patients had vision of < 2/60. Only 2.66% patients had vision better than 6/12. While 80% patients received treatment within 24 hours, 20 (13.33%) and 10 (6.67%) patients were brought on day 2 and 3.

Majority patients had zone 1 injury (50%) followed by zone 2 followed by zone 3. 50% of the patients had corneal laceration, 32% had scleral laceration while 18% had a corneo-scleral laceration.

As summarized in the table 1 below majority of the patients had a final vision worse than 2/60 (45.99%). 10% had visual acuity of 6/12 or better. In 12% patients (pediatric) visual acuity couldn’t be assessed.

27% patients with zone 1 injury had a vision worse than 2/60, while 62.9 % with zone 2 injury had vision worse than 2/60. All Zone 3 had worst visual prognosis. Subconjunctival hemorrhage was present in highest no. of cases (75 %). Out of the 18 patients in whom vision could not be assessed, 10 had subconjunctival hemorrhage, 12 had uveal prolapse, 2 had cataractous lens, 2 had relative afferent pupillary defect, 3 had vitreous loss, 2 had vitreous hemorrhage, 1 had tractional retinal detachment and 1 had intraocular foreign body.

Table 1: Final visual acuity of open globe injury patients after 3 months

| Final Visual Acuity | Number of patients |
|-----------------------------------|--------------------|
| 6/6-6/12 | 15 |
| 6/18-6/36 | 28 |
| 6/60-3/60 | 20 |
| 2/60- accurate projection of rays | 41 |

Discussion

The male to female ratio of our study was 3.8:1. Hence a male predominance was seen in the study This result was similar to a study 10 conducted by Casson R et al (4:1) [10], Haryana (3:1) [11], University college study (4:1) [12]. Males are generally more affected as they are more exposed to outdoor and work related injuries.

Most of the ocular injuries in this study were seen in patients in the age group of young adults. Patients between 11-40 years contributed to 65.32% injuries. Similar results were found by previous studies conducted in University College (median age 18) [12], Meneschg et al. (32.29 years) [13]. Young population is more exposed to trauma as a result of exposure to

outdoors, sports etc. In this study unskilled labourers and farmers contributed to 30.6% of the open-globe injuries while students contributed to 28%. According to a study conducted in Haryana, in occupational injuries (38.26%), those occurring during agricultural activities (19.9%), were most common.

The most common setting where the ocular trauma occurred was during agricultural labor because of lack of eye protection [14].

In this study it was observed that amongst the most frequent causative agents are stick followed by stone. Road traffic accident was responsible for 10.66% of the cases noticeably in young adults. In case of children especially pen, pencil, toy frequently caused open globe injury (9.99%) Krishnaiah S et al study

shows an injury with vegetable matter such as a thorn, branch of a tree, plant secretion, etc. was the major cause of trauma reported in this population [15]. Study conducted in Turkey showed that most common cause of the perforation was metallic substance in 32.6%, wood in 15.3%, stone in 12.0%, glass in 12.3%, pellets in 12%, and injection needles in 8.3%.¹⁶

In this study majority (58.66%) patients had vision worse than 2/60. This result was similar to study conducted in Ibadan, where in the majority of patients (63%) had presenting visual acuity less than 3/60 [12].

It was also observed in this study that 50% of the patients had corneal laceration, 32% had scleral laceration, while 18% had a corneoscleral laceration. Similar results were seen in study conducted in Ibadan (corneal 43.7% or corneo-scleral 41.5%). According to a study conducted in Haryana, cornea was the most affected part of eyeball (47.6%) followed by iris injury (32.64%) [11].

In this study it was observed that majority of the patients had a final best corrected vision worse than 2/60. (45.99%) as against 58.66% having presenting vision worse than 2/60. 10% had final best corrected visual acuity of 6/12 or better. Sharma T et al found improvement in visual acuity of two Snellen lines in eyes with measurable pre operative acuity or improvement to at least 2/60 with pre operative acuity of hand movements, was attained in 62% of the eyes; acuity of 6/9 or better was achieved in 28% [17].

In our study vision was better in zone 1 followed by zone 2. Zone 3 had the worst visual prognosis. This result was similar to that observed by Sharma T et al [17], Russell SR et al [18] (large > 10 mm lacerations and scleral lacerations posterior to the insertion of the rectus muscle).

Posterior segment injury can cause irreversible damage to the retina and optic nerve hence zone 2 and 3 injuries have a worse visual prognosis. In our study factors associated ultimately with poor vision (<2/60) at 3 months were, extensive lid laceration, relative afferent papillary reflex, hyphaema, vitreous loss, retinal detachment. 66.66%, 96.14%, 56.7%, 61.8%, 50% patients presented with these symptoms had final poor vision respectively. These study findings corresponded with previous studies [18-24].

We also observed that uveal prolapse was seen in 81.8% and cataract was seen in 11.35% patients, lens subluxation or dislocation was seen in 4 patients (3%). The patients with traumatic cataract underwent surgery with cataract extraction and had final visual

acuity better than 2/60 (53.3%) and worse than 2/60 was seen in 46.6%. 48.6% of the patients with uveal prolapse had vision worse than 2/60. Study findings were similar as University College study [12].

In this study intraocular foreign body was seen in total 3 adult patients (2.2%). However all had a vision better than 6/60. Two of these were intralenticular and these patients underwent lens extraction with implantation of intraocular lens. While the third patient had a corneal rupture with a penetrating foreign body partly in the anterior chamber which was subsequently removed and the wound was sutured. Intraocular foreign body has been correlated with poor outcome in a study by Punnonen E et al, and Pieramici DJ et al [25,26].

The limitations of this study are short time, single centric data of predominantly low socio-economic strata, exclusion of endophthalmitis, optic nerve involvement and orbital fracture; all 3 are important predictors of final visual outcome.

Conclusion

In case of trauma, early and proper intervention does not always significantly influence the final visual outcome, makes it imperative that preventive eye care programs consider ocular trauma in the population as a priority. Public health education, aimed strategy for protection of vulnerable group, taking safety measures at work, immediate referral is all important.

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