ORIGINAL RESEARCH PAPER

Ophthalmology

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

STUDY OF RISK FACTORS AND VISUAL OUTCOME AFTER SURGICAL REPAIR OF OPEN GLOBE INJURIES IN A TERTIARY EYE HOSPITAL

KEYWORDS: open globe injury, ocular trauma, visual outcome post trauma

DR. ANINDITA MONDAL
Associate Professor, Dept. of Ophthalmology.
Regional Institute of Ophthalmology

DR. UDAYADITYA MUKHOPADHYAY
Associate Professor, Dept. of Ophthalmology.
North Bengal Medical College

DR. NABANITA BARUA
RMO cum Clinical Tutor, Dept. of Ophthalmology.
Nil Ratan Sircar Medical College, Kolkata- 700014

DR. GAURAVI MINANATH UPADHYE
Dept. of Ophthalmology.
Regional Institute of Ophthalmology

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.

Discussion: 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 %).

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.

Materials and methods:

The study was single centric prospective study done at Regional Institute of Ophthalmology, Medical College Hospital, Kolkata over 1 and half year (January 2015- July 2016). 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 lacertion
- Hyphaema
- Traumatic cataract
- Subluxated or dislocated lens
- Uveal prolapse
- Vitreous haemorrhage
- Retinal detachment
- Intra ocular foreign body

Exclusion criteria

- Ocular surface foreign body
- Optic nerve injury
- Subconjunctival haemorrhage only
- Chemical ocular injury
- Patients with orbital fracture
- Patients who have undergone previous intraocular surgeries
- Post traumatic endophthalmitis with or without foreign body

Definations are taken from The Birmingham eye trauma terminology (BETT).9

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

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

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 scleral 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 patiets (79.33%) were males while 31(20.66%) patients were females. The male is 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 %.

Image 2 illustrates 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. Table 2 depicts final visual acuity in different zones 3 months post surgery. 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.

Table 3 shows clinical presentations of all patients. 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.

Discussion:
The male is 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 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 .[11] 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 a 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

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

laceration, 32% had scleral laceration, while 18% had a corneo-scleral laceration. Similar results were seen in study conducted in Ibadan (corneal 43.7% or corneo-scleral 41.5%).[12] 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 al18 (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 ultimate 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 studies18-24.

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 than6/60. 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 predictor 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.

Tables

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
Defective projection-no light perception	28
Could not be assessed	18

Table 2 : Final visual acuity in patients with open-globe injuries in various zones

	6/6-6/12	6/18-6/36	6/60-3/60	2/60- accurate projection of rays	Inaccurate projection of rays-no light perception
Zone 1	10(16.9%)	12(20.3%)	21(35.5%)	14(23.7%)	2(3.3%)
Zone 2	5(9.1%)	6(11.1%)	9(16.6%)	24(44.4%)	10(18.5%)
Zone 3	0	0	0	0	16(100%)

Table 3: Clinical features of open globe injuries

Clinical features	6/6-6/12	6/18-6/36	6/60-3/60	2/60-accurate projectio nof rays	Inaccurate projection of-Rays/ no perception of light	Total
Subconjunctival hemorrhage						99
Lid laceration	0	1(6.66 %)	4(20.6 6%)	7(46.6%)	3(20%)	15
Uveal prolapse	5(4.6%)	22(20. 37%)	18(16. 6%)	38(35.5%)	25(23.1%)	108
Relative afferent pupillary defect	0	0	1 (3.8%)	19 (73.07%)	6(23.07%)	26
Hyphema	0	8(34. 7%)	2(8. 69%)	6(26.08%)	7(30.4%)	23
Lens cataractousSublu xated/	2 (13.3%)	3 (20%)	3 (20%)	3(20%)	4(26.6%)	15
Dislocated				1(25%)	3(75%)	4
Vitreous loss	0	2(4. 7%)	14(33. 3%)	16(38%)	10(23.8%)	42
Vitreous hemorrhage	0	0	0	6(40%)	9(60%)	15
Retinal detachment	0	0	0	13(50%)	13(50%)	26
Intraocular foreign body	1(33.33 %)	1(33.3 3%)	1(33.3 3%)	0	0	3

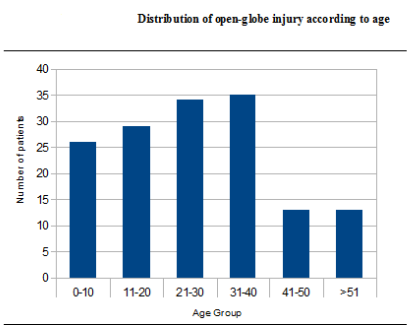
Legends:

Fig 1: Distribution of patients of open globe injury according to age

Fig 2: Distribution of patients of open globe injury according to profession

Fig 3: Distribution of patients of open globe injury according to presenting visual acuity

Fig 1:



Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

Fig 2:

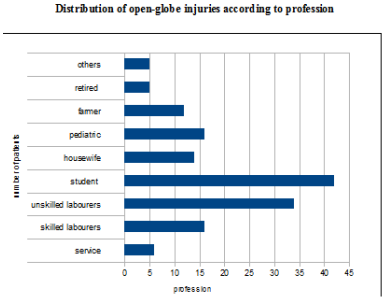
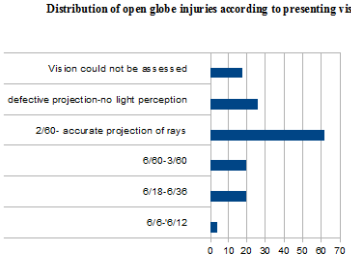


Fig 3:



References:

1. MacEwen, C.J. (1989). Eye injuries A prospective survey of 5671 cases, Br Jr Ophthalmol;73:888-94.
2. Bhopal, R.S., Parkin, D.W., Gillie, R.F., Han, K.H. (1993). Pattern of ophthalmological accidents and emergencies presenting to hospitals. Epidemiol Community Health; 47:382-7.
3. Guly, H.R., Bouamra, O., Gray, H.R., and Lecky F.E. (2006, Dec) . Ocular injuries in patients with major trauma. Emerg Med J.; 23(12): 915–917
4. Hosseini, M., Mohebi M., Alipour F., Mehrdad R.,Mansouri MR.(2010 Jul). Work-related eye injury: the main cause of ocular trauma in Iran. Eur J Ophthalmol. ;20(4):770-5
5. Dalma-Weiszhausz, J. (2011). Extrabulbar tissue prolapse from Ocular Trauma: Principles and Practice. Thieme; 123-130.
6. S Vats, M.D., Murthy G.V.S., Chandra, M., Gupta, S.K., Vashist, P., and Gogoi, M.(2008 Jul-Aug) . Epidemiological study of ocular trauma in an urban slum population in Delhi, Indian J Ophthalmol.; 56(4): 313–316
7. Desai, P.I., MacEwen, C.J., Baines, P., Minassian, D.C.(1996 Jul) Incidence of cases of ocular trauma admitted to hospital and incidence of blinding outcome. Br J Ophthalmol. ;80(7):592-6
8. Shashikala, P., Sadiqulla, M., Shivakumar, D., and Prakash K.H. (2013 May-Aug) Profile of ocular trauma in industries-related hospital. Indian J Occup Environ Med.; 17(2): 66–7
9. Jandeck, C., Kellner, U., Bornfeld, N., Foerster, M.H. (2000) Open globe injuries in children,Graefes Arch Clin Exp Ophthalmol.;238(5):420-426.
10. Casson, R.,Walker, J., Newland, H. (2002). 4-year review of open eye injuries at the Royal Adeliade Hospital. Clin Exp. Ophthalmol;30(1):15-18.
11. Parmar, I.P.S., Sunandan, S., Nagpal, R.C.(1985). Pattern of ocular injuries in Haryana. Ind J Ophthalmol;33:141-144.
12. Oluyemi, F. (2011 Apr-Jun). Epidemiology of Penetrating Eye Injury in Ibadan: A 10-Year Hospital-Based Review Middle East Afr J Ophthalmol.; 18(2): 159–163.
13. Maneschg, O.A., Resch, M., Papp, A., Németh, J. (2011 Sep). Prognostic factors and visual outcome for open globe injuries with intraocular foreign bodies Klin Monbl Augenheilkd.;228(9):801-7.
14. Nirmalan, P.K, Tielsch, J.M., Robin, A.L., Thulasiraj, R.D., Krishnadas, R., Ramakrishnan, R.(2004 Sep). Aravind eye comprehensive eye survey. Ocular trauma in a rural south Indian population: the Aravind Comprehensive Eye Survey. Ophthalmology; 111(9):1778-81.
15. Krishnaiah, S., Srinivas, M., Rao, G.N., Thomas, R. (2006 Jul). Ocular trauma in a rural population of southern India: the Andhra Pradesh Eye Disease Study. Ophthalmology,;113(7):1159-64
16. Kuhn, F., Morris, R., Mester, V., Witherspoon, D. (2005). Ocular Traumatology: 47-77.
17. Sharma, T., Agarwal, P., Gopal, L., Badrinath, S.S., Murugesan, R. (1994 Mar). Vision Research Foundation: "Penetrating ocular trauma in children by broomstick bows and arrows", Ophthalmic Surgery, 25 (3): 175-9
18. Russell, S.R., Olsen, K.R., Folk, J.C. (1988). Predictors of scleral rupture and the role of vitrectomy in severe blunt ocular trauma. Am J Ophthalmol;: 253-7.
19. Titiyal, G.S, Prakash, C., Gupta, S., Vijay J. (2013 April-June) Pattern of Ocular Trauma in Tertiary Care Hospital of Kumaon Region, Uttarakhand. Indian Acad Forensic Med.;35(2): 115-117.
20. Agrawal, R., Wei, H.S. (2013 Sep). Prognostic factors for open globe injuries and correlation of Ocular Trauma Score at a tertiary referral eye care centre in Singapore. Indian J Ophthalmol.; 61(9): 502–506
21. Schmidt, G.W., Broman, A.T., Hindman, H.B., Grant, M.P. (2008). Vision survival after open globe injury predicted by classification and regression tree analysis. Ophthalmology;115:202–9.
22. Pieramici. D.J., Eong, A.K., Sternberg, P.J., Marsh, M.J. (2003). Prognostic significance of a system for classifying mechanical injuries of the eye (globe) in open globe injuries. J Trauma;54:790–4.
23. Gothwal, V.K., Adolph ,S., Jalali S.M. & Naduvilath, T.J.(1999). L V Prasad Eye Institute, Hyderabad: "Demography and prognostic factors of ocular injuries in South India"; Australian and New Zealand Journal of Ophthalmology; Vol 27 Issue 5, 318-325.
24. Esmaeli, B., Elner, S. Schork, G. (1995 Mar). University Michigan school of medicine in "Visual outcome and ocular survival after penetrating ocular trauma : a clinicopathological study";102(3):393-400
25. Punnonen, E., Laatikainen, L. (1989). Longterm follow-up and the role of vitrectomy in the treatment of perforating eye injuries without intraocular foreign bodies. Acta Ophthalmol (Copenh);67: 625-32
26. Pieramici DJ, Au Eong KG, Sternberg P, Marsh MJ: The prognostic significance of a system for classifying mechanical injuries of the eye (globe) in open-globe injuries. J Trauma.2003; 54: 750-4.