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Original Research Article

A Prospective Study of Visual Outcome of Open Globe Ocular Injuries at NMCH Patna

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Abstract:

Background and Objectives: Many factors that carry either a good or poor prognosis for visual outcome in open globe injuries have been studied in numerous retrospective studies in the past. The recent classification of eye injuries accepted by the International Society of Ocular Trauma made the description of eye injuries less ambig-uous and has set the stage for prospective clinicalstudies. To prospectively evaluate all patients with open globe injuries presenting to NMCH Patna over a one year period and study a list of factors with respect to the final visual outcome.

Methods: We evaluated the final visual acuity of thirty eight open globe injuries with a minimum follow-up period of six months. The anatomical and functional factors of each injury was analyzed with respect to the final visual outcome.

Conclusion: We found that factors describing the functional status of the eye were more important in predicting the final outcome when compared to those related to the anatomy of the injury. We also established a pre-operative scoring system based on the internationally accepted factors used to classify an open-globe injury, which could accurately predict the visual outcome. Predicted the final visual outcome with ocular trauma score.

Keywords: Cornea injuries, Sclera injuries, Penetrating Eye Injuries, Globe rupture, Perforating eye injuries, Eye Injuries classification, Intraocular Foreign Bodies, Trauma Severity Indices.

Introduction

An injury to the eye or its surrounding tissues is the most common cause for attendanceat an eye hospital emergency department. The extent of trauma may range from simple superficial injuries to devastating penetrating injuries of the eyelids, lacrimal system, and the globe. The surgical management of such injuries is directed primarily at the restoration of normal ocular anatomy. The ultimate goal is to prevent secondary complications and maximize the patient's visual prognosis. The most significant cause of monocular blindness, globally is trauma. [1,2] WHO statedthat about 55 million eye injuries cause restriction of daily activities, among whom 1.6 million go blind every day. [3] Ocular trauma counts for 7% of all bodily injuries and 10-15% of all diseases of eye.2 Ocular injuries represent 10-27% of cases examined in an outpatient department, 38-65% of cases in emergency department and 5-16% of admissions in eye hospitals. [4] Ocular trauma results from redistribution of the incident energy, which affects both organic as well as inorganic tissues. [5] Ocular trauma is preventable under certain precautions. [6] Ocular trauma, not only, causes visual impairment, but also, is responsible for significantmorbidity with relation to pain, psychosocial and financial stress. [6] Different causative agents of ocular trauma are emerging and there is a change in epidemiology of ocular trauma depending on many factors including population under study, location of injury, activity involved during injury, etc. [4,7,8] Ocular injuries can be prevented and hence, it is necessary to understand the epidemiology and the risk factors for ocular trauma which can be avoided by increasing the awareness within the local population. This data regarding the Indian population is scarce and actual prevalence of ocular trauma in India is not known. [3] There are controversies regarding the management of severely traumatized eyes, particularly the approach towards the condition. Hence, it is important to study the functional outcome of patients with severe ocular trauma. This will prove as an important guide to predict the prognosis of patients with severe ocular trauma.

There is lack of data about the prediction of functional outcome by use of ocular trauma score established by Kuhn et al in Indian patients. Ocular injuries (both open globe and closed globe) are relatively common, but openglobe injuries more often result in a poor visual outcome. [9] Kuhn et al (2002) analysed the evidence on several factors of prognostic importance in mechanical eye injuries. [10] The factors studied were age, sex, laterality of eye injured, cause of injury, type of injury, facial fractures, initial visual acuity, wound location, extent of wound, hyphaema, intraocular foreign body, presence or absence lens injury, retinal detachment, vitreous haemorrhage tissue prolapse, VEP and ERG. They noted that studies on these prognostic factors are difficult to interpret as they often give contradicting results or have different cut off values for the same factor. Kuhn F et al (2002) analysed over a hundred factors in 2500 injured eyes to judge the prognostic value of each of them. [11] Of the variables analysed, only a few were found to be reliable in predicting the long-term visual acuity as well as being easy to determine during initial clinical examination or surgery. These factors were found to be initial visual acuity, type of injury (with more significance to rupture and perforating injuries), the presence of an afferent pupillary defect, the presence of a retinal detachment and the presence of endophthalmitis. The zone (posterior extent) of injury is also an important criteria in the prognosis as posterior injuries generally carry a graver prognosis. [12] Literature shows that visual acuity at the time of presentation and the presence of a relative afferent pupillary defect are the most accuratepredictors of visual outcome. [13,14,15]

Objectives

To study various functional and anatomical factors of an open globe injury with respect tothe final visual outcome, as recorded by the last visual acuity after 6 months of the injury

To use probability models to determine which of those factors correlate best to the finalvisual outcome.

To study various factors of treatment modalities (such as time of initial repair and necessityfor a second surgical procedure) with respect to the final visual outcome.

Material and Methods

The materials for the present study will be drawn from patients attending outpatient department of ophthalmology and casualty at Nalanda Medical College and Hospital Patna, Bihar. with open globe ocular injuries Study duration of One years, who meet the inclusion and exclusion criteria of this study.

Inclusion Criteria: All patients with open globe injury presenting to Nalanda Medical College and Hospital Patna Study duration of One year.

Exclusion Criteria

- Patients presenting with unstable vital signs and/or altered sensorium.
- Patients presenting with associated severe max-illo-facial injuries.
- Eyes with previously impaired vision
- Patients refusing admissions.

The outcome measure was the final visual acuity (six months after the primary surgical procedure). The case would be excluded for outcome analysis if the follow-up period was less than six months after the primary surgery. Those eyes which underwent destructive procedures or those with phthisis documented at follow-up were not excluded, even if the follow-up period fell short of six months as there would not be a change in their visual acuity.

All patients selected for the study underwent a complete ophthalmic examination and the findings were recorded in a Performa. A list of the presence or absence of the prognostic factors being studied was recorded prior to surgery. Along with a case history (including situation and source of injury) and ocular findings the following was recorded for all patients:

- Identification (serial number, chart number and name)
- Demographic data (age, sex, rural/urban location)
- Injury data (work related, left/right eye)
- Ocular data (initial visual acuity, grade, type, zone and pupil status)
- Details of open globe (laceration length, hyphaema, retinal status)
- Surgery details (duration from injury, nature of surgery)
- Follow up details (final visual acuity, follow-up diagnosis)
- Second surgery details (if present: reason, nature of surgery)

Results

A total of 38 open globe injuries were treated by the Department of Ophthalmology in NMCH, Patna. during the one year period, All 38 cases (100%) met the inclusion criteria and were included in the study. The details of the patients will be presented as epidemiology, clinical presentation, details of surgery and follow-up data with visual outcome analysis.

In the total study population of 38 patients, the mean age was 33.89 years (median of32years, ranging from 8 years to 62 years). 28 (73.68%) were males, and 10 (26.31%) were female. The frequency table for age shows a peak in the age range of 26 to 30 years, Out of 38 total patients, 22(57.89%) patients

were from rural background. 16(42.10%) patients from urban background.

Age group	Number	Age group	Number
0 to 5	0	36 to 40	5
6 to 10	2	41 to 45	2
11 to 15	4	46 to 50	4
16 to 20	2	51 to 55	0
21 to 25	3	56 to 60	3
26 to 30	8	61 to 65	2
31 to 35	3	65 to 70	0

Agriculture linked injuries accounted for 15 injuries (39.4%). The injuries occurred in an industrial setting accounted for 7 injuries (18.4%), while the others occurred on a street/highway/road traffic accidents accounted for 5 injuries (13.15%), at school accounted for5 injuries (13.5%). Injuries at home were 4 (10.5%), or assault related injuries accounted for 2 (5.2%) The source of injury was a metallic object in 10 cases (26.31%), consisting of metal shrapnel, spring and nail. Wood piece, broomstick, and thorn in 9 cases (23.6%) The other sources of injury included stones and gravel in 6 cases (15.7%), Glass was the source of injury in 3 cases (7.8%). The source of some blunt forces causing a globe rupture included 3 (7.8%) bull gore injury, 2 injuries (5.26%) were due to a hand or fist. The source of five injuries (13.15%) remained unknown.

Use of Eye Protection

Three of the 38 patients (7.8%) said that protective wear was available in the premises during the time of injury, but none of them had worn any form of protection when they were injured.

Alcohol Consumption

Only 2 patients (5.2%) were under the influence of alcohol during the time of injury.

There was no history of alcohol consumption in the occupational group.

The right eye was affected in 20 patients (52.66%) and the left eye in 18 patients (47.36%). None of the cases suffered from bilateral open globe injuries

The visual acuity at presentation, presence of an afferent pupillary defect, zone of injury and type of injury were noted in all patients and classified according to the ISOT classificationof open globe injuries

Category 3	Predicted by OTS	Findings in presentstudy
No light perception	2%	-
Light perception/ hand motion	1%	-
<6/60	15%	-
6/60-6/15	31%	8 (88.8%)
≥ 6/12	41%	1 (11.1%)

Category 5	Predicted by OTS	Findings in presentstudy
No light perception	0	-
Light perception/ hand motion	1%	-
<6/60	1%	-
6/60-6/15	5%	-
≥ 6/12	94%	3 (100%)

OTS predicted final visual acuity of category 5

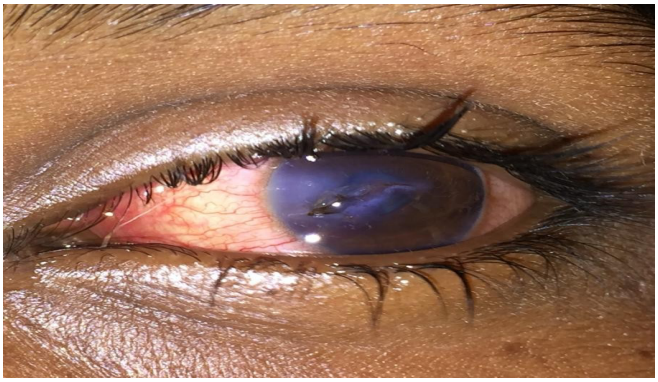

Figure 1: Zone 1 injury

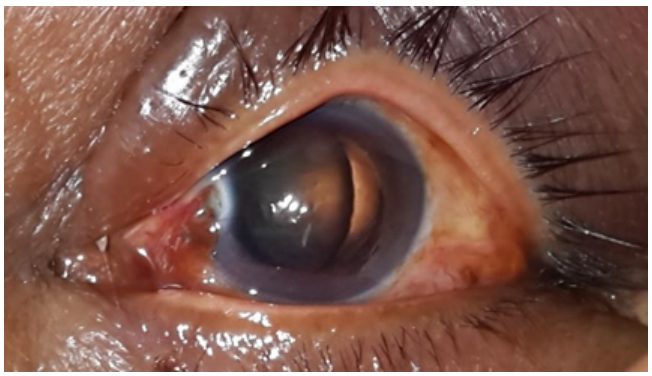

Figure 2: Subluxation of lens

Discussion

In our prospective analysis of patients with open globe injuries, we see that 21 patients 55.26% achieved a final acuity of 6/18 or better (after an average follow-up of (6+3=9) months), fulfilling the WHO criteria for no or mild visual impairment. Compared to literature published within the last two decades, the visual outcome of our study is inferior to that published in western literature. However the results are comparable with Indian reports. Eagling (1976) reported that 62% of those with open globe injuries resulted in a final visual acuity of atleast 6/12 and with the advent of modern vitreoretinal surgical techniques, de Juan et al (1983) reported that 71% of patients with penetrating injuries had a final visual acuity of 6/18 or better. Gothwal et al (1999) reported that with the present microsurgical capabilities in India, prompt and meticulous surgical treatment restored vision to 6/18 or better in 60.5% of patients. In our case series of 38 patients, the mean age was 33.89 years. The frequency shows a peak in the age range of 26 to 30 years. This is similar to the findings of international and Indian studies. All the studies have shown that males are more prone to injuries. Our case series showed a higher male preponderance 28 (73.68%) males and 10 (26.31%) females when compared to other national and international studies. Our study represents the rural and urban population of Patna India, as 22 (57.89%) are rural background and 16 (42.10) are from an urban background. Occupationally linked injuries accounted 57.8% of the injuries in our study. out of which agriculture related injuries 15 cases (39.4%) and industrial related injuries 7 cases (18.4%). Liggett et al (1990) from USA have reported that only 8% injuries occurred at work. Indian studies in general report more occupationally linked injuries when compared to the western literature, but the proportion was higher in our study. Our series shows an incidence of agriculture related injuries 15 cases (39.4%).

Intent of Injury

In our series, 2 cases (5.2%) of the injuries were linked to assault with getting injured bya hand or fist. In the case series by Liggett et al assault accounted for 41% of the injuries. In a study of penetrating eye injuries by Mukherjee et al (1984) the injuries were classified according to the source and it was found that 33% of the injuries were by a metallic object, 23% by a wooden object, 12% by glass and 15% by a stone. In our series, the source of injury was a metallic object in 10 (26.31%) glass in 3 (7.8%), stones and gravel in 6 (15.7%) and organic (wood piece, broomstick, and thorn) in9 (23.6%), while the exact source of injuriesin 5 (13.15%) was unknown.

The findings in patients with OTS grades 1 and 2 were studied in detail to estimate the risk and prognostic factors. According to Kuhn et al, OTS grades 1 and 2 are associated with poor functional outcome. Most of the studies of ocular trauma consider the initial and final visual acuity of all patients for assessing the functional outcome, without paying any heed to different categories as per OTS. In the present study, visual acuity improved at regular time

intervals compared to visual acuity at initial presentation. The visual acuity at presentation was strongly correlated with final visual outcome at 6 months. Thus, a better visual acuity atpresentation will correspond to a better final visual acuity at 6 months, and vice-versa. In all patients of ocular trauma, a strong correlation was found between the initial visual acuity and final visual acuity.

As per WHO criteria, all the patients with OTS category 1 had blindness at 6 months, with no light perception in 100% of OTS 1 patients. In patients of OTS category 2, blindness at 6 months was present in 22.2% patients. In patients of OTS category 3, moderate to severe visual impairment at 6 months was present in88.8%. In patients with OTS category 4, moderate to severe visual impairment at 6 months was presentin 63.63%. In patients with OTS category 5, all patients 100% had mild or no visual impairment. OTS takes into consideration endophthalmitis, RAPD, retinal detachment, rupture of globe and perforating injury as prognostic variables of the final visual outcome. In our study no cases of endophthalmitis, and perforating injury. mRAPD, retinal detachment, and globe rupture were present in patients of OTS 1 and 2 and 3 grades, resulted always in worst visual outcome. The presence of rupture of globe was found to be associated with the worst final visual outcome. Thus, these variables can be used to predict the final visual outcome in patients with OTS grades 1 and 2 and grade 3. These findingsare similar to the findings by Kuhn et al, who formulated the OTS based on these variables.

The OTS could predict approximate prediction of no light perception among the patients of OTS 1 comparable to that in our study (74% vs 100%). A small study population has also resulted in a limitation of the spectrum of injuries assessed by us. For example, we have no cases of type D or type E injuries in this case series. Hence, describing the value of the type of injury as a prognostic factor will not be comprehensive.

Conclusion

The Ocular Trauma Score is considered to be a valuable tool in establishing the severity ofan open-globe injury. However, as the presence of endophthalmitis and retinal detachment are delayed complications of trauma, the value of the score in pre-operative evaluation of an open globe injury is uncertain. We have established a sensitive pre-operative scoring system based on the internationally accepted factors used to classify an open-globe injury. When tested on our data, the scoring system could accurately predict the outcome.

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