Assessment of Predicted Visual Outcome by Ocular Trauma Score In Mechanical Trauma Patients

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Abstract

Background: Ocular trauma is a leading cause of preventable blindness and visual impairment. The Ocular Trauma Score (OTS) was proposed to predict the visual outcome of patients after an ocular trauma. It acts as a useful system that allows clinician to efficiently plan, manage and monitor the full range of ocular injuries. **Objectives:** To assess the predicted visual outcome by Ocular Trauma Score in mechanical trauma patients. **Methods:** This prospective interventional study was carried out at National Institute of Ophthalmology and Hospital (NIO&H) from July 2022 to September 2023. A total of 88 patients at or above 10 years, presented with mechanical trauma were enrolled in this study. Initial visual acuity was recorded and proper in-hospital management was given. Ocular Trauma Score was calculated and recorded and followed for six months to see final visual acuity. **Results:** The mean age of study subjects was 34.61±13.20 years, among them 80.7% were male and 19.3% were female. 59.1% of the cases had closed globe injuries and 40.9% cases presented with open globe injuries. The most prevalent type of injury was accidental (63.6%). Majority of individuals (71.6%) sought medical attention within 24 hours of the injury. But most of them (57.9%) did not get any initial treatment before coming to the tertiary hospital. Initial visual acuity ≥6/12 was 9.1%, 6/60-6/15 was 27.3%, 1/60-5/60 was 35.2%, PL-HM was 20.5%, NPL 7.9%. OTS was 1 in 10.2% patients, 2 in 28.4%, 3 in 29.5%, 4 in 23.9% and OTS 5 in 8.0%. At the end of 06 months, 22.5% patients had ≥6/12 VA, 31.3% had 6/60-6/15 vision, 22.5% had 1/60 5/60, 13.8% had PL-HM, 10.0% had NPL vision. The 'P' value associated with the change of visual acuity from baseline to at 06 months follow up was 0.016, indicating a statistically significant difference between the two time points for this category. Patients with an OTS value of 1 had a higher risk of worst final visual outcome NPL (75.0%), whereas patients with an OTS value of 5 had a higher probability of getting the best visual outcome ≥ 6/12 (85.7%). **Conclusion:** This study shows that the higher the raw score and OTS category of the patient, the better the final visual acuity in patients with ocular trauma. This suggests that the initial ocular trauma score upon presentation could serve as a valuable prognostic indicator. As a result, this scoring system could play a significant role in providing useful insights for counselling both patients and their relatives dealing with ocular trauma.

Keywords: Ocular Trauma Score, open globe injury, closed globe injury, visual acuity.

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Introduction

One of the primary reasons of monocular blindness and visual morbidity worldwide is ocular trauma.[1] A major traumatic injury to eye can result in extreme physical harm as well as psychological trauma for the patients and also the relatives.[2] Ocular injuries can be classified based on the etiological factors causing the injury as– (1) Mechanical trauma, (2) Physical (thermal, electrical, ultrasonic), (3) Chemical agents, (4) Radiation (ultraviolet or ionizing). Among these, the most common etiological factor is mechanical injury to eye.[3] Depending on the object's characteristics- such as whether it is sharp or blunt, its size, its energy, and its speed-different types of ocular trauma may be caused.[4] An Ocular Trauma Classification Group was developed in 1997 to standardize eye injuries brought on by mechanical trauma and to connect

ongoing therapy to the real clinical situation.[5] The Birmingham Eye Trauma Terminology System (BETTS) was created as a standardized nomenclature to describe and share information on eye injuries.[6] Counselling the trauma victim and his family is one of the crucial steps in the care of open-globe injuries both before and after the repair about the visual outcome.[7]

The Ocular Trauma Score (OTS), which was first introduced by Kuhn et al. in 2002, is a condensed method for predicting the visual result for cases of ocular trauma. To identify specific predictors, the Ocular Trauma Classification Group examined more than 2500 injured eyes and analyzed more than 100 variables from the American and Hungarian Eye Injury Registries.[8] Ocular Trauma Score can estimate visual acuity after 06 months of injury in the basis of six variables– Initial visual acuity, Globe rupture, Endophthalmitis, Perforating injury, Retinal detachment, and Relative Afferent Pupillary Defect (RAPD).[9]

Ocular Trauma Score (OTS) ranges from 1 (worst injury severity and poor prognosis at six months) to 5 (least severe injury severity and least poor prognosis at six months). On first examination, an initial raw score is made, based on initial visual acuity. From raw score, points are subtracted for worst prognostic factors. Finally, raw sum is calculated and relevant category is estimated from OTS.[1] Some researcher noted an agreement between the visual acuity predicted by the OTS and the final visual acuity in their studies.

Initial VA, RAPD, vitreous haemorrhage, lens injury, endophthalmitis, retinal detachment, and zone of injury were prognostic markers for the ultimate visual acuity. Nearly all studies revealed that pre-operative visual acuity was the most significant predictive factor. Poor post-operative vision is strongly correlated with poor pre operative vision.[7] A poor visual prognosis was also linked to a delayed hospital presentation.[3]

This study was conducted in a tertiary eye hospital to assess the predicted visual outcome of the patients, after appropriate management attended with ocular trauma on the basis of Ocular Trauma Score.

Methodology

This prospective interventional study was carried out at National Institute of Ophthalmology and Hospital (NIO&H) from July 2022 to September 2023. Patients presented with mechanical trauma through emergency of National Institute of Ophthalmology and Hospital, were enrolled in this study. Patients suffering from other intraocular or ocular surface diseases, patients having injuries in the other parts of the body deteriorating consciousness or demanding immediate management were not included in the study.

A total of 88 patients at or above 10 years were included in study. Informed written consent was taken from each patient or their legal guardian. Details history of patient, clinical examination, investigations were taken. Relevant information was recorded in predesigned proforma. Initial visual acuity was recorded by using Snellen acuity chart. Proper ocular examinations were done by slit lamp biomicroscope and 90D/78D condensing lens. B-scan ultrasonography was done in applicable cases. A standard guideline was followed during in-hospital management.

Initial raw score was formulated based on initial visual acuity. The key variables including globe rupture, endophthalmitis, perforation, retinal detachment, relative afferent pupillary defect was recorded by a fixed raw point according to the computational method. Ocular Trauma Score was then calculated according to raw score sum and recorded.

The patients were followed for six months to see final visual acuity. Follow ups were given at 01 week, at 01 month and at 06 months at least. If any complication detected, patients were referred to the related sub specialists t treat the complications in different follow up periods. In between the follow up schedules 08 patients were lost and total 80 patients could be followed up and analyzed at the end of the 6th months.

Results

A total of 88 patients at or above 10 years with ocular injury were included in the study. The majority of the participants 35 (39.8%) fell into 30-39 years age group. Mean age was 34.61±13.20 (SD) years. Out of 88 patients, 71 (80.7%) were male and 17 (19.3%) were female.

Table 1: Shows the base-line parameters of the study subjects

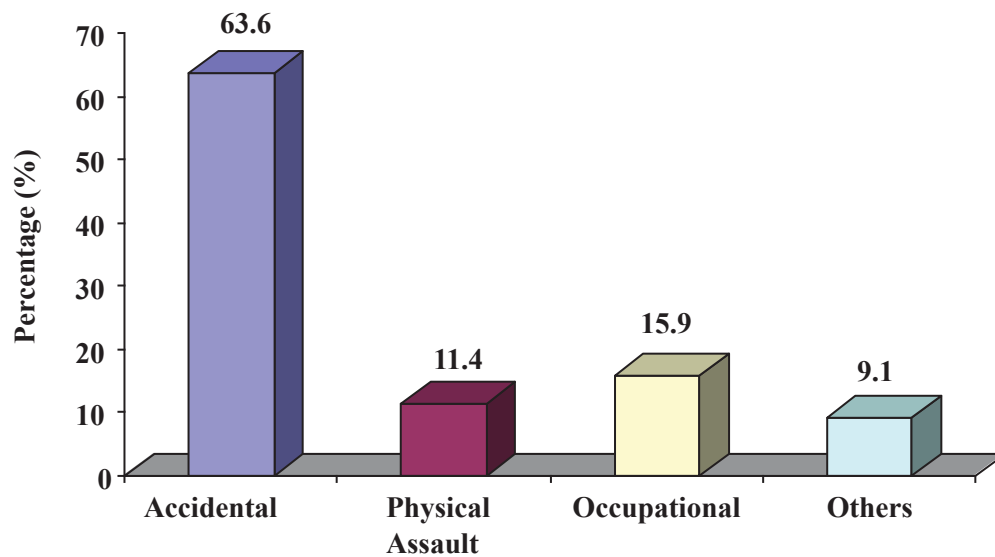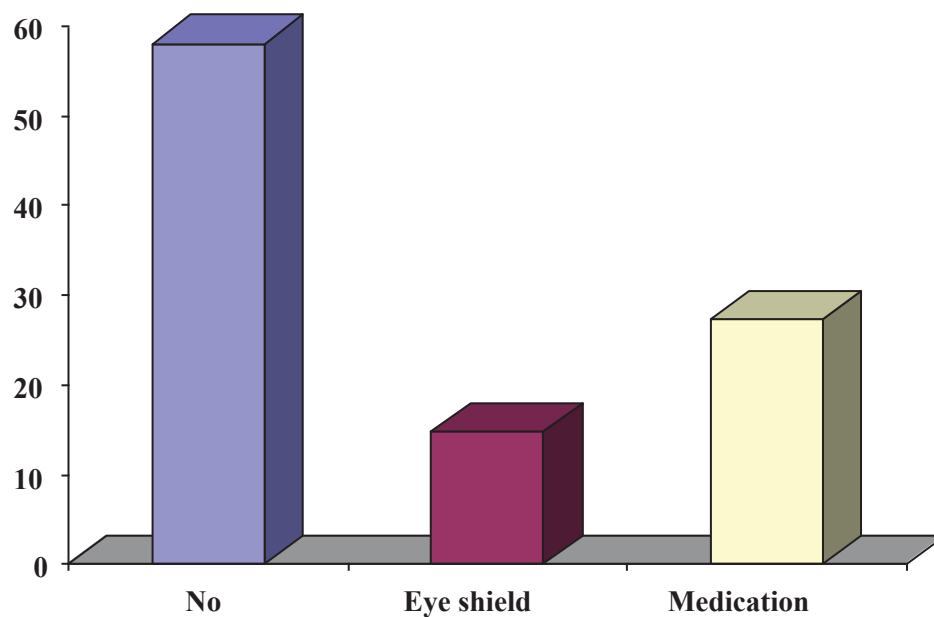| Parameters	Values
Mean age	34.61±13.20 (SD) years
Sex	Male 19.3%, Female 80.7%
Eye involved	Right eye 40.9%, Left eye 59.1%

Figure I: Bar diagram showing nature of injury of the study subjects (n=88)

Figure II: Bar diagram showing initial treatment of the study subjects (n=88)

Table II: Distribution of OTS category of the study subjects (n=88)

Raw score	OTS category	Frequency	Percentage (%)
0-44	1	9	10.2
45-65	2	25	28.4
66-80	3	26	29.5
81-91	4	21	23.9
92-100	5	7	8.0

Data were expressed as frequency and percentage. OTS = Ocular Trauma Score

Table III: Comparison of visual acuity between baseline and at 6 months

follow-up (n=88)					
VA	Baseline (n=88)		At 6 months (n=80)		P value
	No	%	No	%	
NPL	7	8.0	8	10	
PL-HM	18	20.5	11	13.8	
1/60-5/60	31	35.2	18	22.5	0.016
6/60-6/15	24	27.3	25	31.3	
$\geq$ 6/12	8	9.1	18	22.5	

Data were expressed as frequency and percentage. Fisher's exact test was performed and P <0.05 was accepted as level of significance

According to table X, The P value associated with the change of visual acuity from baseline to at 06 months follow up is 0.016, indicating a distinction between the two time points for this category that is statistically significant.

Table IV: Association of final VA and OTS (n=80)

Raw Score sum	OTS category	NPL No (%)	PL/HM No (%)	1/60-5/60 No (%)	6/60-6/15 No (%)	≥6/12 No (%)
0-44	1	6(75.0)	2(25.0)	0(00)	0(00)	0(00)
45-65	2	2(9.1)	9(40.9)	6(27.3)	5(22.7)	0(00)
66-80	3	0(00)	0(00)	10(41.7)	12(50.0)	2(8.3)
81-91	4	0(00)	0(00)	2(10.5)	7(36.9)	10(52.6)
92-100	5	0(00	0(00)	0(00)	1(14.3)	6(85.7)

Data were expressed as frequency and percentage. VA= Visual acuity, OTS= Ocular Trauma Score

Discussion

The study was conducted with an aim, to assess the predicted visual outcome of the patients with ocular trauma attending in National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh. The objective of the current prospective interventional study was to evaluate ocular trauma and estimate the prognosis for vision, and thereby counseling of the patient as well as planning of the management protocol.

This study revealed that among 88 patients 71 (80.7%) were male, while 17 (19.3%) were female which was consistent with the findings from the majority of similar studies.[3,7,10,11] The fact that more males were involved in outdoor activities and likely to engage in risky activities that could result in eye injuries.[11]

In our study, closed globe injuries were found in 52 (59.1%) of patients, whereas open globe injuries were observed in 36 (40.9%) of cases. Therefore, the findings of the study are in well agreement with the findings of the other research works.[12]

This study showed the most prevalent type of injury was accidental, which accounted for 64% of all reported injuries. Occupational injuries representing 15.9%, physical assault represented 11.4% of the injuries reported and 9.1% due to other causes. Similar result was shown by a study in 2014, as they observed road traffic accident, assault and sports related injuries were the common causes.[13]

The present study showed as the most common source of injury was blunt (60.2%) then 28.4% were sharp. This was in accordance with several previous studies.[7,11]

According to the recent study, the majority of the individuals (71.6%) sought medical attention within 24 hours of the injury. However, a significant proportion of participants (21.6%) delayed seeking medical attention until 24 to 48 hours after the injury occurred, and (6.8%) sought medical attention after more than 48 hours had passed since the injury. Delayed hospital admission was linked to a worse visual prognosis.[14]

In this study, out of 88 participants, most of them had poor VA initially. They had NPL vision for 7.9%, PL to HM vision for 20.5%, 1/60-5/60 vision for 35.2%. In 06 months follow up these percentage were reduced to 10.0% NPL vision, 13.8% PL to HM vision and 22.5% within the range of 1/60-5/60.

In another point of view, only 9.1% had initially good vision (VA ≥6/12) and 27.3% patients presented with initial VA 6/60-6/15. These percentage were improved at 06 months follow up. Final VA ≥6/12 was for 22.5% of the participants and final VA 6/60-6/15 was for 31.3% of the participants. Therefore, the findings of the study are in well agreement with the findings of the other research works.[7,10,11,12,15]

The study showed that the study participants who were in OTS category 1 (6.8%), had a poor visual outcome at 06 months. their final VA mostly were NPL (75.0%), followed by PL/HM (25.0%). Similarly, those who fell in the group of OTS category 2, their final VA was not satisfactory as there were NPL cases 9.1% and PL/HM cases were 40.9% of the participants. In contrast, in OTS 4 and OTS 5, the visual outcome at 06 months follow up was up to the mark. In OTS category 4, most study participant had final VA within ≥6/12, which comprised 52.6% of cases. In other hand, in case of OTS category 5, most patients developed good visual outcome. They gained ≥6/12 vision in 85.7% cases. In both category, OTS 4 and OTS 5, none of the patients got worse vision like NPL or, PL to HM.

In OTS category 3, the study showed the final VA at 06 months were mostly (50.0%) in vision group (6/60-6/15), followed by 41.7% participants had final VA 1/60-5/60. After observation of these result findings, it was found that higher the Ocular Trauma Score (OTS) had better visual outcome. Therefore, this study's findings are in well agreement with the findings of the other research works.[3,7,10,12] Kuhn also showed that OTS category 1 had worst prognosis at 06 months and OTS category 5 had the least poor prognosis at 06 months. They calculated a prediction accuracy of about 80%, which indicated that the OTS would be accurate four out

of five times.[16]

Surgical repair of all of the ocular injuries were not done by a single surgeon rather by multiple surgeons, so the quality of repair may interfere the result. It was the limitation of the study.

Conclusion

After analyzing the results of the present study, it can be concluded that a higher Ocular Trauma Score (OTS) has a better final visual outcome in ocular trauma patients. The OTS can give us some insight at first presentation regarding the final visual prognosis in these cases and acts as a guiding tool while planning the treatment procedure. So, the OTS can be used as a valuable standard predictive tool for the management and counselling of ocular trauma patients.

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