Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

A prospective study to evaluate the predictive value of ocular trauma score in cases of mechanical eye injuries in a tertiary care hospital

Arvind Kumar[1,*], **Rupali Verma**[2], **Abha Shukla**[1]

[1]*Dept. of Ophthalmology, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India*
[2]*Dept. of Ophthalmology, Government Medical College, Orai, Uttar Pradesh, India*

ARTICLE INFO

Article history:
Received 18-04-2021
Accepted 28-04-2021
Available online 30-09-2021

Keywords:
Ocular trauma score (OTS)
Eye trauma
Mechanical injuries
Ocular injuries
Mechanical eye injuries
Ocular injury
Eye injury
Open globe injury
Globe rupture

ABSTRACT

Background: Ocular trauma score (OTS) was proposed to predict the visual outcome of patients after ocular trauma, which estimates visual function (visual acuity) after 6 months of ocular trauma. This OTS scale is useful for guiding the treatment and rehabilitation of the patients with eye injury and to provide the valuable information and advice. Aim of this study was to evaluate the predictive value of OTS in cases of mechanical ocular trauma.

Materials and Methods: A prospective interventional study was carried out in a tertiary care centre over a period of 2 years; August 2017 to July 2019. Patients with mechanical eye trauma were included in the study. OTS score was calculated and recorded for each eye at the time of injury. Proper treatment given to each case and followed for six months. Results obtained were compared with standard OTS with respect to final VA.

Result: Out of 50 patients mean age was 28.46 years, with majority between 21 to 50 years of age. There were 78% males and 22% were females. Metallic objects were the common source of injury in 27 cases (54%) like iron rod and nail. In cases (fifty eyes) the distribution of OTS variables was; globe rupture 86% (43 eyes), retinal detachment 6% (3 eyes), relative afferent pupillary defect (RAPD) 6% and endophthalmitis 2% (1 eye) respectively. The final visual acuities in OTS categories in our study groups were similar to those in the OTS study group, except for some categories.

Conclusion: OTS helps treating ophthalmic team to assess evidence based prognosis of a traumatized eye in advance. With the guidance of OTS the patient and their family can be counselled for further management.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Ocular trauma has currently gained attention due to its serious impact on visual morbidity.[1] Ocular trauma is a major cause of monocular blindness and visual impairment throughout the world.[2,3]

Ocular trauma score (OTS) was proposed to predict the visual outcome of patients after ocular trauma.[4] In 2002 the ocular trauma score (OTS) was published, which estimates visual function (visual acuity) after 6 months of ocular trauma. This OTS scale is useful for guiding the treatment and rehabilitation of the patients with eye injury and to provide the valuable information and advice.According to this OTS scale, the traumatized eye may be placed into one of five categories (Globe rupture, Endophthalmitis, Perforating injury, Retinal Detachment and RAPD), each of which has a distinct probability of reaching a range of visual function.[4]

Variables which can be identified easily and affect the visual outcome directly are included as deciding factors of OTS. They are visual acuity, globe rupture, endophthalmitis, perforating injury, retinal detachment and RAPD. Each

* *Corresponding author*.
E-mail address: drarvindkumar69@yahoo.com (A. Kumar).

https://doi.org/10.18231/j.ijceo.2021.103
2395-1443/© 2021 Innovative Publication, All rights reserved.

variable was assigned a number called raw points. If variables are not present, its value is zero. Raw points are added to get a raw score. This raw score helps in getting the final OTS (1 to 5) from standard table. (Tables 1 and 2)

Table 1: Computational method for deriving the OTS score

Initial visual factor	**Raw points**
1. Initial raw score (this is based on initial visual acuity)	NPL = 60 PL or HM = 70 1/200 to 19/200 = 80 20/200 to 20/50 = 90 ≥ 20/40 = 100
2. Globe rupture	-23
3. Endophthalmitis	-17
4. Perforating injury	-14
5. Retinal detachment	-11
6. Relative afferent pupillary defect (RAPD)	-10
Raw score sum = sum of raw points	

NPL: No Perception of light
PL: Perception of Light
HM: Hand movements

It's like APGAR score used in Obstetrics and GLASGOW COMA SCALE in cases of head injuries. After complete examination and investigation of a case of mechanical eye injury, depending on vision and anterior-posterior segment findings, we get raw points as described in table 1. Raw points are summed up to get a raw point score. It is simply like any sports score or exam marks of different subjects; good score guide to victory but in spite of poor score, there does remain hope of winning at last. OTS score of one (0-44 raw point sum) will have poor final visual outcome at 6 months while the OTS score of five (92-100) will have better final vision outcome.

Purpose of this study was to evaluate the predictive value of ocular trauma score (OTS) in cases of mechanical eye injuries and to study the profile of ocular trauma in a tertiary care hospital.

2. Materials and Methods

A prospective, interventional study of 50 patients who presented to our tertiary care centre with mechanical eye injuries was done over a period of two year between August 2017 and July 2019. Prior to commencement of study approval from institutional ethical committee was taken. Patients willing to participate with proper follow up were included in this study. Exclusion criteria were chemicals, electrical, thermal injuries, patients below 2 years and who sustained any new injury during the follow up period.

The findings about significant history and ophthalmic examination were recorded in pre-designed Proforma. The important variables for OTS visual acuity, globe rupture, endophthalmitis, perforating injury, retinal detachment, relative afferent pupillary defect (RAPD) were given special emphasis during initial examination. On first examination each eye was assigned an initial raw score based on the initial visual acuity (VA), anterior and posterior segment finding (Table 1). Once the raw score sum has been calculated, from the relevant category the eye got corresponding OTS score (Table 2). For each OTS score Table 2 gives the estimated probability of each follow-up visual acuity category. Proper treatment was given to each patient. Initially they were closely followed weekly for 1^{st} month, every forth night for next two months. Finally, they were called for final ocular examination to record vision at 6 months.

3. Results

Out of 50 patients mean age was 28.46 years, with majority between 21 to 50 years of age. Males were 78% and 22% were females. Most injuries (92%) were unintentional while only 8% were due to assault. The inflicting agents in 54% (27 cases) were metallic object, in 32% (16 cases) wood. In 12% (6 cases) road traffic accident was the aetiology while broken glass was responsible in 2% (1 case).

7 eyes (14%) presented with lid laceration and in 34 (68%) eyes hyphema was present. Traumatic cataracts developed in 11 eyes (22%). Vitreous loss was noted in 13 (26%) eyes. Intra-ocular foreign body was detected in 2 (4%) eyes (Table 3).

Out of fifty eyes forty-three eyes affected with globe rupture (86%), three eyes with retinal detachment (6%), RAPD noted in (6%) and one patient showed signs of endophthalmitis (2%).

The initial visual acuity was no perception of light in 24% (12 cases), hand movement or perception of light in 33% patients and one patient (2%) had vision between 1/200 to 19/200. Four patients (8%) were presented with the vision between 20/200 and 20/50 (Table 4).

4. Discussion

Our study goes much in consensus with OTS described. This study showed few variations (Table 5) like in the category 2 where the NPL ratio was 27% vs. 8.1% and PL/HM was 26% vs. 54.1%. This difference may be because of vision recording is a subjective test and is totally depend on the status of patient how they respond in traumatised phase while suffering in pain and agony. Sometimes response of patient may be inaccurate. Conventional OTS has been given at that time, when the enucleation was preferred practice in severe trauma for fear of sympathetic ophthalmitis. Now a day's enucleation rate is decreased as better treatment modalities are available. This could affect the results of this category.

Schorkhuber MM et al.[5] also founded statically difference of PL/HM ratio in category 2 (53% vs. 26%) and Unver et al.[6] have also highlighted that final visual acuity for PL/HM in category 2 (55% vs. 26%). The younger

Table 2: Estimated probability of follow up visual acuity category at 6 months

Raw score sum	Ots score	Npl	Pl/hm	1/200-19/200	20/200-20/50	>=20/40
0-44	1	73%	17%	7%	2%	1%
45-65	2	28%	26%	18%	13%	15%
66-80	3	2%	11%	15%	28%	44%
81-91	4	1%	2%	2%	21%	74%
92-100	5	0%	2%	2%	5%	92%

NPL: No Perception of light
PL: Perception of Light
HM: Hand movements

Table 3: Demographic distribution of patients

Demographical Distribution		Number of patients	Percentage (n = 50)
Age	5-20 years	19	38%
	21-50years	24	48%
	51-70years	7	14%
Sex	Male	39	78%
	Female	11	22%
Source of injury	Metallic object (iron rod and nail)	27	54%
	Wood, bamboo stick and thorn	16	32%
	Road traffic accident	6	12%
	Broken glass	1	2%
Associated factors	Lid laceration	7	14%
	Hyphema	34	68%
	Traumatic cataract	11	22%
	Vitreous loss	13	26%
	Intraocular foreign body	2	4%

Table 4: Distribution of the variables of the OTS in our sample population (n = 50)

Variables	N	%
A. Initial visual acuity		
No PL	12	24%
PL or HM	33	66%
1/200 to 19/200	01	2%
20/200 to 20/50	04	8%
>/= 20/40	00	-
B. Globe rupture	43	86%
C. Endophthalmitis	01	2%
D. Perforating injury	00	-
E. Retinal detachment	03	6%
F. Relative afferent pupillary defect	03	6%

Table 5: Comparison of final visual acuities and OTScategorical distributions between OTS study and our series

Sum ofRaw Points	OTS score	NPL	PL/HM	1/200-19/200	20/200-20/50	>/=20/40
0–44	1	74/77.8	15/22.2	7/0	3/0	1/0
45-65	2	27/8.1*	26/54.1*	18/13.5	15/13.5	15/10.8
66-80	3	2/0	11/0*	15/25*	31/50*	41/25*
81-91	4	1/0	2/0	3/0	22/0*	73/0*
92-100	5	0/0	1/0	1/0	5/0	94/0*

*variations

the child at the time of visual deprivation, the more rapid the development of Amblyopia.[7,8] In addition, children may develop more extensive postoperative inflammation, scarring, and proliferative vitreoretinopathy than adults which may also affect the anatomic and functional outcomes.[9]

Another statically differences we founded in category 3 where 1/200-19/200 ratio (15 vs. 25%; P value: 0.047) and 20/200-20/50 ratio (31% vs. 50%; P value: 0.004) were statistically higher than in the OTS study because in our study many patients presented to us with pupil sparing trauma like small incised wound in peripheral cornea and peripheral corneo-scleral tear. After repairing of peripheral wound, vision of patients has improve. Many patients were there with traumatic cataract in which vision improved after cataract surgery. Some patient's vision improved after hyphema gets resolved. Technically good surgical repair of wound also caused the vision to improved post-operatively.

Qi Y et al.[10] concluded that the prognostic factors were initial VA, wound location, injury type, cataract removal procedure, and the way of IOL implantation and suggested that the OTS has good sensitivity and specificity for predicting visual outcome in traumatic cataract patients in long follow-up.PL/HM ratio (11% vs. 0%; P value: 0.013), and >=20/40 ratio (41% vs. 25%; P value: 0.02) were statistically lower than in the OTS study because various factors such as age of patient, presence of total body injury, cause of injury, type or mechanism of injury, presence of intraocular foreign body, expulsive haemorrhage, extent of wound and size of open globe injury, location of open globe wound, lens damage, hyphema, vitreous haemorrhage, patients from rural background, may have affected our study results.

We found that most open globe injuries in males involved in manual work. Now the high rate of work-related injuries is alarming. This indicates there are still a number of companies and construction sites hiring labours do not prioritize ocular protection as part of their occupational health and safety project. These labourers usually belonging to the lower socio-economic status do not give attention on the day of injury and take no medical advice most patients waited for 1 to 3 days before coming for consultation, consistent with the previous study.[11] This could be due to financial constraints and transportation difficulties. Later most patients underwent some form of surgical intervention in addition to medical therapy directing towards the severity of injury.

Based on mode of injury, blunt injury cases had poor final VA compared to penetrating trauma in our study. This can affect the internal structures of the eye by coup-countercoup mechanism resulting in more significant damage and similarly significant injury to optic nerve. With blunt injury, wound can get extended posterior to recti insertion resulting in poorer final vision outcome.

Our study showed majority of patients with initial VA of PL/HM or worse had comparatively good final Visual Acuity. This may be due to traumatic cataract lens removal and good surgical repair of globe and treatment modalities. If the complications like endophthalmitis and retinal detachment develop in later phase of trauma, the value of OTS in predicting pre-operative evaluation of open globe injury is uncertain. In our study most of patients presented to us with open globe injury (globe rupture) it was found to be statically significant.

Visual outcome also depends on the age of patient, type or mechanism of injury, extent of wound and size of open globe injury, location of open globe wound, lens damage, hyphema, vitreous haemorrhage, presence and type of intraocular foreign body. These factors can be responsible for drastic differences in later visual outcome contrary to what is predicted by conventional OTS. As these factors are not mentioned in detail they should be considered in conditions when present. As far as the pre-existing scoring systems are concerned, its applicability is limited in open globe injuries in children. The OTS utilizes a limited number of variables and basic statistics to give the ophthalmologists a 77% chance of predicting the final visual outcome within (plus or minus) one visual category shortly after the eye injury.[12]

5. Conclusion

Ocular trauma in any age creates agony in patient and family. Just after trauma the question treating team faces is how much is visual damage and how it will evolve in future. This question is more haunting in era of consumer protection act. OTS helps to row the boat of prognosis amidst the storm.

OTS provides the reliable information for ophthalmologists and patients about the prognosis in case of ocular trauma. It helps in deciding the therapeutic approach for practicing ophthalmologists involving the patient and the family.

Once expected outcome of trauma can be predicted, treating team develops vision to create awareness and ability to understand prognosis among patient and family.

6. Limiting Factors

Relatively less number of the patients may be a limitation factor for this study.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Desai P, Macewen CJ, Baines P, Minassian DC. Incidence of cases of ocular trauma admitted to hospital and incidence of blinding outcome. *Br J Ophthalmol*. 1996;80(7):592–6.
2. Aghadoost D. Ocular trauma: an overview. *Arch Trauma Res*. 2014;3(2):e21639.
3. Maurya RP, Srivastav T, Singh VP, Mishra CP, Al-Mujaini. The epidemiology of ocular trauma in Northern India: A teaching hospital study. *Oman J Ophthalmol*. 2019;12:78–83.
4. Kuhn F, Maisiak R, Mann L, Mester V, Morris R, Witherspoon CD. The Ocular Trauma Score (OTS). *Ophthalmol Clin North Am*. 2002;15(2):163–6.
5. Schörkhuber MM, Wackernagel W, Riedl R, Schneider MR, Wedrich A. Ocular trauma scores in paediatric open globe injuries. *Br J Ophthalmol*. 2014;98(5):664–8.
6. Unver YB, Kapran Z, Acar N, Altan T. Ocular trauma score in open-globe injuries. *J Trauma*. 2009;66(4):1030–2.
7. Bunting H, Stephens D, Mireskandari K. Prediction of visual outcomes after open globe injury in children: A 17-year Canadian experience. *J Am Assoc Pediatr Ophthalmol Strabismus*. 2013;17(1):43–6.
8. Kaur A, Agrawal A. Paediatric ocular trauma. *Current Science*. 2005;89(1):43–46.
9. Morescalchi F, Duse S, Gambicorti E, Romano MR, Costagliola C, Semeraro F. Proliferative vitreoretinopathy after eye injuries: an overexpression of growth factors and cytokines leading to a retinal keloid. *Mediators Inflamm*. 2013;2013:269787.
10. Qi Y, Zhang YF, Zhu Y, Wan MG, Du SS, Yue ZZ. Prognostic Factors for Visual Outcome in Traumatic Cataract Patients. *J Ophthalmol*. 2016;2016:1748583.
11. Shen Y, Lee LH. Improving the wait time to consultation at the emergency department. *BMJ Open Qual*. 2018;7(1):e000131.
12. Rawat P, Rajput S, Gautam M, Tammannavar S. Grading of severity of ocular trauma by various ocular trauma scores and its effect on prognosis. *Int J Sci Res Publications*. 2014;4(12):2250–3.

Author biography

Arvind Kumar, Senior Resident https://orcid.org/0000-0003-2800-6351

Rupali Verma, Senior Resident

Abha Shukla, Associate Professor

Cite this article: Kumar A, Verma R, Shukla A. A prospective study to evaluate the predictive value of ocular trauma score in cases of mechanical eye injuries in a tertiary care hospital. *Indian J Clin Exp Ophthalmol* 2021;7(3):523-527.