Clinical Profile and Factors Determining the Final Visual Outcome of Patients Presenting with Ocular Trauma

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Purpose:- To determine the clinical profile and the factors affecting the visual outcome of patients with ocular trauma

Materials & Methods:- A retrospective review of medical records of patients with ocular trauma presenting at a tertiary referral centre, Eastern Nepal, from January 2015 to December 2015. Different pre-operative variables were reviewed and analyzed with the final visual acuity (VA).

Results:- The cohort consisted of 136 patients (138 eyes). The mean age was 16.09±15.89 years. Children less than fifteen years and male patients were predominantly affected. To determine the clinical profile and the factors affecting the visual outcome of patients with ocular trauma, open globe injury, close globe injury, visual outcome

Abstract

Introduction
Ocular injury constitutes a major cause of preventable monocular blindness and visual impairment throughout the world especially in children and young adults. Most of the ocular injuries are preventable particularly those occurring during work or sports. The prevalence of ocular trauma varies with age group, gender, geographical distribution and occupation. Thylefors reported ocular trauma as one of causes of unilateral loss of vision in developing countries and 5% of all bilateral blindness is directly due to trauma. Upadhyay et al reported the prevalence of monocular blindness attributable to ocular trauma as 7.9%. Evaluating the clinical profile and cause of ocular trauma could be a major step in planning preventive strategies in developing nations. The present study was aimed to determine the clinical profile and to assess the factors determining the final visual outcome of patients admitted with ocular trauma.

Materials & Methods
We retrospectively reviewed the hospital records of patients admitted with ocular trauma in the department of Ophthalmology at a tertiary referral centre (BP Koirala Institute of Health Sciences, Dharan, Nepal) over a period of one year from January 2015 to December 2015. In this study, ocular injury was defined as any injury affecting the eye or adnexa and classified according to the Birmingham Eye Trauma Terminology system which included status of globe wall (open globe or closed globe), type of injury, zone of injury, grade of injury and pupillary abnormalities.

Classification of the ocular trauma was done by the Ocular Trauma Classification System (OTCS) on the basis of visual acuity, anatomical location of wound, mechanism of injury, and presence of an afferent pupillary defect. Patients with ocular disorders other than ocular trauma and previous ocular surgery were excluded. Detailed demographic data including age, sex and place of injury was collected. Mode of injury, agent of trauma, duration of injury to hospital presentation, initial and final best-corrected (Snellen’s) visual acuity, anatomical site, location of injury, adjuvant treatment, duration of hospitalization and follow up were recorded. The initial visual acuity was the acuity measured at presentation to the hospital and the final visual acuity was taken at the most recent outpatient visit (at 4 months follow up). Final visual acuity was compared with various pre-operative variables to determine the factors influencing the final visual outcome. The study was conducted after getting approval from Institute Review Committee, BP Koirala Institute of Health Sciences (BPKIHS) and in accordance with declaration of Helsinki.

Statistical Analysis
Statistical analysis was performed using SPSS version 20.0. Statistical analysis of quantitative data, including descriptive statistics, parametric and non-parametric comparisons, was performed for all variables. Frequency analysis was performed by Chi-square test. Bivariate and multiple logistic regression analysis were used to find the correlation for pre-operative variables with the final visual
outcome. Chi square test or Fischer's exact test were used as appropriate. A p-value less than 0.05 were considered statistically significant.

**Results**

A total of 136 patients (138 eyes) with ocular injuries were identified and reviewed. The mean age of patients was 16.09 ± 15.89 years (range: 3 months - 72 years). Children less than 15 years were predominantly affected (65.44%). Males were frequently involved (n=104, 76%) than females (n=32, 24%) with M: F ratio 3:1. Right eye was involved in 56 cases (41%), left in 78 (57%) and both the eyes in two cases (2%). Figure 1 shows the distribution of age and sex in the study population. Eighty patients (58.8%) were from rural community and 56 (41.17%) from urban.

Sport related injuries was the most common in 55.52% followed by work related in 27.94%, road traffic accident in 8.08%, physical assault in 4.41% and others (fall injury, home) in 8.74%. Wooden stick was the most common agent of injury (36%). Students were predominantly affected (n=80, 58.82%) followed by farmers (n=25, 18.38%), preschool children (n=12, 8.82%) and others (n=26, 19.1%). Fifty patients (36.76%) presented to the hospital between 24 hours to one week of injury, 40 (33.08%) within 24 hours and 41 (30.14%) presented one week after injury. The average time lag between injury and hospital visit was three days (range: one hour to three months).

Ninety nine patients (71.1%) had sustained open globe injury (OGI) and 28.3% (n=39) had a closed globe injury (CGI). Among OGI, Zone I injury was the most common (71 eyes, 71.7%) followed by zone II in (19 eyes, 19 %) and Zone III (9 eyes, 9.09%). Ninety two eyes (92.9%) had Type B (penetrating) injuries while only 3 (3 %) had Type A (rupture).

Corneal penetration was the most common presentation in 66 eyes (47.82 %) (Figure 2, 3 & 4). The lens was found to be cataractous with or without anterior capsule rupture in 22 eyes (15.9%). The most common type of closed globe injury were contusion (21 eyes, 55.26%), lid and periorbital laceration (n=8, 21.05 %), superficial corneal foreign bodies (n=4, 10.52%) and lamellar laceration in 3 cases, 7.9% (Figure 5). Table 1 shows the pattern of distribution of ocular injuries in the study population.
Among the patients with OGI, the presenting visual acuity was ≥ 6/12 in two cases, 6/18-6/36 in seven cases, 6/60-PL in 68 and 19 patients did not have perception of light. In CGI, two patients had visual acuity of ≥ 6/12, 5 (6/18-6/36), 25 (6/60-perception of light) and two had no perception of light. There was a statistically significant difference seen in the initial visual acuity between OGI and CGI, p=0.002 (Figure 6).

Overall, 95 (68.88%) cases required surgery. The most common primary surgical repair done was reconstruction of the globe integrity. All the open globe injury surgeries were done within five hours of presentation to the hospital under general anaesthesia. Lid laceration and canalicul repair was done under local anaesthesia. Patients with cataractous lens underwent lens aspiration with intraocular lens implantation in a secondary setting. The most common surgical intervention done was corneal perforation repair in 70.2%, followed by lens aspiration (23.4%), sclera perforation repair (15.95%), corneoscleral perforation repair (10.63%), lid repair (8.51%), removal of corneal foreign body (6.36%), canalicul repair with sialastic tube (2.12%) and enucleation in 2.12% patients with irreparable globe rupture. Intravitreal antibiotics (vancomycin 1mg/0.5ml and cefotaxime 2.25mg/0.5ml) were injected in patients with OGI, presenting more than 24 hours after trauma.

All the patients with open globe injuries were treated with intravenous antibiotics (cephazolin 50mg/kg/ weight and gentamicin 4mg/kg/ weight) for three days, topical steroid eye drops in a tapering dose, cycloplegic eye drops and topical antibiotics.

At the last follow up (four months), best corrected visual acuity was ≥ 6/12 in 13 patients, 6/18-6/36 in 30 eyes, 6/60 to perception of light in 73 and no perception of light in 22 eyes. Statistically significant difference was seen in the final visual acuity between open and close globe injuries with p-value <0.001 (OR 0.202, 95% CI 0.089-0.461). Patients with CGI had a better final visual outcome than OGI (Figure 6).

None of our patients developed endophthalmitis.

All the pre operative variables were correlated with the final visual outcome. The factors found to be statistically associated with final visual acuity were grade of injury
Cillino et al found equal
Khatry et al found that upon presentation to the
Geng et al, at three months
Most of the patients' sustained injury while playing (51%)
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Children are the vulnerable age groups and
This variation in
Epidemiological profile of ocular injuries varies in
different countries. In this study, children less than 15
(65.44%) years of age and males were predominantly affected
(76%), which is consistent with the findings reported in
literature. Children are the vulnerable age groups and
more prone for injuries. Males are more frequently exposed
to outdoor and dangerous works than females and hence
more prone for ocular injuries. We found that students were
commonly exposed to ocular trauma (58.8%). This
reinforces the need for prevention of childhood injuries
within home, outdoor activities and school. The mean age
of the patients was 16 years which was lesser than reported
by Kinderan et al where the average age of patients was 28.3
years and Khatry et al with a mean age 28 years. Most of the patients (70%) seek medical management
after ≥ 24 hours after trauma, unlike what was reported
by Upadhyay et al (42%) and Kinderan et al (48%).
The time lag between injury occurrence and presentation to
hospital could be due to lack of care seeking, awareness and
socioeconomic factors.
Outdoor activities were related more with ocular trauma. Most of the patients' sustained injury while playing (51%) followed by work related injuries (27.9%). Preventive measures while playing can reduce such injuries. Wooden stick was the common agent of injury (36%). These findings correlate well with studies done by Misra et al, Umesh et al and Krishnan et al. A large proportion of our patients were from the rural community (n-80, 58.8%), similar to that reported by others. This reflects the greater exposure of people in rural community to ocular injuries as agriculture is their main occupation and suggests the need for better monitoring and awareness among rural people regarding ocular injuries. Most of the cases with CGI were treated on outpatient basis; this could be the reason for having more cases of OGI than CGI (71.1% versus 28.3%).
Misra et al reported a higher percentage of closed globe injuries (41 cases, 68.33 %) when compared to open globe injuries (19 cases, 31.67 %), the commonest object causing injury being wooden stick. Cillino et al found equal incidence of CGI and OGI. Majority of our patients at the time of presentation had visual acuity ≤ 6/60 (83.83%), only 16.17 % had a visual acuity of >6/60. At four months follow up 24.26 % had visual acuity better than 6/60. Statistically significant difference was seen in the final visual acuity between OGI and CGI. Misra et al, in their study, reported that 26.7% had visual acuity better than 6/60 at presentation and 40% of patients presented with visual acuity of 6/60 to 3/60. At two months follow up, visual acuity better than 6/60 increased from 16% to 68%. Khatry et al found that upon presentation to the clinic, 26.4% of patients had a best corrected visual acuity worse than 20/60 in the injured eye, while 9.6% had visual acuity worse than 20/400. Geng et al, at three months follow up, found that, of OGI, 61.5% patients worsened or showed no improvement in VA compared with CGI (28%, OR, 8.7:95% CI 1.2-12.7;P=0.015). Agarwal et al, at four months follow up, found that 441 (65.9%) achieved visual acuity better than 20/40, 84 had VA between 20/50- 20/200 and 144 (21.5%) were worse than 20/200. This variation in visual acuity could be because of variation in population, variables and type of injury.

Table 2: Bivariate analysis of factors affecting the final visual outcome

| Parameters                      | Spearman’s Rho Coefficient | P value |
|---------------------------------|-----------------------------|---------|
| Age                             | -0.046                      | 0.592   |
| Gender                          | 0.060                       | 0.487   |
| Time lag to hospital presentation| 0.149                       | 0.082   |
| Mode of injury                  | 0.196                       | 0.021   |
| Place of injury                 | -0.003                      | 0.973   |
| Agent of injury                 | 0.015                       | 0.862   |
| Grade of injury                 | 0.711                       | <0.001  |
| Group                           | 0.410                       | <0.001  |
| Type of injury                  | -0.074                      | 0.386   |
| Zone of injury                  | 0.250                       | 0.003   |
| Vitreous haemorrhage            | -0.178                      | 0.037   |
| Lens (Cataract)                 | 0.173                       | 0.042   |
| Hyphaema                        | -0.217                      | 0.011   |
| Relative afferent pupil defect  | 0.054                       | 0.529   |
| (traumatic optic neuropathy)    |                             |         |
| Pre operative visual acuity     | -0.309                      | <0.001  |
| Glaucoma                        | -0.078                      | 0.361   |

Table 3: Multivariate analysis of factors affecting the final visual outcome

| Parameters                  | P value | Odds ratio | 95% CI Lower | 95% CI Upper |
|-----------------------------|---------|------------|--------------|--------------|
| Visual acuity at presentation| 0.004   | 0.063      | 0.010        | 0.380        |
| Mode of injury              | 0.961   | 1.010      | 0.688        | 1.481        |
| Grade of injury             | 0.097   | 0.661      | 0.406        | 1.077        |
| Group                       | 0.001   | 8.826      | 2.511        | 31.018       |
| Zone of injury              | 0.004   | 0.278      | 0.117        | 0.658        |
| Hyphaema                    | 0.020   | 0.384      | 0.172        | 0.860        |
| Lens (cataract)             | 0.037   | 2.54       | 1.06         | 6.14         |
| Vitreous haemorrhage        | 0.826   | 1.183      | 0.265        | 5.276        |
| Glaucoma                    | 0.035   | 6.443      | 1.339        | 36.44        |

Discussion
The epidemiological profile of ocular injuries varies in
different countries. In this study, children less than 15
(65.44%) years of age and males were predominantly affected
(76%), which is consistent with the findings reported in
Numerous studies have been done to find out the correlation of the final visual outcome with the preoperative factors related to ocular injuries. On reviewing the literature, the factors that have been found to correlate significantly with the final visual outcome included age,\textsuperscript{8,14,19-23} type or mechanism of injury,\textsuperscript{20,22} duration of presentation,\textsuperscript{18,20} extent of wound,\textsuperscript{8,20} location of wound,\textsuperscript{8,20} vitreous haemorrhage,\textsuperscript{8,20} lens status,\textsuperscript{18-22} hyphaema,\textsuperscript{20,21} retinal detachment and presence\textsuperscript{24} and type of intraocular foreign body.\textsuperscript{25} Poor visual outcomes are associated with increased age; care sought at a site other than the eye clinic, and severity of injury.\textsuperscript{14}

Misra et al found that the final visual outcome was affected by the site and size of the injury and the extent of ocular damage.\textsuperscript{8} Cillino et al reported that initial visual acuity was correlated with final visual acuity (Spearman’s correlation coefficient = 0.658; p < 0.001). The likelihood of the final visual acuity in the OTCS categories was correlated to that of the OTCS study group in 12 of 14 cases (85.7%).\textsuperscript{7} Agrawal et al found that the factors adversely affecting the final visual outcome were elapsed time between injury and surgery, age of the patient and mode of injury. They found preoperative visual acuity affecting final visual acuity only at the level of univariate analysis.\textsuperscript{19}

Time lag between injury and surgery also adversely affects the final visual outcome.\textsuperscript{8,14} Issac et al demonstrated a 1.16 fold increased chance of worse visual prognosis with each day of delay in surgery.\textsuperscript{23} Unlike other studies,\textsuperscript{8,14,19,23} we did not find any correlation of time lag with the final visual outcome.

In our study, statistically significant predictors of final visual outcome were initial visual acuity, lens status, secondary glaucoma, grade of injury, group of injury and hyphaema. However, there are few limitations of this study, which include the fact that this is a retrospective study and there may be limitations of secondary data. A large-scale prospective study, with longer follow-up, seems warranted to more clearly state the prognostic factors for ocular trauma.

**Conclusion**

Children less than fifteen years and males were predominantly vulnerable to ocular trauma. The majority of injuries occurred during playing or outdoor activities. This highlights the need for comprehensive awareness programs for ocular morbidity due to ocular trauma. Public awareness, education, simple precautions and early intervention can effectively reduce the number of ocular injuries and its related ocular morbidities.

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