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Original Research Article

Presentation and Final Visual Outcome of Traumatic Corneal Perforation at a Tertiary Eye Care Centre

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Abstract:

Aim and Objectives: The study aims at analysing the various presentation of traumatic corneal perforations and the factors contributing to the visual outcome so that the understanding can help improving the precautionary measures and treatment.

Materials and Methods: Subjects above the 15 years of age, with traumatic corneal perforation, attending the outpatient department of tertiary care eye hospital, over a period of 18 month from June 2013 to Dec 2014, were included in the study population. Relevant history was taken and examination was done to detect initial visual acuity (Snellen's acuity), length of wound, zone of injury, presence of iris prolapses, afferent pupillary defect, cataract, hyphema, retinal detachment, vitreous haemorrhage and intraocular foreign body. Special investigations like B scan & X ray were done whenever required and appropriate timely medical and surgical intervention was done in all cases. All the patients were followed up at 1week, 1 month, 3 month and 6 months.

Results: A total of 80 cases were included in the study. The mean age (in years) for male and female were 39.82 ± 12.04(SD) and 39.29 ± 12.85 (SD). About 60% of subjects had injury with non-metallic objects. Majority subjects (62.5%) had injury at working place. Most of the cases (71.2%) presented to the hospital within 24 hrs. Initial visual acuity was less than 6/60 in 75% of the cases. Zone 1 was involved in about 46% of cases. Foreign body was present in 15% of cases. Lens opacity was present in 19 cases. Ten patients had cataract extraction. Only 2 cases presented with relative afferent pupillary defect. Three patients presented with retinal detachment while vitreous haemorrhage was seen in two cases. At the end of six month, 17.2% patients had good (more than6/12) visual outcome, 47.5% patients had moderate (6/18 - 6/60) visual outcome while 31.2% patients had poor (less than6/60) visual outcome. Three patients underwent evisceration. Ocular survival rate was 96%. Two eyes had phthisis and 2 patients underwent combined surgery.

Conclusion: The outcome of ocular trauma has improved significantly, but still, it is not good in cases of perforating eye injuries despite of early intervention. In our study significant predictors of outcome were initial visual acuity, time elapsed between injury and surgery, length of corneal wound, zone of injury, hyphema, uveal tissue prolapses, lens opacity and endophthalmitis. Age of patient, material of object causing injury, presence of foreign body was found to be insignificant predictors of outcome.

Keywords: Ocular Trauma, Corneal Perforation, Visual Acuity.

Introduction

Ocular trauma is a common established etiological factor affecting visual system and has a prognostic value in the future lifestyle of the patient. Ocular injuries therefore assume unusual social and economic importance involving a huge cost in human unhappiness, and monetary loss. Worldwide, there are approximately 6 million people blind from eye injuries, 2.3 million bilaterally visually impaired and 19 million with unilateral visual loss.[1] In the Indian scenario, ocular injury cause 1.5% of total blindness according to NPCB 2002.

Unfortunately, the available literature lacks the studies which are solely focussing on corneal perforations (most of the published studies on open globe injuries have considered complete globe as reference). Current study is unique in considering only the traumatic corneal perforations (including limbus) and the factors contributing to the final visual outcome.

Material and Methods

This study is a prospective hospital based non randomised trial. The study population was, patient attending hospital OPD of Tertiary care hospital,

who were diagnosed as a case of traumatic corneal perforation. Time frame for this study was 18 month (June 2013 to Dec 2014) including 6 month follow up.

Inclusion Criteria:

- Traumatic corneal perforation with or without limbal involvement.
- Primarily presenting to the institute.
- Age group-15 yrs and above.

Exclusion Criteria

- Associated scleral rupture.
- Prior ocular surgery.
- Psychiatric patients.

Detail history was taken and a thorough clinical examination was done.

Visual acuity (according to snellen chart) at presentation was documented. Complete slit lamp examination was done. Corneal wound is categorised into:

zone 1 (within central 3 mm diameter of cornea),

zone 2 (3 mm diameter circle to 7 mm diameter circle),

zone 3 (from 7 mm diameter circle to limbus)

mixed pattern (zone 1 + 2, zone 2 + 3, zone 1+ 2+ 3).

Fundus evaluation and B scan as or when required, depending upon individual case.

Primary surgical repair was done with 10-0 nylone suture by Cornea specialist having more than 5 years of experience. Follow up was done after 1week,1 month, 3 month and 6 months. Final visual outcome is grouped as Good (more than 6/12), Moderate (6/18-6/60), Poor (less than 6/60).

Posterior segment involved cases were undergone second sitting of surgery and follow up sequence were done as above**.**

The data collected in the process of the study was analysed using SPSS 16.0 software. The frequency procedure was used to determine the typical values like frequency of the observations in different categories or factors. Analysis of cross classification of visual outcomes with different clinical presentations was done using cross tabulation procedures along with chi square test of independence. The association of visual outcome with different risk factors was studied using crosstab procedure along with chi square test of association.

Results

The mean age (in years) for male and female were 39.82 ± 12.04(SD) and 39.29 ± 12.85 (SD) and 91% patients were males and 9 % patients were females. In about 48 (60%) patients, injury was caused by non-metallic object while in 32(40%) cases injury was caused by metallic object. Evisceration and poor visual outcome with metallic object were 34.3% while said proportion among non-metallic was 35.4 %. The analysis reveals no significant association between object of injury and visual outcome at 6 months. (p= 0.616).

Twenty-three patients presented after the 24 hours of injury. Out of these, 13% patients underwent evisceration, 34.8% patients had poor visual outcome while the patients who presented before 24 hours, poor outcome was in 29.8% patients and no patient underwent evisceration. Similarly, high proportion of patients having good and moderate visual acuity were found to be in patients where time elapsed between injury and surgery is less than 24 hrs. Thus, time elapsed between injury and surgery has a significant association with the final visual outcome at 6 month (p = 0.038).

Table 1: Effect of time elapsed between injury and surgery on final visual acuity at 6 months

Visual acuity at 6 months	Time Elapsed between injury and surgery						χ^2, p
	Less than 24 Hrs		More than 24 Hrs		Total		
	No.	%	No.	%	No.	%	
Eviscerated	0	0.0	3	13.0	3	3.8	χ2=8.406 p=0.038
More than 6/12	11	19.3	3	13.0	14	17.5	
6/18 to 6/60	29	50.9	9	39.1	38	47.5	
Less than 6/60	17	29.8	8	34.8	25	31.2	
Total	57	100.0	23	100.0	80	100.0	

Out of 20 patients who presented with visual acuity between 6/18 to 6/36 (Group 1), 11(55 %) patients resulted in good and 9 (45%) resulted in moderate visual outcome.

Table 2: Visual acuity at presentation and visual acuity at 6 months									
Visual acuity at 6 months	**Visual acuity at Presentation**								χ^2, p
	Group 1 6/18 to 6/36		**Group 2 6/60 to CF3m**		**Group 3 CF 2m to PL+ve**		**Total**		
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
Eviscerated	0	0	0	0	3	6.7	3	3.8	χ^2=50.03 p=0.000
More than 6/12 (Good)	11	55	3	20	0	0	14	17.5	
6/18 to 6/60 (Moderate)	9	45	12	80	17	37.8	38	47.5	
Less than 6/60(Poor)	0	0	0	0	25	55.6	25	31.2	
Total	20	100	15	100	45	100	80	100	

Out of 15 patients who presented with visual acuity between 6/60 to CF 3m (Group 2), 3 (20%) patients resulted in good and 12(80%) patients with moderate visual outcome. Total 45 patients presented with visual acuity between CF 2m to PL +VE (Group 3), 3(6.7%) of them were eviscerated and 25(55.6%) resulted in poor visual outcome. Thus, visual outcome at 6 month is found to be significantly associated with visual acuity at presentation (p = 0.000).

Out of 12 patients having site of wound in zone 1+2+3, 8 (66.7%) patients had poor visual outcome and 2(16.7%) patients resulted in evisceration. Twenty seven patients were having the site of wound in zone 1+ 2, 14 (51.9 %) of them resulted in poor visual outcome. Out of 6 patients with site of wound in zone 1, 1 (16.7%) patient underwent evisceration and 2 patients (33.3%) had poor visual outcome. The patients having site of wound in zone 2, zone 3, zone 2+ 3 had better visual outcome than patients having site of wound in zone 1 or zone 1 + 2 or zone 1+ 2 + 3. This indicated, the zone 1 or combination of zone 2, zone 3 with zone 1 have significant association with poor visual outcome (p =0.000).

Among the cases having the length of wound 5 mm and more, 64.7% of the cases resulted with poor visual outcome and that among cases in which length of wound was 3-4 mm, poor visual acuity was seen in 25.6% cases while in cases with length of wound 1-2 mm, 15 % patients resulted in poor visual outcome. This clearly indicates the significant association of poor visual outcome at 6 months with higher length of wound (p= 0.000).

Total 12 patients presented with the foreign body. Out of these, 2 (16.7%) patients underwent evisceration and 4 (33.3%) patients resulted in poor visual acuity. Though the proportion of poor outcome and evisceration was 50% in presence of foreign body, the analysis failed to reveal statistically significant association (p = 0.075). Foreign body was absent in 68 patients. Out of these 21(30.9%) has the poor visual outcome. Four patients had foreign body in the vitreous. Out of these, 2 patients underwent evisceration and 2 patients had poor visual outcome at the end of 6 month. Thus, presence of foreign body in the vitreous carries poor prognosis.

Only two patients presented with RAPD which resulted in poor visual outcome.

Ten cases were presented with hyphema, out of which 6 (60%) patients had the poor visual outcome and 2 patients underwent evisceration. Among the cases who presented without hyphema, 19(27.1%) resulted in poor visual outcome and 1 patient underwent evisceration. This indicates the significant association of presence of hyphema and poor visual outcome at 6 month (p = 0.002).

Ten patients presented with the iris prolapse, out of which 50% patients resulted in poor visual outcome while 70 patients presented without iris prolapse, out of which 28.6% patients had poor visual outcome. This signifies the significant association of iris prolapse and poor visual outcome at 6 months (P =0.007).

Out of total 19 patient having lens opacity, 4 (21.1%) patients resulted in poor visual outcome and 3 (15.8%) underwent evisceration. Among the cases without lens opacity, not a single case was eviscerated and 34.4% cases resulted in poor outcome. Considering evisceration and poor outcome, the presence of lens opacity indicated significant association with poor visual outcome (0.013). However, the Chi Square test of association needs to be looked with caution as many of the cell frequencies are less than 5. Therefore, the analysis needs to be validated with higher sample size for valid conclusion.

Retinal detachment was present among 3 cases, all of which resulted in poor visual acuity. Two patients presented with the vitreous haemorrhage. One of them had poor visual outcome while other one had moderate visual outcome at end of 6 month. Among the patients who presented without vitreous haemorrhage, 30.8 % patients had the poor visual outcome at the end of 6th month. Though the patients with vitreous haemorrhage resulted in poor visual outcome

Total six cases had endophthalmitis, out of which 3 cases underwent evisceration, 2 patients had less

than 6/60. More than 80 % of patients having endophthalmitis resulted in worse outcome.

Discussion

Traumatic corneal perforation is a common and often preventable cause of permanent visual impairment and visual loss. Unfortunately, the available literature lacks the studies which are solely focussing on corneal perforations, most of the published studies on open globe injuries have considered complete globe as reference). Current study is unique in considering only the traumatic corneal perforations (including limbus) and the factors contributing to the final visual outcome.

In This study, the influence of age on the visual outcome at sixth month was not statistically significant (p= 0.562). Our finding is in concordance with study done by Barr C [2].

We found that visual acuity at presentation had statistically significant (p=0.000) influence on visual outcome at 6 months. The finding is consistent with many other studies. Sternberg et al. [3] found initial visual acuity >20/800 as the most important factor for favourable prognosis. Williams et al. [4], Barr et al. [2] concluded that visual acuity at presentation is prognostic indicator of visual outcome. In the current study, time elapsed between injury and surgery is found to have significant influence on the visual acuity at 6 months. We found that when time elapsed between injury and surgery is less than 24 hours, high proportion of patients have good (more than 6/12) and moderate (6/18 to 6/60) visual acuity at the end of 6 month (p =0.038) probably because of less chances of infection, tissue oedema and necrosis. This is in concordance with the study done by Agrawal et al. [5] They found that time elapsed between injury and surgery is the important factor related to postoperative poor visual outcome. However, Vats et al. [6], Lavanya et al. [7] found that time since injury is insignificant for assessing the prognosis.

In present study, it was found that the site of wound (zone 1) had statistically significant association with poor visual outcome (p = 0.000) probably because zone 1 involves the visual axis. Site of wound shown to be most important prognostic factor by various studies including Lavanya et al [7]. However, Williams et al. [4] found that location of wound is insignificant for assessing the prognosis. It is imperative to note here that, only traumatic corneal perforations were included in our study whereas the other studies mentioned above have considered complete globe as reference.

The next important prognostic factor is the length of wound. We found that length of wound had statistically significant influence over visual outcome at 6 months (p=0.000). Among the patients having length of wound 5 mm or more, 65% of patients had poor (less than 6/60) visual outcome at 6 months probably because of large scar obscuring the visual axis and greater amount of post operative astigmatism. Lavanya et al. [7] concluded that length of wound found to have statistically significant influence on visual outcome.

In present study hyphema was found to have statistically significant influence on the visual outcome at 6 months (p=0.002). Probably because of specific complications of traumatic hyphema like secondary glaucoma, corneal blood staining. However, Chiquet et al. [8] in 1998 found no prognostic importance of hyphema with respect to visual outcome.

In our study, iris prolapse was found to have significant influence on visual outcome at the end of 6 month (p = 0.007). Among the patients who presented with iris prolapse, 20% of the patient underwent evisceration, while 50% of the cases resulted in poor (less than6/60) visual outcome. This is in concordance with the study done by Barr et al. [2]. However, Chiquet et al. [8] found that uveal tissue prolapse has no statistically significant influence on visual outcome.

Out of total 19 patient having lens opacity, 4 (21.1%) patients resulted in poor visual outcome and 3 (15.8%) underwent evisceration. We found that presence of lens opacity had statistically significant influence (p = 0.016) on visual outcome at 6 months. Our findings are in resonance with the studies done by Agrawal et al. [5]. However, Lavanya et al. [7] found the influence of lens opacity on visual outcome is statistically insignificant.

RAPD was found to be significant prognostic factor by Han et al. [9] In present study, we found that 100% of the patients with RAPD resulted in poor (less than 6/60) visual outcome at 6 months but the analysis did not reveal any significant association (p = 0.211). However, it is important to note here that cases of RAPD were extremely few and there is a need of test for association with higher sample size to infer valid statistical results.

Retinal detachment was found to be significant prognostic factor by Lavanya et al. [7], Han et al. [36] In present study, we found that 100% of the patients with retinal detachment resulted in poor (less than 6/60) visual outcome at 6 months but the analysis did not reveal any significant association (p=0.077). As the cases of retinal detachment were extremely few, there is a need of test for association with higher sample size to infer valid statistical results.

Vitreous haemorrhage was found to be significant factor by Lavanya et al. [7]. In present study, we

found that 50 % of the patients with vitreous haemorrhage resulted in poor (less than 6/60) while remaining 50% had moderate (6/18 to 6/60) visual outcome. The analysis did not reveal any significant association (p = 0.880). But it is worth noting that the cases of vitreous haemorrhage were extremely few and there is a need of test for association with higher sample size to conclude valid statistical results.

Endophthalmitis has been mentioned as a prognostic indicator by William et al. [4], Lavanya et al. [7]. The association in our study was statistically significant (p = 0.000). Among the patients having endophthalmitis, 50% of the patients underwent evisceration and about 33% patients resulted in poor (less than 6/60) visual outcome at 6 months.

In nutshell, 75% patients presented with initial visual acuity less than 6/60. Young males (15-45 years) were most commonly affected, with average age of 40 years. About 60% of subjects had injury with non-metallic objects. Majority subjects (62.5%) had injury at working place. At the end of six month, 17.2% patients had good (more than6/12) visual outcome, 47.5% patients had moderate (6/18 - 6/60) visual outcome while 31.2% patients had poor (less than6/60) visual outcome. Three patients underwent evisceration. Ocular survival rate was 96%. In our study significant predictors of outcome were initial visual acuity, time elapsed between injury and surgery, length of corneal wound, zone of injury, hyphema, uveal tissue prolapses, lens opacity and endophthalmitis. Age, material of object causing injury, foreign body were found to be insignificant for assessing the prognosis.

Limitations of Present Study

1. Sample size in current study was inadequate to study the effect of retinal detachment, vitreous haemorrhage, relative afferent pupillary defect on final visual outcome.
2. In present study, details regarding type and size of the intraocular foreign body were not taken into the consideration.

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