

Original Article

Clinical characteristics and visual outcome, prognostic factor, visual acuity and globe survival in posterior segment intraocular foreign body at Tilganga Institute of Ophthalmology

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Abstract:

Purpose: To evaluate clinical characteristics, visual outcomes and globe survival after intraocular foreign body removal from posterior segment via pars plana approach.

Methods: A hospital based retrospective study. All the patients of penetrating eye injury with intraocular foreign body in posterior segment as detected by computed tomography were enrolled from 2012 to 2014. **Results:** Thirty patients of 30 eyes were included. The mean age was 27.7 years. (2-52). Twenty-four (80%) were male. Out of 30 eyes 19 (63.3%) eyes had injury at Zone 1 and 11 (36.7%) eyes had injury at Zone 2. The mean time spent between primary repair following surgery and intra ocular foreign body removal, was 15.47 days. Retinal detachment and endophthalmitis prior to intraocular foreign body removal was present in 9/30 of eyes. We looked for correlation between post operative Phthisis bulbi with zone of injury and pre operative endophthalmitis and preoperative retinal detachment. However, p value for the above correlation was more than 0.552 and 0.815 respectively, which was statistically not significant. **Conclusions:** The eyes with posterior segment intraocular foreign bodies showing clinical features of preoperative endophthalmitis, retinal detachment and the zone of injury also did not have any direct significance with globe survival.

Key words: Intra ocular foreign body, endophthalmitis, phthisis bulbi, retinal detachment.

Introduction

Ocular trauma is one of the major causes of blindness in the earning age group (Belkin M et al, 1986). The intraocular foreign bodies occupy

the major part of the penetrating eye injuries. On time repair of the defect, removal of the IOFB and treatment of complications of the IOFB are the major factors on which the prognosis for vision depends along with type of foreign body (Mahmood H et al, 1996). Treatment of IOFB is challenging and complex. It includes removal of IOFB but is also complicated with managing the complications of these foreign bodies. IOFB frequently causes severe visual loss where by 22-43% of eye injuries with IOFB result in final vision worse than 6/60 in the injured eye (Anil M et al,2015). The visual

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outcome is based on various factors, which can prognosticate visual prognosis including worse initial visual acuity, hyphema, vitreous hemorrhage and retinal detachment (Asif I et al,2015). Prompt and proper repair of the defect, removal of IOFB and treatment of complications of IOFB are major factors on which the prognosis for vision depends along with the type of IOFB (Belkin M et al, 1986). Thus, every penetrating trauma and patients with intraocular foreign bodies patient should be managed properly. The treatment should have good repair of open globe with avoiding possible complications. Thus, a full assessment of patient with IOFB is vital for the clinical characteristics, visual prognosis and the globe survival.

To our knowledge, there were no researches conducted on eye injury related to intraocular foreign body in Nepal. So, this article was aimed at assessing the clinical characteristics and the prognostic factors in patients with intraocular foreign bodies removed through Pars Plana Vitrectomy.

Methods and Methodology

A retrospective study was conducted by reviewing the clinical records of cases with penetrating eye injury and intraocular foreign body (IOFB) who were seen and managed by pars plana vitrectomy for the IOFB removal from 2012 to 2014 in the vitreo-retina department of Tilganga Institute of Ophthalmology. The patients with NPL vision on presentation were excluded from the study.

The following data were collected from the medical records: age and sex, time elapsed between the time of injury to IOFB removal, pre and post-operative best corrected visual acuity (BCVA) by Snellen's Chart, presence of endophthalmitis, phthisis bulbi and retinal detachment. Slit-lamp examination findings, ultrasonography, computed tomography, and or magnetic resonance imaging performed,

were analyzed and the results compared. The visual acuity has been categorized into Group A (with vision 6/6 to 6/12), group B (vision 6/18 to 6/60), group C (vision <6/60 to PL) and NPL group. The zone of open globe injury is based on the standard Birmingham Eye Trauma Terminology as described by Mahmood H et al, 1996 and is categorized as Zone 1, zone 2 and Zone 3. The data on endophthalmitis was taken according to the clinical findings and the diagnosis based on the case records. Data were entered to the MS Excel 2007. The codes, recodes, consistency, outlines were assessed using Microsoft Excel. Statistical analysis was done using the SPSS and the tests applied were chi square test and the Fisher Exact tests wherever applicable.

General objective of the study was to evaluate the clinical characteristics, prognostic factor, visual acuity and globe survival in Posterior segment intraocular foreign body removal. Specific objectives were:

1. To evaluate and analyze globe survival and visual acuity in relation to time of removal of IOFB from the time of injury.
2. To Compare pre and post Visual acuity following Intraocular FB removal.
3. To evaluate the visual acuity and globe survival in relation to the vision at presentation, endophthalmitis and retinal detachment.
4. To evaluate the visual acuity and globe survival in relation to zone of injury

Results

During the study period, a total of 30 patients (eyes) had intraocular foreign body (IOFB) removal by pars plana vitrectomy (PPV). Most of the patients were young with mean age of 27.7 years (median 28) and male accounted for more than three quarters (80%) of the cases. The duration after the injury and before surgical intervention ranged from 2 days to 150 days and 53% of patients had surgery after one week of injury (table1).

The clinical characteristics at presentation of the patients with IOFB were reviewed and accordingly all the eyes had visual impairment at presentation and the majority of the eyes (90%) had presented with visual acuity of $<6/60$. The remaining eyes had presenting visual acuity of 6/18 - 6/60 and none of the eyes had normal visual acuity at presentation. Most of the eye had injury at zone 1 which accounted for 63.3 % and the rest had injury in zone 2. Endophthalmitis was present in nine eyes (30%). Nine (30%) eyes had retinal detachment at presentation (all the retinal detachments were RRD type of retinal detachment) (table 2).

All the patients had removal of intraocular foreign body through PPV. There were some changes in clinical characteristics of the patients after IOFB removal. Three out of thirty (10%) patients had visual improvement to normal visual acuity range and three (10%) patients had worsening of vision to total loss of vision. Most of the patients (73.3%) retained the pre-operative visual acuity range. Endophthalmitis was persisted in nine (30%) patients. After intraocular foreign body removal, six (20%) patient had retinal detachment. There was development of additional complication where by four (13.3) patients developed phthisis bulbi (table 3).

Chi-square analysis was performed to see factors related to final best corrected visual outcome. All the eye which had endophthalmitis had visually impaired category of final best corrected visual acuity (BCVA) compared to 85.7% eyes in which endophthalmitis was not present and had visually impaired category of BCVA. This difference in the BCVA between the two groups was not statistically significant

($p>0.05$). All the eyes which had non-impaired category of BCVA had retinal detachment and all the eyes without retinal detachment had visually impaired category of BCVA but the difference was not statistically significant ($p>0.05$). As expected, all the eyes, which developed phthisis bulbi, had visually impaired category of BCVA compared to 88.5% of eyes, which did not have phthisis bulbi. The difference in the BCVA among the two group was not statistically significant ($P>0.05$). Nearly equal proportion of eyes with zone 2 (91.9 %) and zone 1 (89.5%) injuries had visually impaired category of BCVA (table 4). The BCVA remained unchanged at follow of 1 month.

Several variables were assessed to determine factors, which could be related to the development of phthisis bulbi after intraocular foreign body removal. The occurrence of phthisis bulbi was higher among eyes with retinal detachment than without retinal detachment where by 22.2 % eyes with retinal detachment developed phthisis bulbi compared to 9.5 % of patients without retinal detachment. This difference in the proportion of phthisis bulbi between the two groups was not statistically significant ($p>0.05$). The proportion of phthisis bulbi was higher among eyes with zone 2 injury than eyes with zone 1 where in 18.2 % of eyes with zone 2 injury had phthisis bulbi compared to 10.5 % eyes with zone 1 injury, which had phthisis bulbi and this difference in the proportion of phthisis bulbi among the two group was not statistically significant ($p>0.05$). The timing of surgery after injury did not have statistically significant impact on the development of phthisis bulbi (table 5).

Table 1: Demographic characteristics of patients with intraocular foreign body removal at Tilganga Institute of Ophthalmology

| Variables | | |
|-------------------------|------------|------------|
| Age mean(median) | 27.7 Years | |
| Gender | Frequency | Percentage |
| Male | 24 | 80 |
| Female | 6 | 20 |
| Duration before surgery | | |
| <7 days | 14 | 46.7 |
| ≥7days | 16 | 53.3 |

Table 2: Clinical characteristic of patients with IOFB at presentation (before operation) at Tilganga Institute of Ophthalmology

| Clinical characteristics | Frequency | Percentage |
|--------------------------|-----------|------------|
| Presenting BCVA | | |
| >6/18 | 0 | 0 |
| 6/18-6/60 | 3 | 10 |
| <6/60-LP | 27 | 90 |
| NLP | 0 | 0 |
| Zone of injury | | |
| Zone 1 | 19 | 63.3 |
| Zone 2 | 11 | 36.7 |
| Zone 3 | 0 | 0 |
| Endophthalmitis | | |
| Yes | 9 | 30 |
| No | 21 | 70 |
| Retinal detachment | | |
| Yes | 9 | 30 |
| No | 21 | 70 |

Table 3: Clinical characteristics of patients after IOFB removal at Tilganga Institute of Ophthalmology

| Clinical characteristics | Frequency | Percentage |
|--------------------------|-----------|------------|
| BCVA | | |
| >6/18 | 3 | 10 |
| 6/18-6/60 | 2 | 6.7 |
| <6/60-LP | 22 | 73.3 |
| NLP | 3 | 10 |
| Endophthalmitis | | |
| Present | 9 | 30 |
| Absent | 21 | 70 |
| Retinal detachment | | |
| Present | 6 | 20 |
| Absent | 24 | 80 |
| Phthisis bulbi | | |
| Present | 4 | 13.3 |
| Absent | 26 | 86.7 |

Table 4: Determinant of final best corrected visual acuity outcome in patients with IOFB removal

| Variables | Final best corrected visual acuity | | X ² (p-value) |
|-------------------------|------------------------------------|-------------------------|--------------------------------|
| | Non-Impaired n (%) | Visually Impaired n (%) | |
| Endophthalmitis | | | |
| Present | 0 (0) | 9 (100) | X ² =1.429, p=0.534 |
| Absent | 3 (14.3) | 18 (85.7) | |
| Retinal detachment | | | |
| Present | 3 (25) | 9 (75) | X ² =1.429, p=0.534 |
| Absent | 0 (0) | 18 (100) | |
| Phthisis bulbi | | | |
| Present | 0 (0) | 4(100) | X ² =0.513, p=1 |
| Absent | 3 (11.5) | 23 (88.5) | |
| Zone of injury | | | |
| Zone 1 | 2 (10.5) | 17 (89.5) | X ² =0.16, p=1 |
| Zone 2 | 1 (9.1) | 10 (91.9) | |
| Duration before surgery | | | |
| <7 days | 1(6.7) | 13 (93.3) | X ² =0.238, p=1 |
| ≥7days | 2 (12.5) | 14 (87.5) | |

Table 5: Factors related to the occurrence of phthisis bulbi among patients with IOFB removal at Tilganga Institute of Ophthalmology

| Factors | Phthisis bulbi | | X ² (p-value) |
|--------------------|----------------|---------------|--------------------------------|
| | Present, n (%) | Absent, n (%) | |
| Endophthalmitis | | | |
| Present | 1 (11.1) | 8 (88.9) | X ² =0.55, p=1 |
| Absent | 3 (14.3) | 18 (85.7) | |
| Retinal detachment | | | |
| Present | 2 (22.2) | 7 (77.8) | X ² =0.879, p=0.563 |
| Absent | 2 (9.5) | 19 (90.5) | |
| Zone of injury | | | |
| Zone 1 | 2 (10.5) | 17 (89.5) | X ² =0.353, p=0.611 |
| Zone 2 | 2 (18.2) | 9 (81.8) | |
| Duration | | | |
| Less than 7 | 2 (14.3) | 12 (85.7) | X ² =0.21, p=1 |
| More than 7 | 2 (12.5) | 14 (87.5) | |

Discussion

Ocular trauma is one of the commonest causes of visual impairment. Ocular injuries make up to 10% of all injuries in spite of the fact that the eye makes only 0.27% of the body surface area (Comfort N, et al. 2016). The severity of primary trauma and the unpredictable anatomic and visual outcome are important in ocular

traumatology as described by (Mahmood H et al, 1996). The intraocular foreign bodies represent a subset of ocular injuries that present complex surgical challenges for the removal of IOFB successfully while preserving the vision, restoring the ocular architecture and prevent the complications as described by (Greven CM et. al 2000). Apart from the prominent

feature of IOFB retention, it also includes other characteristics of penetration, rupture, or perforation depending on mechanism of injury. Because of the multitude of potential findings, prompt and full assessment of the patients with possible IOFB retention based on early signs is important to provide the therapeutic plan and the prognosis and the counseling as described by (Ying et al, 2011).

Eye injuries in general and, IOFB in particular, have been found to be common in the young aged population and our finding attests this. We found that majority of patients with IOFB were young with mean age of 27.7 years and median of 28 years. This finding is similar to the findings of several authors. In studies conducted in Bangladesh (Ademola I et al, 2016), Israel (and I(Comfort N, et al. 2016) India (Anil M et al. 2015) the mean ages of patients with intraocular foreign bodies were 25.1 years, 28.7 years and 30.9 years respectively. There were also other studies, which found a higher mean age, but still the patients were in the younger age group (LinT, et al. 2014, Choovuthayakornj et al.2011). We also found that IOFB occurred predominantly in the male patients where 80 % of the IOFB were among the male patients. This finding is concordant with the finding of similar studies from Bangladesh ((Ademola I et al, 2016), India (Anil M et al. 2015, Choovuthayakornj et al.2011), China (LinT, et al. 2014). In the retrospective study from Bangladesh 95.3% of the patients with IOFB were male and in the studies from India and china male patients constitute 90%, 90.9%, and 100% respectively.

As IOFB is associated with the increased ocular morbidity, we analyzed selected variables that may affect the final visual outcome and the globe survival. IOFB frequently cause severe visual loss. In studies by Ameer et al 2009, Ademola et al 2016 and Choovuthayakornj et al 2011, the final best corrected visual acuity was found to be worse than 6/60 in the injured eye

in 48 %, 48%, and 84% of eyes respectively. Similarly, 83.3 %of the patients in our study had best corrected final visual acuity worse than 6/60. Timely repair of the defect, removal of IOFB and treatment of complications of IOFB are key factors on which the prognosis for vision depends along with the type of IOFB.

Posterior segment intra-ocular foreign bodies are usually associated with retinal detachment, endophthalmitis and vitreous hemorrhage. In this study, retinal detachment was present with trauma preoperatively in 30 % and post operatively in 24 % of the eyes. Similarly, in the study by Ameer M et al 2009, it showed 22% of the eyes had retinal detachment post-surgery. These findings are in consistency with studies, which reveal that the intraocular foreign bodies represent a subset of ocular injuries that present complex surgical challenges for the removal of IOFB successfully while preserving the vision, restore the ocular architecture and prevent the complications. In our study, the pretreatment endophthalmitis was present in 9 eyes (30%), which was worse prognostic factor for the final visual outcome. In the study done by Ameer et al 2009, the endophthalmitis was present in 8% of the cases, which is slightly lesser than that in our study. Similarly, the study by Ying Zhang et al 2011, analyzed 1421 eyes showed endophthalmitis to be present in 16.6% of the eyes.

The other outcome measure of the posterior segment trauma is the phthisis bulbi post surgically, which was present in 4 eyes (13.3%) in our study, and is higher than other studies. Chiquet et al 1999 found that phthisis bulbi occurred in 8% of patients after intraocular foreign body removal and in another study by Ameer et al 2009, it was 6 %.

The small sample size and the retrospective nature of the study are the main limitations of the study. Retrospective nature of data with the unavailability of the description of the entry wound and the details about the location and



the size of the foreign body which bears the role in the visual prognosis and the state of globe survival are the drawbacks.

Conclusion

Thus ocular trauma with intraocular foreign body is a common form of ocular injury. The injury is typical among the working age group and thus hampers a lot of work time period and the economy due to the associated morbidity. The associated risk factor for the visual prognosis and the globe survival though not significantly seen to be associated with endophthalmitis, retinal detachment and the duration of intervention from time of injury, need to be considered very important, while dealing with the ocular trauma cases with IOFB. Further a prospective study is recommended, as it could provide a efficient treatment guidelines to reduce the ocular morbidity and provide better visual outcome in cases with open globe injury and posterior segment IOFB.

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