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Original Article

Incidence and Post-Operative Visual Outcome in Patients with Intraocular Foreign Body

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Abstract

Background: Intraocular foreign body is an important complication of ocular trauma, especially open globe trauma. It can cause a range of complications leading to severe visual impairment to permanent blindness. They are removed via Pars Plana Vitrectomy using either forceps, endomagnet, or both. Various management techniques and their impact on final visual outcomes are identified in this study.
Objective: To study the various factors influencing the final visual outcome in cases of intraocular foreign bodies treated via pars plana vitrectomy and surgical removal of the foreign body.
Study type, settings & duration: This retrospective descriptive study was conducted at the Department of Ophthalmology, Allied Hospital, Faisalabad from June 2019 to December 2020.
Methodology: About 57 consecutive patients presenting to the Ophthalmology department, Allied Hospital Faisalabad with intraocular foreign bodies were included in this study. All the patients included, underwent pars plana vitrectomy and surgical removal of an intraocular foreign body. The final best-corrected visual acuity of patients was recorded on follow-up visits.
Results: The mean age of the participants was 29, 54 (94.7%) were males while only 3 (5.3%) were females. Final visual acuity was significantly poor in patients with foreign bodies involving the retina (*p*-value: 0.001) and in patients who underwent pars plana vitrectomy and surgical removal of the intraocular foreign body later than 7 days after the trauma *p* ~0.012 (*p* <0.05).
Conclusion: This study concluded that the final visual acuity is significantly better in cases where IOFB does not involve the retina as well as in cases that were managed surgically earlier for the removal of IOFB.
Key words: Intraocular foreign body, pars plana vitrectomy, visual acuity.

Introduction

Trauma can cause a wide range of ocular injuries ranging from small lid tears which have almost no effect on eyesight to vision-threatening injuries. Ocular injuries are classified according to the Birmingham Eye Trauma Terminology.[1] Penetrating injuries are three times more common in males than in females and typically occur in the younger age group. Intraocular foreign bodies are seen in 15-40% of the penetrating ocular injuries.[2]

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Authors Contribution

EAJ conceptualized the project and did the literature search. SJN did the data collection. MUJ performed the statistical analysis. Drafting, revision & writing of manuscript were done by ZAC.

Intraocular foreign bodies (IOFB) are a leading cause of blindness and poor visual acuity following different kinds of trauma. They are commonly seen after an open globe injury. There is a high chance of missing an intraocular foreign body on examination and caution must be observed while examining any patient with ocular trauma, especially with a missile object. IOFB is highly variable in presentation, complications, management, and visual outcome. They are mainly associated with workplace-related trauma in different professions.[3] They are associated with a variety of ocular pathologies leading to challenges for ophthalmologists in their management and treatment. Lack of proper management can leave the person visually impaired for the rest of their lives. The prognosis even with timely management is not very good. Most of the intraocular foreign bodies are lodged in the posterior segment of the eye.[4] Final visual acuity in the case of Intra ocular-foreign bodies was dependent upon various factors including age, size of wound, time between injury and repair, size of IOFBs, and complications such as relative afferent pupillary defect (RAPD), retinal detachment and

endophthalmitis.[5] However, enough data is not available on intraocular foreign bodies in Pakistan. In this study, we observed 57 patients with intraocular foreign bodies retrospectively who presented in the hospital and were managed by pars plana vitrectomy, and foreign bodies were removed with either magnets or forceps. We present our results based on current literature to determine the factors leading to poor visual outcomes in the case of intraocular foreign bodies.

Methodology

The study was conducted from June 2019, to December 2020, in the Department of Ophthalmology, Allied Hospital Faisalabad. Fifty-seven consecutive patients presenting with the IOFB following trauma in Allied Hospital Faisalabad were identified through a review of ward chart records and operation theatre logs. Participants had a minimum of 6 months of follow-up and were not reported to have any prior ocular disease. All patients were admitted after taking a proper history, visual acuity testing, and slit lamp examination. The general physical examination and all investigations for general anesthesia fitness were done. Topical and systemic antibiotics were started pre-operatively. The digital X-ray and CT scan of the orbit were advised to locate the IOFB. A B-Scan was performed when intraocular pressure was normal and the anterior chamber was formed. All the surgical procedures were done by a single vitreoretinal surgeon on an Accurus vitrectomy machine and Zeiss operating microscope with a BIOM system mounted on it.

The endo photocoagulation was done around the site of intraocular foreign bodies lying on the retina. All patients were operated on using 3 ports pars plana vitrectomy (23 guage) and the intraocular foreign body was removed with endomagnets or forceps. The port size was enlarged from 23 gauge to 20 gauge to facilitate the removal of the intraocular foreign body. The silicon oil was injected into the vitreous cavity to provide an intraocular tamponade. A Vicryl 6.0 double needle was used to stitch the entry sites.

The topical atropine and a combination of antibiotics and steroid drops were prescribed postoperatively along with systemic antibiotics and analgesics for 7 days. After shifting from the Operation theater to the Eye ward the proper positioning of patients was advised according to the surgical procedure.

Data collected for the analysis included patients' age, gender, and mechanism of injury. Findings for analysis included the site of entry, location inside the globe, and ocular complications caused by intraocular foreign bodies.

For statistical purposes, the site of entry was divided into scleral or transcranial and the location of the intra-ocular foreign body was divided into scleral embedded, intravitreal, and lying on the retina.

The time from the injury to the removal of the intra-ocular foreign body was recorded as either less than 7 days or more than 7 days. The method of intra-ocular foreign body removal as well as any subsequent procedure was also recorded.

The major outcome variable was the final best-corrected visual acuity. Visual acuity of 6/60 or better was considered a good visual outcome while a final best corrected visual acuity of counting fingers at 1 meter or worse was considered as a poor visual outcome.

Data was analyzed via univariate and multivariate analysis. Pearson Chi-Square test and lambda test were used to find out if any significant association was present between the final visual outcome and any of the other variables.

The ethical approval was obtained from the Ethical Review Committee of Faisalabad Medical University, Faisalabad vide letter no. 48.ERC/FMU/2022-23/343.

Results

A total of 57 patient records were analyzed, with a mean age of 29 years. Of these patients, 54 (94.7%) were male and 3 (5.3%) were female. Various causes of injuries were identified, with the most common being metal chiseling in 15 cases (26.3%), followed by hammering metal in 12 cases (21.1%), electric drill accidents in 7 cases (12.3%), firecracker-related injuries in 5 cases (8.8%), welding incidents in 5 cases (8.8%), air gun injuries in 3 cases (5.3%), and injuries related to woodcutting, stone work, pencil stabbing, glass bottle opening, and bystanders, each accounting for 2 cases (3.5%).

When the type of intraocular foreign body retrieved was recorded, it was observed that the majority of injuries were caused by metal, affecting 45 patients (78.9%). Stone-related injuries were reported in 5 patients (8.8%), glass in 3 patients (5.3%), wood in 2 patients (3.5%), and graphite in 2 patients (3.5%). The sclera was the most common site of entry for the wound on the eyeball, accounting for 40 cases (70.2%), followed by trans-corneal entry in 17 cases (29.8%).

Regarding the location of the foreign body, 29 cases (50.9%) were found on the retina, 23 cases (40.4%) were intra-vitreal, and 5 cases

(8.8%) were embedded in the sclera. To retrieve the foreign body, forceps were used in 35 patients (61.4%), and magnets were used in 22 patients (38.6%).

Surgical management involved PPV (pars plana vitrectomy) and IOFB (intraocular foreign body) removal with globe repair in 23 patients (40.4%). In 21 patients (36.8%), PPV and IOFB removal were performed after globe repair, while in 13 patients (22.8%), these procedures were done on a healed wound. In 49 patients (86%), the time interval between injury and foreign body removal was less than 7 days, whereas in 8 patients (14%) it was more than 7 days. The final visual outcomes after treatment and discharge are illustrated in given Figure, with 23 patients (40.4%) achieving a good visual outcome.

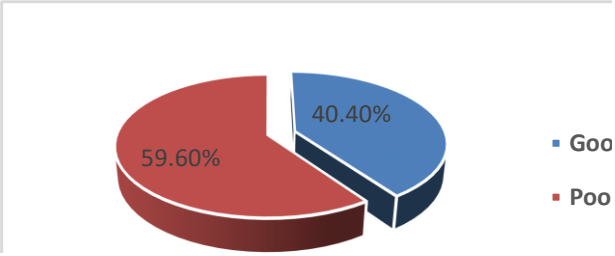

Figure: Visual outcome of the study patients after management and discharge.

Discussion

Management of intraocular foreign bodies is a major problem, especially in developing countries like Pakistan. These cases are more common in laborers, mechanics, and technical persons working on different metals. Industrial cities like Faisalabad have more chances of having injuries with intra-ocular foreign bodies. Also, we have insufficient resources and a limited number of facilities and skilled persons capable of removing intra-ocular-foreign bodies via pars plana vitrectomy. These are a big problem in the active working age group. In the present study, we analyzed the age and gender distribution, mechanism and type of injury as well as visual outcomes and the surgical procedures carried out on these patients. Most of the patients were mechanical workers with a mean age of 29 years. Our study revealed that the majority of the patients were male (94.74%). Our results are quite similar to the previously reported national and international data. Ibrahim et al. reported 95.3% males in cases of IOFB in their study based in Bangladesh while Usama Iqbal et al. reported 84.2% male patients in their 2016 Gujranwala-based study.[6,7] The male dominance is mostly due to males being more involved in professions at risk for Intraocular foreign body and ocular trauma. The majority of the patients had work-related injuries (96.49%) and chiseling was the most common cause of injury (26.32%) followed by hammering (21.05%). Comparing these results with other studies, we can safely say that while chiseling the metal was a more common cause of IOFB in our study, it is not the most common cause in other local and international studies, hammering of the metal was a more important cause in other studies and people involved in these professions must be counseled about the use of protective goggles to reduce the risk.[8] Foreign bodies were almost equally distributed between retinal versus intra-vitreal and scleral embedded. Just like previous studies, no significant relationship was found between the site of entry and the final visual outcome.

Special consideration and emphasis must be laid upon the mechanism and the setting in which the injury occurred. Patients might be unaware of the presence of an intra-ocular foreign body as well and some might not even complain of pain in the presence of an IOFB. Children and bystanders are especially susceptible, comparable to the study of Riaz et. al.[9-11] Intraocular foreign bodies must be suspected in all cases of open globe injury.[12] Kuhn et al. recommend the Birmingham Eye Trauma Terminology for the clear description of all kinds of ocular trauma.[13]

Intraocular foreign bodies were removed via either forceps or endomagnet. No significant association was found between the final visual outcome and the retrieval instrument used. This was mainly because both of these instruments have their benefits as well as drawbacks. Both of them are associated with a range of complications and the choice of instrument is more dependent on the type of the IOFB which was independent of the final visual outcome.[14]

Several factors have been reported to be associated with the final visual outcome. In our study IOFB touching the retina or causing some kind of retinal damage was associated with a poor visual outcome and a final visual acuity of counting fingers or less was achieved. This is in part mostly caused by the complications of IOFB such as retinal tears, endophthalmitis, vitritis, etc. Intraoperative and post-operative complications were also associated with intraocular foreign bodies especially those involving the retina. These can result in severe impairment of final visual acquity.[15] Poh Fong She et al. have recommended observation and regular follow-up in cases of IOFB which were difficult to remove and more Post-Operative complications were expected.[16] We found that

scleral embedded and intra-vitreal foreign bodies were associated with a better final visual outcome.

Time from the injury to the removal of IOFB was another significant factor affecting visual outcome in our study. Intraocular foreign bodies removed early within less than 7 days from the trauma were associated with a better visual outcome than those removed after more than 7 days. Delay in the removal of IOFB significantly increases the risk of developing post-traumatic complications especially post-traumatic endophthalmitis. Long-standing intra-ocular foreign bodies made of iron are also associated with siderosis. The timing of removal is an important prognostic factor in multiple previous studies as well, both inside Pakistan as well as worldwide.[17]

This study had several limitations, most importantly, it being retrospective in nature. All surgeries are done by a single surgeon with the same operating microscope and vitrectomy machine. The size of intra-ocular foreign bodies, which is an important factor in determining the extent of penetration of the eyeball by IOFB was also lacking. However, the selection was randomized and included all patients undergoing PPV and removal of IOFB in Allied Hospital Faisalabad during the specified period thus minimizing the bias.

Intraocular foreign bodies are a major cause of blindness. Most of them are work-related and hence can be avoided by the use of protective gear. The timing of IOFB is very important in determining the overall visual prognosis and hence emphasis must be laid upon the early removal of IOFB as soon as diagnosed. Delayed treatment as well as retinal IOFB were significantly associated with poor visual outcome.

Conflict of interest: None declared.

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