Original Article

Ease of Removal of Posterior Segment Metallic Intraocular Foreign Body with Intraocular Forceps Vs Endomagnet Plus Forceps

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Purpose: To compare the ease of removal of posterior segment intraocular foreign body with intraocular forceps alone or endomagnet plus forceps.

Material and Methods: A comparative case series conducted at Department of Ophthalmology, Mayo Hospital Lahore from March 2013 to August 2013. Fifty eyes of fifty patients with ocular trauma and concurrent metallic posterior segment intraocular foreign body underwent pars plana vitrectomy and we analyzed the ease of removal of posterior segment IOFB with endomagnet plus intraocular forceps (GROUP A) or intraocular forceps alone (GROUP B) by comparing the frequency of intra operative complications with either method.

Results: The comparison of the two methods of removal revealed that in Group A (endomagnet plus forceps) there was a higher rate of IOFB slippage during removal as well as failure to lift the IOFB as compared to Group B. However, iatrogenic retinal break formation was only encountered in Group B (forceps alone).

Conclusion: The best instrument to use for removal depends on the size, shape and magnetic properties of the IOFB as well as its location within the eye. The primary goal in managing IOFB is to preserve vision.

Intraocular foreign bodies (IOFBs) represent a subset of ocular injuries that present complex surgical challenges for successful removal while preserving the vision, restoring ocular architecture and preventing complications.

Studies have reported that an IOFB may be present in 14% to 45% of cases of penetrating injuries of the globe[1, 2]. Removal of posterior segment IOFBs by vitrectomy is advocated because it provides direct viewing and also precise removal of the IOFB[2]. Vitrectomy, by removal of blood in the vitreous, prevents inflammatory and fibrous responses that may lead to tractional sequelae in the posterior segment[3,4]. The hammer-chisel injury is the most common cause of IOFB in adults[5]. The IOFB most commonly causes damage to the eye by mechanical ways, introduction of infection and specific chemical reaction in the intraocular tissues[6, 7].

In this particular study we present our experience with posterior segment IOFB removal with endomagnet plus intraocular forceps vs intraocular forceps alone. Thus ocular trauma with an IOFB is an important cause of ocular morbidity and blindness and is often under reported

MATERIAL AND METHODS

This was a comparative case-series conducted at Mayo Hospital, Lahore. The study was carried out over a period of six months from March to August 2013. Fifty eyes of fifty patients with ocular trauma and concurrent metallic posterior segment intraocular foreign body underwent pars plana vitrectomy and we studied the ease of removal of posterior segment IOFB with intraocular forceps or endomagnet plus forceps. The ease of removal was judged by the various per-operative difficulties / complications encountered during the removal of the IOFB. The patients randomly were assigned into two groups: Endomagnet plus forceps (EF) and Forceps alone (F). We used a 20 G crocodile forceps and a permanent retractable endomagnet.

An IOFB was suspected in all cases of open globe injuries. The preoperative workup included a dedicated history to determine the time lapsed and modality of injury along with detailed data about the composition of the object. A careful ocular examination with minimal manipulation of the globe to avoid further expulsion of its contents was done. If view to the posterior pole was limited, gentle B-scan ultrasound by an experienced ultrasonographer was arranged ensuring that no pressure was applied to the globe. CT scan was done in selected cases to further aid in identifying the objects and evaluating the globe, orbital bones and retrobulbar space.

The surgical technique employed was a standard three port pars plana vitrectomy with simultaneous pars plana lensectomy or phacoemulsification if and when considered necessary. After identification of IOFB, core vitrectomy and induction of PVD was performed. The IOFB was then removed by forceps alone or elevated from the retinal surface by an endomagnet and then grasped with forceps as the magnet is not able to hold the IOFB during its passage through the sclerotomy. For the changeover from magnet to forceps, the endomagnet tip was brought just behind the lens, kept in view with the help of microscope light. An intraocular foreign body forceps was then inserted through the other sclerotomy. In cases where there was inadequate view through the pupil, we used a self-retaining 25G Awh chandelier (synergetics, inc) for illumination. This was inserted through a separately created 4th port with a 25G MVR. We used perfluorocarbon intra operatively to protect the macula and silicone oil as postoperative intraocular tamponade, if required. Endolaser photocoagulation of the breaks and 360 degree photocoagulation of the retinal periphery were performed. Before securing the IOFB, the route of removal was planned so that either the sclerotomy was enlarged or a keratome incision created to remove the IOFB through the limbus in aphakic patients.

RESULTS

Fifty eyes of fifty patients (all male with a mean age of 38; age range 22 to 50 years) were treated during this study period.

In our study we assessed the ease of removal of IOFB by comparing the complication rates of the two methods under discussion.

The IOFB slipped during removal in 9 (36%) of the 25 patients in Group A while slippage occurred in only 5 (20%) of the patients in Group B. In 3(12%) cases in Group A there was failure to lift the IOFB during removal with the endomagnet predominantly due to the large size of the IOFB; however such a complication was not encountered with the group B. One of the drawbacks of using forceps is iatrogenic retinal break due to the sharp edges of the various foreign body forceps coming in contact with the retinal surface. This complication was encountered in 7 (28%) of the 25 cases in Group B; in contrast, none of the patients in group B encountered this complication (Table 1).

DISCUSSION

PPV for removal of IOFB often presents a formidable surgical task. However, the final results can be favorable, despite the serious nature of the initial injury[8-10]. The most common location for a retained intraocular foreign body is within the vitreous cavity[11].

Table 1: The complication rate in the Endomagnet + Forceps alone n = 50

Complication rate	GROUP A (Endomagnet + Forceps) n = 25 (%) P < 0.05	GROUP B (Forceps alone) n = 25 (%) P < 0.05
IODB slippage during removal	9 (36)	5 (20)
Failure to lift the IOFB	3 (12)	0 (0)
Iatrogenic retinal break during removal	0 (0)	7 (28)

Like other traumatic injuries to the eye, occurrence of IOFBs is effectively prevented by strict adherence to the recommended safety measures because most of them are occupational [12, 13]. Some of the activities like hammering metal on metal and chiseling related activities have a relatively high probability of producing high velocity projectiles that can enter and damage the globe[14]. War injuries also have a high probability of IOFBs[15].

Although occasionally other tools may also be utilized e.g., paper clips, catheter, snare[16, 17] there are three basic types of instruments for IOFB removal: External Electro Magnets (EEMs), Intraocular forceps and Intraocular Magnets (IOMs)[18]. EEMs may be equipped with intraocular attachments but they are bulkier and less convenient to use than IOMs[19].

The inherent problem of the EEM is that the surgeon has to view the removal process from an angle, making it difficult to align the following:

- External magnetic pole.
- Surgical incision / instrument tip.
- IOFB.

The potential for complications is significant. The EEM also has a tendency to overheat, reducing efficiency and possibly burning the patient's skin. The weight (up to 1 ton) can cause logistical difficulties.

Intraocular Forceps allow controlled maneuvers but may require considerable dexterity to grasp the IOFB (e.g., lifting up sharp objects from the retinal surface) or to adjust its position (e.g., aligning the IOFBs longest axis with that of the instrument) [20]. Use of additional tools such as heavy liquids provides limited help.

The Intraocular Magnets are permanent magnets that allow controlled IOFB removal with no need for special dexterity. Free-flying of the IOFB, inherently considerable with EEMs is ≤ 2 mm. However, most IOMs gradually lose power with time and have a limited pull force, commonly requiring concurrent forceps use[19].

The aim in managing an IOFB is to achieve the best visual outcome possible by identifying and closing the entry and exit sites, reconstructing the eye and removing the object.

CONCLUSION

The primary goal in managing IOFB is to preserve vision. The best instrument to use for removal depends on the size, shape and magnetic properties of the IOFB as well as its location within the eye.

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