Occupational eye injuries are common, accounting for more than 20% of all penetrating injuries in the United States. The majority of patients are young males, and more than 90% reporting not using safety eye glasses. Approximately one-third of these sustain posterior segment intraocular foreign body (IOFB). Poor prognostic factors are poor visual acuity at presentation, large size of IOFB, posterior segment IOFB, presence of retinal detachment, and endophthalmitis at presentation. Postoperative retinal detachment, endophthalmitis, and proliferative vitreoretinopathy are noted to be late complications of IOFB.

Advances in vitreoretinal surgical techniques have improved visual outcomes in most challenging cases of IOFB. Use of small-gauge vitrectomy systems has been described for various indications such as rhegmatogenous retinal detachments, macular surgery, and diabetic tractional retinal detachment.

We present a case of unusually large iron foreign body with good visual acuity at presentation managed successfully with a small-gauge vitrectomy system.

**CASE HISTORY**

A man aged 25 years presented with history of an iron foreign body entering his right eye while working on lathe machinery 4 hours earlier. He was not using protective eye glasses. At presentation the uncorrected visual acuity in the right eye was 20/80 improving to 20/40 with pinhole. Anterior segment examination revealed clear cornea, formed anterior chamber, and clear crystalline lens. A small conjunctival laceration could be seen in the nasal pars plana region. Dilated fundus examination revealed clear vitreous and attached retina. A large linear iron foreign body could be seen in the inferonasal quadrant (Figure 1). The foreign body was entangled in the vitreous body and immobile. No impact on the retina, however, was observed. Examination of the left eye revealed no abnormalities. A skull x-ray confirmed the presence of a single linear IOFB (Figure 2).
The patient was taken to the OR for vitrectomy. Intraoperatively, the conjunctiva over the nasal pars plana was opened and a crescent-shaped entry wound was revealed. The wound was closed using 8-0 vicryl interrupted sutures. The overlying conjunctiva was closed.

Transconjunctival 23-gauge pars plana cannulas were inserted in the inferotemporal, superotemporal, and superonasal quadrants, and the infusion cannula was fixed in the inferotemporal quadrant. Intraoperatively, the IOFB appeared relatively immobile in the inferonasal quadrant. A frosted branch angiitis appearance of the blood vessels was observed around the foreign body. Initially, core vitrectomy was performed and a vitreous sample was taken, which was sent for microbiological study. Thorough vitrectomy was performed around the IOFB to free it from all vitreous attachments. Posterior vitreous detachment (PVD) was not induced at this stage to protect the retina from the impact of IOFB.

The cannula in the superonasal quadrant was removed, and the existing sclerotomy was enlarged using a No. 11 Bard-Parker blade in a circumferential manner after dissection of conjunctiva. An intraocular foreign body magnet (Geuder Kuhn intraocular magnet, Geuder AG, Heidelberg, Germany) was introduced through the enlarged sclerotomy. The IOFB adhered to the magnet on contact; as the magnet was withdrawn, the IOFB became aligned with the long axis of the magnet, exiting via the sclerotomy. No lens touch or retinal trauma occurred during removal.

Subsequent to IOFB removal, the sclerotomy was sutured with interrupted 6-0 vicryl sutures. PVD was induced using high active suction, and the vitrectomy was completed. Fluid-air exchange was performed, after which endolaser was applied to the inferonasal quadrant where a retinal break was suspected. Cryotherapy was then performed posterior to the enlarged sclerotomy, and watertight suturing of the sclerotomy was completed. Nonexpansile perfluoropropane (14%) was exchanged with air. At the end of the surgery the cannulas in the remaining 2 quadrants were removed. Upon measurement after the removal, the IOFB measured 10.5 mm in length (Figure 3).

The vitreous specimen subjected to microbiology showed *Staphylococcus aureus*, which was sensitive to piperacillin and augmentin. The patient received systemic antibiotics and topical steroid and antibiotic drops. There were no clinical signs of endophthalmitis in the postoperative period.

At 6 weeks follow-up, the best corrected visual acuity in the operated eye was 20/20 with -0.75 D of cylinder. Minimal posterior subcapsular cataract and an attached retina were noted (Figure 4).

At 6 months follow-up, the cataract had become significant. The patient underwent uneventful phacoemulsification and foldable hydrophobic acrylic IOL implantation in the bag, after which he achieved restoration of good visual acuity.

**DISCUSSION**

Surgical management of IOFB is a challenging scenario. The surgeon must weigh various factors to obtain the best possible anatomic and visual outcome while at the same time minimizing complications due to the retained IOFB. The key factors under consideration are timing of surgery and surgical technique. Introduction of various newer surgical tools provide more choices to the surgeon and help improve surgical outcomes.

In the case presented, the large linear IOFB posed a unique challenge because despite its large size, intravitre-
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al location, and presence of intravitreal infection, which often indicate a poor prognosis, visual acuity at presentation was good and all vital ocular structures were intact. The challenge in this case was to extract the IOFB as early as possible without damaging any vital structures and avoiding any late complications such as retinal detachment or endophthalmitis.

While planning our surgical method we contemplated different surgical techniques. The key issues under consideration were use of a 20-gauge vs 23-gauge vitrectomy system, use of IOFB forceps vs magnet, and whether to use perfluorocarbon liquid (PFCL). Surgical options included phacoemulsification, primary posterior capsulotomy, pars plana vitrectomy, and IOFB removal through the limbal route followed by primary, or secondary IOL implantation. An additional option was to remove the IOFB through the pars plana route, sparing the crystalline lens, as was eventually chosen.

It is our belief that the successful outcome can be attributed to the use of the 23-gauge vitrectomy system and the Geuder Kuhn foreign body magnet.

Small-gauge vitrectomy provides a better closed chamber environment, thereby reducing intraocular turbulence and undue movements of the IOFB in the vitreous cavity. Such movements are likely to traumatize the retina. The closer proximity of the cutter port to the tip and the smaller gauge allows the surgeon to use high suction while inducing PVD with less risk of of pulling the retina into the cutter. Failure to induce PVD in primary surgery is often responsible for retinal detachment postoperatively.

PFCL is often used in these cases to protect the retina from contact with the IOFB if it falls back during removal. In this case, however, we did not use it, presuming that the PFCL would flow over the bulky IOFB and not aid in floatation, as it would if the IOFB were small and/or lightweight. Additionally, a small amount of PFCL would not offer adequate protection if the IOFB were to fall back.

The Geuder Kuhn foreign body magnet is 18-gauge in diameter and has length of 35 mm, which allows the surgeon to approach the IOFB close to the retinal surface. It has strong magnetic action only at the tip, which ensures that an iron IOFB attaches only at the tip and not on the sides, aligning the IOFB along the shaft of magnet to allow smooth withdrawal through an enlarged sclerotomy.

Finally, it is important to conduct microbiology of the vitreous specimen even in the apparent absence of active infection. Subclinical infection may progress at a later date to traumatic endophthalmitis. If culture and sensitivity are obtained, a devastating complication can be avoided.

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