

# Vitrectomy for Removal of Posterior Segment Intraocular Foreign Bodies

With careful surgical planning, PPV for IOFB removal can yield favorable outcomes.

BY LISA C. OLMOS, MD, MBA; AND D. WILKIN PARKE III, MD

*In this issue of Retina Today, Lisa C. Olmos, MD, MBA; and D. Wilkin Parke III, MD, provide surgical pearls for performing pars plana vitrectomy to remove an intraocular foreign body.*

*We extend an invitation to readers to submit pearls for publication in Retina Today. Please send submissions for consideration to Ingrid U. Scott, MD, MPH ([iscott@psu.edu](mailto:iscott@psu.edu)); or Dean Elliott, MD ([dean\\_elliott@meei.harvard.edu](mailto:dean_elliott@meei.harvard.edu)). We look forward to hearing from you.*



—Ingrid U. Scott, MD, MPH; and Dean Elliott, MD

Intraocular foreign bodies (IOFBs) present unique surgical challenges, particularly when the posterior segment is involved. Risk factors for IOFB after ocular injury include youth, male gender, work-related injury, metallurgy, and battlefield or blast injury. If either traumatic endophthalmitis or traumatic cataract is present, there should be a high index of suspicion for IOFB, and imaging studies should be obtained. Possible consequences of posterior segment IOFB include endophthalmitis, toxicity (such as siderosis or chalcosis), cataract, retinal detachment (RD), intraocular hemorrhage, secondary choroidal neovascular membrane, and sympathetic ophthalmia. The most common intraocular location of a retained foreign body is within the vitreous humor. These cases require vitrectomy with foreign body removal either through the pars plana or anteriorly through the pupil and clear cornea after lensectomy. Retinal or subretinal IOFBs frequently cause widespread hemorrhage and retinal damage and may require retinotomy. Postoperatively, there is a high risk of RD associated with proliferative vitreoretinopathy (PVR). This article presents helpful surgical techniques and reviews the literature on the surgical management of these complex cases.



Figure 1. Patient presented with a red, painful left eye.

## CASE EXAMPLE

A 33-year-old man was referred from an outside emergency room with a red, painful left eye (OS; Figure 1). Five days earlier, he presented to the ER after work with mild pain OS. He worked as a furniture mover, and all week long he had been removing chairs that were sta-

pled to the floor. He was diagnosed with a corneal abrasion and started on antibiotic ointment. His pain initially improved, then worsened along with his vision, causing him to seek further care.

Upon examination, his visual acuity was 20/20 in the right eye (OD) and light perception OS. Intraocular pressures were 16 and 14 mm Hg, OD and OS, respectively. Ocular examination OD was unremarkable. Slit-lamp examination OS showed 2 to 3+ conjunctival injection and a 0.5-mm hypopyon. The cornea was edematous, and there was a small self-sealing laceration centrally. The view to the fundus was compromised by cloudy media. Computed tomography of the orbits was obtained (Figure 2).

The patient was diagnosed with retained IOFB and traumatic endophthalmitis OS. He was told to take nothing by mouth, given topical fortified and oral antibiotics, and taken to the OR emergently the following morning. He underwent 20-gauge pars plana vitrectomy (PPV) and lensectomy with retinectomy for removal of the IOFB and repair of the secondary RD with silicone oil tamponade. The IOFB was identified embedded in the retina just superior to the optic disc and fovea. Fortunately, the macula was spared from direct impact.

Perfluorocarbon liquids were used intraoperatively to protect the macula during IOFB removal. The object proved to be magnetic, but it was excessively large and heavy for removal using an intraocular magnet. It also had an irregular, C-shaped contour. The IOFB was therefore grasped with Rappazzo Intraocular Foreign Body Forceps (Storz Ophthalmics), delivered through the pupil, and ultimately externalized via a preplaced limbal clear corneal incision anteriorly. The patient was left aphakic, and the sclerotomies and the corneal incision were sutured. Vitreous cultures were taken, and intravitreal antibiotics were administered.

The foreign body was a 12 x 1 x 1 mm magnetic metal object, presumed to be a furniture staple (Figure 3). Histopathologic examination demonstrated some attached tissue with acute and chronic inflammation and a positive iron stain. The vitreous cultures grew methicillin-resistant *Staphylococcus epidermidis*, sensitive to vancomycin, cipromycin, moxifloxacin, trimethoprim/sulfamethoxazole, gentamicin, and erythromycin.

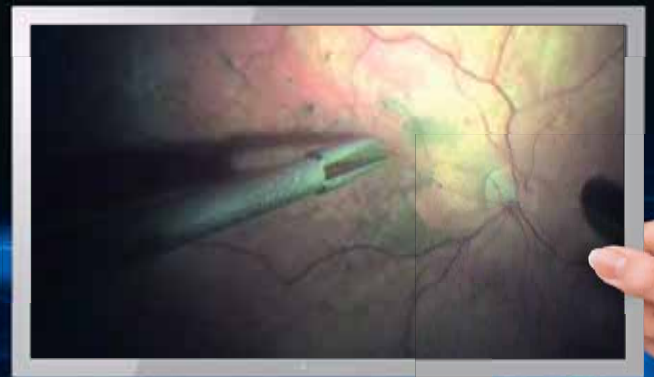
At postoperative day 3, vision OS was hand motions, and the IOP was 16 mm Hg. The patient was aphakic, but a dense, fibrinous pupillary membrane had developed (Figure 4). Frequent application of topical steroids was prescribed.

By postoperative month 3, the vision was 5/200, and the IOP was 15 mm Hg. There was a large retinectomy scar just superior to the optic disc and macula, but the retina remained attached under silicone oil. At postoperative month 6, the patient remained clinically stable (Figure 5).

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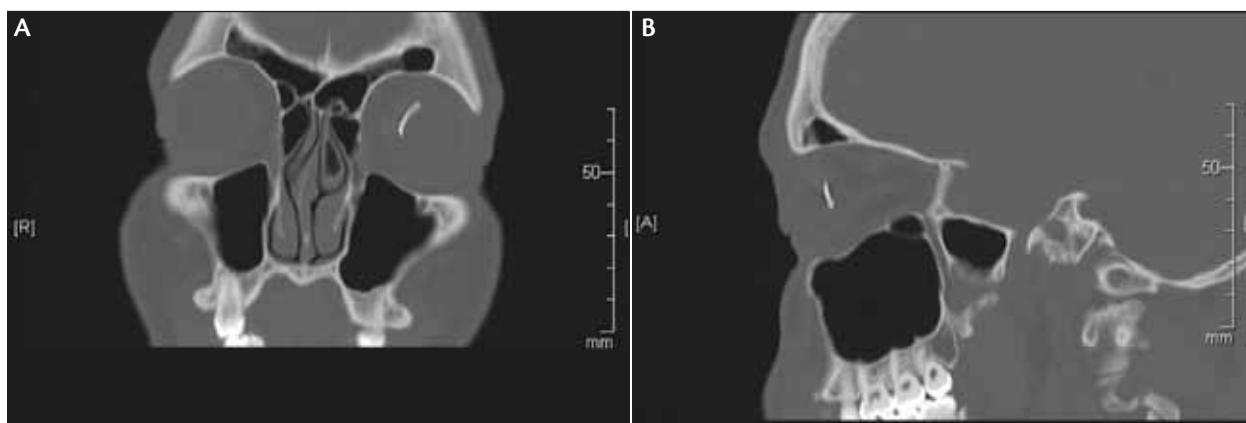


Figure 2. Computed tomography of the patient's orbits.

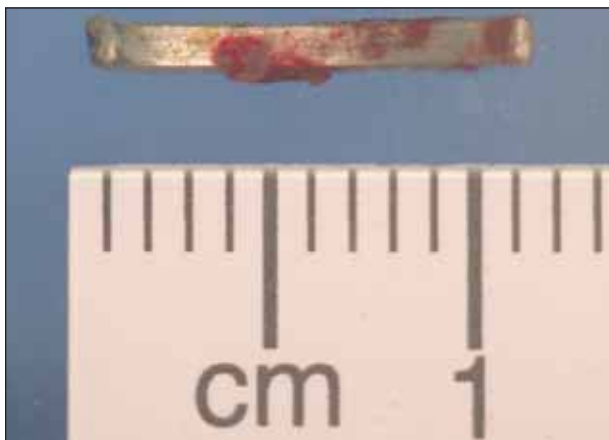


Figure 3. The removed IOFB, presumed to be a furniture staple.

## DISCUSSION

The prognosis after IOFB removal can be highly variable, but it is often favorable with timely surgical attention.<sup>1-14</sup> In 1 study, 62% of patients had a final best corrected visual acuity of  $\geq 20/60$ , but a large minority (15%-31%) had a final best corrected visual acuity of  $\leq 20/400$ .<sup>6</sup> Another study found that factors predictive of final visual acuity include initial visual acuity, IOFB size and location, and presence of an initial RD.<sup>1</sup> Interestingly, interval to IOFB removal was not predictive of final visual acuity.

The optimal timing of vitrectomy in penetrating ocular trauma was originally evaluated by Ryan et al<sup>4</sup> using a Rhesus monkey model. In this model, posterior vitreous detachment (PVD) occurred 1 to 2 weeks after injury, and PVR and/or tractional RD occurred 7 to 11 weeks after injury. Vitrectomy at 1 or 14 days post-injury decreased risk for tractional RD compared with 70 days after injury. However, slightly delayed vitrectomy may confer the advantage of spontaneous PVD development

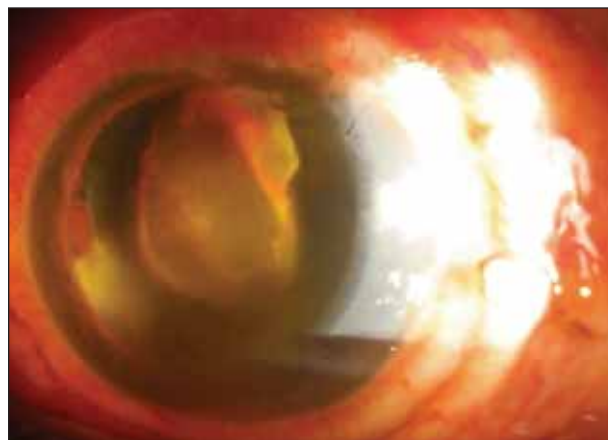


Figure 4. At postoperative day 3, a dense, fibrinous pupillary membrane had developed.

and less risk of intraoperative hemorrhage.

More recently, the timing of IOFB removal was evaluated in a seminal paper by Colyer et al<sup>5</sup> in a retrospective study of 79 open globe injuries among American military in Iraq and Afghanistan. The paradigm included primary closure in a combat hospital with prophylactic systemic and topical antibiotic, followed by IOFB removal an average of 39 days later. Of these patients, 24.6% developed PVR; there were no cases of endophthalmitis or sympathetic ophthalmia. This study gives clinicians some flexibility in their management strategy. Primary closure can be performed promptly by an ophthalmologist, but if access to a vitreoretinal surgeon or vitrectomy equipment is limited or delayed, vitrectomy for IOFB removal can be performed safely as a secondary procedure.

## TECHNIQUE

The strategy for IOFB removal involves careful surgical planning. After core vitrectomy, the IOFB must be identi-

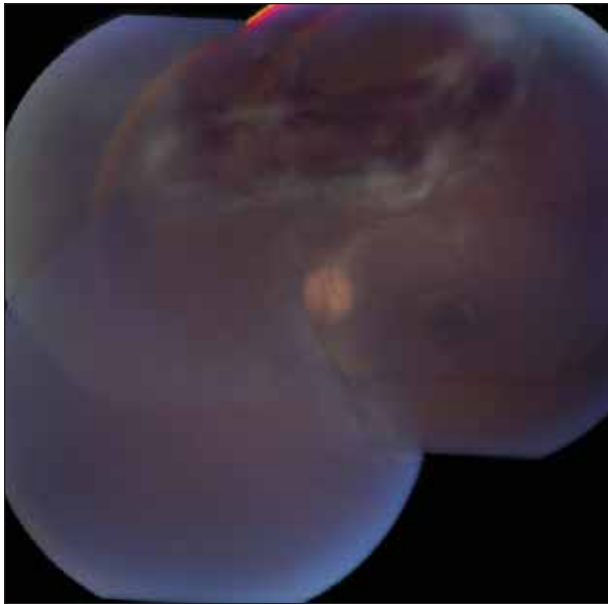


Figure 5. By postoperative month 6, the patient remained clinically stable.

fied, which is often not an easy task because of hemorrhage or retinal disruption. Careful hemostasis using intravitreal diathermy is helpful. Many IOFBs can be removed via a sclerotomy wound, with or without enlargement, in either a linear or T-shaped configuration. This technique must be employed if the crystalline lens is to be left intact, and it works very well with small to medium IOFB (up to 5 mm in maximal width) having a regular contour.

Limitations to the use of sclerotomy for removal include necessity to enlarge the sclerotomy excessively or an irregularly shaped IOFB, which may slip during removal. In many cases, a traumatic cataract is present, so lensectomy is performed at the time of PPV, thus clearing the anterior segment for removal via a clear corneal or scleral tunnel incision. This is a good choice for removal of larger or irregular foreign bodies, and it permits excellent visualization. Before securing the IOFB, it is important to plan the route of removal so that either the sclerotomy can be enlarged or a keratome incision can be created.

The best instrument to use for removal depends on the size, shape, and magnetic properties of the IOFB. Ferromagnetic materials (those that are attracted to a magnet) include iron, nickel, and cobalt. Removal of ferromagnetic IOFBs can be aided either by an external magnet or by a handheld intraocular rare-earth magnet inserted through a sclerotomy. These magnets work particularly well for small or light IOFBs, but care should be taken with larger and heavier IOFBs, which may slip during removal despite their magnetic properties. For these, as well as nonmagnetic IOFBs, a variety

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of forceps can be used, such as Rappazzo or Wilson forceps. Modifications such as serrated edges; heavy jaws; cups or rings; or a cage-like, retractable basket are helpful in securing the IOFB. Many of these forceps are available primarily in 20 gauge; therefore, if small-gauge PPV is chosen, one of the trocars should be removed and the sclerotomy enlarged to the appropriate size using a microvitrectoretinal blade. Finally, for large, heavy, or irregular IOFBs, we advocate the use of perfluorocarbon liquids to protect the macula during the critical step of IOFB removal, as slippage is possible, even with maximal precautions.

Finally, after the IOFB is removed, one must assess attendant retinal damage and repair any RD. This may require retinectomy or even chorioretinectomy to create a regular edge and facilitate healing without PVR. The subject of chorioretinectomy was addressed by Weichel et al<sup>14</sup> in a review of cases of IOFB penetrating the choroid. The results showed that final visual acuity, globe survival, final reattachment rate, and PVR rate were all more favorable in the group that received chorioretinectomy. Silicone oil is a favored tamponade agent in these cases, especially if extensive RD is present or if retinectomy is required.

## CONCLUSION

PPV for removal of IOFB often presents a formidable surgical challenge. Aided by careful surgical planning, final results can be favorable, despite the severe nature of the injury. ■

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