# Intraocular lens-blocking technique for intraocular foreign body removal

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The aim of this study was to describe a novel technique for intraocular foreign body (IOFB) removal. Phacoemulsification was performed in all patients, followed by a complete microincision vitrectomy to free all tissues surrounding the IOFB. A three-piece intraocular lens (IOL) was placed in the capsular bag, and an opening was made in the upper center of the capsule. The IOFB was removed and lifted to the anterior chamber through the capsular opening and IOL edge. The IOFB was confined to the anterior chamber by the IOL, and then easily extracted through the main corneal incision. The technique was adopted in six eyes of six patients. All IOFBs were removed successfully in all patients without intraoperative or postoperative complications. The IOL-blocking technique is a useful approach for IOFB removal.

**Key words:** Intraocular foreign body, intraocular lens-blocking, posterior capsulotomy

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Intraocular foreign body (IOFB) injuries represent a common, potentially vision-threatening ocular injury.[1] Many surgical techniques have been proposed as safe and effective treatments for IOFBs. Because IOFB removal through an enlarged sclerotomy may have many complications, surgeons often extract IOFBs through the corneal incision.[2,3] However, IOFBs can retreat into the vitreous cavity and cause retinal damage during this process. Here, we present an intraocular lens (IOL)-blocking technique for IOFB removal to prevent intraoperative IOFB retreat.

## Surgical Technique

Under retrobulbar anesthesia, a 2.0-mm clear corneal incision was made and phacoemulsification for the cataractous lens was performed under viscoelastic; this was followed by cortex removal. The first 23-gauge infusion cannula was placed in the inferior–temporal region, whereas two cannulas were placed in the superior–temporal and superior–nasal quadrants. A standard microincision pars plana vitrectomy was performed using the Stellaris Vitrectomy System (Bausch & Lomb, Inc., Rochester, NY, USA). A posterior vitreous detachment was created and a complete vitrectomy was performed to free all tissues surrounding the IOFB. When necessary, endolaser photocoagulation was performed around the retinal lesions. A three-piece IOL was placed in the capsular bag, and an opening in the upper center of the capsule was made with the vitrectomy probe during posterior capsulotomy (Fixed Cut-Rate Mode, 5,000 cuts per minute, linear control of vacuum up to 400 mm Hg). The anterior chamber was filled with viscoelastic (Amvisc, Sihong Jinjing, Inc., Jiangsu, China). The IOFB was grasped at a position perpendicular to its long axis using intraocular forceps. The IOFB was then removed and lifted to the anterior chamber through the capsular opening and IOL edge, with the aid of an iris spatula and intraocular forceps. During this process, the IOL was pushed to one side of the capsule to ensure sufficient space for the operation. The IOFB was confined to the anterior chamber because the capsular opening was repeatedly blocked by the IOL [Fig. 1]. Then, the IOFB was held with the forceps and easily extracted through the main corneal incision along the long axis of the IOFB [Fig. 2]. The corneal incision was enlarged when necessary. The IOL was centered and the viscoelastic was aspirated. The corneal incision was closed at the end of the procedure. A thorough retinal examination was performed, and the lesions of the retina were treated appropriately. An appropriate tamponade agent was used when necessary. Cannulas were removed, and any remaining incisions were closed [Supplemental Digital Content, Video 1].

## Results

The technique was adopted in six eyes of six patients between March 2018 and November 2020. This study followed the

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**Table 1: Characteristics of patients in this report**

| Patient no./sex/ age, years | Time between trauma and IOFB removal, months | pre-op IOP/IOP First Day/IOP First Week/ IOP First Month/IOP Third Month, mmHg | Follow-up, months | Initial BCVA/ BCVA Third Month | Lens status | Preoperative comorbidities |
|---|---|---|---|---|---|---|
| 1/female/53 | 120 | 11.0/23.4/7.5/9.8/12.3 | 7 | FC/(20/100) | Cataract | Siderosis |
| 2/male/56 | 1 | 6.2/30.1/13.1/16.6/13.1 | 6 | FC/(20/400) | Cataract | Retinal detachment, macular lesion |
| 3/male/49 | 12 | 18.1/13.3/19.6/15.2/19.8 | 6 | HM/FC | Cataract | Siderosis |
| 4/male/45 | 13 | 19.2/16.8/20.6/17.1/15.5 | 7 | (20/200)/(20/30) | Cataract | Siderosis |
| 5/male/45 | 168 | 14.2/16.3/24.8/15.3/19.8 | 6 | FC/(20/10) | Cataract | Retinal detachment |
| 6/male/30 | 3 days | 9.1/7.8/16.8/19.5/9.5 | 6 | (20/160)/ (20/100) | Cataract | Retinal tear, vitreous hemorrhage |

IOP, intraocular pressure; BCVA, best-corrected visual acuity; CF, counting fingers; HM, hand motion

**Table 2: Characteristics of IOFBs in this report**

| Patient no. | Ocular entrance of foreign body | Sizes of IOFB, mm | Material | Shape |
|---|---|---|---|---|
| 1 | Sclera | 4×2 | Metal | Blade |
| 2 | Sclera | 5×3 | Glass | Cylinder |
| 3 | Sclera | 6×4 | Metal | Blade |
| 4 | Cornea | 5×2 | Metal | Blade |
| 5 | Sclera | 3×3 | Plastic | Cube |
| 6 | Cornea | 3×2 | Metal | Blade |

IOFB, intraocular foreign body

tenets of the Declaration of Helsinki. All participants signed written informed consent. The mean age was 49.2 ± 4.5 years. The mean time between trauma and IOFB removal was 52.3 ± 72.7 months. The mean minimum length of the IOFB was about 2.6 ± 0.8 mm. The mean maximum length of the IOFB was about 4.3 ± 1.2 mm. The types of IOFBs in our study include metal, glass, and plastic. The shapes of IOFBs include blade, cylinder, and cube. The IOFBs were combined with siderosis in three patients, whereas they were combined with vitreous hemorrhage, retinal detachment, or retinal tears in the remaining three patients. No signs of intraocular infection were observed in any patient. The characteristics of the six patients and their IOFBs are shown in Tables 1 and 2.

Phacoemulsification was performed and a three-piece IOL was implanted in the capsular bag in all eyes with cataracts. The size of the opening made in the posterior capsule is generally determined according to the minimum length of the IOFB. The maximum length of the opening was about 4 mm. Two patients had a cornea wound of entry and broken suspensory ligaments; however, the lens capsule was intact without rupture. Phacoemulsification, IOL implant, and the IOL-blocking technique could be performed as usual. All IOFBs were removed successfully in all patients without intraoperative complications (e.g., IOFB retreat, iatrogenic retinal injury, extension in size of the opening, or IOL dislocation). The corneal incision was enlarged and sutured in three eyes because the minimum length of the IOFB was greater than 3 mm. Silicone oil was injected into two eyes because of pre-existing retinal detachment, whereas perfluoropropane (C3F8) was injected in one eye with retinal tear and vitreous hemorrhage. Air was injected into the remaining three eyes with no retinal tears. The best-corrected visual acuity at 3 months postoperatively was better than the initial best-corrected visual acuity in all patients. No postoperative complications such as IOL decentration were observed during the follow-up period (mean, 6.3 ± 0.5 months).

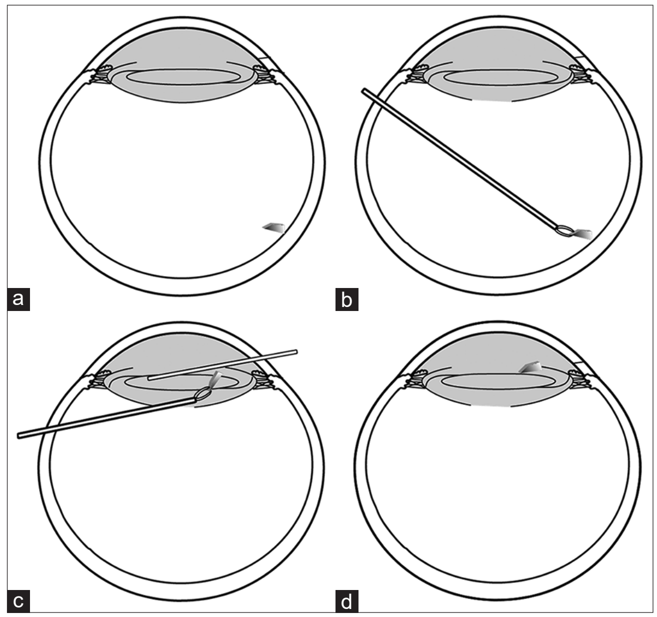


**Figure 1:** Schematic diagrams of the intraocular lens-blocking technique. (a) Combined vitrectomy, phacoemulsification, and IOL implantation were performed. The anterior chamber was filled with viscoelastic. (b) Posterior capsulotomy was performed with a vitrectomy probe. The IOFB was removed using intraocular forceps. (c) The IOFB was lifted to the anterior chamber through the capsular opening and IOL edge, with the aid of an iris spatula and intraocular forceps. (d) The IOFB was confined to the anterior chamber by the IOL and could easily be extracted through the main corneal incision

## Discussion

IOFBs may cause endophthalmitis, chalcosis, siderosis, and a poor prognosis.[4,5] Vitrectomy has been a powerful means for IOFB removal; it can provide acceptable visual results.[6] Similar to Batman *et al*.,[2] we performed phacoemulsification, IOL implantation in all eyes with cataracts. Combined vitrectomy, phacoemulsification, IOL implantation, and IOFB extraction can also allow good visual rehabilitation in our study. No intraoperative complications directly related to

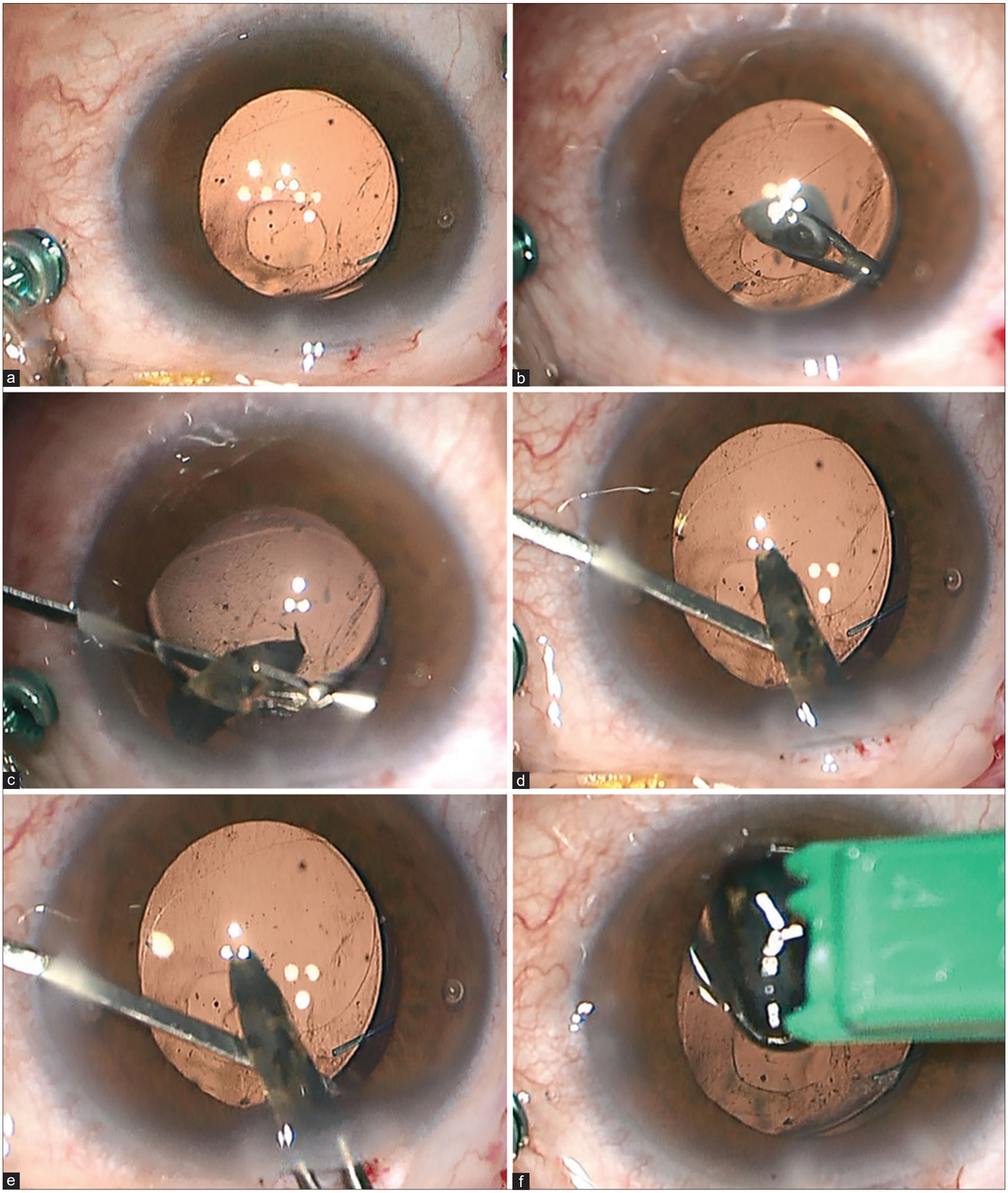


**Figure 2:** Intraoperative views of intraocular lens-blocking technique. (a) Combined vitrectomy, phacoemulsification, and IOL implantation were performed, and an opening was made in the upper center of the capsule. (b) The IOFB was removed using intraocular forceps. (c) The IOFB was lifted to the anterior chamber through the capsular opening and IOL edge, with the aid of an iris spatula and intraocular forceps. The capsular opening remained intact during this process. (d) The IOFB was confined to the anterior chamber by the IOL. (e) The IOFB was easily extracted through the main corneal incision using the forceps. (f) The size of the foreign body was approximately 4 × 2 mm

the operation were noted during the 6-month postoperative follow-up.

Some surgeons have described IOFB extraction through the sclerotomy site. These techniques require sclerotomy enlargement, which could result in vitreous hemorrhage, hypotony, and/or injury to surrounding structures.[7] In our technique, IOFB removal through the limbus could have some advantages, including direct visualization, conjunctival and scleral microincisions, reduced conjunctival scarring, more stable intraocular pressure, shorter surgical time, and increased patient comfort.

Different surgical techniques have been proposed to remove IOFB through a limbus incision. Most surgeons generally change the IOFB-holding hand when lifting the IOFB to the anterior chamber. This procedure may result in IOFB retreat and retinal injury. Therefore, the use of perfluorocarbon liquids or viscoelastic in the vitreous cavity has been recommended to protect the retina during IOFB removal; these approaches require additional surgical procedures.[3] However, with the IOL-blocking technique, IOL implantation before IOFB removal can prevent IOFB retreat into the vitreous cavity by blocking the capsular opening. With the aid of an iris spatula and intraocular forceps, the IOFB could be lifted to the viscoelastic-filled anterior chamber and placed on the IOL. It could then be easily extracted through the corneal incision with forceps. No potential complications of removing IOFB through a limbus incision including IOL decentration, extension in size of the opening, damage to the corneal endothelium, and the lens capsule were noted in our study.

Park *et al*.[8] proposed a technique to remove the IOFB by viscoelastic capture. The long axis of the IOFB captured in the anterior chamber by DisCoVisc was about 2.75 mm. When removing large-sized IOFB, using the viscoelastic capture may not stabilize the IOFB in the anterior chamber. Furthermore, in some cases, the IOFB could not be removed smoothly through an improperly sized corneal incision. Then, the DisCoVisc in the anterior chamber may be lost quickly due to changes in perfusion and intraocular pressure. The IOFB retreat and retinal injury may occur with the viscoelastic capture technique. In our technique, the IOFB is confined to the anterior chamber by the IOL. IOFB retreat into the vitreous cavity is unlikely to occur during the removal process due to improper corneal incisions, which can reduce the anxiety of the surgeon. The viscoelastic device that fills the anterior chamber could prevent damage to the corneal endothelium, the lens capsule, and the iris.

Agarwal *et al*.[9] used IOL scaffold technique to prevent IOFB retreat. The IOFB retreat may occur during the process of IOL implantation. In addition, a three-piece IOL could only be placed in the sulcus because the presence of the posterior capsulotomy makes the placement of IOL in the capsular bag more difficult. In the IOL-blocking technique, a three-piece IOL is implanted before posterior capsulotomy. Thus, the IOL can easily be positioned in the capsular bag, which is considered the optimal location for IOL implantation. This IOL position can isolate the IOL from the adjacent uveal tissue and reduce the risks of IOL decentration, pupillary capture, pigment dispersion, and other postoperative complications.[10]

The mean minimum length of the IOFB was about 2.6 ± 0.8 mm. The types of IOFB in our study include metal, glass, and plastic. Our clinical experience suggests that the IOL-blocking technique is suitable for IOFBs of various properties with a minimum length of less than 4 mm.

## Conclusion

A large number of patients and a longer follow-up duration are needed to confirm the long-term effectiveness and safety of this technique. Nevertheless, our findings indicate that the IOL-blocking technique is a safe and efficient approach for IOFB removal.

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### Conflicts of interest

There are no conflicts of interest.

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