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Surgical treatment for penetrating corneal injury with a pars plana foreign body in a teenager: a case report

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We report a rare case of penetrating corneal and lens injury with a pars plana foreign body in a teenager and a technique for removing such an intraocular foreign body (IOFB) during complex reconstructive surgery.

A 16-year boy was admitted urgently to the Pediatric Ophthalmology Department with complaints of decreased vision in his right eye. He had received a mowing-related injury to the eye three days before presentation.

Urgent surgical intervention included initial surgical treatment of the wound, phacoaspiration of traumatic cataract with anterior vitrectomy and endocapsular implantation of a +23.0 D Acrysof SN60WF intraocular lens (IOL), and removal of IOFB from the pars plana.

We used wide-spatula scleral compression at the ciliary body not only for visualizing and removing the IOFB, but also for assessing the status of the surrounding tissue (the presence or absence of mild suppurative lesions). The IOFB was removed anteriorly (via cataract incision and anterior and posterior capsulorhexes) with a magnet under direct intraoperative microscopic control. The preservation of residual capsular fornices enabled us to perform primary endocapsular IOL implantation immediately.

Therefore, we managed to perform a complete rehabilitation of the injured teenager (IOFB and traumatic cataract removal and endocapsular IOL implantation) using one limbal incision in a single surgery.

Key words:

adolescents, intraocular foreign body, removal, pars plana, traumatic cataract, phacoaspiration, vitrectomy

Introduction

A penetrating eye injury complicated by an intraocular foreign body (IOFB) is the most severe type of eye injury. The presence of an IOFB presents an additional threat not only to the visual function but also to the very existence of the eye.

Our previous studies [1] have demonstrated that the presence of an IOFB in a pediatric eye is accompanied by the development of inflammation with exudative response of the ocular shells, potentially resulting in adhesion processes with the formation of commissures and significant fusions, mostly along the wound canal. Consequently, in pediatric patients, diagnosing an IOFB timely and removing it as early as possible is of paramount importance.

The IOFB is most commonly removed through the pars plana at the time of pars plana vitrectomy (PPV). This approach can be used when an IOFB is located in the posterior segment, outside the equator [2, 3, 4]. However, visualizing and removing an IOFB is challenging when it is located anterior to the equator, not to mention the pars plana.

We report a rare case of penetrating corneal and lens injury with an IOFB in the pars plana in a teenager, and a method for removing it in the course of reconstructive treatment.

Case description

A 16-year boy was admitted urgently to the Pediatric Ophthalmology Department, State Institution "The Filatov Institute of Eye Diseases and Tissue Therapy of the NAMS of Ukraine" with complaints of decreased vision in his right eye. He reported that he had received a mowing-related injury to his right eye three days before presentation.

Informed consent for treatment (including eye surgery) and publication was obtained from the patient’s parents.

On examination, the right eye showed mixed injection. At 8:30 o’clock, there was a 2-mm paracentral linear full-thickness corneal wound. The cornea was transparent elsewhere. There was a moderately deep anterior chamber and clear aqueous. At 9 o’clock, approximately 2-3 mm from the pupillary margin, there was a linear vertical conjunctival wound, and the pupillary margin at this site was devoid of pigment. The pupil was round and could be dilated to 8 mm, but to a less extent at the site of the wound. At 9 o’clock, there was a rupture of pigmented anterior capsule from the iris within the lens hole. The outer cortical lens was opacified, and, at 9 o’clock, there was a hole in the peripheral posterior capsule. A star-shaped posterior capsular opacity was seen (Fig. 1). The red fundus reflex was visible (but was less pronounced at the periphery), and the retina and optic disc appeared blurred at ophthalmoscopy. No focal pathology was seen in the sites available for examination. The uncorrected visual acuity (UCVA) was 0.3, and the intraocular pressure (IOP) was normal.

The left eye was clinically healthy (the visual acuity was 1.0).

On X-ray examination of the right orbit in the anterior and lateral projections using the technique of Comberg-Baltin, a radiopaque IOFB measuring 2x1x2 mm was seen at 4:40-5:20 o'clock, 8-10 mm from the anatomical axis of the eye, 5-7 mm from the limbal plane.

An ultrasound examination of the right eye (Fig. 2) showed a moderately deep (2.9 mm) anterior chamber and an anterior chamber angle of 35 degrees. A corneal defect was seen at 9 o'clock. Near the pupil, there was a perforating dot-shaped iris defect above a dot-shaped anterior capsular defect. The lens was acoustically heterogeneous and 3.3-mm thick. The ciliary body was attached. The vitreous exhibited isolated punctal-and-fibrous structures of low echogenicity. At 6 o'clock, in the equatorial region, there was a highly echogenic IOFB measuring 2.0 x 1.5 mm with an acoustic shadow; the IOFB had no communication with any of the ocular shells.

A-scan ultrasound biometry showed that axial length, anterior chamber depth and lens thickness were 23.64 mm, 3.26 mm, and 3.48 mm, respectively, for the right eye and 23.63 mm, 3.20 mm, and 3.14 mm, respectively, for the left eye.

Keratometry was 40.875 D OD and 40.75 D OS.

The calculated intraocular lens (IOL) power was + 23.0 D.

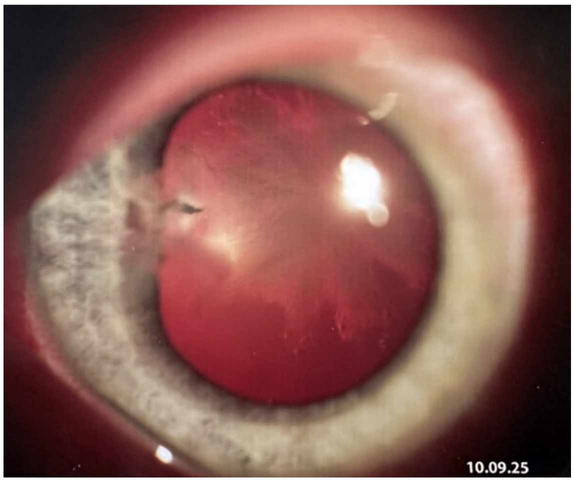

Fig. 1. Photograph of the right eye in a patient diagnosed with penetrating corneal injury with pars plana foreign body, traumatic cataract and iridocyclitis OD.

The patient was diagnosed with a penetrating corneal wound, an IOFB in the pars plana, traumatic cataract and iridocyclitis.

Urgent surgical intervention included initial surgical treatment of the wound, phacoaspiration of traumatic cata-

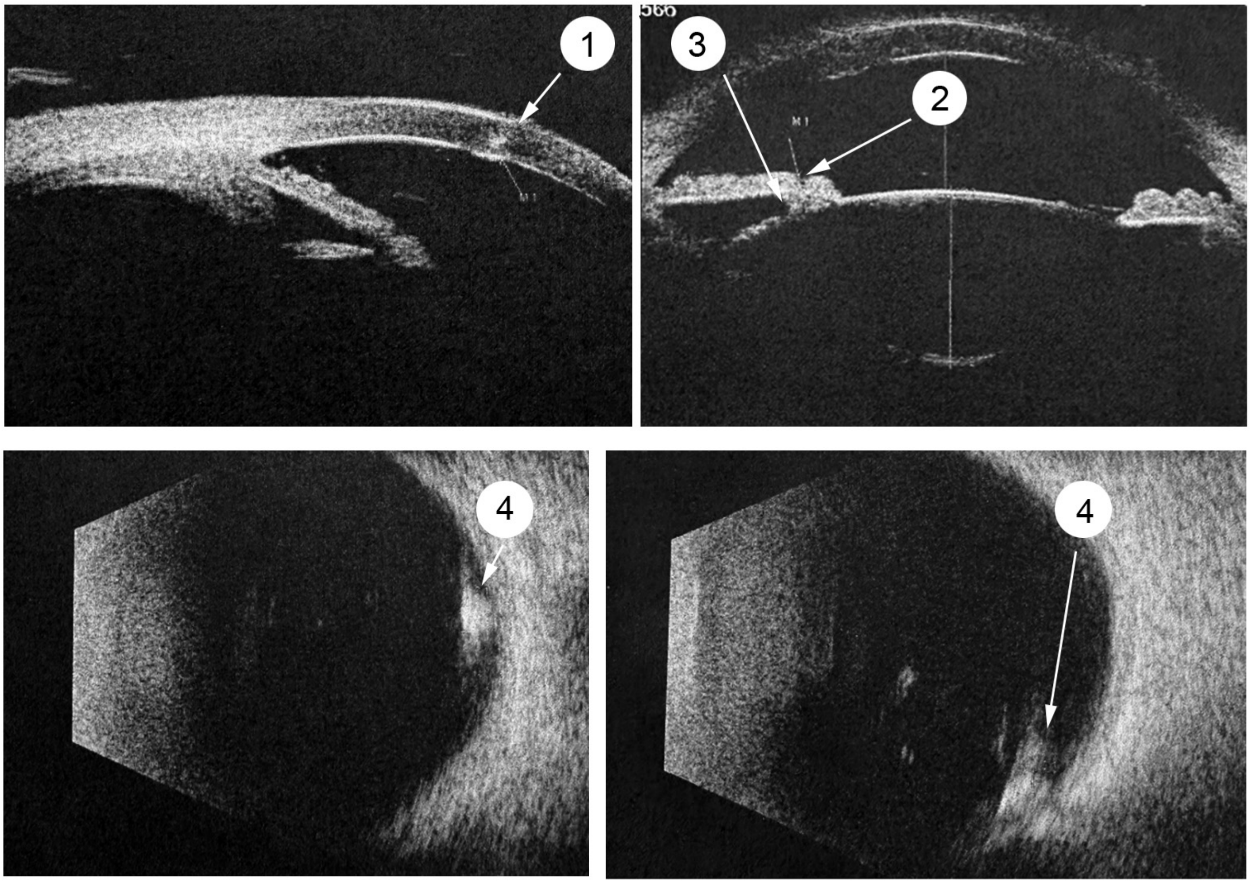

Fig. 2. Right-eye ultrasonography showing a corneal defect at 9 o'clock (1). Near the pupil, there is a perforating dot-shaped iris defect (2) above a dot-shaped anterior capsular defect (3). At 6 o'clock, in the equatorial region, there is a highly echogenic IOFB measuring 2.0 x 1.5 mm with an acoustic shadow; the IOFB has no communication with any of the ocular shells.

ract with anterior vitrectomy and endocapsular implantation of a +23.0 D Acrysof SN60WF IOL, and anterior removal of IOFB from the pars plana.

In brief, the corneal wound was closed with a full-thickness suture. Notches were placed on the posterior capsule at the site of post-traumatic damage, and vitreous microscissors and forceps were used to perform an atypical anterior capsulorhexis from the post-traumatic hole in the peripheral posterior capsule (Fig. 3). The nucleus and an opacified lenticular mass were removed with an angled aspiration handpiece of the Centurion phacoemulsification system. A wide spatula was applied for scleral compression at the pars plana and the site of IOFB until the IOFB (a metallic fragment located in the pars plana region and having no connection with the ciliary body) was visualized. The surrounding tissues (the ciliary body and the vitreous body) had no signs of suppurative inflammation, and there was no exudative capsule around the IOFB (Fig. 4). An endovitreal handpiece of cobalt samarium magnet was introduced through a limbal cataract incision and anterior and posterior capsulorhexes to remove the IOFB (a metallic fragment) (Fig. 5). The surrounding tissues showed no signs of suppurative inflammation. It was decided to perform flexible IOL implantation immediately. Partial anterior viscovitrectomy was performed without irrigation. The flexible IOL was turned obliquely and implanted into the residual conjunctival fornices (Fig. 6). Fig. 7 shows the state of the eye at the final stage of surgery.

The postoperative period was unremarkable. The patient received anti-inflammatory therapy.

At discharge, the right eye showed residual mild injection of the conjunctiva. At 8:30 o'clock, there was a 2-mm paracentral linear corneal wound closed with one 10-0 nylon suture. The cornea was transparent elsewhere. There was a moderately deep anterior chamber and clear aqueous. At 9 o'clock, approximately 2-3 mm from the pupillary margin, there was a post-traumatic iris coloboma, and the pupillary margin at this site was devoid of pigment. The pupil was round and measured 3 mm in the diameter. A posterior synechia formed at 9 o'clock, and the pupil

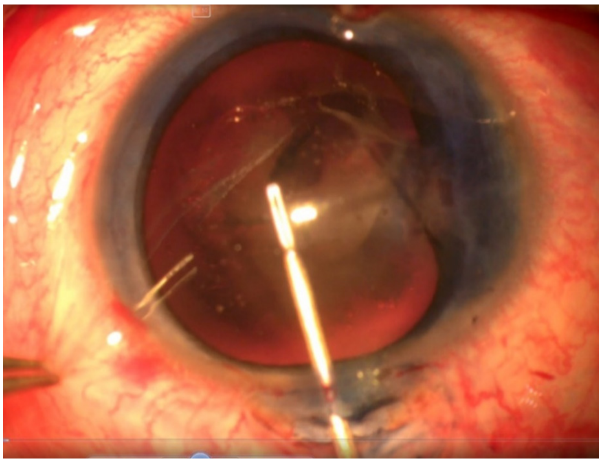

Fig. 3. Atypical anterior capsulorhexes performed with draw-in forceps

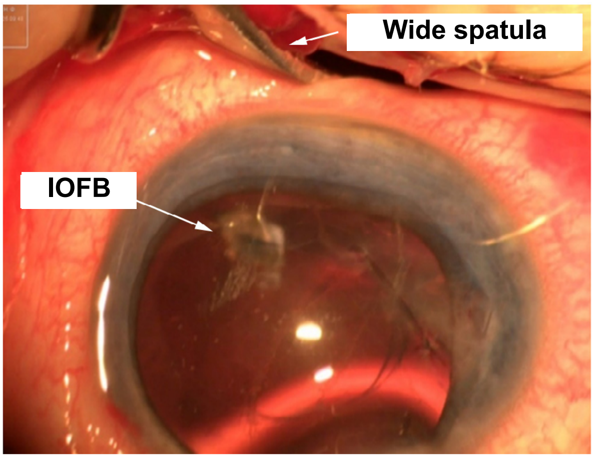

Fig. 4. Scleral compression at the ciliary body region with the intraocular foreign body (IOFB) located in the inferior ciliary body

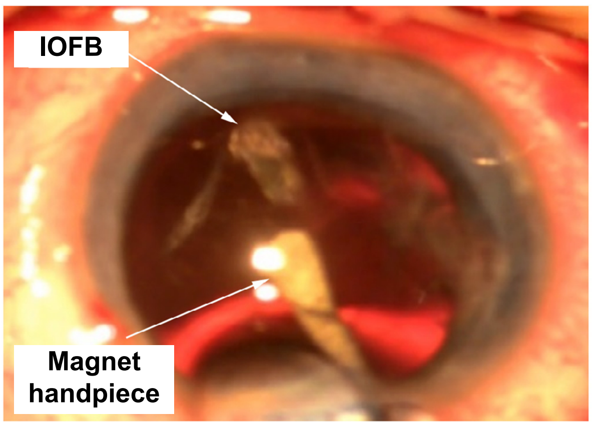

Fig. 5. An endovitreal handpiece of cobalt samarium magnet is introduced through a limbal cataract incision and anterior and posterior capsulorhexes to remove the intraocular foreign body (IOFB).

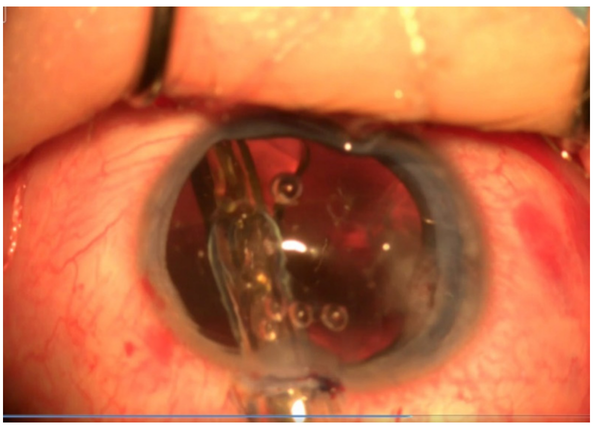

Fig. 6. Flexible intraocular lens implantation in the residual capsular fornices

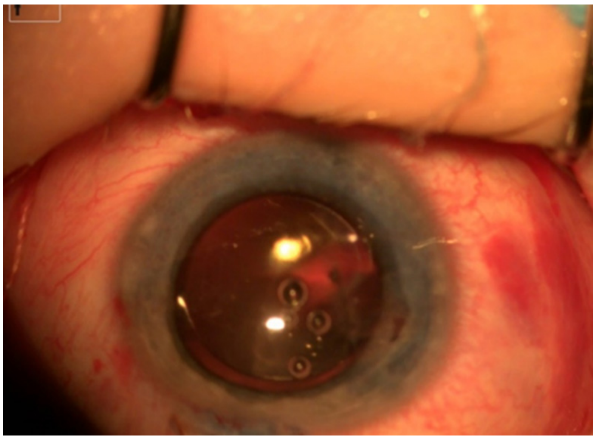

Fig. 7. The right eye at the final stage of complex surgery

was otherwise mobile. The IOL was inside the capsular bag and well centered. There was a hole in the posterior capsule. The vitreous exhibited mild residual opacity. On fundus examination, the optic disc was pink with sharp margins. No focal disease of the macula or retinal periphery was seen in the sites available for examination. The patient's UCVA improved to 0.5 OD, and the IOP was normal OD.

At two months after surgery, his UCVA improved to 0.7 OD, and best-corrected visual acuity was 0.8.

Discussion

IOFB in the pars plana constitutes about 2.2% of all IOFB cases [1]. A pars plana foreign body leads to the fast development of septic inflammation because the pars plana is the most reactive choroidal component that is important for blood supply for blood filtration and aqueous production. Therefore, the presence of abundant blood supply at the site of the IOFB causes fast and marked inflammatory and pyogenic reaction that may result in endophthalmitis and death of the eye [5]. Consequently, the IOFB located in the pars plana should be removed early (in the first days or even hours) after injury.

Diascleral extraction is used and more effective in medium- to large-sized magnetic IOFBs. However, small IOFBs are difficult to localize and extract diasclerally, and nonmagnetic small IOFBs are almost impossible to localize and extract diasclerally [6].

It is possible to remove an IOFB from the pars plana during endoscopic vitrectomy, but this requires specific skills and equipment, which is not always available in the clinical setting. Additionally, internal approaches such as pars plana or endoscopic vitrectomy require zonulectomy in order to grasp the foreign body – risking lens instability, subluxation, or capsular damage [7].

Indirect gonioscopy with Goldmann three-mirror lens enables visualizing the IOFB located at the ciliary sulcus beneath the hole in the iris, and removing it through an anterior limbal route [8]. However, this approach will be of a low informative value if an IOFB is located in the pars plana behind the ciliary sulcus.

Ji and colleagues [9] reported on removing IOFBs located at or near the ciliary body with scleral indentation in direct visualization. After completing the capsulorhexis, a chalazion curette was used to lift up the sclera around the IOFB [9].

In our observations [1], IOFBs localized in the pars plana usually have entered the eye through the cornea, passing through the lens and injuring the anterior and posterior capsules, and stopping after hitting the ocular shells. We took into account these IOFB movements in the eye, and decided that using the existing tract that had been made by the IOFB in the eye would be the best option for removing it.

The technique of extrascleral compression is well known and commonly used, enabling the vitreoretinal surgeon to visualize the ora serrata for a more meticulous removal of the basal vitreous. Additionally, extrascleral compression is used in the diagnosis of retinopathy of prematurity and when performing extremely peripheral retinal laser interventions.

While removing uveal cataracts in the presence of chronic uveitis and ultrasound evidence of pars planitis, Bobrova and Skrypnychenko [10] performed partial vitrectomy in the presence of scleral compression at the pars plana. In the case reported here, we used wide-spatula scleral compression not only for visualizing and removing the IOFB, but also for assessing the status of the surrounding tissue (any presence of suppurative capsule surrounding the IOFB, and/or mild suppurative lesions of the vitreous, ciliary body or retina). Because the surrounding tissues showed no signs of suppurative inflammation, we decided to perform flexible IOL implantation immediately.

Adequate visualization of the IOFB enabled making a decision to use a magnet for retrieval, since it was seen that the IOFB was a metallic fragment. The decision was correct, and the IOFB was fast removed using a magnet. It the IOFB was nonmagnetic (e.g., a stone IOFB), it would be possible to remove it with forceps.

Conclusion

The removal technique proposed here is related to magnetic or nonmagnetic IOFBs located in the pars plana region. Direct visualization enables the surgeon not only to see the IOFB, but also to assess the status of the surrounding tissue for planning subsequent surgery phases.

In this technique, we used scleral compression at the ciliary body region for visualizing the IOFB and taking it out anteriorly through cataract incision with a magnet under direct intraoperative microscopic control.

Performing viscovitrectomy without irrigation enabled us to remove (1) the vitreous body locally from the anterior chamber and (2) the contents of the capsular bag.

Performing atypical anterior and posterior capsulorhexes in the presence of traumatic damage to both lens capsules enabled us to preserve the periphery of both capsules and perform primary endocapsular IOL implantation into the residual conjunctival fornices.

Therefore, we managed to perform simultaneous rehabilitation of the injured teenager (IOFB and traumatic cataract removal and endocapsular IOL implantation) using one limbal incision in a single surgery.

References

1. Bobrova NF. [Reconstructive surgery for pediatric ocular injuries]. Odesa: Feniks; 2013. Russian.
2. Pasyechnikova NV, Ulianova NA, Sidak-Petretska OS. [Reconstructive surgery of combat ocular trauma]. Odesa: Optimum; 2023. Ukrainian.
3. Jung HC, Lee SY, Yoon CK, et al. Intraocular foreign body: diagnostic protocols and treatment strategies in ocular trauma patients. J Clin Med. 2021 Apr 25;10(9):1861. doi: 10.3390/jcm10091861
4. Guevara-Villarreal DA, Rodriguez-Valdés PJ. Posterior segment intraocular foreign body: extraction surgical techniques, timing, and indications for vitrectomy. J Ophthalmol. 2016; 2016:1-5. doi: 10.1155/2016/2034509.
5. Dehghani AR, Rezaei L, Salam H, et al. Post traumatic endophthalmitis: incidence and risk factors. Glob J Health Sci. 2014 Jun 30;6(6):68-72. doi: 10.5539/gjhs.v6n6p68.
6. Tyagi AK, Kheterpal S, Callear AB, et al. Simultaneous posterior chamber intraocular lens implant combined with vitreoretinal surgery for intraocular foreign body injuries. Eye (Lond). 1998 Mar;12(2):230-3. doi: 10.1038/eye.1998.51.
7. Peters KS, Meeker A, Williams L. Endoscopic-assisted removal of intraocular foreign body embedded in ciliary sulcus. Am J Ophthalmol Case Rep. 2022;27:101665. doi: 10.1016/j.ajoc.2022.101665.
8. Naharwal A, et al. Gonioscopy aided detection and scleral indentation assisted extraction of an occult intraocular foreign body from the ciliary sulcus. BMJ Case Rep. 2023;16:e256954. doi:10.1136/bcr-2023-256954.
9. Ji JD, Ding YZ, Hu ZZ, et al. Extracting intraocular foreign body at or near the ciliary body with scleral indentation in direct visualization. Int J Ophthalmol. 2018;11(3):533–5. doi: 10.18240/ijo.2018.03.29
10. Bobrova NF, Skrypnychenko ZM. [Toxic, congenital and secondary cataracts]. Odesa: Feniks; 2017. Russian.

Disclosures

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Author contribution. *BNF: Detection and diagnosis of intraocular foreign body, Methodology, Writing – review and editing; DGM: Writing - original draft preparation; STA: Detection and diagnosis of intraocular foreign body, Conceptualization; DOD: Data analysis and interpretation, Writing - original draft preparation. All authors have read and approved the final manuscript.*

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Abbreviations: *ACA, anterior chamber angle; IOFB, intraocular foreign body; IOL, intraocular lens; IOP, intraocular pressure; OD, oculus dexter; OS, oculus sinister.*