Case Report

PENETRATING OCULAR INJURY MANAGEMENT IN INTRAOCULAR FOREIGN BODY (IOFB) AND TRAUMATIC CATARACT

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ABSTRACT

Most IOFB are metallic and found in males of productive age as a consequence of work-related accidents. A 45-year-old man complained of sudden blurred vision in the left eye (3/60 pinhole 5/12) after getting hit by a foreign body when cutting grass with a lawn mower. Anterior segment examination revealed a 10 mm long, one-plane, straight, full thickness, already sutured inferonasal corneal laceration, inferonasal traumatic iridectomy size 3x7 mm, and opaque lens. Head CT-scan revealed opacity with metallic density intraocularly. Ultrasonography revealed an echogenic lesion, particle-shaped with 100% RCS complex density, located at the inferonasal of the vitreous cavity. Focal laser photocoagulation was performed preoperatively because there was a tear at the superonasal of the retina. The patient underwent cataract extraction, intraocular lens implantation, vitrectomy, and IOFB extraction in a one-step procedure. IOFB was found at the inferonasal side of a vitreous cavity with size 3 x 1 mm, metallic, and not attached to the retina. Silicon oil tamponade was used as a precaution because there were retinal tears. Postoperatively, the left eye's visual acuity was 5/20. After 6 months, the silicon oil was evacuated and the visual acuity became 5/8.5.

Keywords: *Penetrating ocular injury; intraocular foreign body; IOFB; traumatic cataract; vitrectomy; IOFB extraction*

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Highlights:

1. The management of penetrating ocular injury with IOFB and traumatic cataracts needs a thorough examination of the mechanism of injury, location, size, and composition of IOFB.
2. Endophthalmitis, retinal detachment, and development of PVR are potentially vision-threatment.

INTRODUCTION

Intraocular Foreign Bodies (IOFB) is one of the most common causes of ophthalmologic emergencies, which represent 3% of all emergency room visits and accounts for approximately 17% to 41% of penetrating ocular injuries in the United States. The risk factors include male sex, not wearing eye protection, and performing a metal-on-metal task (hammering or chiseling a metal object). Intraocular foreign bodies (IOFB) account for 18%–41% of all OGIs (Zhang et al. 2011, Yigit 2012). Most post-traumatic IOFB (58%–88%) reside in the posterior segment (Bhagat et al. 2011, Patel et al. 2012), while it is account for 17–41% of open globe injuries. About 70.3% of posterior segment injuries lead to blindness (Esmaeli B et al.1995; Pieramici DJ et al. 1996; Li L et al. 2018). IOFBs could trigger complications including hyphema, cataract, vitreous hemorrhage and retinal tear and detachment (Williams DF et al. 1988)

The extent of ocular injury and visual prognosis depends on the IOFB size, the zone of the injury, and the ensuing complications (Knyazer et al. 2008). The foreign body most frequently enters the cornea and approximately 65% land in the posterior segment (Babineau & Sanchez 2008, Erakgun & Egrilmez 2008, Abrams et al. 2011).

IOFB can be serious as they may result in vision-threatening ocular inflammations, even loss of the eye. The inflammation often results in severe vision-threatening complications, such as endophthalmitis, retinal detachment, and toxic optic retinopathy or neuropathy (Peters et al. 2022). A delay in treatment by more than 24 hours from the injury results in a poor prognosis. In penetrating wounds, microorganisms enter the eye through the penetrating objects. Both bacterial and fungal organisms are responsible for causing panophthalmitis. At the ocular level, these microorganisms produce irreversible damage which includes keratitis, retinal necrosis, hypopyon, uveitis, detachment, vitreous abscesses, and, finally, panophthalmitis (Pandit et al. 2022).

The management of penetrating ocular injury with intraocular foreign body and traumatic cataracts is often challenging. Many cases have complicated clinical courses, and surgeries with coordinated care among several ophthalmologic services and necessitate multiple patient visits (Zhang et al. 2011).

IOFB can injure the eye mechanically, give infection, or any toxic effect that can damage the intraocular structure. IOFB can attach to any ocular structure, whether in the anterior or posterior segment. It may result in severe visual loss depending on a number of factors, including mechanism of injury, size and location of the IOFB, and the occurrence of endophthalmitis. The most common complication of IOFB is retinal detachment. Others are endophthalmitis, corneal scar, cataract, angle recession glaucoma, vitreous hemorrhage, retained IOFB, and sympathetic ophthalmia (Abrams et al. 2011, Zhang et al. 2011, Kanski & Bowling 2016).

Generally, traumatic cataracts give rise to several accompanying findings depending on the severity and type of the trauma (Sarikkola et al. 2005, Tian et al. 2017). Associated injuries to other ocular structures create a surgical challenge for ophthalmologists and significant medical treatment (Kanskii 1989). Consequently, careful ophthalmic examination, a detailed history, and defined case management should be utilized, which provide the best possible visual outcome and facilitate the process (Akpolat et al. 2019).

Obtaining accurate keratometry and axial-length measurements, surgery timing, and implanting the intraocular lens (IOL) are prominent challenges in traumatic cataracts management (Kavitha et al. 2016). The preferred approach for a penetrating eye injury patient is scleral laceration (if one exists) or first fixing the cornea and then performing the removal of the cataract (Brar et al. 2001, Verma et al. 2011). The secondary extraction of the cataract may be performed with less chance of postoperative complications and better visibility during surgery (Kuhn et al. 2002).

The reaction of the eye to a retained foreign body varies greatly depending on the chemical composition, sterility, and location of the object. Inert, sterile foreign bodies such as stone, sand, glass, porcelain, plastic, and cilia are generally well tolerated. As long as such material does not appear to create an inflammatory reaction, it may be left in place, provided it is not obstructing vision. Whereas, zinc, aluminum, copper, and iron are metals that are commonly reactive in the eye (Al-Thowaibi et al. 2011, Ugarte et al. 2013). In this case, we reported a case of penetrating ocular injury with IOFB and traumatic cataract.

CASE REPORT

A 45-year-old man came to the emergency ward Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, complaining of sudden blurred vision in the left eye after his left eye got hit by a foreign body when cutting grass with a lawn mower 8 hours before admission. The patient's left eye visual acuity was 2 meters in finger counting. Anterior segment examination revealed a 10 mm long, one-plane, straight, full thickness inferonasal corneal laceration, deep anterior chamber, inferonasal traumatic iridectomy sized 3 x 7 mm, and opaque lens. Head CT-Scan of the left eye revealed opacity with metallic density intraocularly, sized 3 x 2 mm.

The patient underwent surgery under general anesthesia in the emergency operating room in Dr. Soetomo Hospital to repair the corneal laceration. Preoperatively, the patient received an anti-tetanus and antibiotic (Ceftriaxone 1000 mg) injection. The surgeons did 3 sutures on the lacerated cornea with nylon 10.0 and there was no leakage of aqueous found after the procedure. Postoperatively, the patient's visual acuity was 3 meters in finger counting with pinhole improved to 5/12. For therapy, the patient was given with oral and topical eyedrop of corticosteroid, and also intravenous and topical eyedrop of antibiotics.

Two days after the surgery, the patient underwent focal laser photocoagulation in the left eye because there was a superonasal retinal tear. Ultrasonography examination revealed an echogenic lesion, particle-shaped with 100% RCS complex density, located at inferonasal of vitreous cavity, anterior of the equator, sized 3 x 1 mm.

Three days after the laser procedure, the patient underwent cataract extraction and IOL implantation, vitrectomy, and IOFB extraction in a one-step procedure under general anesthesia. Aspiration of the lens was performed, and then because there was a rupture in the posterior lens capsule, it was decided to implant the IOL in the sulcus. Thereafter, the vitrectomy was undergone. From the retinal examination, the IOFB was found in the inferonasal vitreous body and it did not attach to the retina. There were also two retinal tears, at 7 and 10 o'clock of the retina. IOFB was extracted by bringing it out to the anterior chamber and then was grasped by forceps, which were inserted into the anterior chamber through the main port of the corneal incision. Because of the retinal tears, so it was decided to perform laser demarcation surrounding the tears by endolaser and silicone oil tamponade as a precaution. After the surgery, the foreign body was evaluated. It was metallic and sized 3 x 1 mm.

Postoperatively, the patient was instructed to continue the corticosteroid and antibiotic eyedrop in the operative eye. The left eye's visual acuity was 5/20 and there was silicone oil in the anterior chamber. The patient was asked to do face down position for 2 weeks.

In the fourth week after the IOFB extraction, the patient had slightly increased intraocular pressure (IOP), 23 mmHg, and the silicon oil was still seen in the anterior chamber. We gave Timolol eye drop twice daily to the patient and for the next follow-up, the IOP was under control. After 6 months, the silicon oil was evacuated. Two weeks after the last surgery, the patient's visual acuity became 5/8.5 and the IOP was normal. During the follow-up periods, complications, such as endophthalmitis and retinal detachment were never found.

Figure 1. First admission slit lamp photograph of the patient’s left eye

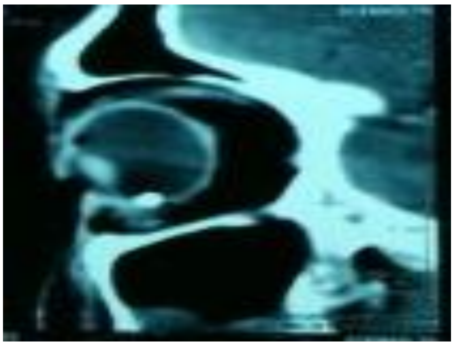

Figure 2. Head CT-scan without contrast, orbital-focused

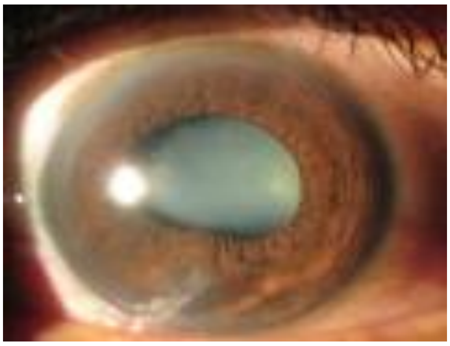

Figure 3. After suturing corneal laceration, slit lamp photograph of the patient’s left eye

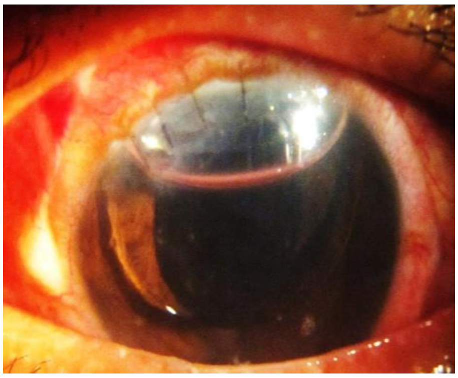

Figure 4. Postoperative slit lamp photograph of the patient’s left eye

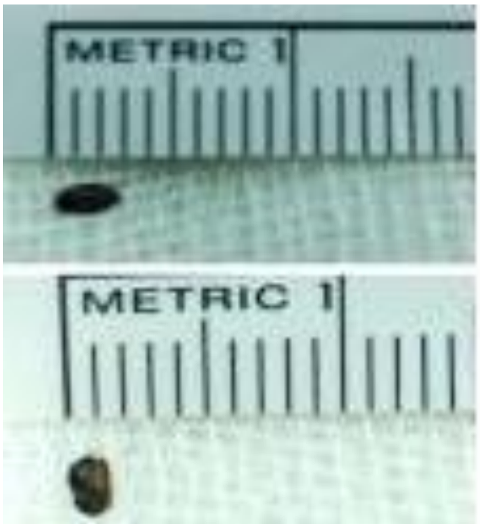

Figure 5. The IOFB, metallic, size 3 x 1 mm

DISCUSSION

In most cases, the IOFB is suggested because an entry wound is visible, or the IOFB itself can be seen. Even without such direct evidence, however, an IOFB should always be suspected and ruled out after ocular or orbital trauma. Accurate history-taking with attention to the mechanism of injury should be obtained when possible. When IOFB is observed clinically, features that may be predictive of poor visual outcomes should be examined. We used Ocular Trauma Score (OTS) for this patient by evaluating the visual acuity, the presence or absence of endophthalmitis, globe rupture, perforating injury, retinal detachment, and an afferent pupillary defect (Loporchio et al. 2015).

If a sample of the suspected foreign body material can be located promptly, it may be examined to determine whether it is magnetic, radioopaque, or both. CT is better than plain film x-rays at localizing the radiopaque foreign bodies. CT is also better at detecting and locating less radiopaque foreign bodies. MRI is contraindicated if the foreign body is metallic because the magnetic force may move a metallic foreign body, causing further ocular damage (Yeh et al. 2008, Platt et al. 2017).

The decision to remove the IOFB at the time of primary globe repair or delay IOFB removal warrants careful consideration of several factors including the presence or absence of clinical endophthalmitis, the stability of the patient for an extended surgical procedure, and the availability of well-trained operating room personnel (Yeh et al. 2008). Ehlers et al did not find a significant association between time to surgical intervention and outcome. A study by Zhang et al concluded that for IOFBs, primary wound closure by repair within 24 hours or self-sealing independently reduced the risk of endophthalmitis and there was no association between delayed IOFB removal and intraocular infection. Those recent studies suggest that emergent IOFB removal (within hours) may not be as necessary as long as the open-globe injury is closed promptly and systemic antibiotics are initiated quickly (Ehlers et al. 2008, Zhang et al. 2011).

The surgical planning for removal of a magnetic IOFB must include the surgeon's ability to see the foreign body, and location in the eye, size, shape, composition, and encapsulation of the foreign body. Pars plana vitrectomy allows removal of the vitreous and facilitates extraction of the IOFB. A pars plana magnet extraction can be considered for small, nonencapsulated ferromagnetic foreign bodies that can be easily seen in the vitreous cavity, are not embedded in or adherent to the retina or other structures, and have no associated retinal pathology, such as a retinal tear. If the media are opaque because of cataract or hemorrhage, or the foreign body is encapsulated and adherent to the vitreous or retina, or if the foreign body is large or nonmagnetic, vitrectomy and forceps extraction of the foreign body is indicated. Yeh et al. (2008) referred to outcomes of eyes that underwent primary cataract extraction, IOL implantation, and IOFB removal and vitrectomy appeared to be a safe procedure. The single procedure has the potential advantages of more rapid visual rehabilitation and patient comfort. However, the adequacy of the capsular bag and zonular support for a posterior chamber or sulcus IOL should be considered before primary IOL implantation.

Endophthalmitis, postoperative retinal detachment, and the development of proliferative vitreoretinopathy (PVR) are considered prognostic factors associated with poor functional and anatomic outcomes. Preoperative and postoperative retinal detachments complicated by severe PVR are the main reasons for visual loss following IOFB injuries involving the posterior segment. Thus, careful examination for those potential complications is warranted during postoperative visits (Erakgun & Egrilmez 2008, Yeh et al. 2008).

Traumatic cataract remains an important cause of visual impairment despite therapeutic developments and new diagnostic (Wos & Mirkiewicz-Sieradzka 2004, Shah et al. 2008). In surgical complications, associated ocular injuries such as retinal detachment and corneal laceration may cause poor prognoses (Sternberg Jr et al. 1984, Greven et al. 2002, Loncar & Petric 2004). It is more difficult to treat traumatic cataracts as compared to atraumatic cataracts, as there is a higher risk of intra- and postoperative complications due to zonulysis, lens subluxation, and other associated ocular injuries (Gayton et al. 2001, Zaman et al. 2006). The visual rehabilitation success in traumatic cataract cases without adequate capsular support depends upon the choice of the experience of the surgeon, the surgical procedure, and the preferred type of IOL (Dakshayani & Rakesh 2014).

Strength and limitation

Overall, the sentence is well-constructed and provides a clear and concise summary of the case. The report describes the findings from various examinations and procedures, including anterior segment examination, head CT-scan, and ultrasonography, and details the surgical steps taken to extract the IOFB and repair associated injuries. It effectively conveys important details such as the patient's age, gender, and occupation, as well as the type and location of the IOFB, the extent of associated injuries, and the outcomes of the surgical intervention. The use of specific medical terminology and numerical values adds to the precision and credibility of the report.

CONCLUSION

The management of penetrating ocular injury with IOFB and traumatic cataracts needs a thorough examination of the mechanism of injury, location, size, and composition of IOFB. Prompt primary wound closure is necessary to reduce the risk of endophthalmitis. The decision to remove the IOFB at the time of primary globe repair or delay IOFB removal build upon several factors, including the presence or absence of clinical endophthalmitis, the stability of the patient for an extended surgical procedure, and the availability of well-trained operating room personnel and instruments. Continual postoperative assessments of potentially vision-threatening complications, such as endophthalmitis, retinal detachment, and development of PVR, are needed.

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Conflict of interest

None.

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Author contribution

NTP and RP conceptualized, wrote, and revised the manuscript. MF reviewed, finalized the manuscript and managed the administration.

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