

Good Results in Open Globe Injury Including Intraocular Foreign Body

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ABSTRACT

Introduction: The second most frequent cause of open globe injury (OGI) is an intraocular foreign body (IOFB), a serious ocular emergency that needs to be diagnosed and treated right once to avoid blindness. It can enter the eye and cause damage later on, resulting in direct harm. When treating post-traumatic endophthalmitis, an urgent pars plana vitrectomy (PPV) procedure helps maximize visual outcome.

Case report: A 55-year-old male patient came to the Emergency Room Tertiary Eye Hospital with chief complaints of blurry vision, pain, and red-eye in his right eye 3 days before admission. The patient's right eye was hit by a fragment of the sickle knife while mowing the grass in the yard without protective eyeglasses. His chief complaints getting worse accompanied by lacrimation. The patient was diagnosed with Open Globe Injury Type C Grade D Pupil B zone 1, suspected early endophthalmitis, traumatic cataract of the right eye, and hypertension. Pars plana vitrectomy, vitreous tap, antibiotic intravitreal injection (with Ceftazidime and Vancomycin), IOFB extraction, explore, corneal scraping on the wound, cultural resistance, primary hecting of the cornea were done. The visual acuity improved and the infection was resolved. The infection was treated, and visual acuity returned after a month.

Conclusion: In ophthalmology, IOFB is one of the most frequent traumas and is regarded as an emergency. To identify this problem, a thorough ophthalmology examination and the relevant ancillary testing should be performed. A patient with good care will have a favorable visual prognosis.

Keywords: endophthalmitis, IOFB, open globe injury

INTRODUCTION

About 1.6 million persons worldwide are blinded due to ocular trauma, while another 2.3 million have bilateral low vision and roughly 19 million have unilateral blindness or low vision. One of the studies in Indonesia regarding eye trauma by Benita et al, 59.6% were caused by sharp objects and 93% occurred unilaterally. To avoid blindness or globe loss, intraocular foreign bodies (IOFBs) are a serious ophthalmic emergency that needs to be diagnosed and treated right once. The second reason for Open Globe Injury is an intraocular foreign body (OGI). Twenty percent or thereabouts of IOFB are reproductive age. Vision-threatening consequences from this

illness include traumatic endophthalmitis (2–30%) and retinal detachment (5.5–30%).^{1,2,3,17}

An intraocular foreign body needs to be adequately evaluated since, if left untreated, it might result in severe repercussions, including the removal of the eyeball. In addition to causing mechanical harm to the eye, intraocular foreign bodies can also result in endophthalmitis and impairment of vision, particularly in cases of IOFB-related endophthalmitis, which is frequently life-threatening. Doing a thorough examination is especially crucial for an early diagnosis of IOFB and for creating a treatment strategy that works to anticipate visual

prognosis. The two main goals of surgical intervention after ocular injuries are to preserve the integrity of the ocular structure and to enhance or stabilize vision. For IOFB situations, the choice of treatment is critical in determining the prognosis of the patient.^{1,2} The purpose of this study is to present patients with IOFB after surgical intervention with a good outcome.

CASE REPORT

Three days before admission, a 55-year-old male patient with primary complaints of blurred vision, discomfort, and red eye in his right eye visited the Emergency Room of a tertiary referral hospital. The patient was cutting the grass in the backyard without wearing safety goggles when a piece of the sickle knife struck his right eye three days before admission. He has complained of increasing pain in his right eye and lacrimation, but he wasn't having nausea, vomiting, fainting, or bleeding from the mouth, nose, or ears. The patient's concerns were getting worse, so he went to the Tertiary Eye Hospital.



Figure 1. Clinical Appearance of The Right Eye

Overall, the examination went well. The left eye's visual acuity was 0.32 pinhole 0.5 while the right eye was 1/300 (Snellen Chart). Intraocular pressure (IOP) was 17 mmHg in the left eye and absent in the right. Both eyes exhibited good ocular motions in every direction. The right anterior portion of the eye displayed a

cloudy lens, epithelialized laceration cornea, and ciliary injection conjunctiva.

The fluorescence test (FT) revealed a positive result. Examining the left eye within normal limits, flare and cell on the anterior chamber were determined to be +4/+4, along with fibrin, hypopyon 1.5 mm, and retained lens material. The patient had an ultrasonography (USG) examination since it was challenging to check the posterior portion of the right eye due to hazy media.

The USG examination showed that the vitreous cavity was echogenic and that one object had been discovered close to the optic nerve. Reflectivity was quite high. The scleral, choroidal, and retinal layers were discovered to be joined; yet, a T sign was observed. A lens mass and inflammatory cells with endophthalmitis are recommended as part of the IOFB differential diagnosis. A radiopaque lesion in the right orbital cavity that suggested IOFB was observed on plain X-ray imaging of the skull using the Waters and Schedel lateral technique (as seen in Figure 2).

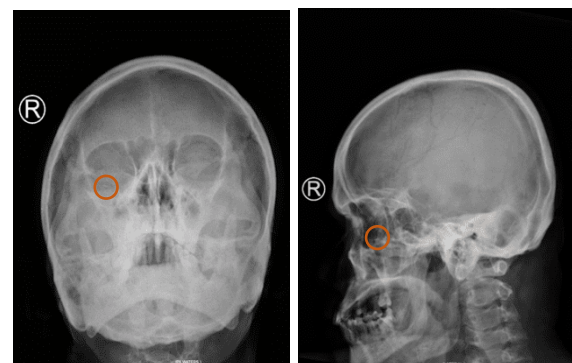


Figure 2. IOFB was suggested by Waters and Schedel Lateral X-Ray.

The patient was diagnosed with hypertension, suspicious early endophthalmitis, traumatic cataract of the right eye, and Open Globe Injury Type C Grade D Pupil B zone 1 (vulnus laceratum cornea and IOFB). Ocular Trauma Score was calculated, and the total score was 2. The patient was made ready for a pars

plana vitrectomy, vitreous tap, intravitreal antibiotic injection (with Vancomycin and Ceftazidime), IOFB extraction, exploration, corneal scraping on the incision, cultural resistance, primary hecting of the cornea toward the center of it and in the direction of 10 and 11 o'clock, anterior chamber washout, and lens extraction under general anesthesia. An intraocular foreign

body measuring 2.2 mm by 0.5 mm was discovered to be a metallic sickle knife fragment. Using forceps, the IOFB is elevated to the anterior chamber and removed via a corneal incision. Following the surgical management, the right eye was fitted with a bandage contact lens.

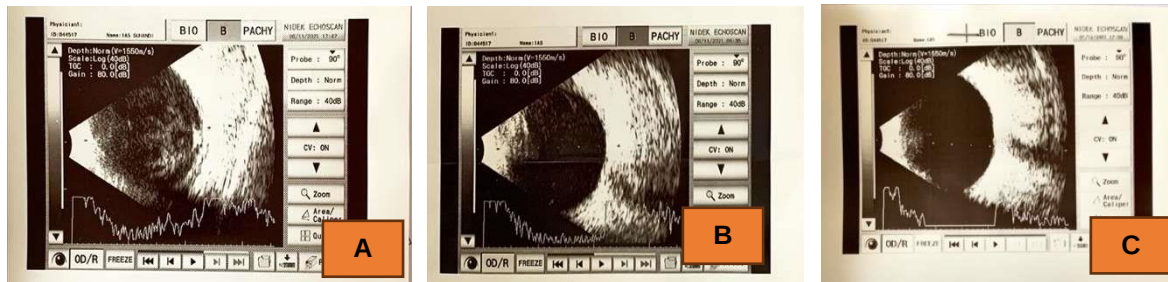


Figure 3. Pre-operative ultrasound of the right eye. (A) Pre-operation. (B) Post Operation Day-1. (C) Day 10 following surgery.

On the first post-operative day, the right eye's visual acuity was 1/300, and the left eye's 0.32 ph 0.5 (Snellen Chart). The left eye's IOP was 14 mmHg and the right eye's 10 mmHg. Both eyes' ocular mobility was good in every direction. During the examination of the right eye, ciliary injection in the conjunctiva, subconjunctival hemorrhage, and blepharospasm on the palpebra were discovered. A corneal examination revealed three intact primary sutures, Descemet folds, and edema. In the anterior chamber, flare and cells were detected +3/+3 in the absence of hypopyon. Pharmacologically, both the pupil and the aphakic lens were fully dilated. The left eye's anterior portion was within normal bounds. Due to unclear media, the patient had a USG since it was challenging to check the posterior portion of the right eye. There were no more IOFBs identified, and the echogenic appearance suggested the presence of inflammatory cells. The left eye's posterior portion fell within the typical range. The patient has been diagnosed with post-

endophthalmitis OD, DM type 2, and aphakia OD. Pharmacological therapy included three 500 mg doses of paracetamol, two 750 mg doses of ciprofloxacin, six OD doses of prednisolone acetate, six OD doses of levofloxacin eye drops, and three OD doses of cyclopentolate eye drops. Seven days following surgery, the patient was requested to return for a follow-up visit before being released from the hospital.

After surgery, the patient visited the Vitreoretinal Clinic ten days later. The patient reported less pain and an improvement in his right eye's visual acuity. According to the Snellen chart, the left eye's visual acuity was 0.32 ph 0.5 and the right eye was 2/60. In both eyes, the ocular mobility was good. The left eye's IOP was 16 mmHg, whereas the right eye's was 14 mmHg. minor ciliary injections in the conjunctiva and minor blepharospasm in the palpebra were found during an anterior examination of the right eye. There were three intact primary sutures and a modest amount of corneal edema. Van Herrick Grade III flare

and cell were detected +1/+1 on the anterior chamber. Pharmacologically, the pupil was mid-dilated, and the lens was aphakic. The right eye's posterior portion was within normal bounds. The left eye was examined in the same way as it had been previously. After doing an Optical Coherence Tomography (OCT), the right eye's epiretinal membrane was observed, whereas the left eye's results were within normal limits.

Gram-positive coccus bacteria were detected by both aqueous and vitreous tap methods in one-on-one arrays of 0-1/large field of view (LFW), leucocytes of <15/LFW, and <10/LFW, respectively. By using microorganism culture, *Staphylococcus saprophyticus* was discovered. The drug resistance test result showed resistance to benzylpenicillin, amoxicillin, and carbenicillin but sensitivity to several medicines, including vancomycin, gentamycin, ciprofloxacin, and levofloxacin. The prescribed medications were Paracetamol 3x500, ciprofloxacin 2x750mg, prednisolone acetate 6xOD, levofloxacin eye drop 6xOD, and cyclopentolate eye drops 3xOD. Two weeks later, the patient requested to visit the hospital.



Figure 4. Right eye's anterior segment one month after surgery

A month following surgery, the patient visited the Vitreoretinal Clinic. The patient did not voice any problems. According to the Snellen chart, the right eye's visual acuity was 3/60; with a +10.00D lens, this

increases to 0.2 ph 0.32 for the right eye and 0.32 ph 0.5 for the left. Both eyes have strong ocular motions. Right eye IOP was 12 mmHg, whereas left eye IOP was 17 mmHg. The right eye's anterior corneal main suture was loose. The previous examination's left eye was the same. Both eyes underwent interferometry. The results (Snellen Chart) showed 0.32 and 0.8. The patient was recommended for secondary intraocular lens implantation for improved eyesight to Cataract and Refractive Surgery.

DISCUSSION

In the adult population, there were 10.6 Open Globe Injury (OGI) cases for every 1,000,000 people. 50.4 years was the average age. There were more men (92%) than women. Ages 26 to 45 were the most common range in North Sumatra for ocular trauma (56.7%). 35 patients at the National Eye Center, Cicendo Eye Hospital, experienced ocular trauma, particularly IOFB, between July 2014 and December 2017. Gardening and farming activities accounted for 52% of the injuries, with building and industrial sites accounting for 32%. The patient in this case study was an adult male, and the accident occurred at his place of employment. It is consistent with the Open Globe Injury incidents that have occurred both internationally and in Indonesia.^{1,2,3}

Intraocular Foreign Body (IOFB), a sign of OGI, was discovered in this case report in accordance with the classification of ocular trauma. A central corneal tear was discovered and was previously sutured. The Ocular Trauma Score (OTS) can be used to calculate the visual prognosis, which determines the patient's quality of life. Several prognostic factors, including age, presenting visual acuity, endophthalmitis, retinal involvement, and history of retinal surgery, have been identified as potential predictors of visual outcome and global survival following

IOFB injury. The patient in this case report had an OTS score of 2, which is determined by the patient's pre-operative visual acuity and the presence of a globe perforation. Although approximately 27% of patients have no light perception, 15% of patients are better than 20/40. One month following surgery, the patient's baseline right eye visual acuity is 3/60, with an extra correction of S + 10.0, which could increase to 0.2 to 0.32 (Snellen Chart).^{3,4,5} In addition to taking a history, an ophthalmology examination could involve indirect ophthalmoscopy to examine the posterior segment after the anterior section has been examined. All IOFBs cannot be identified by a clinical examination alone. In order to rule out multiple IOFBs and support their accurate localization diagnostic testing, ocular imaging modalities such as X-ray, Computed Tomography Scan (CT-Scan), magnetic resonance imaging (MRI), A/B-Scan ultrasound, and ultrasound biomicroscopy (UBM) should be considered even after an IOFB is identified. Compared to an X-ray, a CT scan has a higher positive rate and resolution. Although it is regarded as the gold standard for the diagnosis of IOFBs, the patient's economic constraints prevented us from using it as our imaging modality in this instance. Thus, in addition to the CT scan, plain X-rays and USGs were still utilized as a localizing technique before IOFB intervention and should be taken into account when making the diagnosis.^{6,7}

The injured eye needs to be bandaged sterilely and right away if an IOFB is suspected. Prior to the urgent surgery, anti-infection and anti-tetanus treatments had to be administered. The immediate closure of the eye wound, reconstruction of the anterior chamber, recuperation, and maintenance of intraocular pressure are the goals of emergency surgery. Because of the toxicity and the risk of

endophthalmitis, IOFBs should be removed as soon as feasible. Vitrectomies can be used to accurately remove any type of IOFB. Intraocular forceps are the most often used approach for IOFB removal, while vitrectomy remains the most regularly utilized procedure for managing posterior IOFBs. An iron sickle knife piece measuring 2.2 mm by 0.5 mm was discovered to be the patient's IOFB. Given that it can result in a bad visual prognosis and has caused a strong inflammatory reaction, it should be removed very away. Three days following the injury, the patient had vitrectomy pars plana and IOFB excision, with the expectation of a favorable visual prognosis.^{3,4,6}

Intraocular foreign bodies can be classified into metallic foreign bodies (active metals like iron, copper, etc) and non-metallic foreign bodies/inert (stable foreign bodies like glasses and unstable foreign bodies like wood). Distinct foreign body types result in distinct pathophysiological mechanisms. Due to their toxicity, metallic foreign bodies—especially active metals—may cause serious eye injury quickly. Long-term retention of active metals in the eye can result in chalcosis or siderosis, both of which have a poor prognosis.^{1,6}

Microbiologic specimens can be obtained when endophthalmitis is suspected. The source of samples is from the aqueous tap, vitreous tap, and vitrectomy fluid. Not only these sample sources but also IOFB from injured eyes should be cultured. Approximately 80%–90% of culture-positive cases are caused by bacteria. Gram-positive cocci are the more common isolates among bacteria, followed by Gram-positive bacilli and other Gram-negative organisms. According to Long C etc most common causative microorganisms identified by culture and smear are bacteria, fungi, and mixed infection. About 80–90% of cases of

culture-positive post-traumatic endophthalmitis are caused by bacteria. *Streptococcus* and coagulase-negative *Staphylococcus*, such as *S. epidermidis* and *S. saprophyticus*. In this instance, *Staphylococcus saprophyticus* was the outcome of culture. The typical flora of the skin includes species of *Staphylococcus* and *Streptococcus*, particularly in the conjunctiva and edge of the eyelid. Thus, there is a high probability of infection when an open wound results from trauma.^{13,14,16}

The intraocular route of delivery was mainly included with intracameral injection (47.9%) and intravitreal injection (42.0%). Cephalosporins (53.8%) and vancomycin (42.0%) were the main choices of antibiotic agents, followed by fluoroquinolones (24.3%), and aminoglycosides (13.4%). Injection of intravitreal broad-spectrum antibiotics recommendations include vancomycin and ceftazidime, with coverage against *Bacillus* species and Gram-negative organisms. Intraocular injection of antibiotics should only be used in situations where there is a high risk of developing endophthalmitis, such as when there is a large wound, an obvious inflammatory response before wound repair, the lens capsule ruptures, an intraocular foreign body remains, the wound is injured in an unclean environment, and the primary closure of the wound takes longer than 24 hours. For one week, individuals with endophthalmitis should take 750 mg of ciprofloxacin orally twice a day. Its good pharmacokinetic profile and strong tissue and biological fluid penetration, including aqueous and vitreous humor, make it an effective agent for this usage. The result of the drug resistance test was sensitivity with several antibiotics such as gentamycin, ciprofloxacin, levofloxacin, vancomycin, etc while resistance with benzylpenicillin, amoxicillin, and carbenicillin. The patient underwent antibiotic intravitreal injection

(with Ceftazidime and Vancomycin) and followed by oral Ciprofloxacin a week after surgery and Levofloxacin eye drop. According to the existing literature and the results of the resistance culture, the patient in this case has a good prognosis. In order to ensure that patients receive the appropriate antibiotics, the numerous options for antibiotic administration and kind must be modified by clinical and cultural results.^{6,7,8}

There is presently disagreement over whether the lens for traumatic cataracts should be removed during the initial surgery or at a later time. The procedure of implanting intraocular lens (IOL) is challenging, as they are often complicated by coexisting pathology, including zonular dialysis, posterior capsular tears, and iris trauma. Penetrating trauma or IOFBs are the cause of traumatic cataracts. It may cause fast lens opacification or focal cortical alterations by lacerating the anterior lens capsule. Both blunt and penetrating injuries can leak lens material, which can cause endophthalmitis, a serious form of intraocular inflammation. According to Chang et al, traumatic cataract (78.7%) were the most frequent ocular findings. Other ocular findings were followed by vitreous hemorrhage (47.1%) and endophthalmitis (16.7%) eyes. In this case, the patient underwent cataract extraction without IOL implantation with consideration of waiting for the inflammation to reside, conducting a good biometric measurement, give the surgeon sufficient time to evaluate zonular and capsular integrity.^{4, 5, 15}

The patient has a *quo ad vitam ad bonam* prognosis due to an intraocular foreign body, which means that the injury is not fatal. *quo ad functionam dubia ad bonam* indicates that the patient is still being closely monitored for infection and inflammation, but his visual acuity has improved after receiving a +10.00D lens. *quo ad sanationam dubia ad bonam*

indicates that the patient's open globe injury can recur if he does not take preventive measures while performing his daily tasks. However because the patient has received instruction from medical professionals, it is hoped that the open globe injury would not recur as much. We verified this by routinely checking the patient at each outpatient clinic appointment, and the patient stated that they always use safety glasses when working.

CONCLUSION

In ophthalmology, IOFB is one of the most frequent traumas and is regarded as an emergency. To identify this problem, a thorough ophthalmology examination and the relevant ancillary testing should be performed. Prognostic variables for an IOFB injury's visual outcome may help assess how severe the trauma was, choosing the best course of treatment, and more precisely forecasting prognosis. in order for the patient's visual prognosis to improve as a result of effective care.

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