A SHIMMER IN THE SHADOWS: THE CASE OF HIDDEN GIANT CRESCENT INTRAOCULAR FOREIGN BODY

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Open Globe Injury, Intraocular Foreign Body, Metallic Foreign Body, Pars Plana Vitrectomy

ABSTRACT:

Ocular Trauma with Intraocular Foreign Body (IOFB) is a serious ophthalmic emergency that needs urgent treatment. Prompt intervention and antimicrobial strategies are critical to prevent endophthalmitis and poor visual outcomes. A 29-year-old male presented with pain in his right eye (RE) after being struck by a metal fragment 12 hours prior to admission. Examination revealed a full-thickness laceration of the superior palpebra of the RE, accompanied by scleral laceration beneath it. The head CT scan and ocular ultrasound confirmed the presence of IOFB penetrating the RE. In the Emergency Room (ER), he underwent scleral-palpebral suturing and intravitreal antibiotic injection. Due to limited surgical equipment and the absence of a vitreoretinal surgeon in the ER, vitrectomy surgery was delayed. One week later, he was performed IOFB extraction and vitrectomy with Sulfur hexafluoride (SF_6) gas tamponade. During the procedure, a large metallic IOFB was discovered beneath the subretinal space in the macular area. Additional findings included vitreous hemorrhage and retinal detachment in the superior and inferotemporal regions. The IOFB was successfully removed, though with limited visual prognosis. However, no signs of intraocular infection were observed. In IOFB cases, immediate globe closure and antimicrobial prophylaxis are crucial to prevent infection. When simultaneous IOFB removal and globe closure are not feasible, prioritizing globe closure and employing aggressive antibiotic prophylaxis is an alternative to prevent endophthalmitis.

1. Introduction

Ocular trauma remains a leading cause of visual impairment worldwide, with intraocular foreign body (IOFB) accounting for 18-41% of open globe injuries (1). IOFB refer to unintended projectiles that remain inside the eye, necessitating urgent diagnosis and treatment (2). IOFBs can become lodged in various ocular structures, potentially affecting the anterior or posterior segments. Their mechanical impact may lead to cataract formation due to capsular damage, vitreous liquefaction, and retinal hemorrhages (3). Metallic IOFBs are particularly common and give some risks, including infection, retinal detachment, and toxic damage to ocular structures (4). Subretinal IOFBs, while rare, present additional challenges due to their concealed location, making diagnosis and surgical management more complex (5).

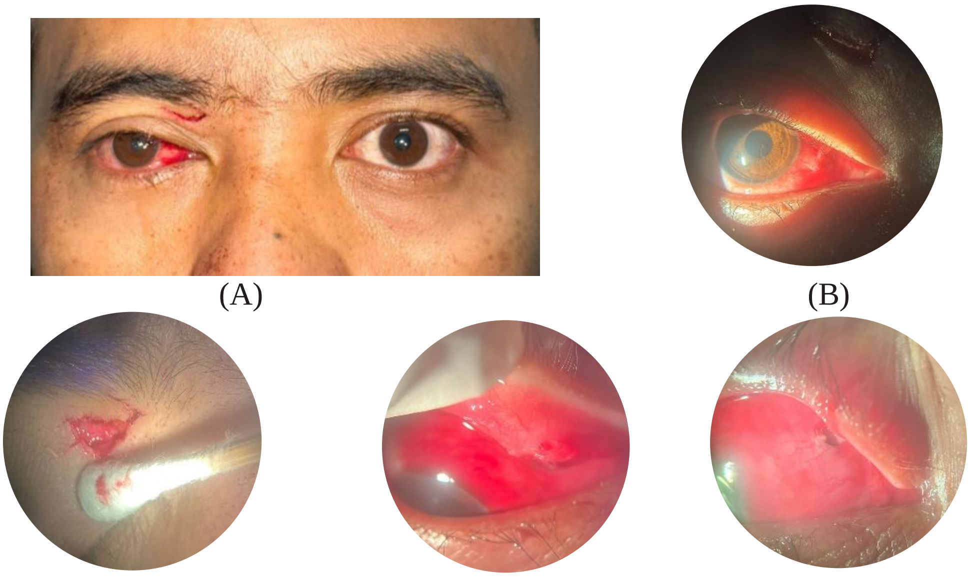
In emergency settings, initial treatment is crucial to prevent infection and minimize further damage. This involves the use of systemic broad-spectrum antibiotics, such as cephalosporins or fluoroquinolones, and in some cases, intravitreal antibiotics to prevent endophthalmitis (6). The eye should be protected by eye shield to avoid further trauma. Definitive treatment involves surgical removal of the IOFB, with the approach determined by its size, location, and associated injuries. Timely intervention, including vitrectomy, is critical to minimize complications (7).

This case report presents a giant crescent-shaped metallic IOFB hidden beneath the subretinal space, highlighting the diagnostic challenges, initial treatment, surgical approach, and outcomes. General ophthalmologists must be prepared to diagnose and manage ocular trauma, particularly open globe injuries with IOFB, in emergency settings. By sharing this case, we aim to enhance understanding and improve the management of similar conditions to optimize patient care.

2. Case Presentation

A 29-year-old male patient came to the emergency ward with chief complaint of pain and blurred vision in his Right Eye (RE) after being struck by metal fragment 12 hours prior to admission. The complaints were accompanied by redness, tearing, and bleeding of RE. The incident occurred while the patient was working with a hydraulic machine, when a metal fragment suddenly bounced toward his RE. The patient was unsure whether the metal fragment remained in the eye. He was initially taken to a nearby eye clinic and subsequently referred to Dr. Soetomo Hospital, Surabaya.

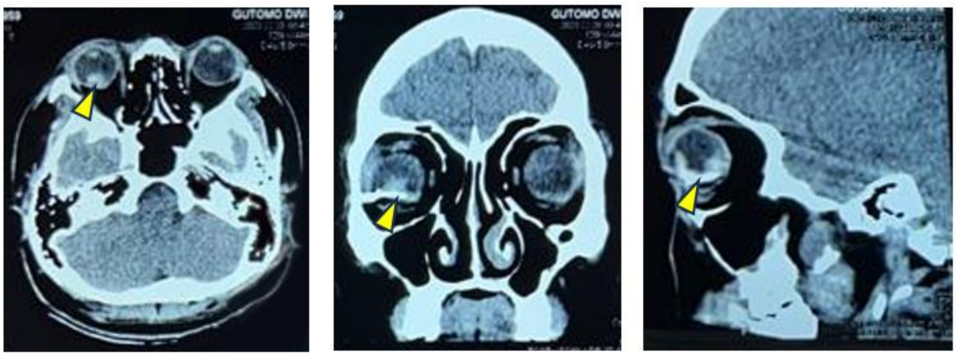
Based on the physical examination, visual acuity of the RE was hand movement, and the intraocular pressure (IOP) showed 3.3 mmHg. The anterior segment of the RE, which was shown in Figure 1, revealed eyelid edema and spasm, with a full-thickness laceration on the medial one-third of the upper eyelid, extending horizontally to the nasal sub-brow area. Beneath this laceration, there was scleral laceration located at the 2 o'clock position, approximately 8 mm posterior to the limbus. No vitreous prolapse was found. On posterior segment examination, vitreous hemorrhage was observed in the inferior area. A silvery-white foreign body, and retinal detachment were suspected. Other details of posterior segment were difficult to evaluate due to obscured visualization from vitreous hemorrhage.



(A) (B) (C) (D) (E)

Figure 1. The clinical presentation of the patient was as follows : (A) Examination of both eyes revealed oedema and spasm in the eyelid of RE, with a laceration extending horizontally across the medial one-third of the superior palpebra into the nasal sub-brow area (B) The anterior segment of RE showed conjunctival injection and subconjunctival hemorrhage. (C, D) There was a full-thickness laceration of the superior palpebra (E) Beneath the site of the superior palpebra laceration, a scleral laceration was found, but there was no evidence of vitreous prolapse.

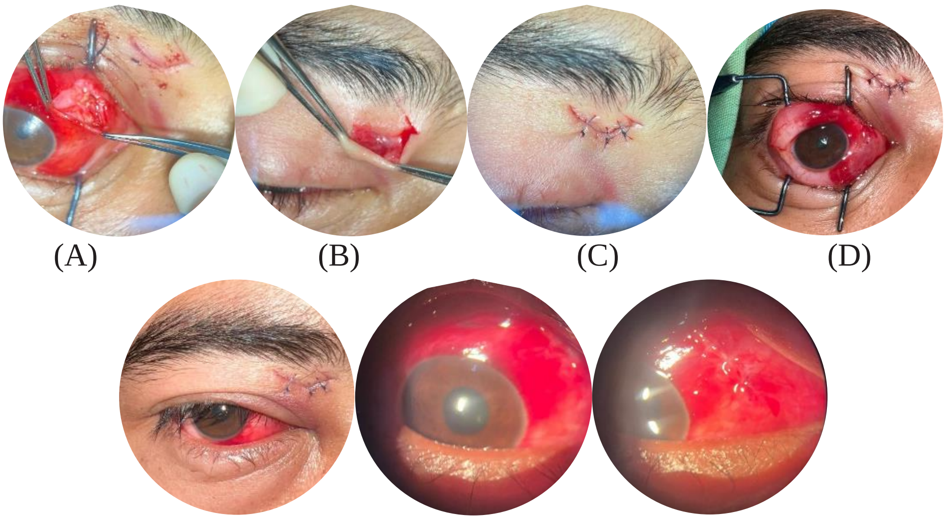
The patient was hospitalized, then received anti-tetanus prophylaxis, intravenous analgesic, and broad-spectrum antibiotic. The Head Computed tomography (CT) scan which is showed in Figure 2 revealed penetrated dense foreign body of RE. Exploration of globe, scleral and palpebral suturing was planned under general anesthesia. Due to limited equipment and the absence of a vitreoretinal surgeon in the emergency room, a second-step vitrectomy was scheduled.



(A) (B) (C)

Figure 2. The non-contrast Head CT scan showed (A) axial view, (B) coronal view, and (C) sagittal view. Yellow arrow revealing a dense foreign body penetrating the RE, causing globe deformation, along with vitreous hemorrhage and intraocular gas presence.

During the first procedure, a V-shaped scleral laceration, 5×3 mm in size was identified at the 2 o'clock position, along with a 7×1 mm fullthickness superior laceration in the medial one-third of the eyelid. A peritomy of the conjunctiva was performed, followed by scleral laceration repair and injection of intravitreal ceftazidime. Additionally, subconjunctival injections of gentamicin and dexamethasone were administered. Then palpebral laceration was sutured. Postoperative medications included intravenous antibiotic, oral analgesic, and topical treatments of antibiotic, steroid, and cycloplegic eye drops. The condition during and one day after surgery was shown at Figure 3. Then, ocular ultrasound (USG) was performed, indicating vitreous hemorrhage, and the possibility of an IOFB in the subretinal space, as shown in Figure 4.



(A) (B) (C) (D)

(E) (F) (G)

Figure 3. The procedure of RE exploration of globe, scleral and palpebral suture. During surgery we identified (A) V-shaped scleral laceration, (B) Superior palpebra laceration (C and D) Palpebra superior and scleral laseration was sutured (E, F, and G) Anterior segment condition one day post-surgery, showing intact palpebral and conjunctival sutures, along with conjunctival injection and subconjunctival hemorrhage.

Figure 4. The USG of RE revealed a vitreous echogenic lesion in the form of particles and membrane with RCS complex of 20–90%, on half of the vitreous cavity in the inferior area. A shadowing effect was observed, indicating vitreous hemorrhage, and the possibility of an IOFB in the subretinal space

A week later, the patient underwent a second surgery, which included simple lens aspiration, IOFB extraction, and vitrectomy with Sulfur hexafluoride (SF6) gas tamponade under general anesthesia. The procedure began with a sclerectomy, followed by the insertion of an infusion cannula. Simple lens aspiration was then performed, followed by vitrectomy. During the vitrectomy, a metallic IOFB was discovered embedded in the subretinal layer. The tip of the metallic IOFB hit the macular area, while the other side affected the peripheral retina, which is resulted in massive vitreous hemorrhage and damage to the papillomacular bundle. The retinal detachment was revealed in the superior and inferotemporal regions, along with a retinal break in the macular area. The IOFB was extracted through the corneal main port. The extracted IOFB measured 14 × 2 mm and was crescent-shaped. Five corneoscleral sutures were placed at the main port. Then we repaired the retinal detachment, followed by SF6 gas tamponade. The surgical procedure is illustrated in Figure 5. The patient was instructed to maintain a face-down position to allow the gas to properly support the retina.

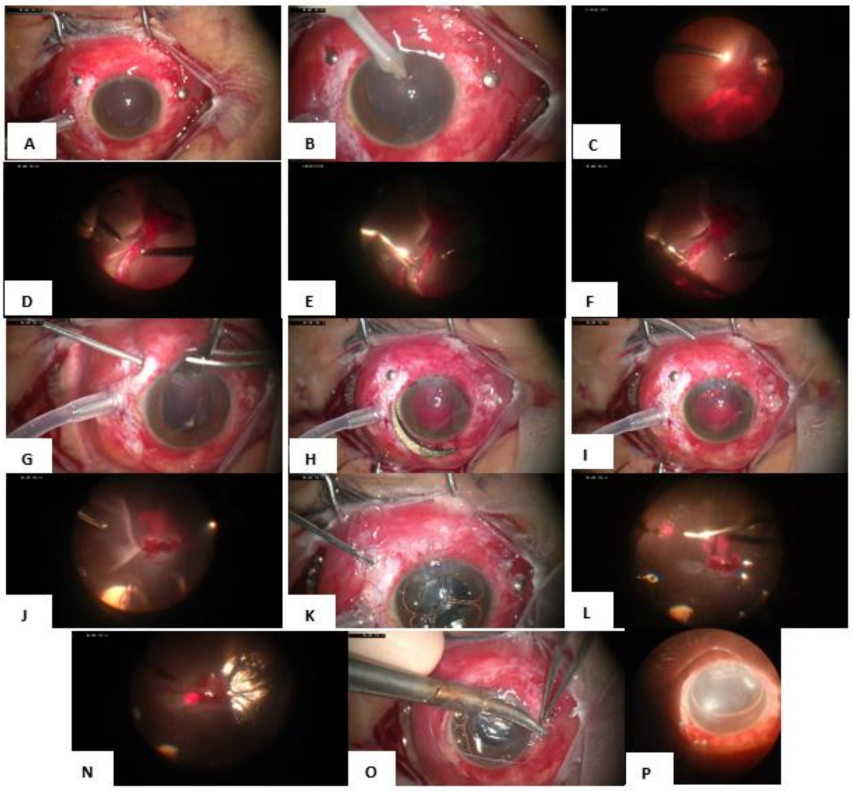
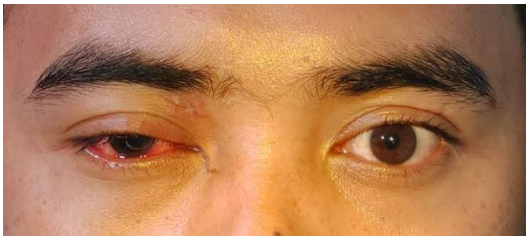


Figure 5. The procedure of RE simple lens aspiration, IOFB extraction, vitrectomy with SF6 gas tamponade (A) Sclerectomy was performed at 2, 7 and 10 o'clock to insert the infusion and scleral cannula. (B) Simple aspiration of lens was performed. (C) During vitrectomy, massive vitreous hemorrhage was found (D, E, F) Metal IOFB was found at 7 o'clock on the subretinal layer. (G) The metallic IOFB was extracted through the corneal main port, which was widened from 10 to 1 o'clock. (H) the metal IOFB was large and cresent in shape (I) Five corneoscleral sutures were placed from 10 to 1 o'clock. (J) Vitrectomy and fluid-air exchange were performed. (L) Laser barricade was applied around the macular break and 360 degrees in the peripheral retina. (N) SF6 gas tamponade was administered. (O) The scleral cannula was removed, and the sclera was sutured with Vicryl 6.0, while the conjunctiva was sutured with Vicryl 8.0 at 2, 7, and 10 o'clock. A subconjunctival injection of dexamethasone was given. (P) The anterior segment condition one day after the second surgery showed 360-degree subconjunctival hemorrhage, with conjunctival sutures in place. The corneoscleral sutures were intact and an air bubble was present in the anterior chamber. The pupil was 7 mm while lens was aphakic.

The day after surgery, the right eye (RE) remained blurred, red, and pain. Visual acuity was light perception, and IOP measured 19 mmHg. The conjunctiva showed hyperemia and subconjunctival hemorrhage, with conjunctival sutures at the 2, 7, and 10 o’clock positions. The cornea was edematous, and corneoscleral suture extended from the 10 to 1 o’clock position. An air bubble was present in the anterior chamber. The pupil was round, measuring 7 mm, with a diminished light reflex due to atropine instillation. The lens was aphakic. The posterior segment of the RE was difficult to evaluate due to SF6 gas coverage. The patient was discharged the next day with prescription of oral steroids and antibiotics, while previous medications continued until the first follow-up.

The next following week, the patient returned for follow-up at the outpatient clinic. The RE remained blurred. However the edema of palpebra had decreased. Visual acuity in the RE was light perception, and IOP was 11 mmHg. The anterior segment was shown in Figure 6. The posterior segment of the RE still showed retinal detachment. Additionally, gas was observed in the superior area, along with laser scars and a macular break. Detailed evaluation was challenging due to corneal and retinal edema. Image of the posterior segment was shown in Figure 7.


(A)


(B)

Figure 6. Condition a week after the 2nd surgery of RE (A) Edema and spasm of palpebra had decreased. (B) Conjunctival and subconjunctival injection had also reduced. The cornea appeared slightly hazy, with Descemet’s folds and five corneal sutures in the superior area. The anterior chamber was deep, with +1 cells, and posterior synechiae were present from 2 to 5 o’clock, causing an irregularly shaped pupil. The pupil measured 8 mm due to atropine instillation. The lens remained aphakic.

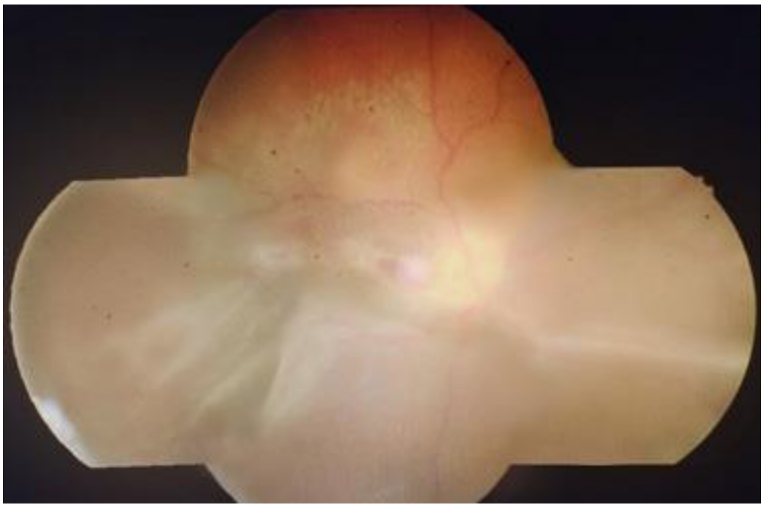


Figure 7. The posterior segment of RE showed retinal detachment at the 3–9 o'clock position, along with a macular break. There were also gas in the superior area, and laser scar. However, the detailed evaluation of retina and optic nerve head was difficult to asses due to corneal and retinal edema.

3. Discussion

IOFBs are found in 10% to 41% of open globe injuries, with prevalence reaching to 53% in cases of traumatic endophthalmitis. A study conducted by Widjaja et al. in 2021 at Dr. Soetomo Hospital, Surabaya, reported that case of open globe injuries (17.7%) were less than closed globe injuries (80.3%). The most frequent mechanisms of injury were sharp objects (32.6%), followed by blunt trauma (24.8%)(8). The injury mechanism plays a crucial role in IOFB occurrence, with high-velocity, small particles being the most common cause. High-risk activities include hammering, metal shaving, grinding, machine work, and exposure to explosions. The majority of patients with IOFB are approximately 90% young males with average age ranges from 25 to 39 years (9,10). This case represent 29-year-old male patient who was struck by a metal fragment while operating a hydraulic machine.

Posterior segment IOFBs are the most common, primarily located in the vitreous but also could be found in preretinal, subretinal, or suprachoroidal regions. Between 34% and 56% of these cases are associated with vitreous hemorrhage, while 12% to 73% present with traumatic cataracts, which can obstruct IOFB visualization (9). Metallic IOFBs, particularly iron and copper, are the most common and can trigger metallosis by releasing metal ions into ocular tissues. Iron retention leads to siderosis bulbi, causing pigmentation and degeneration in the cornea, lens, trabecular meshwork, iris, and retina. It also damages the Retinal Pigment Epithelium (RPE), resulting in retinal degeneration (4). In this case, the IOFB is suspected to be embedded in the subretinal area, with an entry wound originating from the superior palpebra, penetrating through the sclera. Posterior segment examination revealed vitreous hemorrhage, suspected metallic IOFB, and retinal detachment.

The selection of diagnostic imaging depends on the IOFB's material and location. Head CT scan is the preferred imaging modality for diagnosing and localizing IOFBs in ocular trauma (9). Metallic foreign bodies are best detected using a non-contrast CT scan, as metal appears hyperdense, making localization more precise. USG should be avoided in cases of suspected open-globe injuries. The application of pressure from the ultrasound probe can exacerbate existing damage, potentially leading to extrusion of intraocular contents. Therefore, USG is recommended only after the structural integrity of the globe has been confirmed or restored. B-scan ultrasonography is an affordable and effective tool for detecting metallic foreign bodies. These objects appear as hyperechoic structures with acoustic shadowing on B-scan and produce a high spike on A-scan (11). In this case, head CT scan was chosen over USG due to the presence of an open-globe injury, the need for accurate IOFB localization, the risk of associated orbital or brain injuries, and the necessity for detailed pre-surgical planning. This decision minimized further ocular damage while ensuring optimal management for both globe closure and delayed IOFB extraction. After suturing the ocular laceration, an ocular USG can be performed to evaluate the condition of the IOFB. Figure 8 illustrates the diagnosing process for managing patients with ocular trauma.

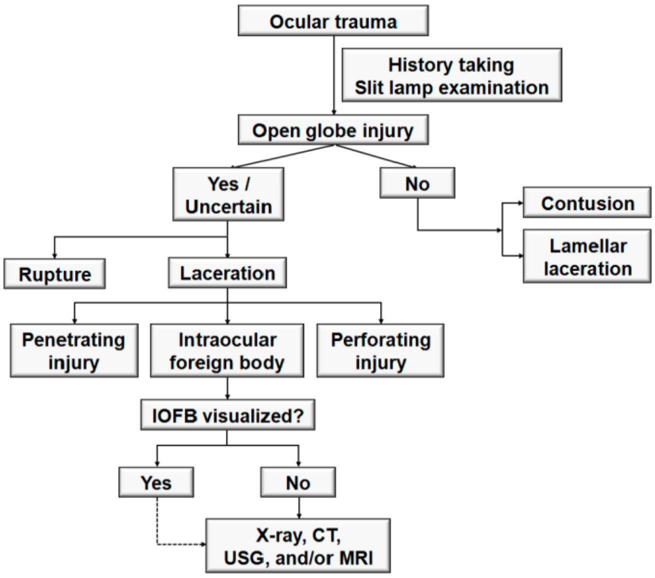


Figure 8. Flowchart outlining the diagnostic approach for IOFB (12)

The initial approach to IOFBs involves a systematic assessment and management protocol to optimize patient outcomes. Initial management of IOFB are to stabilize the patient's condition, protect the injured eye, and prevent infection (1). A comprehensive algorithm typically includes the following steps which is shown in Figure 9.

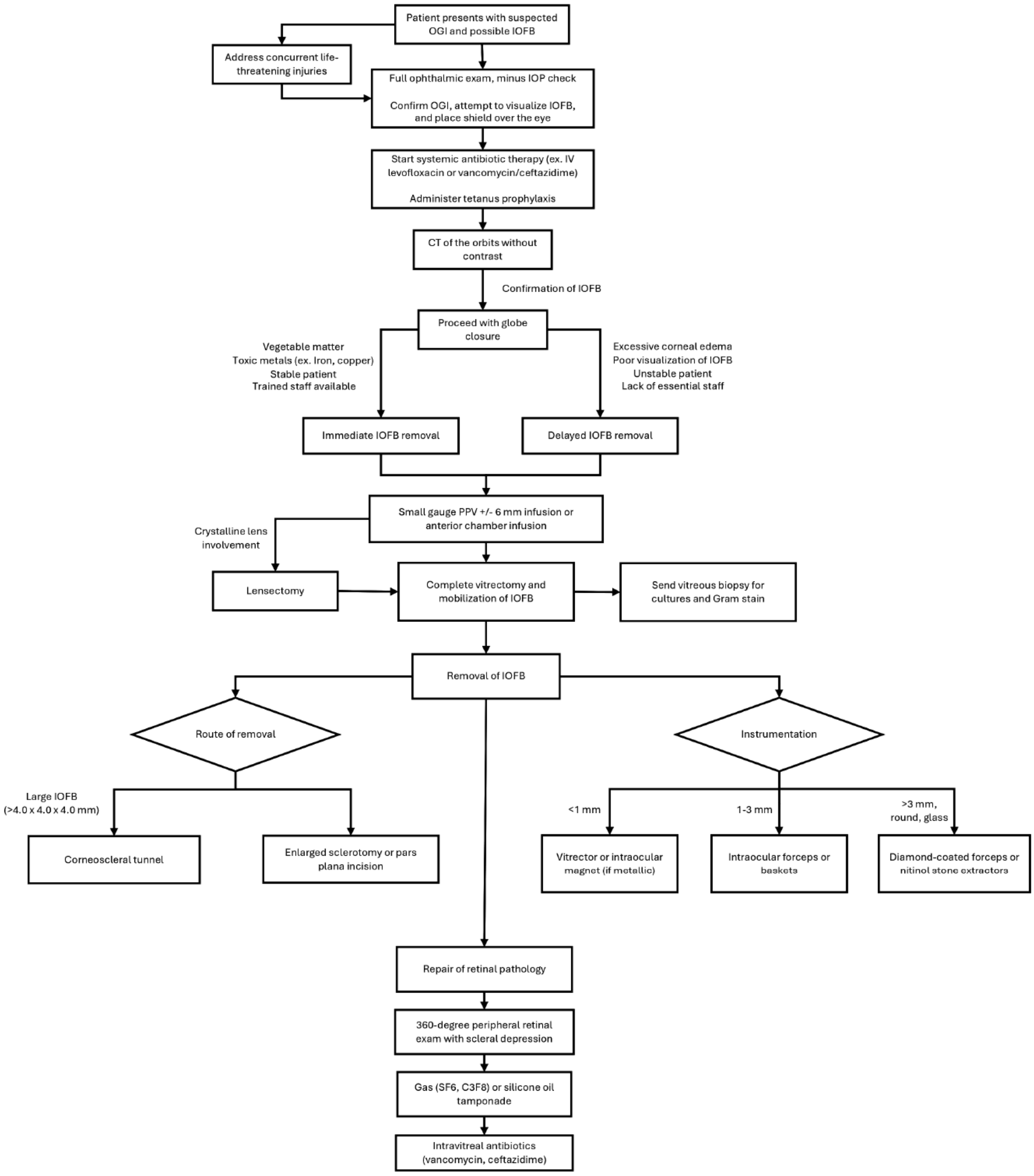


Figure 9. Algorithm for Managing IOFB Cases(1).

In situations where immediate removal of the IOFB is not feasible due to limited resources or the unavailability of specialized surgical expertise, as described in the case, prioritizing globe closure and administering systemic broad-spectrum antibiotics are essential steps. The administration of systemic antibiotics, such as intravenous ceftriaxone, is commonly employed to provide coverage against a broad range of potential pathogens (13). The role of prophylactic intravitreal antibiotics in open globe injuries remains a topic of discussion. Some studies suggest that administering intravitreal antibiotics at the time of primary repair can reduce the incidence of post-traumatic endophthalmitis, especially in cases where there is a high risk of infection, such as the presence of an IOFB (14). This approach helps to stabilize the injury and provides a window during which definitive surgical management, such as vitrectomy for IOFB extraction, can be planned.

The initial approach also involves prompt surgical closure of the globe to restore its integrity and prevent further intraocular contamination. This primary repair should be performed as soon as possible, ideally within 24 hours of injury, to minimize the risk of infection and other complications(15). In the presented case, the initial management involved scleral-palpebral suturing, intravitreal and systemic antibiotic injection, aligning with the principles of immediate globe closure and infection prophylaxis. Due to limited surgical resources, definitive IOFB removal was delayed, highlighting the importance of adaptable management strategies in resource-constrained settings. This case underscores the critical importance of adhering to established management protocols for metallic IOFBs, including immediate globe closure and antimicrobial prophylaxis, to optimize patient outcomes. Vitrectomy was performed once the vitreoretinal surgeon and necessary equipment were available.

When an IOFB is associated with lens damage, particularly in cases of lens capsule rupture or significant lens opacity that impairs visualization of the posterior segment, lens aspiration becomes a necessary step. Removing the lens improves access to the vitreous cavity and retina, enabling safe IOFB extraction and facilitating the management of associated posterior segment injuries, as demonstrated in this case(16).

PPV is a standard procedure in the management of posterior segment IOFBs. This technique involves the removal of the vitreous gel, which may be opacified by hemorrhage or inflammation, thereby providing a clear view and access to the IOFB. The approach to removal is determined by factors such as the IOFB's size, composition, location, and the presence of any associated ocular injuries. The three most commonly used tools in foreign body extraction are external electromagnets, forceps, and intraocular magnets. Forceps offer precise surgeon control during intraocular procedures but require high dexterity. Following IOFB extraction, the intraocular tamponade agent, is often indicated, especially in cases where retinal tears or detachments are present (17,18). In this case, The surgeon used forceps and a limbal approach to remove the IOFB, as it provided precise control and optimal visualization, allowing careful maneuvering while minimizing trauma to surrounding tissues. The IOFB was embedded in the subretinal space, making magnetic extraction ineffective. Additionally, the foreign body was non-magnetic and had an irregular crescent shape, requiring a firm grip for safe removal. Using a magnet could have disrupted sensitive structures like the macula or optic nerve, increasing the risk of complications. Forceps enabled a stepwise removal approach following vitrectomy, ensuring controlled extraction while preserving retinal function.

Key determinants of prognosis include the initial visual acuity at presentation, the size and location of the IOFB, and the presence of additional ocular injuries. Studies have shown that better initial visual acuity is associated with more favorable outcomes, while larger IOFBs and those located in the posterior segment of the eye are linked to poorer visual prognoses. Complications such as retinal detachment, vitreous hemorrhage, and endophthalmitis further negatively impact visual outcomes. Prompt surgical intervention to remove the IOFB, along with appropriate management of associated injuries, is crucial for optimizing visual recovery(19–21). In the presented case, the patient's initial visual acuity, the size and location of the IOFB, and the timely surgical management were critical factors influencing the final visual outcome. The poor visual prognosis in this case is primarily due to the large, crescent-shaped IOFB, its impact on the macula, and peripheral retinal damage leading to massive hemorrhage and papillomacular bundle injury. These factors collectively result in irreversible structural damage, reducing the chances of significant visual recovery despite timely surgical intervention.

4. Conclusion

Ocular trauma with an IOFB is a critical ophthalmic emergency requiring immediate intervention to prevent severe complications, including endophthalmitis and vision loss. This case highlights the importance of prompt globe closure and antimicrobial prophylaxis when immediate IOFB removal is not feasible. Despite surgical delays due to logistical limitations, successful extraction and vitrectomy with SF_6 gas tamponade were performed, though with a poor visual prognosis. No signs of intraocular infection were observed, reinforcing the effectiveness of early antimicrobial intervention. Prioritizing globe closure and aggressive antibiotic prophylaxis remains a viable approach in managing IOFB cases when definitive surgical treatment is delayed.

References

1. Ohlhausen M, Menke BA, Begley J, Kim S, Debiec MR, Conrady CD, et al. Advances in the management of intraocular foreign bodies. Front Ophthalmol. 2024 Sep 2;4:1422466.
2. Firmansjah M, Sudrajat N, Yustiarini I, Prakosa AD, Widjaja SA, Sasono W. Intraocular Foreign Body: Striving the Optimal Visual Outcome. Vis Sci Eye Health J. 2023 Apr 3;2(2):52–6.
3. Anjaswari NA, Yustiarini I, Hermawan D. Excellent Visual Potential in Intraocular Foreign Body-Associated Endophthalmitis. 2023;
4. Iskandar F, Angelia M. Management of Intraocular Foreign Bodies. Cermin Dunia Kedokt. 2024;51(12).
5. Olmos LC, Iii DWP. Vitrectomy for Removal of Posterior Segment Intraocular Foreign Bodies. 2012;January February 2012(Retina Surgery Retina Pearls):40–4.
6. Bhagat N, Nagori S, Zarbin M. Post-traumatic Infectious Endophthalmitis. Surv Ophthalmol. 2011 May;56(3):214–51.
7. Falavarjani K, Hashemi M, Modarres M, Parvaresh M, Naseripour M, Nazari H, et al. Vitrectomy for posterior segment intraocular foreign bodies, visual and anatomical outcomes. Middle East Afr J Ophthalmol. 2013;20(3):244.
8. Widjaja SA, Hiratsuka Y, Ono K, Yustiarini I, Nurwasis N, Murakami A. Ocular Trauma Trends in Indonesia: Poor Initial Uncorrected Visual Acuity Associated with Mechanism of Injury. Open Access Maced J Med Sci. 2021 Aug 29;9(B):903–8.
9. Parke DW, Flynn HW, Fisher YL. Management of intraocular foreign bodies: a clinical flight plan. Can J Ophthalmol. 2013 Feb;48(1):8–12.
10. Abdullah R, Fatmariyanti S, Dwikoloso H. Comparison of Prognostic Prediction Value by Ocular Trauma Score with Visual Outcome in Ocular Foreign Body Trauma. Int J Res Publ. 2021 Aug 1;83(1).
11. Modjtahedi BS, Rong A, Bobinski M, McGahan J, Morse LS. IMAGING CHARACTERISTICS OF INTRAOCULAR FOREIGN BODIES: A Comparative Study of Plain Film X-Ray, Computed Tomography, Ultrasound, and Magnetic Resonance Imaging. Retina. 2015 Jan;35(1):95–104.
12. Jung HC, Lee SY, Yoon CK, Park UC, Heo JW, Lee EK. Intraocular Foreign Body: Diagnostic Protocols and Treatment Strategies in Ocular Trauma Patients. J Clin Med. 2021 Apr 25;10(9):1861.
13. Ahmed Y, Schimel AM, Pathengay A, Colyer MH, Flynn HW. Endophthalmitis following open-globe injuries. Eye. 2012 Feb;26(2):212–7.
14. Narang S, Gupta V, Gupta A, Dogra MR, Pandav SS, Das S. Role of Prophylactic Intravitreal Antibiotics in Open Globe Injuries.
15. McMaster D, Bapty J, Bush L, Serra G, Kempapidis T, McClellan SF, et al. Early versus Delayed Timing of Primary Repair after Open-Globe Injury. Ophthalmology. 2024 Aug;S0161642024005281.
16. Guevara-Villarreal DA, Rodríguez-Valdés PJ. Posterior Segment Intraocular Foreign Body: Extraction Surgical Techniques, Timing, and Indications for Vitrectomy. J Ophthalmol. 2016;2016:1–5.
17. Demircan N, Soylu M, Yagmur M, Akkaya H, Ozcan AA, Varinli I. Pars Plana Vitrectomy in Ocular Injury with Intraocular Foreign Body: J Trauma Inj Infect Crit Care. 2005 Nov;1216–8.
18. Mester V, Kuhn F. Intraocular foreign bodies. Ophthalmol Clin N Am. 2002;15:235–42.
19. Rozon JP, Lavertu G, Hébert M, You E, Bourgault S, Caissie M, et al. Clinical Characteristics and Prognostic Factors of Posterior Segment Intraocular Foreign Body: Canadian Experience from a Tertiary University Hospital in Quebec. Nb K, editor. J Ophthalmol. 2021 May 17;2021:1–7.
20. Greven CM, Engelbrecht NE, Slusher MM, Nagy SS. Intraocular Foreign Bodies. 2000;107(3).
21. Hapca MC, Muntean GA, Drăgan IAN, Vesa Ștefan C, Nicoară SD. Outcomes and Prognostic Factors Following Pars Plana Vitrectomy for Intraocular Foreign Bodies—11-Year Retrospective Analysis in a Tertiary Care Center. J Clin Med. 2022 Aug 1;11(15):4482.