



Case Series



Panophthalmitis secondary to retained intraocular foreign body amidst a national lockdown during the COVID-19 pandemic: A case series and review of literature

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ABSTRACT

Introduction: Intraocular foreign bodies (IOFBs) can be serious as they may result in vision-threatening ocular inflammations and even loss of the eye. Delay in presentation or treatment by more than 24 hours from the time of injury results in a poor prognosis. In penetrating wounds, microorganisms enter the eye through penetrating objects. Both bacterial and fungal organisms are responsible for causing panophthalmitis. At the ocular level, these microorganisms produce irreversible damage which includes keratitis, uveitis, hypopyon, vitreous abscesses, retinal necrosis, detachment, and, finally, panophthalmitis.

Case scenarios: In this case series, we report three cases of IOFB presenting with panophthalmitis secondary to delay in seeking medical attention. In our cases, there was a delay in the presentation by more than 24 hours of trauma. All cases had panophthalmitis at the time of presentation. In two cases, the causative organism was coagulase-negative staphylococci and in one case it was staphylococcus. Initially, we planned to manage them with intravitreal, intravenous and topical antibiotics till the inflammation subsides, then IOFB removal surgeries were planned. However, in two cases, the clinical presentation worsens with scleral necrosis. Therefore, they had to undergo evisceration. In one case, the antibiotics therapy was enough without IOFB removal surgery to manage her symptoms. All cases recovered uneventfully after the interventions.

Discussion/Conclusion: In developing nations, like Nepal, transportation barriers can affect a person's access to health care services. This can be clearly explained from this case series as limited transportation options in rural regions are a major factor for all patients' delayed presentation to the hospital during the time of national lockdown in the second wave of the COVID-19 pandemic. The concerned authority must pay attention to solving such social determinants of health.

1. Introduction

An intraocular foreign body (IOFB) is any material- organic or inorganic, which penetrates the ocular tissue. This foreign material may be retained within the eye, or it may be extruded out of the eye into the orbit as in high-velocity injuries and become intraorbital. The foreign bodies may be classified as metallic or nonmetallic.

IOFBs can be serious as they may result in vision-threatening ocular inflammations and even loss of the eye. Endophthalmitis is a serious complication of penetrating eye injuries. It occurs in 2–7% of all

penetrating ocular injuries [1]. It has been reported that nearly 90% of patients with traumatic open globe injuries with IOFB can present with endophthalmitis [2]. Delay in presentation or treatment by more than 24 hours from the time of injury results in a poor prognosis. This delay is known to increase the chance of not only endophthalmitis but also panophthalmitis [3].

In this case series, we report three cases of IOFB presenting with panophthalmitis secondary to delay in seeking medical attention during the time of national lockdown in the second wave of the COVID-19 pandemic in Nepal.

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2. Case 1

2.1. Clinical scenario

An 11-years-old male child presented with pain and outward bulging of his left eye with no light perception after trauma to his left eye by a small metallic object while playing in the field. He states that there was an associated gushing of warm fluid out of his left eye immediately after the trauma. He presented to our department eight days following the incident. Systemically, he had a temperature of 100.2°F which was associated with nausea and three episodes of vomiting. The rest of the review of the system was found to be normal.

On ocular examination, the right eye (OD) had the best uncorrected visual acuity (BUVA) of 6/6 with normal anterior and posterior segment findings. Examination of the left eye (OS) revealed a marked proptosis with periorbital swelling and complete restriction of ocular movement. The conjunctiva had grade 3 chemosis (Fig. 1a). On slit-lamp examination, corneal melting with keratinization was found and the rest of the ocular tissues could not be identified. A lacerated wound at 6 o'clock – approximately 3 mm away from the limbus was found in the sclera.

2.2. Investigation

The patient had leukocytosis (17,000/mm³) with neutrophilic predominance (80%). Ultrasonography using amplitude(A) and brightness (B) scan depicted hyper-echogenicity all around the vitreous cavity suggesting an ongoing vitritis. An urgent non-contrast computed tomography (CT) scans of the orbit and head was advised. A linear hyperdense foreign body in the left globe likely metal, measuring 3.5 mm × 4.5 mm was found and it was associated with diffuse heterogeneous soft tissue density within the globe and extending to both the intra and extraconal compartments (Fig. 1b and 1c). Culture and sensitivity of the discharge from left eye corneal and scleral wound revealed the growth of coagulase-negative staphylococci.

2.3. Treatment, outcome and follow up

The patient was admitted and received intravitreal (vancomycin (1 mg/0.1 ml) and ceftazidime (2.25 mg/0.1 ml)), intravenous (ceftriaxone 500 mg, flucloxacillin 250 mg, and metronidazole 250 mg) and topical antibiotics (fortified vancomycin and tobramycin) empirically. Later, they were de-escalated as per the culture and sensitivity report. On the fifth day of admission, scleral corneal melting was noticed. Given the persistence of the active inflammation, history of ocular perforation, and risk of spread, a decision was made to eviscerate the eye (Fig. 1d and 1e).



Fig. 1a. showing corneal melting with keratinization and chemosis.

A metallic foreign body was found embedded in the eviscerated tissue. The eviscerated tissue was sent for histopathological examination. The sample was reported to have keratitis and necrotizing scleritis, acute purulent iridocyclitis, suggestive of panophthalmitis.

Following the surgery, the proptosis of the left eye decreased and chemosis subsided (Fig. 1f). Intravenous and topical medication were continued for five more days, and the patient recovered uneventfully. The patient was discharged on day six post-evisceration with oral cefixime 200 mg twice a day for seven days and pain medications. On follow-up at one month, the inflammatory phase had subsided, and he had a phthisical globe.

3. Case 2

3.1. Clinical scenario

A 51-year-old female presented with pain, swelling, and complete vision loss in her right eye after trauma to her right eye by a small stone while working on a farm. Following the trauma, she also noticed the gushing of warm fluid out of her right eye. She presented to our hospital four days following the incident. She had fever and nausea but no vomiting. She had a history of keratoplasty six years back. Her vitals were within the normal limit. We did not observe icterus, pallor, lymphadenopathy, or rashes during our assessment.

On her eye examination, the right eye had no light perception. There was marked proptosis with periorbital swelling, near total ophthalmoplegia, and visible discharge (Fig. 2a). The slit-lamp examination of the right eye showed congested conjunctiva and opaque and necrotic cornea. The sclera was lacerated superiorly 2 mm from the limbus. The anterior chamber had hypopyon due to which the intraocular structures were invisible (Fig. 2b). The left eye was normal with vision of 6/6 and a benign funduscopy.

3.2. Investigations

Complete and differential blood counts showed 13,000/mm³ with 76% neutrophils. A B-scan of the right eye showed significant vitritis. An urgent non-contrast CT scan of the orbit and head revealed a round, hyperdense foreign body with diffusely heterogeneous soft tissue density in the intra and extraconal compartments of her right globe, suggestive of panophthalmitis with dislocation of the lens to the vitreous cavity (Fig. 2c and 2d). The discharge from the right eye was sent for culture and sensitivity, which revealed the growth of *Streptococcus pneumoniae*.

3.3. Treatment, outcome and follow up

The patient was admitted and intravitreal (vancomycin (1 mg/0.1 ml) and ceftazidime (2.25 mg/0.1 ml)), intravenous (ceftriaxone 1 g, flucloxacillin 500 mg, and metronidazole 500 mg) and topical antibiotics (fortified vancomycin and tobramycin) were given empirically which were later changed as per the culture and sensitivity report. Foreign body removal surgery was planned once the inflammatory phase subside with a course of antibiotics. However, chemosis and inflamed conjunctiva with purulent discharge persisted despite the treatment. On the second day of the admission, the expulsion of the lens through the perforated cornea was noticed from the affected eye (Fig. 2e). Given the persistence of the active inflammatory focus and ocular perforation, it was decided to perform a right eye evisceration (Fig. 2f). The metallic foreign body was embedded in the eviscerated tissue. The intraocular implants could not be placed due to the active inflammatory phase. After evisceration, the wound was repaired. Subconjunctival vancomycin and dexamethasone were injected. The pathological analysis of the surgical specimens reported the presence of purulent panophthalmitis. After the surgery, the swelling of the eyelids decreased and chemosis improved (Fig. 2g). Intravenous and topical

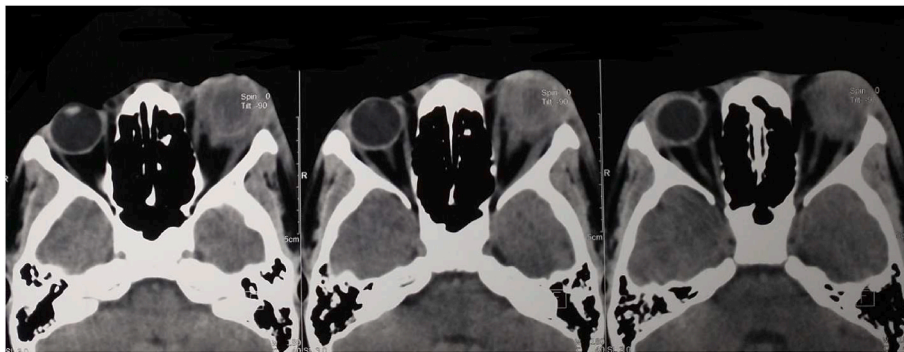


Fig. 1b. Non-contrast CT showing diffuse heterogeneous soft tissue density within the globe and extending to both the intra and extraconal compartments.

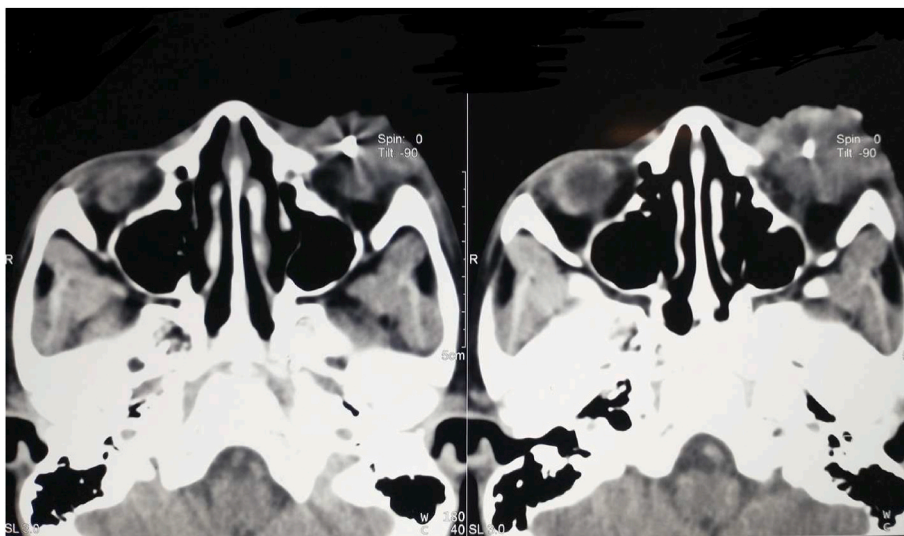


Fig. 1c. Non-contrast CT showing hyperdense foreign body in the left globe.

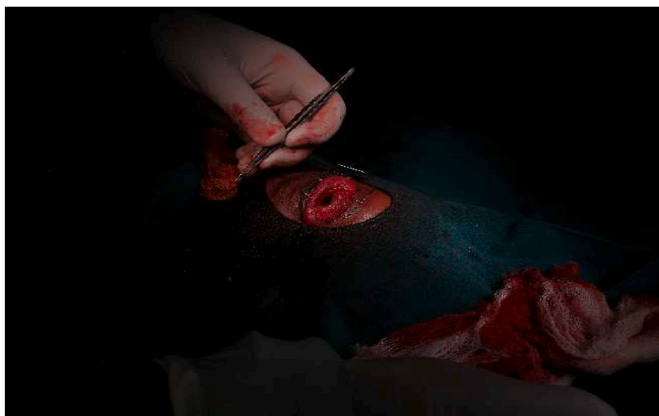


Fig. 1d. showing the evisceration of left eye.



Fig. 1e. showing the eviscerated tissue.

medications were continued for five more days, and the patient recovered uneventfully. Then, the patient was discharged with oral cefixime 200 mg for seven days and pain medications. On her one-month follow-up, the inflammatory phase subsided, and the right was progressing to phthisis bulbi.

4. Case 3

4.1. Clinical scenario

A 9-year-old female child presented with pain, swelling, and complete vision loss in her right eye after getting hit by a pebble to her right eye while playing. Following the trauma, she also noticed the gushing of warm fluid out of her right eye. She presented to our hospital three days following the incident. She had a fever, nausea, and two episodes of



Fig. 1f. showing post-operative left eye with decreased proptosis and chemosis.



Fig. 2a. showing marked proptosis of right eye with periorbital swelling.



Fig. 2b. showing congested conjunctiva with necrotic cornea and hypopyon on anterior chamber.

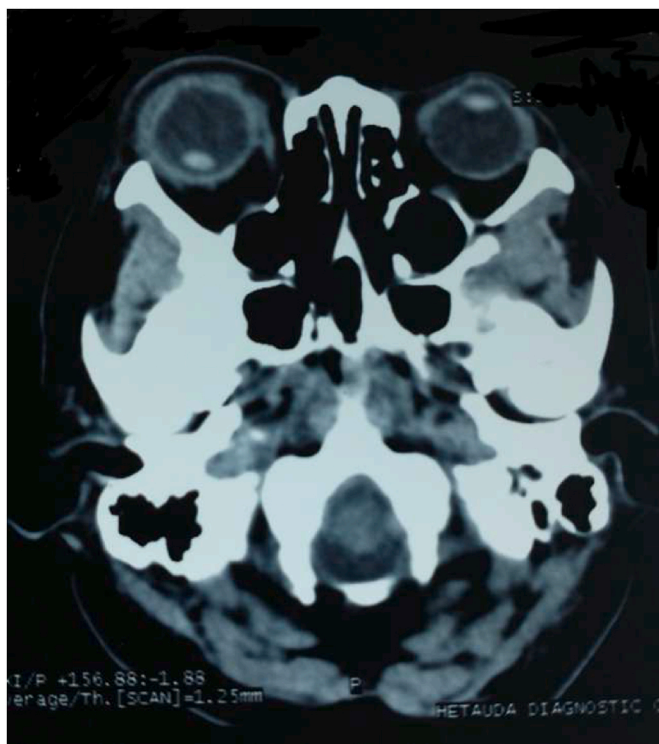


Fig. 2c. Non-contrast CT showing dislocation of lens to the vitreous.

vomiting. Her vitals were within normal limits for her age. We did not observe icterus, pallor, lymph node enlargements, or rashes during our assessment.

On eye examination, the right eye was markedly proptosed with periorbital swelling and total ophthalmoplegia (Fig. 3a). On slit examination, the conjunctiva on the right eye was edematous and massively chemosed. The scleral laceration could not be seen. The anterior

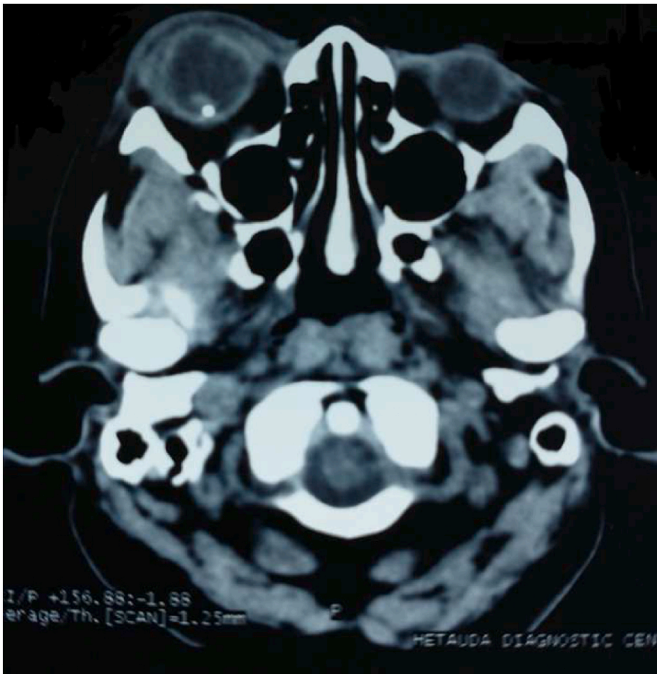


Fig. 2d. Non-contrast CT showing a round, hyperdense foreign body.

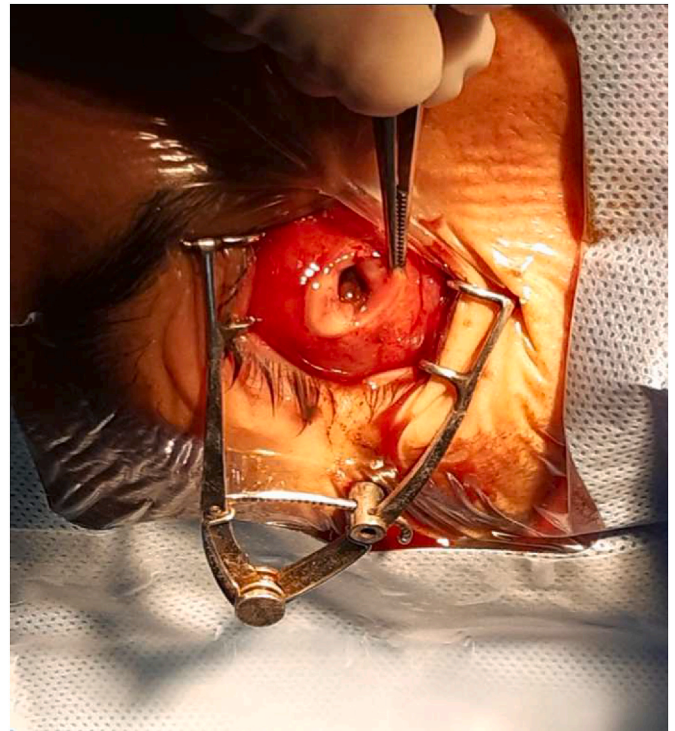


Fig. 2f. showing evisceration of the right eye.



Fig. 2e. showing expulsion of lens through perforated cornea from right eye.

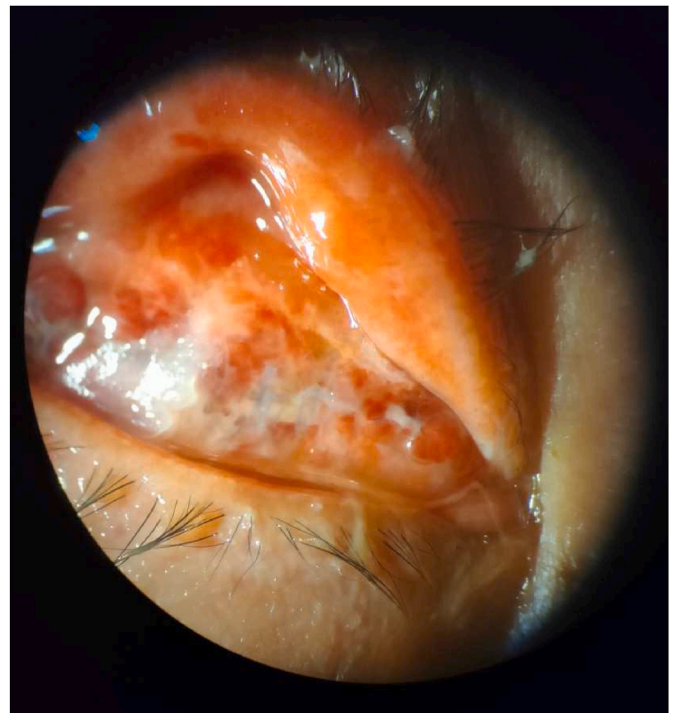


Fig. 2g. showing post-operative right eye with decreased periocular swelling and chemosis.

chamber was filled with a whitish hypopyon making intraocular structures invisible (Fig. 3b). There was no visible discharge from the right eye. The light perception was noted in the right eye. The left eye was normal in external, slit lamp, and funduscopy evaluations with a vision of 6/9.

4.2. Investigations

Complete and differential blood counts showed $14,000/\text{mm}^3$ with 60% neutrophils. B-scan of the left eye showed vitritis. An urgent non-contrast CT scan of the orbit and head revealed a linear hyperdense foreign body in the right globe measuring 5.9×3.9 mm with diffusely heterogeneous soft tissue density in the intra and extraconal compartments of the right globe, suggestive of panophthalmitis (Fig. 3c). The discharge from the right eye was sent for culture and sensitivity which revealed the growth of coagulase-negative staphylococci.

4.3. Treatment, outcome and follow up

The patient was admitted to the hospital and intravitreal (vancomycin (1 mg/0.1 ml) and ceftazidime (2.25 mg/0.1 ml)), intravenous (ceftriaxone 500 mg, flucloxacillin 250 mg, and metronidazole 250 mg) and topical antibiotics (fortified vancomycin and tobramycin) were



Fig. 3a. showing proptosed right eye with periorbital swelling.

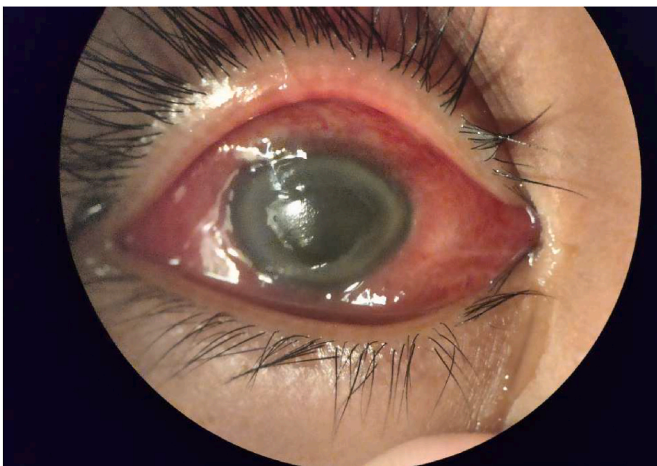


Fig. 3b. showing hypopyon in anterior chamber.

given empirically. Later, they were changed as per the culture and sensitivity report. Even though a foreign body removal surgery was originally planned after the resolution of inflammation, given the significant improvement of the patient after 10 days of antibiotics (Fig. 3d), the foreign body was assumed to be inert (as it was a stone fragment). Surgery was not pursued, and spontaneous phthisis of the left eye was expected. Then, the patient was discharged with oral cefixime 200 mg twice a day for seven days. On her one-month follow-up visit, the inflammatory phase subsided. The left eye was progressing to phthisis bulbi.

5. Discussion

Panophthalmitis is a serious complication of penetrating eye wounds. In penetrating wounds, microorganisms enter in the eye through penetrating objects. Both bacterial and fungal organisms are responsible for causing panophthalmitis. Common bacteria causing panophthalmitis are *Streptococcus*, *Staphylococcus*, *Bacillus cereus*,

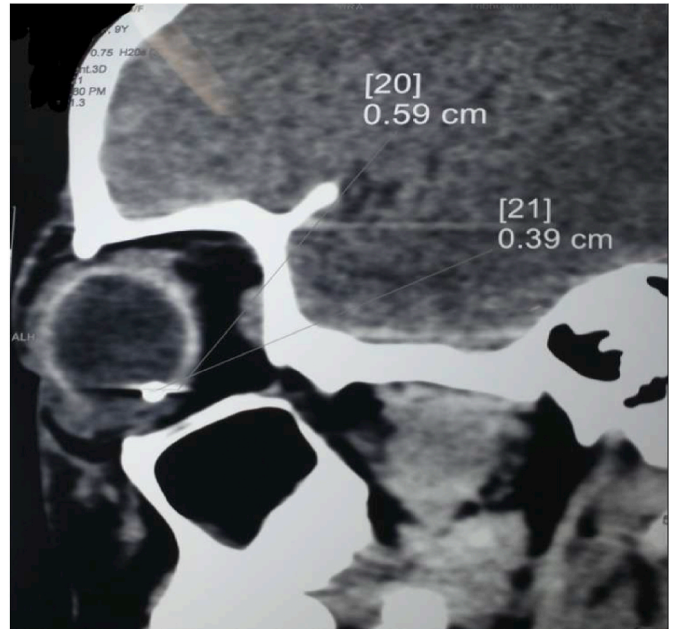


Fig. 3c. Non-contrast CT showing hyperdense foreign body in the right globe with diffusely heterogenous soft tissue density in the intra and extraconal compartment of the right globe.

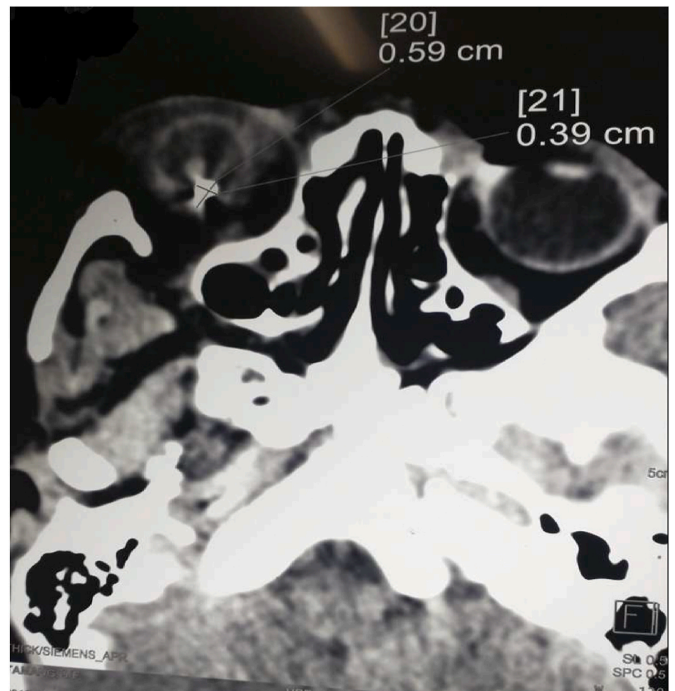


Fig. 3.d. Non-contrast CT showing hyperdense foreign body in the right globe with diffusely heterogenous soft tissue density in the intra and extraconal compartment of the right globe.

Propionibacterium acnes, *Escherichia coli*, *Klebsiella*, *Neisseria*, and *Pseudomonas* [4]. Ho PC et al. has described 4 cases of panophthalmitis secondary to trauma [5]. The fungal organisms causing panophthalmitis are *Aspergillus fumigatus*, *Candida parapsilosis*, *Fusarium solani*, *Paecilomyces lilacinus* and *Acremonium curvulum* [6]. Among bacterial etiology, coagulase-negative staphylococci (21.5%) are the most common cause of panophthalmitis followed by *Bacillus* (18.5%) [7].

At the ocular level, these microorganisms produce irreversible

damage which includes keratitis, uveitis, hypopyon, vitreous abscesses, retinal necrosis, detachment, and, finally, panophthalmitis [7]. In animal models, it is seen that structural alterations in the retina, as well as an infiltration of the vitreous by polymorphonuclear leukocytes, occur as early as four hours later to the inoculation of the germ into the vitreous [8]. Bacterial endophthalmitis becomes symptomatic within days as compared to fungal endophthalmitis, which usually presents from weeks to months [6].

Panophthalmitis usually presents with severe eye pain associated with reduced visual acuity, chemosis, periorbital swelling, and ptosis [9]. Additionally, the presence of fever, nausea, vomiting, leukocytosis, and elevated CRP are also important diagnostic signs. Radiological investigations such as x-ray and CT scan also help to determine the type and location of IOFB and help diagnose panophthalmitis as in our cases.

The management of panophthalmitis secondary to IOFB involves both medical and surgical interventions. It involves vitrectomy with removal of the foreign body, an intra-vitreous antibiotic as well as intravenous antibiotic therapy. The timing of IOFB removal remains controversial. Several studies have shown that removal of foreign bodies within 24 hours of injury is associated with a reduced risk of endophthalmitis [10,11]. However, other reports have demonstrated that early removal of IOFB may not be necessary as no cases of endophthalmitis were reported among patients who had undergone delayed IOFB removal (median time of 21 days) [12]. With the inert IOFB, medical management alone can be done without any need of surgical intervention as we saw in our third case [13].

In our cases, there was a delay in the presentation by more than 24 hours of trauma. According to patients' statement the delay in their presentation was due to unavailability of transportation facility during the national lockdown in response to COVID-19 pandemic. All cases had panophthalmitis at the time of presentation (Table 1). In two cases, the causative organism was coagulase-negative staphylococci and in one

case it was staphylococcus. Initially, we planned to manage them with intravitreal, intravenous, and topical antibiotics till the inflammation subsides, then IOFB removal surgeries were planned. However, in two cases, the clinical presentation worsens with scleral necrosis. Therefore, they had to undergo evisceration. In one case, the antibiotics therapy was enough without IOFB removal surgery to manage her symptoms. All cases recovered uneventfully after the interventions.

Panophthalmitis secondary to IOFB is extremely serious, resulting in the functional and even anatomical loss of the eyeball. Clinical history (metallic foreign body soiled in rural areas), inflammatory signs (intra- and peri-ocular, rapid progression) as well as the presence of systemic signs (fever, nausea, leukocytosis) should immediately raise suspicion of this type of infection. Prompt medical and surgical intervention can save vision. In developing nations, like Nepal, transportation barriers can affect a person's access to health care services. This can be clearly explained from this case series as limited transportation options in rural regions are a major factor for all patients' delayed presentation to the hospital. The concerned authority must pay attention to solving such social determinants of health. This case series has been reported in line with the PROCESS 2020 [14].

Patient consent

Written informed consent was obtained from the patient's parents in case of paediatrics patient and from patient in case of adult for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Table 1

Table depicting the Mode of injury of panophthalmitis, Clinical findings, Treatment and Outcomes of patients.

Cases	Mode of injury	Clinical findings	CT findings	Organisms	Treatment	Outcome
Case 1.	Metal to the left eye while playing.	- <u>Left eye</u> : marked proptosis - <u>Cornea</u> : corneal melting with keratinization	Diffuse heterogeneous soft tissue density within the globe and extending to both the intra and extraconal compartments and hyperdense foreign body in left globe (Fig. 1.2 and 1.3)	Coagulase negative staphylococci	- <u>Intravitreal</u> : Vancomycin and ceftazidime - <u>Intravenous</u> : Ceftriaxone, flucloxacillin and metronidazole - <u>Topical</u> : fortified vancomycin and tobramycin - <u>Surgery</u> : left eye evisceration (Fig. 1.4 and 1.5)	Left phthisical globe
Case 2.	Pebble to the right eye while working on a farm.	- <u>Right eye</u> : marked proptosis with periorbital swelling with chemosis - <u>Cornea</u> : opaque and necrotic.	A round hyperdense foreign body with diffuse heterogeneous soft tissue density in the intra and extraconal compartments of the right globe suggestive of panophthalmitis with dislocation of the lens on vitreous cavity (Fig. 2.3 and 2.4)	<i>Streptococcus pneumoniae</i>	- <u>Intravitreal</u> : Vancomycin and ceftazidime - <u>Intravenous</u> : Ceftriaxone, flucloxacillin and metronidazole - <u>Topical</u> : fortified vancomycin and tobramycin - <u>Surgery</u> : left eye evisceration (Fig. 2.6)	Right phthisical globe
Case 3.	Pebble to the right eye while playing.	- <u>Right eye</u> : markedly proptosed with periorbital swelling (Fig. 3.1) - <u>Anterior chamber</u> : whitish hypopyon (Fig. 3.2)	A linear hyperdense foreign body in right globe with diffuse heterogeneous soft tissue density in the intraconal and extraconal compartments of the right globe suggestive of panophthalmitis (Fig. 3.3)	Coagulase negative staphylococci	- <u>Intravitreal</u> : Vancomycin and ceftazidime - <u>Intravenous</u> : Ceftriaxone, flucloxacillin and metronidazole - <u>Topical</u> : fortified vancomycin and tobramycin	Right phthisical globe.

Sources of funding for your research

There is no any source of funding for this case series.

Ethical approval

This study was conducted in accordance with ethical standard.

Author contribution

Kamal Pandit took relevant history, clinical examination, collected relevant investigations of the patient and wrote the report. And he was directly involved in patient's care. Anadi Khatri, Sagun Narayan Joshi, Gulshan Bahadur Shrestha, Sanjeeta Sitaula, Meenu Chaudhary and Ranju Kharel (Sitaula), Pravin Rai and Pratap Karki provided support and mentorship for development, writing and revision of this case report.

Registration of research studies

1. Name of the registry: Research Registry
2. Unique Identifying number or registration ID: researchregistry7817
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-the-registry#home/registrationdetails/625c30a7234569001f5d45b4/>

Guarantor

Kamal Pandit. He is the first author and corresponding author for this case series.

Declaration of competing interest

There is no any conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.103692>.

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