Post-Traumatic Ocular Infection Caused by Escherichia coli: A Case Report

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ABSTRACT

Introduction- Penetrating ocular injury threatens the integrity of the globe and constitutes a true ophthalmic emergency, which often leads to severe vision loss if not managed appropriately. Inadequate or delayed surgical intervention may result in irreversible blindness. Corneal wounds are among the most common forms of ocular trauma and are frequently preventable, yet they carry a significant risk of long-term visual sequelae. Herein, we report a rare case of post-traumatic ocular infection caused by *Escherichia coli*, highlighting the importance of early microbiological diagnosis and prompt, appropriate antimicrobial therapy.

Case presentation A 40-year-old male presented with a penetrating injury to the right eye caused by a wire, following which he developed sudden loss of vision and corneal haziness. On examination, visual acuity was perception of light positive (PL+) with inaccurate projection of rays (PR defective), and intraocular pressure (IOP) was 0 mmHg. Seidel's test was not formally performed; however, it was clinically negative. Emergency management included primary repair of the corneal wound under aseptic precautions. An anterior chamber (aqueous) tap was performed, and the sample was sent to the microbiology laboratory for culture and sensitivity. On direct microscopy, gram-negative bacilli along with a few gram-positive cocci in pairs were observed, with no evidence of pus cells. However, culture of the aqueous sample yielded *Escherichia coli* as the causative organism.

Conclusion Post traumatic ocular infections caused by gram negative bacilli is associated with rapid disease progression and poor visual outcomes. This case highlights the importance of early microbiological diagnosis and prompt institution of broad-spectrum antimicrobial therapy in post-traumatic ocular infection.

INTRODUCTION

Intra-orbital and periorbital foreign bodies are objects lodged within or around the eye, most often resulting from direct trauma such as occupational accidents, metallic fragments, or wooden splinters (1). These injuries account for nearly one-sixth of orbital trauma cases, with penetrating injuries showing a prevalence of 4–16% and posing a significant risk of rapid vision-threatening complications (2). Penetrating ocular injuries are true ophthalmologic emergencies, as delayed management may result in irreversible visual loss or complete destruction of the globe (3). Microorganisms may enter the wound from periocular flora, delayed closure, or contaminated foreign objects, increasing the risk of severe infection (4). Globally, approximately 203,000 open globe injuries occur each year, and recent estimates suggest that

Take Home Massage

Penetrating ocular trauma is a true ophthalmic emergency that requires immediate surgical management and microbiological evaluation. Although uncommon, Escherichia coli can cause severe post-traumatic ocular infection through environmental contamination. Early culture-guided antimicrobial therapy, prompt intervention, and strict patient follow-up are essential to preserve vision and improve outcomes

2–2.5 million individuals sustained mechanical eye injuries in 2023, with nearly 22% leading to hospitalization and substantiavision impairment (5). Falls are the predominant cause among the elderly, whereas workplace and traffic-related incidents are more common in younger populations (6).Clinical features typically include reduced vision, diplopia, photophobia, floaters, discharge , and foreign body sensation. The composition of the retained object influences clinical behaviour: inert materials such as steel and glass may provoke minimal inflammation, whereas organic foreign bodies require urgent removal due to their high risk of secondary infection (7).Bacteria account for 80–90% of post-traumatic ocular infections, predominantly gram-positive cocci such as *Staphylococcus epidermidis*, *Staphylococcus aureus*, and *Streptococcus* species, while gram-negative organisms including *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Enterobacter* species are also important pathogens (8).Early recognition, timely intervention, and appropriate antimicrobial therapy are critical to preventing vision-threatening outcomes in patients with orbital foreign body injuries.

CASE REPORT

A 40-year-old male presented to the casualty department with a penetrating injury to the right eye caused by an accidental wire injury at his workplace. The patient reported sudden loss of vision in the affected eye accompanied by pain and redness. On examination, visual acuity was perception of light positive (PL+) with inaccurate projection of rays (PR defective). Corneal haziness with signs of ocular inflammation was noted, and intraocular pressure (IOP) was recorded as 0 mmHg. Seidel's test was not formally performed; however, no obvious aqueous leak was detected clinically. The patient had been in good health prior to the incident, with no past history of ocular trauma or surgery and no evidence of immunocompromised status.

Immediate management was initiated upon presentation to prevent vision-threatening complications. Emergency care included primary repair of the corneal wound under aseptic precautions. An anterior chamber (aqueous) tap was performed for microbiological evaluation, and the sample was sent to the microbiology laboratory for Gram stain, bacterial, and fungal culture.

Gram stain of the aqueous humour revealed no pus cells; however, gram-negative bacilli along with a few gram-positive cocci in pairs were observed. On culture, only gram-negative bacilli were isolated and identified as *Escherichia coli*, demonstrating a favourable antimicrobial susceptibility pattern. Fungal culture showed no growth.

In view of suspected post-traumatic endophthalmitis, intracameral and intravitreal antibiotics were administered to provide broad-spectrum antimicrobial coverage. The patient was also initiated on systemic antibiotic therapy with intravenous ceftriaxone and amikacin. This combined approach resulted in marked clinical improvement by the third day of hospitalization. However, despite the favourable response to treatment, the patient opted for discharge against medical advice (DAMA), and subsequent follow-up could not be obtained

DISCUSSION

Ocular trauma is broadly classified into blunt and penetrating injuries, with the latter involving the entry of a foreign object into the ocular tissues. Early differentiation is essential, as penetrating injuries are associated with more severe complications, including post-traumatic endophthalmitis, a potentially sight-threatening intraocular infection.Ocular trauma constitutes a significant cause of visual morbidity in the Marathwada region of Maharashtra, particularly among young adult males engaged in outdoor and occupational activities. The higher prevalence in males is largely attributed to increased exposure to agricultural and manual work. In this region, trauma is a major predisposing factor for infectious keratitis, especially fungal infections, highlighting the strong association between ocular injury and subsequent infection. These findings emphasize the critical role of environmental exposure in the development of post-traumatic ocular infections (9).

Although gram-positive organisms, particularly *Staphylococcus epidermidis* and *Bacillus* species, remain the predominant causative agents in post-traumatic endophthalmitis, there is a growing concern regarding gram-negative bacteria. A multicentre study from northern Spain has reported the emergence of multidrug-resistant gram-negative organisms in such cases, underscoring the need for region-specific empirical antimicrobial therapy (10).

The isolation of *Escherichia coli* in the present case is noteworthy, considering its uncommon involvement in exogenous ocular infections. Nevertheless, recent literature has increasingly recognized *E. coli* as a causative agent in endogenous endophthalmitis, frequently associated with systemic infections such as urinary tract infections and pyelonephritis. For example, Braga et al. reported a case of *E. coli* endophthalmitis linked to recurrent urinary tract infections in an immunocompromised patient (11). Likewise, Talwar et al. described a similar presentation in a diabetic patient, where *E. coli* endophthalmitis developed secondary to pyelonephritis (12).

The most probable source of infection in this case is environmental contamination following the metallic wire injury sustained at the workplace, with likely exposure to dust, soil, or organic matter harbouring the organism. Additionally, secondary inoculation may have occurred through rubbing of the eye with contaminated hands or by washing the eye with contaminated water after the trauma. Such exogenous infections are well recognized following penetrating ocular injuries, where microorganisms may be directly introduced by the offending object or from the surrounding environment, particularly in cases involving contaminated foreign bodies and rural or occupational settings. (13)

In the present case, direct microscopic examination revealed the presence of a few gram-positive cocciarranged in pairs along with gram negative bacilli, whereas culture yielded only *Escherichia coli*. This discrepancy may be attributed to contamination with anaerobic organisms at the time of injury or the presence of non-viable organisms that were identifiable on microscopy but failed to grow in culture. As culture remains the gold standard for microbiological diagnosis, *Escherichia coli* was considered the definitive etiological agent.

Management of post-traumatic endophthalmitis necessitates prompt microbiological evaluation and initiation of empirical therapy. Intravitreal antibiotics, particularly vancomycin for gram-positive coverage and ceftazidime or amikacin for gram-negative coverage, remain the cornerstone of treatment. Systemic antibiotics may be added based on the severity of the infection. Recent guidelines suggest that in cases where immediate vitrectomy is not feasible, a vitreous tap followed by intravitreal antibiotic injection is a prudent approach. (14) Compared to previously reported cases, *Escherichia coli* endophthalmitis is typically rare, endogenous in origin, and seen in immunocompromised patients, often with a rapid course and poor prognosis requiring evisceration. (15), (16) In contrast, our case was an exogenous, post-traumatic infection in a healthy individual following a metallic wire injury, suggesting direct inoculation.

In our case, the patient received intracameral and intravenous ceftriaxone and amikacin, leading to clinical improvement. This aligns with current recommendations for managing gram-negative bacterial endophthalmitis. However, the patient's subsequent transfer to a higher centre limited our ability to monitor long-term outcomes, highlighting challenges in ensuring continuity of care in resource-limited settings.

This case underscores the importance of considering atypical pathogens like *E. coli* in post-traumatic ocular infections. Early identification through microbiological analysis and prompt, appropriate antimicrobial therapy is

vital for preserving vision and preventing severe outcomes.

CONCLUSION

This case emphasizes that penetrating ocular trauma requires urgent evaluation and prompt treatment to prevent vision-threatening complications. The isolation of Escherichia coli, an uncommon cause of exogenous endophthalmitis, highlights the importance of early microbiological investigation and culture-guided antimicrobial noticeable improvement; however, discharge against medical advice may compromise long-term outcomes. Overall, timely diagnosis, appropriate antibiotics, and patient compliance are essential for achieving favourable visual prognosis in post-traumatic ocular infections.

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