



Open globe ocular trauma with penetrating corneal wound and intraocular foreign body. Case report from Bolivia.

Trauma ocular a globo abierto, con herida corneal penetrante y con cuerpo extraño intraocular. Reporte de caso en Bolivia.

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ABSTRACT

Introduction: Open globe trauma with an intraocular foreign body constitutes an ophthalmological emergency that irreversibly threatens vision. Its prognosis depends on the location of the injury, the structures involved, and the speed of treatment. **Case report:** A 34-year-old male patient, with no relevant medical history, presented with right ocular trauma from a metallic foreign body, eight hours prior, with intense pain, tearing, and sudden vision loss. Biomicroscopy revealed a 4 mm penetrating corneal wound, a positive Seidel sign, a narrowed anterior chamber, an intralenticular foreign body, and a traumatic cataract. Ultrasound ruled out retinal and vitreous detachment. Corneal repair, extraction via a scleral tunnel, and aspiration of the lens nucleus were performed; intraocular lens implantation was deferred. **Discussion:** The corneal location of the wound and the anterior position of the foreign body define a favorable prognostic stratum. Its proximity to the endothelium determined the extraction route and the postponement of aphakic correction. **Conclusions:** In cases of penetrating ocular trauma, preserving vision depends not only on acting quickly but also on correctly deciding what needs to be addressed first. The presence of a metallic foreign body, a corneal wound, and a traumatic cataract necessitates simultaneous consideration of the integrity of the eyeball. The decision not to immediately implant an intraocular lens in a recently injured eye may represent a prudent reconstructive strategy. In occupational cases, workplace eye protection is identified as the most effective intervention.

Keywords: Ocular trauma; open globe; intraocular foreign body; traumatic cataract; lensectomy.

RESUMEN

Introducción: El trauma a globo abierto con cuerpo extraño intraocular constituye una urgencia oftalmológica que amenaza la visión de forma irreversible. Su pronóstico depende de la localización de la lesión, estructuras comprometidas y rapidez del tratamiento. **Caso clínico:** Paciente masculino de 34 años, sin antecedentes relevantes, presentó traumatismo ocular derecho por cuerpo extraño metálico, con ocho horas de evolución, dolor intenso, lagrimeo y pérdida brusca de la agudeza visual. La biomicroscopía evidenció herida corneal penetrante de 4 mm, Seidel positivo, cámara anterior estrecha, cuerpo extraño intralenticular y catarata traumática. La ecografía descartó desprendimiento de retina y vítreo. Se realizó reparación corneal, extracción mediante túnel escleral y aspiración del núcleo cristalino, difiriéndose el implante de lente intraocular. **Discusión:** La localización corneal de la herida y la posición anterior del cuerpo extraño definen un estrato pronóstico favorable. La contigüidad con el endotelio condicionó la vía de extracción y el aplazamiento de la corrección afáquica. **Conclusiones:** Frente a un trauma ocular penetrante, preservar la visión no depende únicamente de actuar con rapidez, sino de decidir correctamente qué debe resolverse primero. La presencia de un cuerpo extraño metálico, una herida corneal y una catarata traumática obliga a considerar simultáneamente la integridad del globo ocular. La decisión de no implantar inmediatamente una lente intraocular, en un ojo recientemente lesionado puede representar una estrategia reconstructiva prudente. El origen ocupacional identifica la protección ocular laboral como la intervención más eficiente.

Palabras clave: Traumatismo ocular; globo abierto; cuerpo extraño intraocular; catarata traumática; lensectomía.

INTRODUCTION

Birmingham terminology for ocular trauma defines an open balloon injury as any full-thickness wound of the eyewall, and separates the rupture, produced by a blunt object, from the laceration, generated by a sharp object. Within lacerations, the retention of an intraocular foreign body is a category of its own: there is an entry wound, not an exit wound, and the projectile remains inside the balloon (1). This distinction is not merely nosological. The type of injury, the visual acuity of presentation, and the location of the wound predict functional outcome with greater consistency than any other preoperative variable (2). Intraocular foreign bodies disproportionately affect young males of productive age. Metal-on-metal hammering, grinding, and the use of percussion tools release fragments of reduced mass and high velocity, capable of passing through the cornea without producing obvious periorbital lesions or pain commensurate with the damage (3). A study conducted in southwestern China on 1055 patients with eye trauma attributed 42.9% of the injuries to work activity, identified metal as the most frequent causative agent, and found that workers without prior training or eye protection suffered these injuries much more frequently than those with both (4). The prognosis depends on variables that interact with each other and are not evenly distributed. Series with prolonged follow-up place posterior projectile location, retinal detachment, and vitreous hemorrhage among the factors associated with poorer final visual acuity (5,6). When the fragment stops in the anterior segment and the lesion is limited to the cornea, the proportion of eyes that recover useful vision increases appreciably (7,8). Endophthalmitis modifies this panorama regardless of the initial topography, which is why early wound closure occupies a central place in management (2).

Bolivia lacks systematic records of occupational ocular trauma, and emergency computed tomography is not uniformly available outside reference centers. We describe the surgical management of an open-globe trauma with a penetrating corneal wound and an intralenticular metallic foreign body, with particular attention to the decisions adopted regarding the proximity between the projectile and the corneal endothelium.

CASE REPORT

A 34-year-old male patient with no relevant personal medical history presented to the ophthalmology clinic 8 hours after a work-related accident. He reported the impact of a metallic foreign body on the right eye, followed by severe ocular pain, tearing, and sudden vision loss. Uncorrected visual acuity was light perception with color projection in the right eye and 20/60 in the left eye. Ocular motility was preserved in both eyes. Biomicroscopy of the right eye revealed marked cilioconjunctival hyperemia and a penetrating corneal wound of approximately 4 mm in the pupillary area, with a positive Seidel sign and a shallow anterior chamber. In the pupillary area, a metallic foreign body was identified lodged in the lens, accompanied by total lens opacity (Figure 1A-B). The anterior and posterior segments of the left eye appeared normal.

Given the total opacity of the lens, which prevented assessment of the fundus, a B-mode ocular ultrasound of the right eye was performed. The ultrasound revealed an eye globe with preserved morphology. The vitreous cavity was predominantly anechoic, without mobile echoes or images compatible with vitreous hemorrhage. No echogenic membranes with insertion into the optic nerve or echographic signs of retinal detachment were identified. No focal hyperechogenic images with posterior acoustic shadow suggestive of an intraocular foreign body were observed. The retina was applied in the explored sectors.

The patient was transferred to the operating room for emergency surgical intervention. Microscopic examination confirmed the penetrating corneal wound and the presence of the metallic fragment, approximately 4 mm, in the pupillary area. The attempt to extract it through the wound itself was unsuccessful due to the size of the foreign body, so the corneal wound was repaired with interrupted 10-0 nylon sutures. Extraction was completed through a scleral tunnel constructed between the 11 and 1 o'clock positions, and the lens nucleus was aspirated (Figure 3). Intraocular lens implantation was deferred to a second surgical stage. This decision was based on uncertainty regarding the state of the corneal endothelium, which had remained in contact with the metallic fragment—a situation that could lead to endothelial decompensation and bullous keratopathy.

In this patient, the initial priority was to preserve the structural integrity of the eyeball and reduce the consequences of the retained foreign body. The repair of the corneal wound and the removal of the metal fragment were the immediate objectives of the procedure, while optical rehabilitation was planned for a second stage, once the evolution of the cornea and the other intraocular structures had been established.

Figure 1. A. Open-globe ocular trauma with a penetrating corneal wound and intraocular foreign body in the right eye. B. The foreign body extracted through the scleral tunnel is observed.

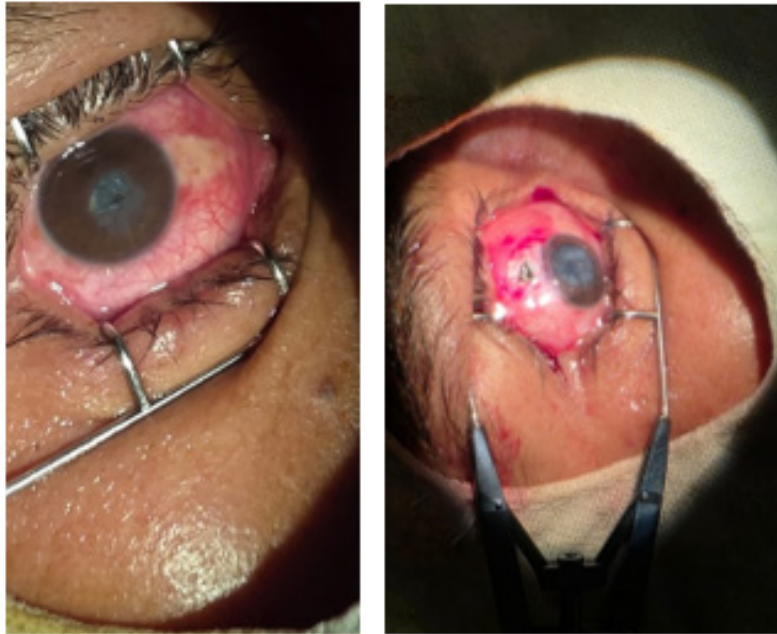


Figure 2. Ocular ultrasound of the right eye. No signs of retinal detachment, vitreous hemorrhage, or the presence of a foreign body in the vitreous cavity are observed.

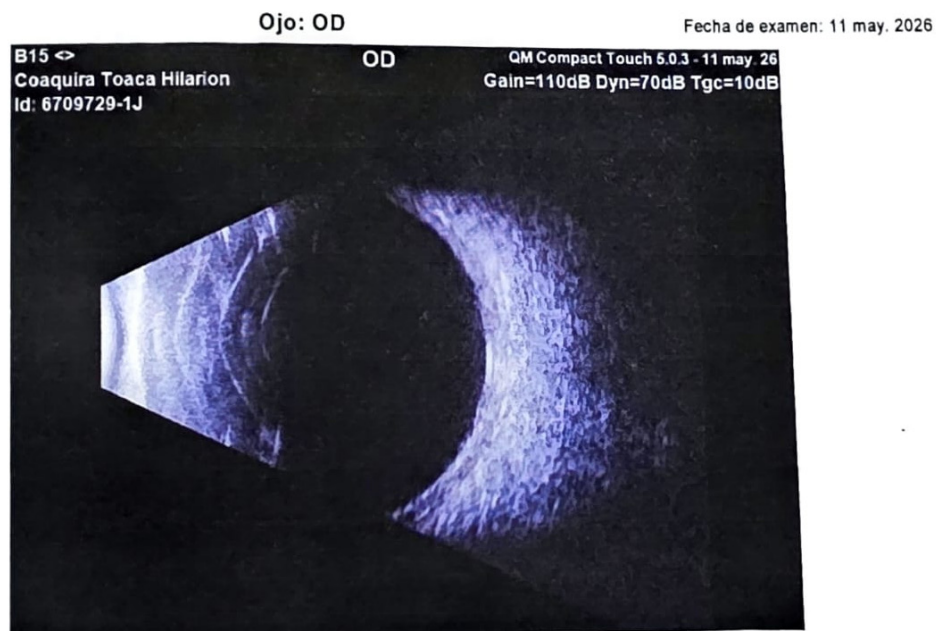
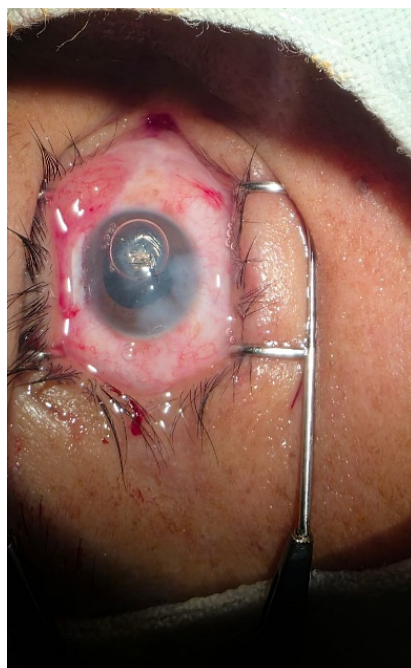


Figure 3. Immediate postoperative appearance of the right eye after removal of the intraocular metallic foreign body and lensectomy. Corneal edema, ciliary and conjunctival hyperemia, and inflammatory changes of the anterior segment are observed.



As an additional treatment, antibiotics, intravitreal vancomycin in intracameral as prophylaxis, and topical gatifloxacin 0.3% associated with dexamethasone 0.1%, 1 drop every 3 hours, in addition, bronfenac 0.09% 1 drop every 8 hours, Difluprednate 0.05% 1 drop every 8 hours, anti-inflammatories and analgesics orally. Intraocular pressure 3 days after the procedure, contact IOP: OD 15 mmHg OI 16 mmHg. Visual acuity without correction: OD 20/400 OI 20/60.

DISCUSSION

Penetrating ocular trauma with retention of an intraocular foreign body constitutes a highly complex ophthalmic emergency, as the initial injury can simultaneously compromise the cornea, anterior chamber, lens, and, in certain cases, the posterior segment. Intraocular foreign bodies frequently occur during occupational activities involving high-speed mechanisms, particularly hammering, cutting, or handling of metallic materials. Their prognosis depends not only on the characteristics of the retained foreign body, but also on the location, wound size, involved structures, initial visual acuity, and the occurrence of secondary complications (14,15). Computed tomography surpasses both clinical examination and ultrasonography in the identification of intraocular foreign bodies and constitutes the reference method when their presence is suspected (9). In our patient, the foreign body was directly visible under slit-lamp examination, so the diagnosis was clinical, and imaging served a complementary role directed at the posterior segment. B-mode ultrasonography was used precisely for that reason, given a lens opacity that prevented ophthalmoscopy. However, its performance before primary closure warrants critical consideration: the pressure of the transducer on an open globe can promote extrusion of intraocular contents, so the examination should be deferred until after repair, unless the information obtained immediately modifies the surgical management (3). The traumatic cataract observed during the examination constitutes a direct consequence of the penetrating mechanism. The foreign body crossed the cornea and reached the lens region, producing total opacification of the lens. Surgical management of cataract secondary to trauma differs from age-related cataract surgery, because alterations of the capsule, loss of zonular support, intraocular inflammation, corneal injury, and involvement of other structures may coexist. In a series of 555 patients with traumatic cataract, Shah et al. identified various factors related to visual recovery, demonstrating that the final outcome depends on the overall extent of the injury and not exclusively on lens extraction (16).

The interval between injury and wound closure influences the infectious risk. Endophthalmitis complicates up to 16.5% of open-globe traumas, and its prevention relies on early repair and antibiotic prophylaxis (2). Retention of a foreign body, disruption of the lenticular capsule, wound contamination, and delay of closure beyond 24 hours consistently increase this risk (10,11). In the present case, the intervention was performed within the first hours after the accident, an interval within the range associated with the lowest incidence of intraocular infection. The extraction route conditioned the remainder of the procedure. Enlarging the corneal wound would have facilitated access to the fragment, but at the cost of greater manipulation in contiguity with the endothelium, irregular astigmatism, and a larger scar over the visual axis. The scleral tunnel between the 11 and 1 o'clock positions allowed removal of the foreign body through an incision away from the pupillary area and preservation of the already sutured corneal architecture. Extracting the foreign body through the area that least compromises structures, rather than necessarily through the entry wound, constitutes a principle included in reviews on the subject and a measure also aimed at limiting secondary damage (3).

The simultaneous presence of a retained foreign body and lens injury increases the risk of infectious complications. Post-traumatic endophthalmitis is among the most serious complications of open-globe trauma and has been associated with factors such as the presence of an intraocular foreign body, lens disruption, and delay in primary wound closure [5]. Consequently, the management of these patients requires consideration of prevention and surveillance strategies for intraocular infection from the time of admission. The available evidence on systemic antibiotic prophylaxis remains heterogeneous; a meta-analysis published in 2023 found low rates of endophthalmitis with both oral and intravenous systemic prophylaxis, without demonstrating a significant difference between the routes, although the studies excluded some higher-risk cases [6]. This evidence supports the need to individualize prophylaxis according to the characteristics of the trauma and institutional protocols.

Deferring the implantation of intraocular lens responded to the uncertainty about the endothelial reserve. A randomized clinical trial compared early traumatic cataract surgery, within the first week, with late, between the first and second month, and did not find differences in final visual acuity nor in intraoperative or postoperative complications (12). The absence of superiority of one or another strategy moves the decision to the field of clinical judgment. When corneal transparency is uncertain or biometry is not very reliable due to irregularity of the surface, the wait provides information that haste does not allow to obtain: the eye quiets, the inflammation subsides and the calculation of the power gains precision after the removal of the sutures. In pediatric population, the comparison between primary and secondary implantation after open globe trauma showed comparable visual and refractive results, and reserved the primary implantation for small and peripheral corneal lacerations (13), a condition that this patient did not meet.

The prolonged retention of an intraocular ferrous fragment triggers siderosis bulbi, characterized by iron deposition in the retinal pigment epithelium, the lens, and the dilator muscle of the iris, as well as progressive visual deterioration. Removal of the foreign body during the same surgical procedure suppresses this pathway of damage and justifies the adopted management, despite the technical difficulty encountered (3).

The mechanism of the accident points to a preventable problem. The lack of eye protection and prior training concentrates the risk among manufacturing and metalworking workers (4). In settings where access to computed tomography and vitreoretinal surgery is unequal, primary prevention and early referral have a greater impact on the outcome than any subsequent technical refinement. The clinical case presents limitations that should be explicitly stated. Computed tomography was not available to rule out additional fragments, specular microscopy and preoperative endothelial cell count were not performed, and the described observation period is not long enough to evaluate medium-term corneal transparency or the functional outcome of the secondary implant. The experience gained from this case also indicates that the treatment of severe ocular trauma should not be reduced to the removal of the foreign body. The injury represents a sequence of events in which the initial impact can trigger structural damage, inflammation, infection, and subsequent functional alterations. Surgical intervention must, therefore, seek a balance between resolving the immediate lesion and avoiding further damage resulting from therapeutic maneuvers. The selection of the extraction route, the manipulation of the lens, corneal repair, and the decision on the timing of the lens implant are all part of the same reconstructive strategy.

This case also demonstrates the value of a staged approach. The first surgery was aimed at managing the anatomical emergency; the second stage, if necessary, may be directed toward optical rehabilitation when the conditions of the anterior segment are more predictable. This separation between stabilization and reconstruction does not imply unnecessarily delaying treatment,

but rather adapting each intervention to the biological state of the traumatized eye. Importantly, in these circumstances, individualized surgical planning, team experience, foreign body location, extent of damage, and intraoperative anatomical restoration do not solely involve removing a foreign body; they also involve limiting secondary damage and preserving the possibility of future functional recovery.

CONCLUSIONS

This case demonstrates that, in the context of penetrating ocular trauma, preserving vision depends not only on prompt action but also on correct prioritization. The presence of a metallic foreign body, a corneal wound, and a traumatic cataract requires simultaneous consideration of globe integrity, infectious risk, corneal viability, and future visual rehabilitation. The decision to defer intraocular lens implantation may appear, from an exclusively refractive perspective, to postpone treatment; however, in a recently injured eye, it may represent a prudent reconstructive strategy. The goal of the first intervention is not always to immediately restore visual acuity, but to preserve the anatomical conditions that permit later visual recovery. The occupational origin of the accident identifies the most efficient point of intervention. No surgical technique compensates for the absence of eye protection in the workplace, and systematic reporting of these cases constitutes the minimum input to sustain prevention policies, especially in countries without consolidated occupational ocular trauma registries.

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CONFLICT OF INTEREST

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