

# Open-globe Injury Complicated by Endophthalmitis – a Case Report

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**Abstract:**

**Introduction:** Ocular trauma remains a leading cause of unilateral blindness in the working-age population. Penetrating injuries involving organic material, such as wood, carry an exceptionally high risk of infectious and vitreoretinal complications.

**Case report:** We present the case of a 40-year-old patient with an open-globe injury of the left eye caused by impact from a fragment of a wooden board. Initial examination revealed a full-thickness, extensive corneal wound with iridodialysis and prolapsed iris tissue, ocular hypotony, and hemorrhagic choroidal detachment. During the primary procedure, the corneal wound was repaired, traumatic cataract extraction was deferred, and tetanus prophylaxis and antibiotic therapy were initiated. Due to the rapid development of intumescent cataract and fibrous proliferation, pars plana posterior vitrectomy with cataract removal was performed. The patient’s condition stabilized by the 15th week after injury.

At 18 weeks, sudden deterioration occurred, presenting with hypopyon and reduced visual acuity (5/50); endophthalmitis was diagnosed. During urgent surgical revision, material was collected, from which *Serratia marcescens* – a rare and aggressive pathogen – was cultured. Treatment was initiated according to the antibiogram.

**Conclusions:** The case illustrates the complex course of a severe open-globe injury. It shows that injuries involving organic material carry a risk of late, destructive endophthalmitis. The surgical strategy must prioritize primary globe closure, with prompt decisions regarding secondary procedures to prevent vitreoretinal complications and to preserve the eye from atrophy.

**Key words:**

ocular trauma, endophthalmitis *Serratia marcescens*, pars plana vitrectomy (PPV), posttraumatic cataract, proliferative vitreoretinopathy (PVR), corneal laceration.

**Introduction**

Ocular injuries represent a significant public health concern and are one of the leading causes of unilateral blindness in the young population. Despite considerable advances in diagnostic and therapeutic techniques, the incidence of severe post-traumatic ocular damage remains high, particularly in low- and middle-income regions.

The main etiological factors of ocular trauma include:

- work-related accidents, especially in high-risk sectors such as agriculture and mining,
- sports injuries,
- injuries occurring in the home environment,
- interpersonal violence [1].

The introduction and enforcement of legal regulations, such as mandatory seatbelt use in motor vehicles and restrictions on pyrotechnic materials, have contributed to a reduction in the number of severe injuries. Epidemiological patterns of ocular trauma vary according to the level of economic development:

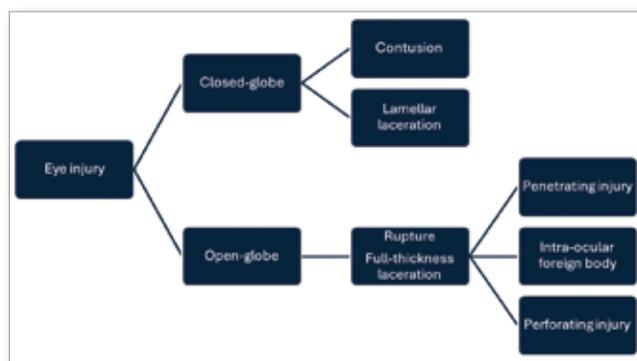
- in developed countries, mechanical and chemical injuries predominate;
- in developing countries, injuries related to agricultural activities and inadequate use of personal protective equipment are more common [2].

According to the recognized Birmingham Eye Trauma Terminology (BETT) system, ocular injuries are classified as closed

globe (contusion, lamellar laceration) and open globe (rupture or laceration) [3] (Fig. 1).

In the context of prevention, wearing certified protective eye-wear during occupational or recreational activities with elevated risk is considered the most effective measure [4, 5].

Early recognition, followed by appropriate diagnostic and therapeutic management, is crucial for preserving visual function. Given the considerable heterogeneity of clinical presentation and the risk of potentially permanent sequelae (including irreversible



**Fig. 1.** Classification of ocular injuries based on the Birmingham Eye Trauma Terminology (BETT).



vision loss), knowledge of injury pathomechanisms, classification standards, and current evidence-based treatment methods forms the foundation of effective ophthalmic care.

### Case report

A 40-year-old male patient presented to the Emergency Department of the Kornel Gibiński University Clinical Center, Medical University of Silesia in Katowice, with acute trauma to the left eye. The injury occurred during gardening work, when a wooden terrace board splintered and a fragment (approximately 2 cm in diameter) struck the patient's eyeball directly. The patient reported severe pain, rated 7/10 on the NRS scale, and a subjective sensation of moist content leaking from the injured globe. His medical history was unremarkable, with no chronic illnesses or regular medication use. Additionally, the patient reported lifelong amblyopia in the left eye, with pre-injury visual acuity of approximately 5/12.

Physical examination of the left eye revealed marked reduction of visual acuity, limited to hand-motion perception, accompanied by ocular hypotony. Slit-lamp evaluation showed features of a severe open-globe injury, including bulbar conjunctival injection, subconjunctival hemorrhage, and blood in the conjunctival sac. The key finding was a full-thickness, paracentral corneal laceration extending over a wide arc (from 11:00 to 4:00), with significant corneal tissue loss, accompanied by extensive iridodialysis (iris detachment from the limbus) in the sector from 10:30 to 2:00, and prolapse of an iris fragment through the corneal wound. The anterior chamber contained dispersed blood, preventing detailed visualization of deeper intraocular structures. Because of confirmed corneal perforation and the risk of further clinical deterioration, ultrasonography was deferred. Examination of the right eye revealed no pathology, with full visual acuity (5/5) and normal intraocular pressure (IOP = 15 mmHg).

In the Emergency Department, the patient received tetanus toxoid. Also, a soft bandage contact lens was applied to temporarily stabilize the corneal wound. Non-contrast computed tomography of the head and orbits revealed hyperdense intraocular areas, predominantly medially, suggesting retinal or choroidal detachment. In addition, a slight displacement of the natural lens was noted. The patient was admitted to the Department of Ophthalmology on an emergency basis.

On ultrasonographic examination performed at admission, a hemorrhagic choroidal detachment was visualized, with no evidence of scleral rupture. The patient was promptly scheduled for surgical management of the traumatic lesions. Prior to the procedure, the patient was informed of the unfavorable prognosis, as well as the nature of the intervention aimed at preserving the anatomical integrity of the globe. During the surgery, necrotic fragments of the prolapsed iris were excised, and the remaining portion of the iris was repositioned into the interior of the eye. The full-thickness corneal wound, extending in a wavy course from 11:00 to 3:00, was repaired using multiple interrupted 10-0 non-absorbable sutures. The anterior chamber was irrigated with a vancomycin solution. Due to the extent of the injury, iris repair and removal of the subluxated lens with post-traumatic cataract were deferred. The procedure was completed with placement of a bandage contact lens and a sterile dressing. Immediately after surgery, wound integrity was achieved and intraocular pressure stabilized at approximately 14 mmHg.

During subsequent days of hospitalization, a rapidly developing intumescent cataract was observed. Given the freshly sutured corneal wound and the need for its healing, further surgical intervention was postponed. Follow-up ultrasonographic examinations of the posterior segment revealed the development of linear fibrous proliferations extending to the posterior pole of the globe,

locally exerting traction on the retina. The finding was consistent with proliferative vitreoretinopathy. On the eighth day after the injury, due to the deteriorating condition and the risk of permanent retinal detachment, a decision was made to perform secondary surgical intervention, and a pars plana posterior vitrectomy was carried out. During this procedure, the intumescent post-traumatic cataract was removed, leaving the eye aphakic.

Because the patient continued to experience discomfort from the corneal sutures, a bandage contact lens was reapplied after the procedure. Throughout the period of hospitalization, pharmacological treatment was implemented, including topical therapy with eye drops: moxifloxacin (Vigamox, Novartis Poland, Switzerland), amikacin (Biodacyna Ophthalmicum, Polfa Warsaw, Poland), voriconazole (compounded ophthalmic drops), dexamethasone (Dexamethason WZF, Polfa Warsaw, Poland), atropine (Atropin Vision, Unimed Pharma, Slovakia), chlorhexidine (Ocusept, PharmaSwiss, Switzerland); and systemic therapy: cefuroxime (Biofuroxym, Bioton, Poland), metronidazole (Metronidazol Polpharma 0.5%, Polpharma, Poland), etamsylate (Cyclonamine, Sanofi, France), and methylprednisolone (Meprelon, Pfizer, Germany). On the 10<sup>th</sup> day after the injury, the patient was discharged in locally stable condition, with recommendations for strict and regular ophthalmic follow-up.

The patient remained under close outpatient supervision, with follow-up examinations at the ophthalmology clinic conducted at 3, 7, 9, and 15 weeks after the injury. Clinical observations demonstrated a gradual reduction of corneal edema, allowing full visualization of the posterior segments of the eye. Follow-up ultrasonography confirmed retinal apposition. Ultimately, visual acuity in the left eye, corrected with a +12.00 Dsph spherical lens, stabilized at 5/16.

At 18 weeks after the primary injury, the patient presented again to the Emergency Department due to sudden deterioration of vision, redness of the left eye, and purulent discharge in the conjunctival sac. Ophthalmic examination confirmed an exacerbation of inflammation, with visual acuity reduced to 5/50 and intraocular pressure of 16 mmHg. Slit-lamp examination revealed bulbar conjunctival hyperemia, purulent discharge in the conjunctival sac, and persistent corneal and limbal sutures, around which numerous infiltrates and haze were visible. The anterior chamber contained remnants of cortical material and a hypopyon in the inferior part. Iris detachment from the limbus was visible circumferentially (from 9:00 to 3:00), along with aphakia. Fundus view was limited, although the outlines of the optic disc remained visible. Ultrasonographic examination of the left eye demonstrated numerous scattered echoes within the vitreous body, interpreted as inflammatory exudate, confirming the diagnosis of endophthalmitis; the retina remained attached.

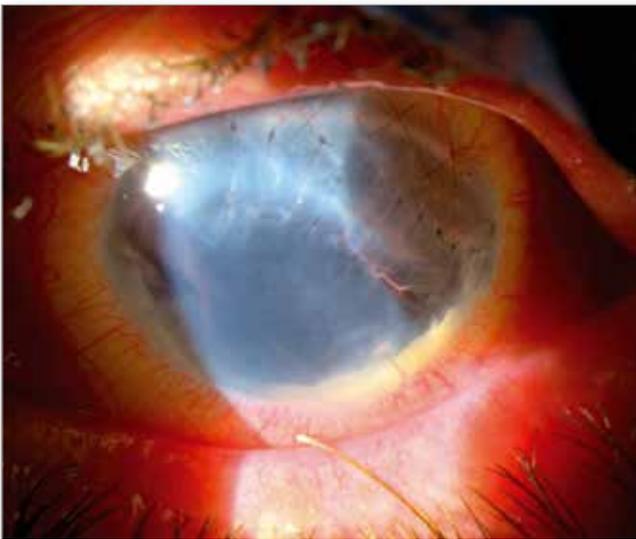
The patient was readmitted to the Ophthalmology Department with a diagnosis of endophthalmitis. As part of urgent management, anterior chamber irrigation was performed with sampling material for microbiological culture. An exploratory posterior pars plana vitrectomy was carried out. During the procedure, silicone oil and vancomycin were administered into the vitreous chamber. Due to corneal malacia, removal and reapplication of corneal sutures was necessary. Cultures obtained from the conjunctival sac as well as intraoperative samples from the vitreous cavity and corneal sutures yielded *Serratia marcescens*. Pathogen identification enabled targeted treatment according to the antibiogram.

Topical treatment included broad-spectrum antibiotics: moxifloxacin (Vigamox, Novartis Poland, Switzerland), amikacin (Biodacyna Ophthalmicum, Polfa Warsaw, Poland), and antifungal agents: fluconazole (compounded ophthalmic drops), voriconazole (compounded ophthalmic drops), combined with steroids (Dexamethason WZF, Polfa Warsaw, Poland). Additionally, atro-

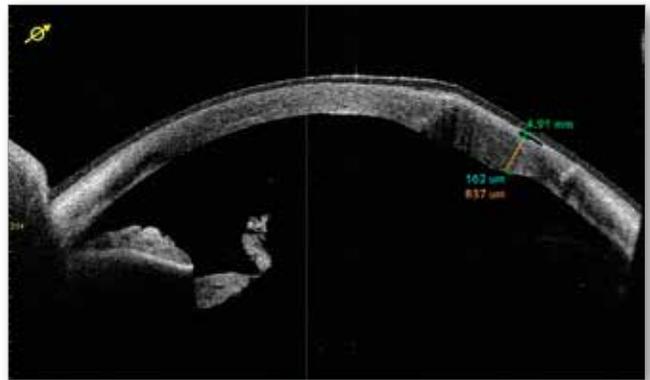
pine (Atropin Vision, Unimed Pharma, Slovakia), chlorhexidine (Ocusept, PharmaSwiss, Switzerland), and brinzolamide (Azopt, Alcon, Switzerland) were administered. Systemic treatment was based on ceftriaxone (Ceftriaxon Kabi, Fresenius Kabi, Germany), metronidazole (Metronidazol Polpharma 0.5%, Polpharma, Poland), voriconazole (Vfend, Pfizer, USA), and dexamethasone (Dexaven, Krka, Slovenia). The patient remains under close follow-up at the ophthalmology outpatient clinic. At the next stage of treatment, once local stabilization was achieved and active inflammation excluded, silicone oil removal was planned via pars plana posterior vitrectomy (Figs. 2–5).



**Fig. 2.** Photograph of the anterior segment of the left eye – status post primary surgical repair – conjunctiva with mild injection, soft bandage contact lens in place, limbal suture intact, interrupted corneal sutures paracentrally from 11:00 to 2:00, wound sealed, anterior chamber preserved, small fragment of cortical material present, iris detachment from the limbus superiorly between 9:00 and 3:00, absence of the natural lens.



**Fig. 3.** Photograph of the anterior segment of the left eye, 19 weeks after the injury, status post PPV of the left eye – conjunctiva with mixed injection, soft bandage contact lens in place, limbal suture intact, corneal oedema, interrupted corneal sutures paracentrally from 11:00 to 2:00, wound sealed, anterior chamber preserved, small fragment of cortical material present, iris detachment from the limbus superiorly between 9:00 and 3:00, aphakia.



**Fig. 4.** Optical coherence tomography of anterior segment of the eye – bandage contact lens visible on the ocular surfaces, status post repair of a full-thickness corneal wound, absence of iris in the temporal region, post-traumatically folded iris in the nasal region, aphakia.



**Fig. 5.** Ultrasongraphy of the posterior segment of the eye – the vitreous chamber is filled with hyperechogenic structures representing exudate.

## Discussion

The clinical case described concerns an open-globe injury in a patient with pre-existing amblyopia, further complicated by late endophthalmitis of aggressive etiology.

The injury, caused by a fragment of wood, represents a high-risk infectious trauma due to the organic and contaminated nature of the material, necessitating antibiotic prophylaxis. Extensive corneal laceration, iris prolapse, and hemorrhagic choroidal detachment confirmed on ultrasound indicate high-energy impact and a poor initial prognosis.

The fact that the injury involved the amblyopic eye meant that, although the prognosis was unfavorable, it did not carry the risk of losing the patient's primary organ of vision, as the right eye remained healthy. However, the development of complications, including fibrous proliferations within the vitreous body and an intumescent cataract, required urgent vitrectomy. The intervention was crucial to prevent permanent retinal detachment.

The most serious complication was an episode of late endophthalmitis, with *Serratia marcescens* identified as the causative agent. *Serratia marcescens* is an opportunistic, Gram-negative bacterium commonly associated with nosocomial infections. Although its occurrence in endophthalmitis is rare, it carries an exceptionally poor prognosis – including potential loss of vision or even the eye – due to rapid ocular tissue destruction (high protease production). Urgent surgical revision, comprising chamber irrigation, exploratory vitrectomy, and silicone oil tamponade with intravitreal antibiotic injection, was the standard and indispensable step aimed at salvaging the globe.

The bacterium *Serratia marcescens* is a pathogen that causes infectious keratitis, conjunctivitis, and infections of the lacrimal system and orbit. Endophthalmitis caused by *Serratia marcescens*

was first described in 1971. It occurs in both exogenous (post-traumatic, postoperative) and endogenous forms (often in patients with comorbidities such as diabetes, leukemia, sepsis, or in those who abuse intravenous drugs). Despite treatment, more than half of affected patients require enucleation or evisceration. A characteristic, though rare, feature is the presence of a pink or dark red-brown hypopyon, which may result from bacterial pigment production or iris necrosis [6, 7].

## Conclusions

The described case highlights the critical importance of recognizing the etiology of ocular trauma. Penetrating globe injuries caused by wood or other organic materials carry a high risk of infection and late-onset endophthalmitis, even with intensive antibiotic prophylaxis [8]. Infection with *Serratia marcescens* is a rare complication associated with a poor prognosis, which justifies early aggressive surgical management and targeted intravitreal and systemic antibiotic therapy [7].

Severe open-globe injuries frequently lead to posterior segment complications, such as choroidal detachment, retinal detachment, and the development of proliferative vitreoretinopathy. Rapid recognition of retinal traction and urgent secondary vitrectomy are crucial for preserving retinal integrity and achieving long-term reattachment, even if the functional prognosis (visual acuity) remains limited [8].

In cases of extensive open-globe trauma with multiple anterior and posterior segment injuries (e.g. corneal laceration, iridodialysis, or cataract), the priority is primary wound closure and restoration of globe integrity. Reconstructive anterior segment procedures (iris repair, cataract extraction, secondary implantation) often need to be deferred until stabilization to minimize the risk

of infection and further complications, although this may necessitate subsequent multi-stage surgeries.

## Disclosure

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