



CASE REPORT

Open Globe Injury with Corneal Laceration Full-Thickness, Anterior Lens Capsule Rupture, and Traumatic Cataract

Authors:

Rahadi Akbar*^{ORCID}
Budy Surakhman^{ORCID}
Damaryati Widyastuti^{ORCID}

Affiliations:

Rumah Sakit Mata Masyarakat,
Surabaya, East Java, Indonesia.

Corresponding author:

Rahadi Akbar
rahadiakbarnumber1@
gmail.com

Dates:

Received: 21 February 2023
Revised: 21 May 2023
Accepted: 11 July 2023
Published: 07 August 2023

DOI:

<https://doi.org/10.20473/vsehj.v2i3.2023.80-84>

Copyright:

© 2023 Author(s). Open access under Creative Commons Attribution-Share Alike 4.0 International Licence (CC-BY-SA).

**Abstract**

Introduction: Ocular trauma is a common, preventable cause of visual impairment. Mechanical eye injuries affect the eye in many ways ranging from mild to severe morbidity. In this case, we inform the sequence of what we found in this ocular trauma and how we treat this case. **Case Presentation:** A 26-year-old male patient presented with pain and stiffness in the right eye. The patient was involved in an accident 16 hours before being admitted to the emergency room. Previously, the patient had been taken to a secondary hospital. No medications were given. The patient was referred directly to a tertiary hospital for further management. The visual acuity of the right eye and left eye were 1/300 and 6/6. Soft palpation indicated decreased intraocular pressure (IOP) on the right eye. Slit lamp examination found conjunctival hyperemia, full-thickness corneal laceration, irregular iris, posterior synechiae, declining pupil reflex, and hazy lens. Fundus reflex declined. The right eyeball exploration showed a membrane at the camera oculi anterior and a suspected hazy lens with mass and capsule of the lens. Doubtful prognosis on the right eyeball. **Conclusions:** The outcome of ocular trauma might be debatable and vary in any condition. Proper management can avoid unprecedented complications and improve patient visual results. A good perspective will also make satisfied both the patient and the physician.

Keywords: open globe injury; corneal laceration; traumatic cataract

Introduction

Ocular trauma is a general case that is curable of visual impairment. From the first to third country, eye injury causes deformity in the community.^[1] The treatment of eye injuries is both complicated and various.^[1] Mechanical eye injuries may afflict the eye from mild to severe morbidity. The effect of blindness is related to a disturbance in quality of life and the inability to be productive in person.^[2] Full-thickness eye wall laceration is caused by a sharp object or fast-moving projectile which cuts the cornea, sclera, or both completely. The presumptive object is often not found at the site but is taken or lost before examination.^[3]

The laceration may be from penetration, perforation, or intraocular foreign body (IOFB).^[4] Compression in the eyeball with anteroposterior, horizontal, coup, and countercoup may cause blunt eye trauma.^[4] The mechanism of injury may blow directly or accidentally blunt trauma. The traumatic lesions of blunt eye trauma are classified as closed globe injury, globe rupture, and extraocular lesions. This injury may affect all eyeball structures.^[5] The diagnosis mainly accounts for clinical rather than laboratory and imaginary. Laboratory investigations are required in critical patients and patients with surgical intervention.^[5]

Case presentation

A 26-year-old male patient came to the emergency room complaining of pain and right eye stiffness 16 hours ago. The patient was referred from the outpatient clinic with a right eye full-thickness corneal laceration and vitreous trapped diagnosis. Prior to being referred, the patient had not been given any medication.

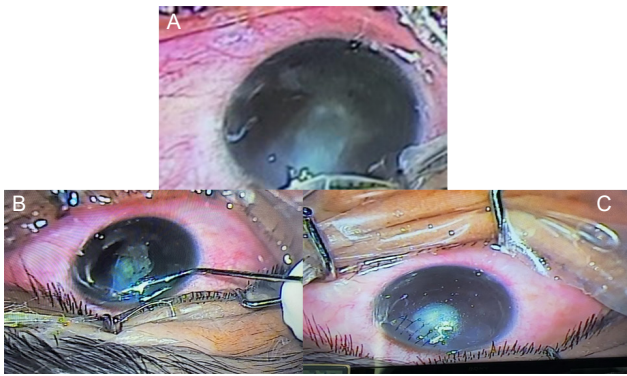


Figure 1. (A) Right eye anterior segment pre-operation examination; (B) right eye debridement; and (C) Right eye corneal suturing.

Before the incident, the patient was hit by a nail when nailing a fan to the wall. The vision immediately blurred and felt increasingly blurry. The patient also complained of pain in the right eye, glare, and chatter. The patient had no history of previous hospitalization or surgery. There was no history of systemic disease.

The general condition is moderately ill, and vital sign is stable. The left eye visual acuity is 6/6, and the right eye visual acuity is 1/300. The intraocular pressure in the left eye is within normal limits, and the right eye is decreased to 7.9 mmHg. The examination of the anterior segment of the right eye showed edema palpebra, full-thickness laceration in the cornea, irregular iris, posterior synechiae, and cloudy lens. The posterior segment of the right eye is hard to evaluate. The examination of the anterior segment in the left eye is normal, and the posterior segment is in line.

The patient will explore the right eye, debridement, and corneal suturing under local anesthesia. Then phacoemulsification operation if the condition of the right eye is stable. The education plan is to explain to the patient about the disease, namely open globe injury of the right eye with total thickness corneal laceration, anterior capsule rupture, traumatic cataract, or damage to the right eye caused by blunt force mechanical trauma. The patient needs immediate surgery, namely exploration and debridement of the right eye; after the operation, it is necessary to be hospitalized in the hospital for periodic monitoring and evaluation, always maintain cleanliness and avoid rubbing the eyes to prevent complications of infection and damage, explaining to the patient about

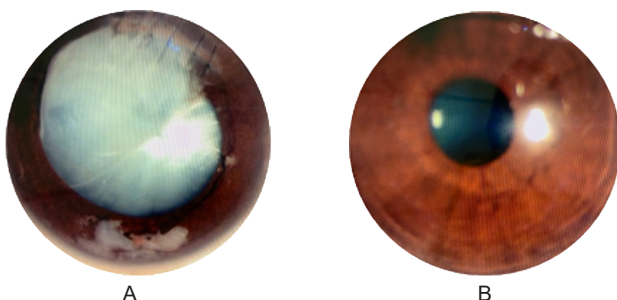


Figure 2. Post-operation examination in outpatient clinic; (A) Right eye and (B) Left eye.

therapy and the purpose of saving the eyeball and preventing complications, and explaining to the patient that surgery is needed for continued phacoemulsification, namely the operation to remove the cloudy lens and replace the implanted lens intraocular lens (IOL) if the patient's eye condition is under control.

The first operation step is the early stages; the operation was carried out under strictly aseptic conditions. Then a speculum for the right eye was placed, a lidocaine injection was performed on the subtenant, an incision of the cornea, and removal of the membrane from the camera oculi anterior (COA). Furthermore, after removing the COA membrane, the cornea was sutured ten times and given an intracameral cefuroxime injection. The right eye is closed with a bandage. At the end of the procedure, there were corneal sutures, cataract lenses, lens masses in the cornea, and miosis pupils (Figure 1).

Follow-up results at the external eye disease clinic were the right eye visual acuity of 1/300, clear and sutured of the cornea, mass capsule of lens in the anterior chamber, irregular iris, cloudy lens, and normal IOP. The patient planned to do phacoemulsification to remove and replace the cataract lens with an intraocular lens. The assessment is the right eye post open globe injury with capsule, the mass of the lens, and traumatic cataract. The planning therapy is tobrosone 6 x 1 drop for the right eye and protagente 4 x 1 drop for the right eye. The planning action is the patient will undergo a second operation to remove the cataract lens and replace it with an implanted lens (IOL) in the next two weeks (Figure 2).

Before surgery, the patient underwent biometry and keratometry measurements. Keratometry examination of the right eye found 8.42/175 and 8.23/65. The biometry examination in the right eye found measuring the IOL lens plan difficult, so the biometry results in the left eye were used. Biometric results in the left eye obtained spheres +20.50/-0.33 with a foldable IOL (hydrophilic acrylic).

The second operation step was carried out under aseptic conditions in the early stages. Then a speculum for the right eye was installed, disinfect the operating field with 10% betadine and irrigate the surface of the eyeball with 5% betadine, then rinse with balanced salt solution (BSS). Topical anesthesia was performed with 2% lidocaine, lens staining with methylene blue, superior precise corneal incision with an incision width of 2.75 mm. Curvilinear capsulorhexis anterior capsule and phacoemulsification with the phaco-chop technique about 00.10 min. Cortical residual aspiration irrigation, viscoelastic aspiration, insertion of IOL lens in sulcus, corneal hydration, and intracameral injection of cefuroxime 5 mg. In this operation, complications were found in the form of posterior capsule rupture during phaco, hyphema, posterior synechiae, and vitreous prolapse (Figure 3).

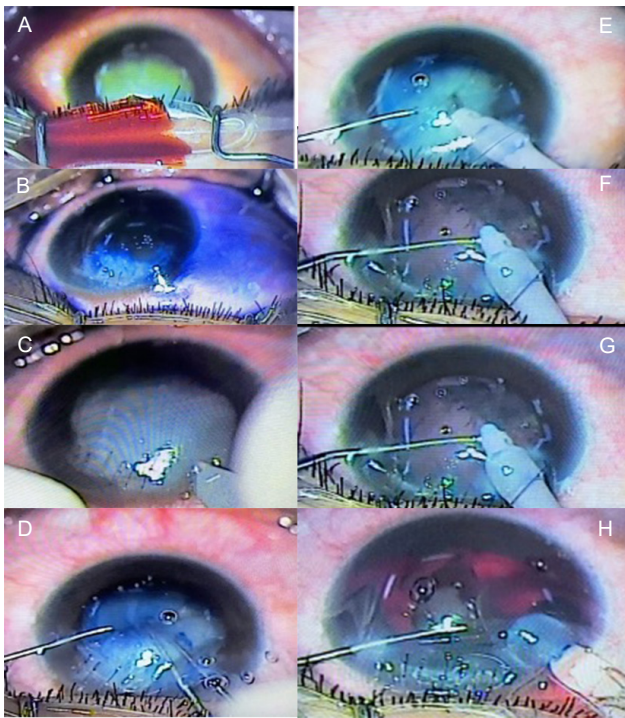


Figure 3. (A) Disinfect the operating field with 10% betadine, irrigate the surface of the eyeball with 5% betadine then rinse BSS. Topical anesthesia was performed with 2% lidocaine; (B) Lens staining with methylene blue; (C) Superior clear corneal incision with an incision width of 2.75 mm; (D) Continuous curvilinear capsulorhexis (CCC) anterior capsule and phacoemulsification with the Phaco Chop technique about 00.10 min; (E) Cortical residual aspiration irrigation; (F) Viscoelastic aspiration; (G) Insertion of IOL lens in sulcus; and (H) Corneal hydration and intracameral injection of cefuroxime 5 mg.

In phacoemulsification procedure, complications were found in the form of posterior capsule rupture during phaco, hyphema, posterior synechiae, and vitreous prolapse.

Postoperative therapy is hospitalization, observation of vital signs, postoperative complaints, postoperative bleeding, Fowler's sleeping position, high-calorie high protein diet, mefinal 3 x 500 mg, xytrol ointment right eye one drop six times daily, injection of taxegram 2 x 1 gr intravenously (skintest), injection of dexamethasone 2 x 1 ampoules intravenously, transaminase tablets 3 x 500 mg. Follow-up results at the outpatient clinic were the right eye visual acuity 6/20, clear and sutured cornea, deep anterior chamber, irregular lens, and IOL in place.

Discussion and conclusions

Blunt eye injury is mainly happened due to the lack of force required to affect an injury.^{[6],[7]} The eye is a firm structure fluid-filled that is not easily compressed.^{[6],[7]} A full speed of moving object transfers kinetic energy to the eyeball, which causes the eyeball structure to be compressed.^{[6],[7]} After that, it may raise intraocular pressure and spread forces in the interface of tissues with different elasticities.^{[6],[7]} The resulting high stresses eventually cause tissue to rip off, that result in decompression through a penetrated hole in the eye.^{[6],[7]}

Blunt trauma to the eye comes from some trauma to ocular structures, starting from subconjunctival hemorrhages to abrasion in the cornea.^[8] One severe appearance after blunt eye trauma is blood filling in the anterior chamber due to the tortoise of the iris or ciliary bodies.^[8] Traumatic cataracts may consequence from blunt trauma from direct damage to the lens and rupture of the lens capsule. Further, they cause aqueous humor inflow, lenticular fiber hydration, and lens fiber haziness.^[5] Cataract caused by blunt trauma may appear as opacification of posterior subcapsular cortex and sutures, resulting in flower-shaped or rosette cataracts.^[5]

The corneal laceration may be infected or non-infected due to ocular trauma. Corneal laceration should be assessed to exclude another injury that may be life-threatening. After the corneal laceration is confirmed, then we can manage this problem. It has to be examined to confirm the appearance of incarcerated intraocular tissue or intraocular foreign body. However, it may be challenging to show a completed examination if it is not under surgery conditions. So, the history-taking of the trauma mechanism is very important to anticipate what must do during the operation. The vitrectomy procedure should be done if the intraocular foreign body suspects penetrate the posterior segment.^[9] The cataract operation procedure should be done if it is found in the anterior segment. All of them have to be predicted with the primary procedure of eye trauma management as these will impact future surgeries and results. The cornea laceration has to be repaired as soon as possible. This repair aims to secure wounds, prevent infection, and decline scarring and astigmatism.^[9]

Foreign debris and membrane should be removed during the initial exploratory operation.^[2] 360-degree conjunctival peritomy is ideal.^[2] Perioperative assessment of the injury with extension and meticulous planning is essential.^[2] Limbus should be secured first, followed by sclera and cornea. Usually, 10-0 monofilament nylon is used for cornea, 8-0 vicryl for sclera and 8-0 silk for conjunctiva.^[2] Corneal sutures should be placed radially and neither be too tight to distort the cornea nor loose, leading to wound dehiscence. Corneal sutures should be shorter in the center of the cornea than in the peripheral cornea. Experienced surgeons should perform the repair to reduce the mal handling of the delicate cornea and optimize the outcome. Stellate corneal laceration should be repaired using purse-string sutures.^[2]

When intraocular foreign body and vitreous hemorrhage happen, the prognosis worsens. The timing of the vitrectomy and the kind of trauma based on multivariant analysis had no major effect on the final results. Corneal injuries have a better prognosis than scleral injuries.^[10]

One of the sequelae of blunt trauma is hyphema. Although it may accomplish without future problems, it may have hidden trouble such as secondary hemorrhage, glaucoma, and corneal blood staining.^[11] The first 24 hours following penetrating eye injuries are critical to a successful surgical and visual outcome. The basic principles of initial management include preventing vomiting, pain, and infection and avoiding further injury.^[12]

In cases of anterior lens capsule rupture, the surgical approach depends on the size and extent of the capsular rupture.^[13] A continuous curvilinear capsulorhexis (CCC) may be fashioned around or incorporated into a minor central defect, whereas more significant defects may provide adequate access to allow phacoemulsification and IOL insertion without capsulorhexis.^[13]

Patients with ocular trauma may need hospitalization and outpatient follow-up. Many ocular trauma patients are productive workers that may cause economic and social burdens.^[14] It needs comprehensive management to protect workers with protective stuff to avoid trauma, especially ocular trauma.^[14]

As explained before, most clinical signs in patients can cause poor vision. In the history taking, it is asked about what object caused the laceration of the eyelids. It aims to discover whether this can cause manifestations that worsen the patient's condition. So that prophylactic measures can be carried out on patients. The anamnesis results found that the patient's eye was hit by a nail when installing the fan. The vision immediately blurred and felt increasingly blurry. The patient also complained of pain in the right eye, glare, and chatter.

After a complete history, the ophthalmological examination was continued. On examination of the right eye, no abnormalities were found in the eyeball's position or the eyeball's movement. The visual acuity of the right eye decreased by 1/300 with a negative pinhole. A slit lamp examination revealed hyperemic conjunctiva, 1-hour full-thickness corneal laceration, hyperemic cornea, irregular iris, and posterior synechiae—cloudy lens. The existing theory states that the clinical symptoms that arise are mechanical ocular trauma. As for the definition put forward by the American Ocular Trauma Society regarding mechanical ocular trauma, one of the classifications that direct this patient's case is ocular trauma open-globe injury.^[15]

Examinations that have been carried out include anamnesis, physical examination, and supporting examinations resulting in a working diagnosis in the following patients, the right eye open globe injury with full-thickness corneal laceration, anterior capsule rupture, traumatic cataract.

The patient is managed with medical and operative therapy to reduce the patient's symptomatic complaints and keep the rupture area from being damaged. The patient is planned to explore the right eye, debridement,

and suture the cornea with topical anesthesia. After the first operation, it will be followed by phacoemulsification surgery if the eye condition is stable.

Therapy obtained after the first operation, steroid eye drops four times a day in the right eye, mydriatic agent eye drops three times a day in the right eye, vitamin eye drops six times a day in the right eye, antibiotic eye drops six times a day in the right eye, nonsteroidal anti-inflammatory drug (NSAID) tablets every eight hours if needed. Required administration of drugs to prevent infections that arise after surgery, relieve pain in the eyes, and lubricate and cool the eyes due to lack of tear secretion.

Therapy obtained after the second operation, observation of vital signs, post-operative complaints, post-operative bleeding, Fowler's sleeping position, high-calorie high, protein diet, oral NSAID, topical antibiotic on the right eye, injection of antibiotic intravenously (skintest), steroid injection intravenously, and hemostatic agent. Drug administration is needed to prevent infections that arise after surgery, relieve eye pain, and reduce eye complications. The prognosis in this patient is *dubia ad bonam*.

Open globe injury is an emergency case that requires full attention in management because it can be turned into blindness if delayed. The purpose of management of open globe injury is achieving normal anatomical and physiological conditions, so the ophthalmologist should do a comprehensive strategy to treat open globe injury. Patients and physicians need to collaborate on visual rehabilitation after surgery and complication after surgery. The result of open globe injury treatment in any patient may be different. Good post-operative results and visual improvement can make better patient quality of life.

References

- [1] Agrawal R, Shah M, Mireskandari K, Yong GK. Controversies in ocular trauma classification and management: review. *Int Ophthalmol* 2013;33:435–445. <https://doi.org/10.1007/s10792-012-9698-y>.
- [2] Rahman S, Hossain A, Alam S, Rahman A, Sultana C, Khan YJ, et al. Mechanical eye trauma epidemiology, prognostic factors, and management controversies—An update. *Open J Ophthalmol* 2021;11:348–363. <https://doi.org/10.4236/ojoph.2021.114029>.
- [3] Riordan-Eva P, Augsburger JJ, editors. *Vaughan & Asbury's General Ophthalmology*. 19th ed. China: McGraw-Hill Education; 2018.
- [4] Rajsic S, Breitkopf R, Bachler M, Treml B. Diagnostic modalities in critical care: Point-of-care approach. *diagnostics* 2021;11:2202. <https://doi.org/10.3390/diagnostics11122202>.
- [5] Mohseni M, Blair K, Gurnani B, Bragg BN. Blunt Eye Trauma. *Stat Pearls* [Internet] 2023. <https://www.ncbi.nlm.nih.gov/books/NBK470379/> (accessed April 4, 2023).
- [6] Lee C-H, Lee L, Kao L-Y, Lin K-K, Yang M-L. Prognostic indicators of open globe injuries in children. *Am J Emerg*

- Med 2009;27:530–535. <https://doi.org/10.1016/j.ajem.2008.04.004>.
- [7] Bisplinghoff JA. High-Rate Internal pressurization of human eyes to predict globe rupture. *Archives of Ophthalmology* 2009;127:520. <https://doi.org/10.1001/archophthalmol.2008.614>.
- [8] Kumar K, Figurasin R, Kumar S, Waseem M. An uncommon meridional globe rupture due to blunt eye trauma. *Case Rep Emerg Med* 2018;2018:1–3. <https://doi.org/10.1155/2018/1808509>.
- [9] Gopal Pradeep T, Rameshbabu Honniganur D. Anterior segment trauma: The fundamentals of management. *Vision Correction and Eye Surgery*, IntechOpen; 2022. <https://doi.org/10.5772/intechopen.101610>.
- [10] Guthoff RF, Beck R. Mechanical ocular trauma. *Curr Opin Ophthalmol* 1994;5:105–109. <https://doi.org/10.1097/00055735-199408000-00015>.
- [11] Kirkness CM. Mechanical ocular trauma. *Curr Opin Ophthalmol* 1993;4:106–111. <https://doi.org/10.1097/00055735-199308000-00016>.
- [12] Wagner PJ, Lang GK. Mechanical ocular trauma. *Curr Opin Ophthalmol* 1996;7:57–64. <https://doi.org/10.1097/00055735-199608000-00011>.
- [13] van der Westhuizen DP, Stuart KV. Bilateral spontaneous anterior lens capsule ruptures in a child: A rare presentation of Alport syndrome. *Am J Ophthalmol Case Rep* 2020;20:100896. <https://doi.org/10.1016/j.ajoc.2020.100896>.
- [14] Haavisto A-K, Sahraravand A, Puska P, Leivo T. Eye injuries caused by wooden projectiles in Finland. *Wilderness Environ Med* 2022;33:284–289. <https://doi.org/10.1016/j.wem.2022.03.008>.
- [15] Dewi GN, Karunika AR, Trisihono. Triple procedures for mechanical ocular trauma. *Vision Science and Eye Health Journal* 2023;2:45–48. <https://doi.org/10.20473/vsehj.v2i2.2023.45-48>.