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MANAGEMENT OF TRAUMATIC GLOBE PERFORATION AND ITS FINAL VISUAL OUTCOME.

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Abstract : To report our symptomatic ultrasound-based approach and surgical method in a case of severe penetrating trauma with total hyphema, iris disinsertion, iridodialysis, and fibrin formation.

Hyphema is blood accumulation in the anterior chamber of the eye. The most common aetiologies for hyphema are blunt and penetrating trauma. However, the annual incidence of hyphema is 12 injuries per 100,000 population, with males being affected three to five times more frequently than females. This condition must be recognized timely to manage and avoid its complications, such as glaucoma and corneal blood staining.

Keywords: Hyphema, Iridodialysis, Ultrasound, surgery, fibrin

INTRODUCTION

Sympathetic ophthalmitis (SO) is characterized by bilateral granulomatous uveitis that can develop after ocular surgery or uveal trauma to one eye.[1] Although the exact pathogenesis is unknown, the disease is thought to be an autoimmune response to the uveal antigens exposed to the conjunctival Langerhans cells, which cause damage to the traumatized eye and the sympathetic eye then can lead to the loss of bilateral vision loss and blindness.[1] Current evidence suggests that eye surgery, especially vitreoretinal surgery represents a higher risk factor for SO than accidental trauma, with up to 90% of cases reported within 1 year of the inciting injury.[2] According to data from the National Ocular Emergencies Surveillance System (NOES), a total of 1,234,567 eye emergencies were reported in India in 2022, with a crude incidence rate (CIR) of 91.5 per 100,000 population and an age-standardized incidence rate (ASIR) being 87. 6 per 100,000 inhabitants. Eye disease is a leading cause of morbidity and mortality in India. They can result from many factors, such as trauma, infection, inflammation, glaucoma, and other eye diseases.[3]

Most of these injuries appear in the form of superficial damage to the cornea, eyelid tears or eye bruising.[4-6] However, other more serious injuries can also occur. Iris sphincter tears are common in cases of blunt trauma to the anterior eye. The separation between the root of the iris and the ciliary body is called iridodialysis. The sphincter muscles are irreversibly damaged, and the resulting mydriasis causes visual disturbances, including glaucoma.[7]

Hyphema is another manifestation of ocular trauma in which blood collects in the anterior chamber after the rupture of the ocular vessels.[8] A small amount of blood visible only by microscopic examination is called Microhyphema. Hyphema is most often caused by blunt or penetrating trauma. Other causes of hyphema include neoplasm, uveitis, juvenile xanthogranuloma, coagulopathy, and iatrogenic after intraocular surgery.[9-10] Even small amounts of blood in the anterior chamber can lead to complications such as glaucoma, blood spots of the cornea and secondary haemorrhage. Therefore, proper management of this condition is essential to prevent vision loss.

Case presentation

We present a case of an apparent minor trauma causing severe damage to the eye consisting of complete hyphema and iridodialysis with fibrin in the anterior chamber. Our diagnostic ultrasound-based approach and surgical strategy are described.

A 26-year-old male came to our hospital emergency MGM Medical College and Hospital, Jamshedpur for a penetrating trauma in his left eye. The patient complained of moderate pain, redness and unable to see. The patient said that he was hit in the left eye with a nail while he was working in his company as a carpenter work. The patient's visual acuity was OD:6/6, OS: perception of light positive and projection of rays doubtful. Intraocular pressure (IOP) was measured revealing 17 mmHg in the right eye and <4

mmHg in the left eye. The Seidel test used to assess leakage of the anterior chamber into the cornea was positive. A focused physical examination of the eyes revealed grade 4 hyphema and globe perforation of the left eye at the limbus. Slit-lamp examination showed cornea hazy with conjunctival congestion. It was not possible to see any other structures, the lens, or the posterior segment. On light stimuli in the left eye, there was a pupillary response in the right eye. Extraocular movements of the left eye were intact.

Our diagnostic approach was X-ray orbit (LE) and ultrasound-based with the B-scan examination (LE) showing some vitreous haemorrhage but no signs of retinal detachment. Routine investigations (BT, CT, Hb%, TLC, DLC, CBC, Blood sugar, HIV, HBsAg, AntiHCV) were advised. The patient was hospitalized and a systemic and topical treatment was started.

The patient was given TETANUS prophylaxis, PERINORM injection(metoclopramide)for nausea, and CLOPAR injection (diclofenac and paracetamol) for analgesia in the Emergency department. After an ophthalmologic consult, the patient was prescribed an injection GENTAMYCIN i.m. administered to decrease the risk of endophthalmitis. Topical antibiotic eyedrop(APDROPS) and ointment(AZITHRAL), antifungal(NATAMYCIN 5%)prescribed, and topical long-acting cycloplegic ATROPINE(1%): 1 drop 3 times{decrease IOP, synechiae development, attenuate photophobia and risk of secondary bleeding}. Tablet CEFIXIME(200mg),DILONA,OMEPRAZOLE(20mg) AND MULTIVITAMIN was also prescribed. He was also advised to wear black goggles and elevate his head to 30 degrees.

2nd day ,visual acuity :OD:6/6 and OS:perception of light present and projection of rays present in all quadrant. GENTAMYCIN and CEFIXIME was stopped and injection CEFTRIAXONE started.Ultrasound B-scan(very gentle) for LE was done and report suggested:multiple dot and membranous echo in VITREOUS suggesting vitreous hemorrhage;RETINA was attached;CHOROID:mild thickening,OPTIC NERVE HEAD SHADOW:within normal limit.

3rd day , he was prescribed prednisolone acetate 1%(PREDFORTE) drop in left eye :1 Drop 6times.

5th day , Visual acuity :OD :6/6 and OS:6/18. On slit lamp examination: Fibrin present on one half nasal side of pupil and iris in anterior chamber as impact was on nasal side. Hyphema resolved. Pupil irregular. Cornea clear. Tab. WYSOLONE (10mg)2*2 for 5 days was started.

6th day, after stabilisation of active status,he was recommended surgical correction. days after,on slit lamp examination: Conjunctival congestion decreased. Iris prolapse present. Surgery procedure included: excision of prolapsed iris done with repair of globe with three 10-0 ethilon suture to fix the iris root with three mattress stitches at 1.5 mm from the limbus at superonasal position from 9 o'clock to 12 o'clock position done under peribulbar anaesthesia. Air in anterior chamber with subconjunctival injection of GENTAMYCIN and DEXONA was given.Post operative advice of inj. GENTAMYCIN BD;inj.PERINORM;inj.CLOPAR;inj.DEXONA:2cc i.m.stat;Tab PARACETAMOL(500mg)BD;tab.CIPLOX(500mg)BD;Tab.VITAMIN B COMPLEX;Tab.RANTAC;e/d NEPAFENAC(3 times)

8th day,Visual acuity:OD=6/6 and OS=6/12.On slit lamp examination,pupil was oval.He was prescribed e/d 4QUIN-LP[MOXIFLOXACIN and LOTEPREDNOL](4 times);e/d NATAMET[NATAMYCIN](4 times); e/d NEPASTAR[NEPAFENAC](3 times);Tab.ZINTAC[RANITIDINE](BD); Tab. WYSOLONE[PREDNISOLONE] (10mg);Tab. MULTIVITAMIN

10th day,Visual acuity:OD=6/6 and OS=6/9(pinhole).Close monitoring was done for sympathetic ophthalmitis in the other eye.

12th day ,on slit lamp examination:iridodialysis present.Patient discharged with e/d PREDFORTE(6 times);e/d 4QUIN-LP (4 times);e/d NEPASTAR(4 times);Tab. TAXIM-O[CEFIXIME 200mg](BD);Tab. CALPOL [PARACETAMOL](500mg);Tab. VITAKIND-I[LUTEIN, ZEAXANTHIN,LYCOPENE, MECOBALAMIN, ZINC , COPPER, SELENIUM];Tab. PAN-40[PANTOPRAZOLE];Tab. WYSOLONE(10mg):1*3->1*2->1*1->stop

35th day,IOP:RE=13.6mmhg and LE=13.6mmhg;Visual acuity:OD=6/9;OS=6/24.He complained of headache and burning sensation(BE).He was prescribed e/d ZYAQUA[CARBOXYMETHYLCELLULOSE](4 times)and e/d PREDFORTE(4 times)and spectacles with power:RE=-0.25 D sph,-0.25 D cyl 20^0 (6/6);LE=-0.50 D sph,-2.00 D cyl 160^0(6/9).

36th day,he was prescribed e/d PREDFORTE(4->3->2->1times);e/d MAHAFLOX[MOXIFLOXACIN](4 times);e/d NEPASTAR (4 times);Tab. PARACETAMOL(500mg)

38th day, suture was removed.IOP:RE=17.3mmHg and LE=17.3 mmHg.

45TH day, Visual acuity:OD=6/6 and OS=6/6.On slit lamp examination: iridodialysis and fibrin present.He was prescribed e/d PREDFORTE(3->2->1 times);e/d NEPAFENAC(2 times);Tab. VITAKIND-I.

110th day (3 month 19 days),visual acuity:OD=6/6 and OS=6/9P.On slit lamp examination:iridodialysis present and fibrin resolved.Schirmers test:RE=15mm;LE=23mm.refraction was done:RE=-0.25D cyl 10^0 (6/6)and LE=-3 D cyl 170^0(6/6)

Figure 1: shows complete grade 4 hyphema of left eye compared with normal right eye at day1

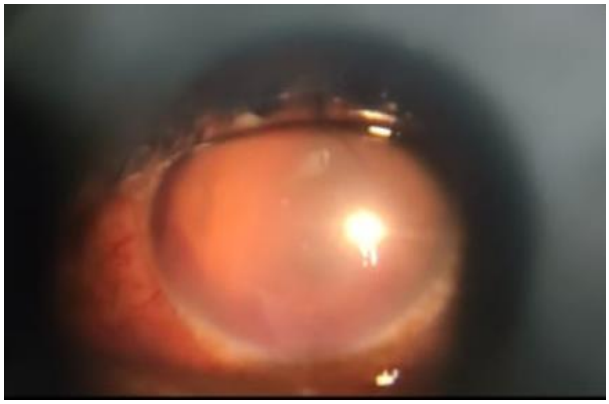


Figure 2 : shows complete hyphema at day 1

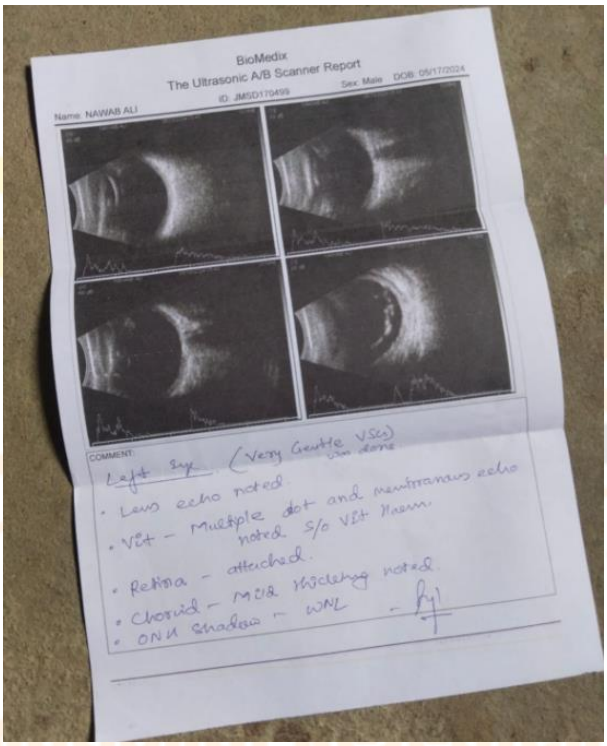


Figure 3: shows ultrasound b scan(very gentle) report on day 2 of trauma

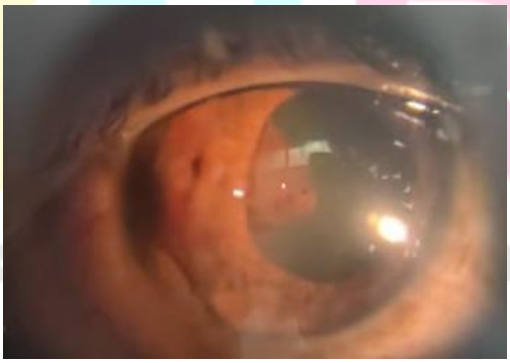


Figure 4: shows fibrin on nasal side of pupil on 4 days after trauma

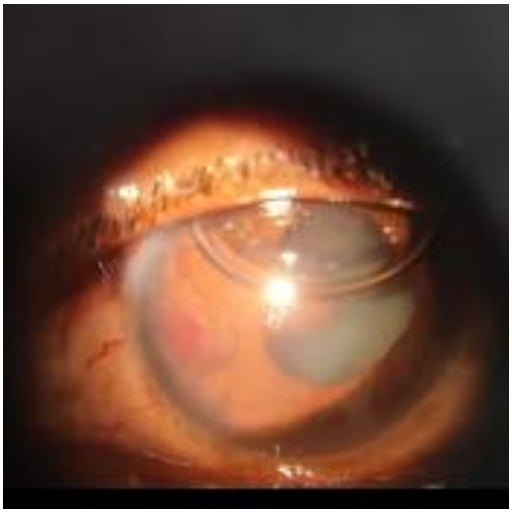


Figure 5: shows post surgery air in anterior chamber 7 days after trauma

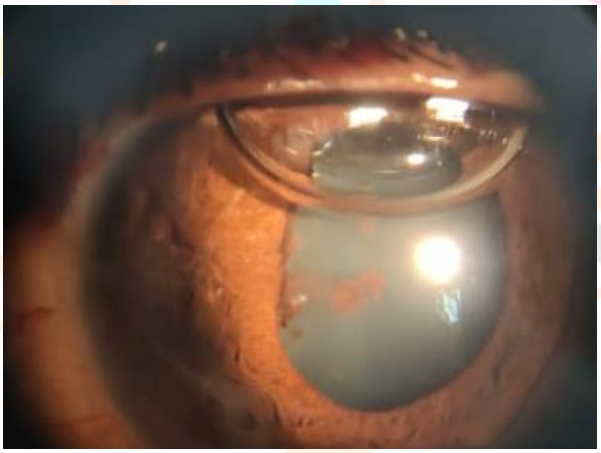


Figure 6: shows post surgery slit lamp examination 8 days after trauma

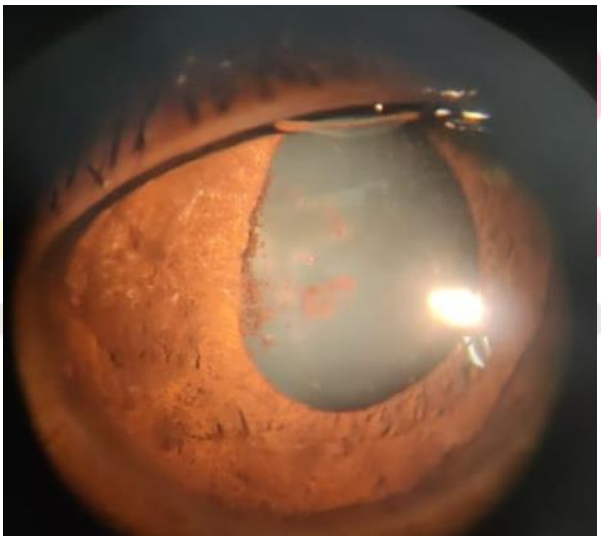


Figure 7: shows post surgery slit lamp examination 9 days after trauma

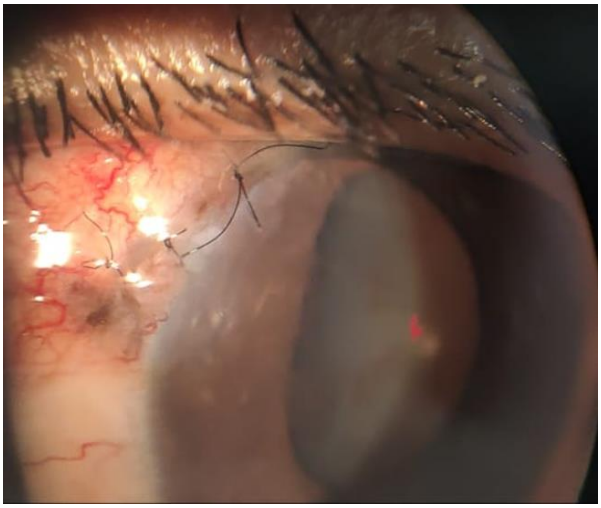


Figure 8: shows three 10-0 ethilon suture post-surgery 12 days after trauma

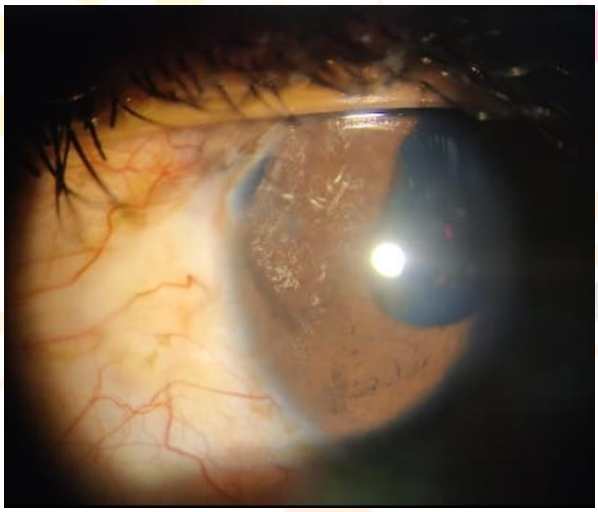


Figure 9: shows globe perforation superonasally at limbus 44 days of trauma after suture removal in follow-up session

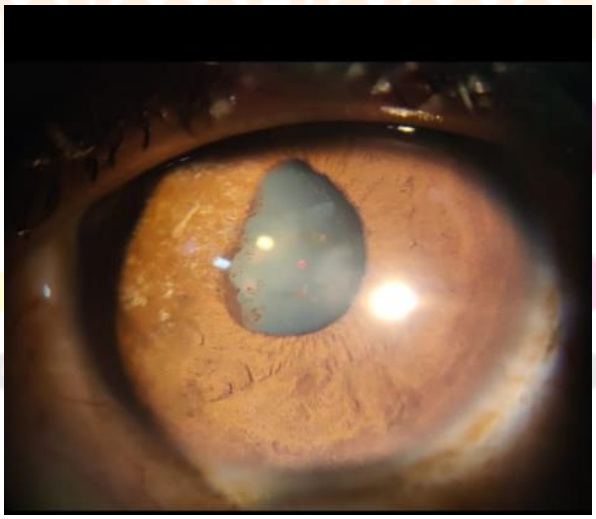


Figure 10: shows iridodialysis with fibrin clot 44 days after trauma

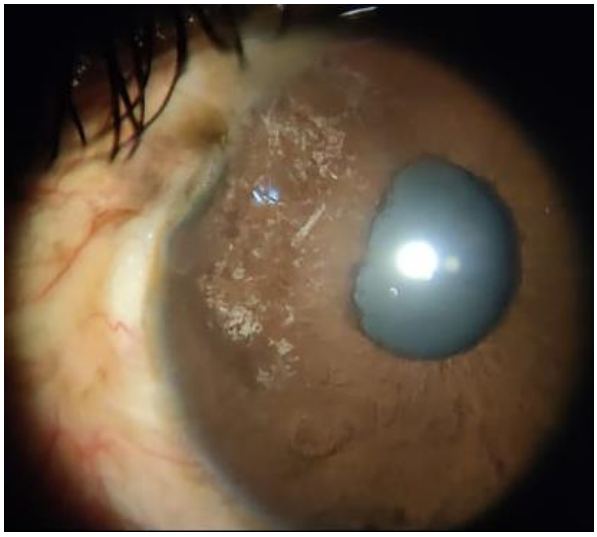


Figure 11: shows iridodialysis and fibrin clot resolved on 3 months 19 days of follow-up

Discussion

During trauma to the eye, the compressive force exerted on the globe causes an increase in intraocular pressure. Configurational changes in the elastic layers of the eye such as the cornea, the corneoscleral junction and the iris dissipate this pressure. However, when the pressure exceeds the tolerance of these elastic layers, the rupture occurs in the weakest parts of the eyeball. The force of the trauma moves the aqueous humour from the anterior chamber to the posterior through the pupil where it meets the strong resistance of the lens. This force cannot be handled by the iris and the fibres of the sphincter are torn. The result is persistent mydriasis. [11]

Hyphema results from the accumulation of blood in the anterior chamber after the rupture of the blood vessels supplying the iris and ciliary body. Bleeding can occur within the first two to five days after injury, with an increased risk if the patient delays medical evaluation for more than 24 hours, has significant initial hyphema, IOP greater than 21 mmHg, or visual acuity initially less than 20/200. Grade 0 hyphema has an almost 100% prognosis for a good visual acuity outcome, while Grade IV hyphema has only a 50% chance. Our patient had a grade 4 hyphema, but his visual prognosis was good.

In a study of 97 patients, risk factors for poor outcomes after traumatic hyphema included: causation, initial visual acuity, onset of injury, and grade of hyphema.[12] Hyphemas rarely require hospitalisation and can be safely treated on an outpatient basis. Iridodialysis may require surgical correction. Timely ophthalmological follow-up is imperative.[11]

The long-term consequences of a hyphema can vary. Secondary haemorrhage, or rebleed, occurs in approximately 5% of cases and is associated with worsening visual outcomes. [13] New haemorrhage, is often more severe than the initial hyphema damage. Surgical intervention may be indicated in some serious and intractable cases. Secondary glaucoma, optic neuropathy, and early cataract formation are common and can occur anywhere from days to years after the injury. Therefore, annual follow-up is necessary after resolution.

The risk of permanent damage to the eyes from a nail in the carpentry profession supports the need for increased awareness and a regulation of protective glasses in companies that employ workers. Workers cite inconvenience, cost, and perceived risk of injury as reasons they do not wear safety glasses while on the job. Non-certified safety glasses and prescription glasses should not be worn, due to the risk of breaking the lens and causing open globe injury.[14]

A recent Cochrane review found limited evidence for the use of antifibrinolytics, including tranexamic acid and aminocaproic acid.[14]

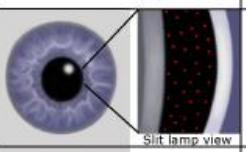
Heparin drops could have been used because they have anti-inflammatory properties (such as inhibition of activated granulocytes and inhibition of the release of free radicals and other chemical mediators of inflammation), and their ability to breakdown proteins in the anterior chamber, in this case due to large iridodialysis. Heparin also prevents fibrin formation. [15-16]

The patient here present with low intraocular pressure. Low pressure is of concern in cases of open globe, damage to the ciliary body, or retinal detachment. [17-19]

Ultrasound (US) provides imaging without exposure to radiation, is quick and cost effective. [20] Particularly useful in patients with media opacification, US can detect lens dislocation, IntraOcularForeignBody, retrobulbar or vitreous haemorrhage, and retinal detachment. [20-22] However, due to direct contact with the eyelids, US is contraindicated if an open globe is suspected.[20]

A full-thickness wound results in an open eye socket. The patient had eye pain and vision loss after the trauma. The removal of the foreign body, if any, was postponed and the affected eye was protected with dark glasses. [23]

Ocular contusion causes anteroposterior compression of the globe with synchronous equatorial stretching. This extension can harm the iris or ciliary body vessels with consequent bleeding. [24-25] Hyphemas run from tiny to including the entire anterior chamber and are graded from 0–IV, separately. Complications incorporate hindrance of trabecular meshwork with increased IOP, optic atrophy, rebleeding, synechiae, and corneal blood staining. [25]

Grade	Anterior chamber filling	Diagram	Best prognosis for 20/50 vision or better
Microhyphema	Circulating red blood cells by slit lamp exam only		90 percent
I	<33 percent		90 percent
II	33-50 percent		70 percent
III	>50 percent		50 percent
IV	100 percent		50 percent

Adapted from Brandt MT, Haug RH. Traumatic hyphema: a comprehensive review. J Oral Maxillofacial Surg 2001; 59:1492.

Conclusions

Sympathetic ophthalmia is an uncommon but blinding disease if not effectively managed. It should be considered in the differential diagnosis for all patients with uveitis following ocular surgery or trauma. [26]

In our patient, conservative treatment, and surgery, supported by B-scan ultrasound imaging, achieved a satisfactory anatomical and functional outcome.

Therapy was able to control the hyphema and pain and, after 7 days, the hyphema disappeared leaving behind fibrin and iridodialysis. It was possible to see the fundus with no evidence of serious retinal damage and mild vitreous haemorrhage.

We obtained a good result with surgery. The best corrected visual acuity was 6/6 at postoperative 44 days. The patient did not experience a significant photophobia.

We concluded the surgical intervention with a careful removal of viscoelastic sutures of the scleral, conjunctival, and corneal wounds. In this way, we obtained a circular pupil, even though moderate large. The patient was satisfied with the final visual outcome.

We recommend that traumatic globe perforation be treated as an emergency and patients be taken up what is best immediately to increase chances of visual recovery.

Statement of Ethics

The authors have no ethical conflict to disclose. The patient provided written informed consent to have the case details and accompanying images published.

Disclosure Statement

The authors report no conflicts of interest in this work. No funding was received for this work.

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