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CASE REPORT

Triple Procedures for Mechanical Ocular Trauma

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Abstract

Introduction: Mechanical ocular trauma is a major cause of ocular morbidity and can lead to severe visual loss. One of the most complicated mechanical ocular trauma is iridodialysis. In this case, we report three surgical procedures to treat the effect of mechanical ocular trauma. **Case Presentation:** A 32-year-old man was referred to Gatot Soebroto National Army Hospital, Jakarta, with major complaints of pain and blurred vision in the left eye after sustaining blunt trauma while playing tennis two days ago. He was diagnosed with postoperative corneal laceration repair, subtotal iridodialysis, traumatic cataract, and vitreous hemorrhage on his left eye. He underwent iridodialysis repair with the McCannel suture technique and continued with a pars plana lensectomy to remove the lens and a pars plana vitrectomy to treat the vitreous hemorrhage. Postoperative examination showed a significant improvement of best-corrected visual acuity (BCVA) from hand movement to 0.15 and no sign of acquired infection. **Conclusions:** The effect of mechanical ocular trauma might be unpredictable and may include various conditions. Accurate management will prevent further complication and improves the patient's quality of life. A good approach and visual result will satisfy both patients and doctors.

Keywords: iridodialysis; mechanical ocular trauma; McCannel suture; lensectomy; vitrectomy

Introduction

Mechanical ocular trauma is a major cause of ocular morbidity and can lead to severe visual loss.[1] One of the most complicated mechanical ocular trauma is iridodialysis. Iridodialysis separates the iris root from its attachment to the ciliary body.[2] The Iris root is the thinnest and weakest portion of the iris stroma.[3] Iridodialysis may appear with other damages such as corneal rupture, subluxated lens, and vitreous hemorrhage.[4] A small iridodialysis may not require any surgical intervention. A large iridodialysis with clinical symptoms often requires surgical intervention. The patient may have symptomatic glare, disabling diplopia, photophobia, and ectopic pupil.[5] Iridodialysis should be treated as soon as possible, within a few weeks of the injury, because prolonged contracture of the radial iris fibers may prevent a round pupil after normal iris anatomy is re-established.[6]

Some surgical techniques can be used to treat mechanical ocular trauma. Which technique offers better visual results is different in each case.[7] In some cases, multiple eye injuries usually require more than one surgical procedure. In this case, we report three surgical procedures to treat the effect of mechanical ocular trauma.

Case Presentation

A 32-year-old man came to the emergency department in Gatot Soebroto National Army Hospital, Jakarta, on 26 September 2022 with major complaints of pain and blurred vision in the left eye. He sustained blunt trauma while playing tennis. The racket hit his glasses on the left side until it broke and damaged his left eye. The patient had already visited the local ophthalmologist

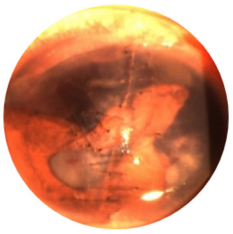
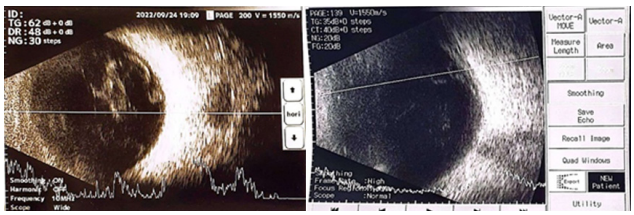


Figure 1. Preoperative subtotal iridodialysis at 9 to 5 o'clock meridian.



A B

Figure 2. (A) First ultrasonography showed diffuse vitreous hemorrhage, and (B) Second ultrasonography showed moderate vitreous hemorrhage.

in Iskandar Muda Military Regional Health Hospital, Banda Aceh, on 24 September 2022. The ophthalmologist did a primary suture of the corneal laceration on his left eye. After that, the patient was referred to Gatot Soebroto National Army Hospital, Jakarta, for further management of iridodialysis, traumatic cataract, and vitreous hemorrhage.

Visual acuity in the left eye was hand movement. The intraocular pressure (IOP) was normal in the left eye. The ocular movement of both eyes was good in all directions. An objective eye examination showed post-surgical repair on the central cornea and iridodialysis with more than 240° superior and temporal of the iris extending from 9 o'clock to 5 o'clock meridian (Figure 1)—no visualization from the funduscopic examination.

At Iskandar Muda Military Regional Health Hospital, Banda Aceh, ocular ultrasonography was performed. The ophthalmologist reported diffuse vitreous hemorrhage and no retinal damage. In our ophthalmology department, we repeated ocular ultrasonography and revealed retina, choroidal, scleral layers were found attached, and vitreous opacity was caused by vitreous hemorrhage (Figure 2). The patient was diagnosed with iridodialysis, post surgical repair of corneal laceration, traumatic cataract, and vitreous hemorrhage on the left eye. As the patient complained of poor postoperative visual gain and cosmetic blemishes, we planned surgical intervention using iridodialysis with the McCannel suture technique, pars plana lensectomy, and pars plana vitrectomy.

The surgery was scheduled the day after arrival and performed by a vitreoretinal surgeon and anesthesiologist. The patient was operated on under general anesthesia. The surgical steps of the iridodialysis repair are illustrated in Figure 3. First, we performed a conjunctival limbal peritomy from 10 o'clock to 5 o'clock and then made corneal side port incisions in four areas (5, 8, 9, and 11 o'clock) starting from 9 o'clock meridian. The viscoelastic agent was injected through a corneal side port incision to push the peripheral edge of the iris. After that, the folded iris was reopened and released from fibrinous adhesion with the help of a spatula iris and micro forceps. We used a double-armed 10-0 polypropylene suture to stitch the iris. The first needle was inserted from the incision opposite to the iridodialysis side through the anterior chamber and moved under the iris, passed into the middle of the iridodialysis edge, and pulled out through the scleral groove. The second needle was also inserted from the opposite side to the iridodialysis side and pulled out through the sclera until the iris was attached to the sclera. The sutures were tied, and the knot was buried into the sclera. The procedure was repeated until the entire iris tissue had returned to its base. The operator found it difficult when he was trying to open the folded iris because some parts were slightly sticky and twisted. After the first stitch of the iris in the 2 o'clock meridian, it took an hour to open the folded iris into the sclera because of the sticky and twisted iris. Once the iris can be extended and pulled toward the sclera, the first suture becomes inappropriate and must be removed and re-stitched. This action took about three hours to return the entire iris to its original place.

After iridodialysis repair, we performed pars plana lensectomy without intraocular lens (IOL) implantation, followed by pars plana vitrectomy because the nucleus was substantially subluxated and the vitreous filled most of the anterior (Figure 4). A lensectomy was performed before vitreous removal to minimize the dislocation of lens particles into the vitreous cavity. The 23G vitrectomy technique used a closed system approach. The three ports were placed 3-4 mm posterior to the surgical limbus. One port infused a balanced saline solution into the vitreous cavity. The remaining ports were used to access the vitreous cavity to visualize the posterior segment through a fiber optic endoilluminator and other instruments to manipulate, dissect, or drain fluids. There were no difficulties with both procedure. The lens extraction and

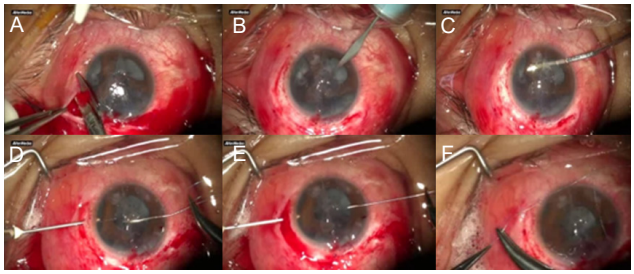


Figure 3. The surgical steps of the McCannel suture technique. (A) After the peritomy was performed, (B) The corneal side port incision was made; (C) Use the spatula to reposition the folded iris; (D) The first needle entered from the opposite side to the iridodialysis side and pulled out through the sclera; (E) and the second needle followed the same steps as the first needle; (F) The suture was tied and buried into the sclera.

Figure 4. (A) Pars plana lensectomy; and (B) Vitrectomy to clear the vitreous hemorrhage; (C) After iridodialysis repair.

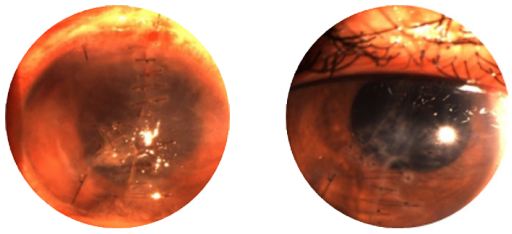


Figure 5. (A) Postoperative anterior segment condition on day one, and (B) day seven.

vitrectomy can be easily solved.

Postoperative day one, examination revealed a progressive improvement in best-corrected visual acuity (BCVA) from hand movement to finger counting at one meter with normal IOP (16 mmHg). The ocular movement was good in all directions. Blepharospasm was found on the palpebra, subconjunctival hemorrhage, dilated pupil, and the aphakic and intact primary suture was found in the central corneal. The contact lens bandage was placed correctly. The patient was given topical and systemic antibiotics, topical anti-inflammation, topical beta-blocker agents, and systemic analgesics. One week postoperatively, the BCVA of the left eye was 0.15, and IOP was 9.4 mmHg. Eye movement was good in all directions. Anterior segment examination revealed minimal blepharospasm in the palpebra; an intact central corneal suture was better than before. Fundus ocular examination revealed normal macular tropism. Two weeks postoperatively, the BCVA of the left eye was 0.1. The IOP was 8.4 mmHg. The cornea looked clearer with scar improvement. The patient planned to have the IOL insertion later when the eye conditions fully recover.

Discussion and conclusions

Mechanical ocular trauma is still a leading cause of monocular vision loss and blindness. Ocular trauma can cause extensive damage to the orbit, eyeballs, adnexa, and optic nerve, ranging from superficial lesions to vision loss; ocular trauma classification developed into local, associational, and environmental. The local injury is limited to eyeball and ocular adnexa and divided into mechanical and non-mechanical types. Anterior segment condition related to mechanical ocular trauma may result in damage to the conjunctiva, cornea, limbus, anterior chamber angle, iris, lens, and ciliary body depending on the mechanism of trauma (closed or open, blunt, penetrating, or perforating), force and extent of trauma. B-scan ultrasonography for imaging examination in ocular trauma is highly effective, especially in cloudy media. This case report diagnosed the patient with subtotal iridodialysis, post-surgical corneal laceration repair, traumatic cataract, and vitreous hemorrhage. The treatment options and the final visual outcome depend on these trauma variables. Good visual acuity is one of the outcomes that will increase the patient's quality of life; therefore, estimating visual prognosis is important.[8],[9],[10]

The effect of mechanical ocular trauma might be unpredictable and may include conditions such as iridodialysis, traumatic cataract, and vitreous hemorrhage. The impact of blunt ocular trauma can cause a small radial tear of the sphincter muscle at the pupillary margin (iris sphincter ruptures), localized or extensive tearing of the iridociliary junction (iridodialysis), or even a localized or extensive tearing of the circumferential separation of the peripheral iris and ciliary body from the sclera behind the scleral spur (cyclodialysis). In our case, we performed an iridodialysis surgical repair combined with pars plana lensectomy and pars plana vitrectomy to treat vitreous hemorrhage and to allow a complete retinal inspection, searching for any retinal damage.[11],[12]

Iris injuries like iridodialysis are the most common complication following blunt ocular trauma. Achieving a good anatomical and functional outcome is a big challenge in all cases. Surgical repair of iridodialysis should be attempted as soon as possible to minimize corectopia from permanent contracture of the radial iris fibers. There are many procedures to do iridodialysis repair, including a McCannel suture technique, a single pass four throw pupilloplasty, pupillary cerclage, or the implantation of artificial iris devices to alleviate symptoms. The most common procedure used to repair the iridodialysis is the McCannel suture technique. This technique is a good option for severe iridodyalisis because of its effectiveness and is minimally invasive.[5],[6],[13]

A McCannel suture iridodialysis repair was performed using double-armed sutures and fixating the peripheral iris to the scleral wall, approximately 1 mm posterior to the limbus. It begins with one needle entering the anterior chamber through the corneoscleral limbus and then pierces the iris base and exiting the chamber angle and sclera. The second needle is utilized similarly, entering from the same incision. The suture is then tied and buried under the sclera.[14],[15] This procedure is challenging to return the folded and twisted iris to its original position because some of them are stuck together. While the operator pulls one side of the iris, the other parts also will be pulled. So it is hard to maintain the iris in a normal position. It took about three hours to complete the McCannel suture. In this case, accuracy, patience,

and consistency in action are critical success factors.

The indications of pars plana lensectomy are an incomplete lens dislocation of more than 180° with the lens entering the vitreous cavity, the vitreous body falling into the anterior chamber, vitreous hemorrhage, or retinal detachment. In our case, a traumatic cataract was found in this patient. Lensectomy may be preferred over lens extraction in severe cases of zonular loss and the absence of contraindications to ocular comorbidities. In some cases, the lensectomy with IOL implantation and pars plana vitrectomy are performed in the same setting. However, in this case, we did not put the IOL inside because the biometric measurement would be inaccurate due to the cornea condition still not fully recovered.[6],[9] This procedure went well without any complications. The IOL insertion is planned after the condition of the cornea and iris are fully recovered.

Vitreous hemorrhage can be caused by bleeding from the ciliary body, choroid, and retina. Pars plana vitrectomy is commonly used to remove vitreous opacities due to vitreous hemorrhage, vitreoretinal traction, restore the normal anatomy of the retina and retinal pigment epithelium (RPE), and access the subretinal space. In a dense vitreous hemorrhage case, starting the vitrectomy with an infusion in the anterior chamber is recommended to ensure that it is not in the suprachoroidal space.[8],[11] This procedure treated the vitreous hemorrhage with no complications.

The limitations during these procedures are due to the condition of the post-repair corneal laceration. One potential complication during the actions is the rupture of the cornea because of the scar on it. However, as long as the procedure is carried out carefully, it can minimize the risk of complications in the cornea.

This patient's prognosis is *quo ad vitam ad bonam* because there is an improvement in visual acuity. The IOP also remains normal, and there is no sign of infection in follow-up after surgery. Another prognosis is *quo ad functionam dubia* because the patient is still in aphakic condition, and there is a scar on the cornea that has not healed completely. *Quo ad sanationam dubia* because mechanical ocular trauma can be repeated if the patient does not take preventive action while doing his daily activities.

Treating patients with mechanical ocular trauma can be a complicated, even frustrating process depending on how much the damage to the eye is. The ophthalmologist surgeon must be able to master the management of ocular trauma to create a comprehensive understanding to determine strategies before implementing the actual reconstruction. Determining the action taken must also consider the side effects and complications that may occur according to the patient's condition. The choice of which better technique, thoroughness, patience, and consistency in action will produce a good outcome and prevent further complications so we can improve the patient's quality of life. A good approach and improvement in visual results will satisfy patients and doctors.

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