

Case Report

A Report of Pupilloplasty for Secondary Glaucoma after Vitrectomy Associated with Ocular Trauma

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Blunt ocular trauma is frequently seen in clinical practice, and is likely to cause ocular structure disruption and visual function impairment. Vitrectomy is considered as an efficacious treatment of severe ocular trauma; however, secondary glaucoma has been frequently observed postoperatively¹⁻⁴. The present paper reported a case undergoing pupilloplasty, which successfully lowered intraocular pressure (IOP), reconstructed anterior segment structure, and restored visual function.

Patients and methods

Patient's information

The male patient, aged 48 years, consulted a doctor in Guangzhou Red Cross Hospital for hammer injuries on his right eye half a month ago. The patient was diagnosed with blunt ocular trauma on his right eye, lens dislocation, and traumatic mydriasis, and admitted to Guangzhou Red Cross Hospital on June 23, 2011.

Clinical information

Eye examination: Vod: (+12.00DS=0.15), IOP: Od: 9.3 mmHg, transparent cornea of the right eye, deep anterior chamber, vitreous body was seen in the anterior chamber, aqueous flare(+), pupil diameter 9 mm, peripheral anterior chamber about 1/4 CT, vitreous cavity was bright and transparent, and complete lens dislocation was located under vitreous cavity and in front of 12 o'clock-position retina.

Surgical procedure: after routine physical and topical examinations, the patient underwent the com-

bined surgery of vitrectomy, lensectomy, intraocular laser photocoagulation, gas-liquid exchange, plus intravitreal C3F8 injection on his right eye on June 27, 2011. The intravitreal lens was uplifted by optical fiber intra-operatively. The lens was removed using a vitreous tip. Retinal detachment was not found during surgery. Retinal peripheral hole was sealed using laser. A portion of 0.5 mL C3F8 was injected after gas-liquid exchange, IOP Tn. The patient self-reported swelling on his right eye accompanied by a right-side headache. IOP was elevated by 40 mmHg. Visual acuity could not be corrected. Conjunctival mixed hyperemia and central corneal opacity were observed. Anterior chamber and vitreous cavity were filled with gas. The pupil was centered, 9 mm×9 mm; peripheral angle closure was noted. He received conservative therapies including systemic and topical IOP-reduction, myosis, anterior chamber puncture to release gas and liquid, etc. IOP ranged from 24 and 32 mmHg. OCT revealed whole angle closure.

Pupilloplasty was successfully performed on July 20, 2011 to increase peripheral angle, accelerate outflow of aqueous humor, lower IOP, and ameliorate pupil appearance. Anti-inflammatory and anti-infection therapy was given post-operatively. The surgery was conducted as follows: "L" shaped incision was made on 7 o'clock-positioned bulbar conjunctiva at corneoscleral limbus of the right eye under anesthesia, about 3.5 mm from corneal limbus. Sclerotic puncture incision was made at 7 o'clock position; catheter was installed and fixed with suture (since the patient received vitrectomy, and intravitreal pressure was low, perfusion head was fixed inferior temporal intra-operatively to stabilize perfusion and IOP). Approximately 3 mm tunnel incision was made

at 12 o'clock-position of the upper cornea. Peripheral iris was pulled toward center using positioning hook and capsulorhexis forcep. No.10-0 needle was inserted into inferior 7 o'clock position cornea, penetrated cornea, and entered into anterior chamber. The suture needle passed through the inner edge of 7 o'clock iris and upper 11 o'clock, and then penetrated from 11 o'clock corneal periphery. A tunnel incision was made at 12 o'clock upper cornea using

lens hook, suture was hooked intraocularly; a knot was tied extraocularly and slowly tightened upper and lower sutures. Another knot was tied by the same procedure. Then, 9 o'clock iris was tightened toward center and aligned. Iris suture was made at 3 and 12 o'clock positions using the same method, forming a near round pupil, 5 mm×5 mm in size. Then corneal and conjunctival incisions were sutured, IOP Tn.

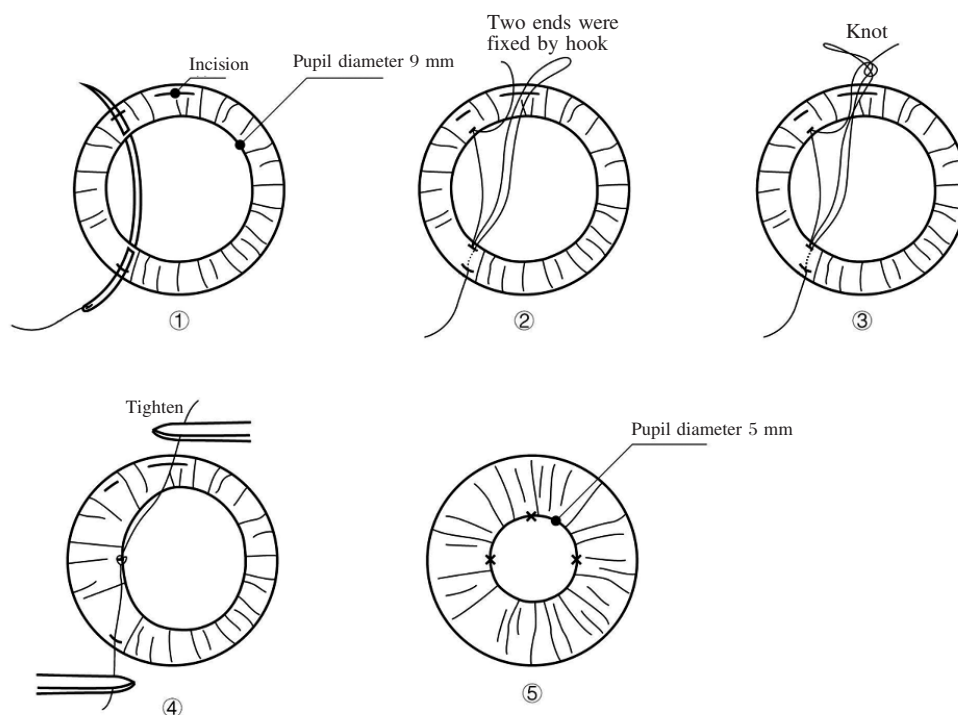


Figure 1 Schematic diagram of pupilloplasty

Results

Treatment efficacy: post-operative IOP 6 mmHg, Vod; (+12D=0.2), pupil was centered and presented round shape (5 mm×5 mm), iris suture was in proper position, circumferential angle opening and transparent vitreous cavity were observed. Retina was flattened.

Auxiliary examination: OCT and anterior segment photograph imaging were performed before and after surgery.

Discussion

The pathogenesis of secondary glaucoma after par plana vitrectomy plus C3F8 injection remains uncer-

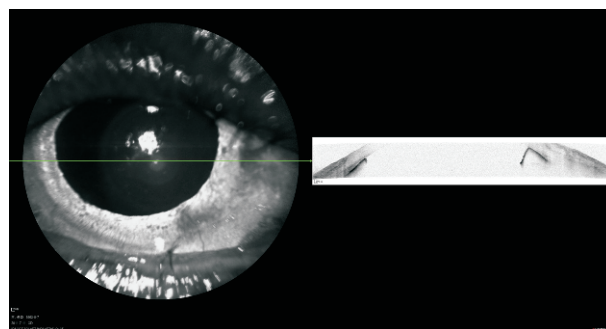


Figure 2 OCT image of angle of anterior chamber before pupilloplasty

tain, possibly due to the following reasons. (1) Following traumatic mydriasis and lens dislocation, the relative positions of lens, iris and vitreous were al-

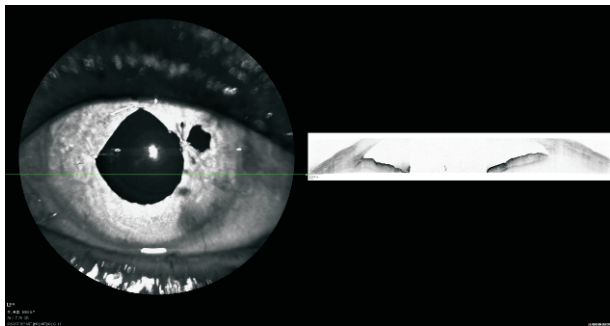


Figure 3 OCT image of angle of anterior chamber after pupilloplasty

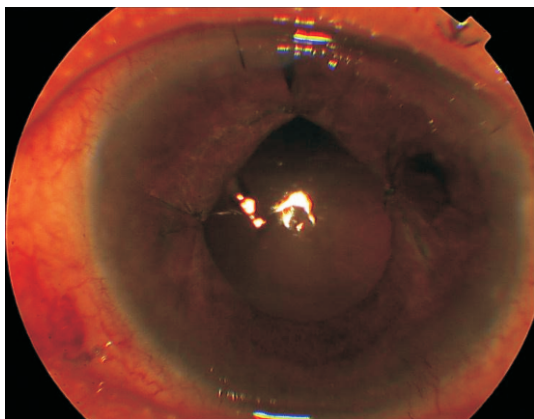


Figure 4 Image of anterior segment after pupilloplasty

tered, leading to peripheral anterior synechia and blocking the outflow of aqueous humor⁵. (2) Intraocular gas expansion let iris diaphragm move forward and exacerbated angle closure, causing extensive peripheral anterior synechia⁶. (3) Temporary IOP elevation was noted at early stage because the speed of gas expansion exceeded that of aqueous outflow⁶. (4) The patient failed to lie in prone position, which exacerbated angle obstruction⁶. (5) Excessively injected C3F8 overflowed into the anterior chamber, fully filling the vitreous cavity or the anterior chamber. IOP-lowering agent was ineffective; gas release from the anterior chamber played a temporary role and then aqueous humor release was conducted, whereas the IOP failed to decrease persistently. Intraoperative lens excision possibly exacerbated postoperative inflammatory response. (6) Intraoperative retinal photocoagulation might interfere with the backflow of choroidal vein and cause ciliary body edema and effusion and antedisplacement, leading to anterior displacement of root of iris and narrowing chamber angle².

The patients had traumatic injuries for a relatively short time. Although postoperative IOP was not high, ocular inflammation was observed, and the condition of chamber angle remained unclear. Among the multiple factors contributing to postoperative elevated IOP, gas-filled anterior chamber and vitreous cavity and iris antedisplacement-induced chamber angle obstruction acted as major factors. The present authors considered that iris antedisplacement and angle obstruction are the dominant factors leading to secondary glaucoma when employing surgery. Pupilloplasty can exert traction on iris toward centrality, restore the position of anterior iris diaphragm, reopen peripheral chamber angle, promote the outflow of aqueous humor, and decrease IOP steadily. However, filtering surgery (trabeculectomy or glaucoma valve implantation) failed to resolve the problem fundamentally. In addition, postoperative scarring proliferation and filtering tunnel block probably led to surgical failure^{6,7}. Ciliary body freezing may be effective, though severely destructive⁸.

Clinical practice demonstrated that pupilloplasty can decrease IOP significantly and persistently. Besides, it serves as an efficacious treatment of mydriasis, restores the morphological shape of pupil, and eliminates photophobia and flare⁹. Postoperative visual acuity can be maintained, and pupil appearance can be improved. Pupilloplasty is a safe, simple, and low cost surgery that causes mild injuries. Therefore, pupilloplasty serves as a proper treatment of traumatic pupillatonia, anterior synechia, angle closure secondary glaucoma.

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