Case Report

Taiwan J Ophthalmol 2021;11: 296-299

Access this article online

Quick Response Code:

Website:
www.e-tjo.org

DOI:
10.4103/tjo.tjo_36_20

Combined phacovitrectomy with capsular tension ring and gas tamponade for chronic cyclodialysis cleft unresponsive to conventional closure

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Abstract:

Traumatic cyclodialysis clefts, a rare diagnosis after blunt injury to the eye, are typically amenable to closure with either medical therapy or direct surgical cyclopexy. However, when cyclodialysis clefts cannot be closed through these methods, unorthodox techniques may be required. We describe a method to close a traumatic cyclodialysis cleft involving simultaneous vitrectomy, capsular tension ring placement, and insertion of an intraocular lens.

Keywords:

Capsular tension ring, choroidal folds, cyclodialysis cleft, hypotony, phacovitrectomy

Introduction

Traumatic cyclodialysis clefts are a rare diagnosis after blunt injury to the eye.[1] If diagnosed in a timely manner, most are amenable to closure with either medical therapy or direct cyclopexy. For clefts unamenable to primary closure, there are numerous techniques to attempt cleft repair. We describe a technique in which an intraocular lens (IOL) is placed at the same time as cleft repair without the need for iris cerclage.

Case Report

A 38-year-old male was initially seen by the ophthalmology service due to blunt trauma to the right eye secondary to assault with a metal pipe. On initial consultation in the hospital, he was diagnosed with a right-sided closed orbital wall fracture, traumatic iritis with microhyphema, and a choroidal rupture in the right eye. Vision at that time was hand motion, and intraocular pressure (IOP) was 44 mmHg through rebound tonometry. After initial treatment with topical steroids, his visual acuity improved from hand motion to 20/60 over the course of 2 months. During his recovery, the patient was noted to have persistent hypotony and macular folds [Figure 1a]. No cyclodialysis cleft was initially seen, although he was persistently dilated on cycloplegia for the iritis during initial gonioscopy. In addition, his IOP was noted to be consistently lower than the left eye, with at least a 5 mmHg difference each visit, and ranged between 6 and 11 mmHg. A month after his initial injury, choroidal folds were noted on examination and on optical coherence tomography. Although his IOP at this time was 9 mmHg, the IOP in his left eye was 20 mmHg.

Three months after his initial injury, he was referred to the retina service for the

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Submission: 25-04-2020
Accepted: 08-06-2020
Published: 12-02-2021

How to cite this article: Petersen EL, Blieden LS, Newman TM, Lin AL. Combined phacovitrectomy with capsular tension ring and gas tamponade for chronic cyclodialysis cleft unresponsive to conventional closure. Taiwan J Ophthalmol 2021;11:296-9.

evaluation. Best-corrected visual acuity (BCVA) was 20/60 in the right eye, IOP was 11 mmHg in the right eye, and 20 mmHg in the left eye. Examination of the anterior segment revealed a shallow anterior chamber, and undilated gonioscopy revealed a 5-clock-hours cyclodialysis cleft located temporally. The patient was then referred to the glaucoma service for cyclodialysis cleft closure. Initial surgical repair was performed by direct cyclopexy through scleral flaps with 10–0 prolene suture. Afterward, a small area (<1 clock h) of open cleft was still noted superotemporally, which did not close after application of argon laser. A repeat direct cyclopexy was performed a month after initial surgery with 9–0 prolene suture, but was unsuccessful in relieving his hypotony.

Given his refractory course, he was referred to another glaucoma specialist for evaluation and treatment. Ultrasound biomicroscopy (UBM) examination revealed shallow choroidal serous detachments with an atrophic, detached ciliary body processes corresponding to the location of the cyclodialysis cleft. Gonioscopic examination showed an area concerning for residual cleft opening between 7 and 8 o'clock, but closure of the cleft was confirmed with pressure on the globe during UBM [Figure 2]. His hypotony was thought to be secondary to infarcted ciliary body processes secondary to detachment. Due to the cause of hypotony, the glaucoma specialist suggested phacoemulsification with capsular tension ring (CTR) insertion with the IOL, and pars plana vitrectomy with gas tamponade to bolster and reattach the ciliary body as a more heroic measure.

A month afterward (over 3 months since the initial injury), a combined phacovitrectomy with IOL, CTR implantation, and gas tamponade with 22% sulfur hexafluoride (SF6) was then performed. During phacoemulsification, zonular instability was noted in areas associated with the cyclodialysis cleft. A MORCHER® Type 14C CTR (FCI Ophthalmics, Pembroke, MA, USA) was inserted into the capsular bag to provide capsular support, and an +22.50D SN60WF acrylic monofocal IOL (Alcon, Fort Worth, TX, USA) was placed in the capsular bag without complication. The diopter was chosen based on the calculations and axial length of the normal contralateral eye. A complete vitrectomy was performed, with induction of a posterior vitreous detachment and vitreous skirt shaving. After air-fluid exchange, the air was exchanged with 22% SF6 in the vitreous cavity. He was then instructed to remain supine for a week. Postoperatively, the patient had short-term ocular hypertension above 30 mmHg that was well controlled with topical therapy and oral acetazolamide. A little over 1 month after the surgery, the hypotony resolved in the right eye, with normalization of the anterior chamber and ocular hypertension at 28 mmHg on topical steroids. His topical steroids were tapered off over the next 2 weeks, and his pressure decreased to 14 mmHg without any topical aqueous suppressants. Three months after the surgery, his BCVA improved to 20/25 (requiring +0.50 D correction) and his IOP was 14 mmHg without any medications, with some resolution of his choroidal folds. His cyclodialysis cleft was noted to be closed on gonioscopy at this visit. A year after his last surgery, BCVA remained 20/25 without any complications, with a measured IOP of 18 mmHg off all drops. No lens decentration or dislocation was noted at present. His choroidal folds were noted to have improved significantly, though not completely resolved [Figure 1b].

Discussion

There are many sequelae that can occur after blunt trauma to the eye, but cyclodialysis cleft formation appears to be relatively rare compared to other conditions.[1] Cyclodialysis clefts unamenable to closure by medical therapy through cycloplegia or laser treatment require surgical management for long-term successful closure and resolution of hypotony. Direct cyclopexy through scleral resection to access the ciliary body with subsequent suturing of the cyclodialysis cleft (with various suture techniques) have been the most studied and are typically very successful.[2,3] Overall success rate by direct cyclopexy is high; closure is often successful within two attempts.[3,4]

Other techniques to close cyclodialysis clefts have been described, though they have not been analyzed as much in the literature compared to direct cyclopexy. These techniques include direct cryotherapy,[2,3,5] temporary anterior segmental scleral buckling with sponge elements and cryotherapy,[6] gas tamponade with 20% SF6 with cryotherapy,[7] pars plana vitrectomy with cryotherapy and gas tamponade,[8] suturing a CTR to sclera with iris cerclage,[9] and supporting the sulcus with either the haptics of a three-piece IOL or CTR.[10-13] Although case reports have described their successes, the rareness of this diagnosis after an injury makes it difficult to determine the overall effectiveness of these techniques. Failure of the initial attempts with direct cyclopexy was likely due to a combination of detached ciliary bodies as well as ciliary body infarction, rather than surgical technique given the high success rate described in the literature.

Gross *et al*. has described a fairly recent surgical technique to close large cyclodialysis clefts.[14] In this technique, phacoemulsification with the placement of a CTR, subsequent pars plana vitrectomy, gas tamponade, and light cryotherapy, was used to repair large cyclodialysis clefts >180° successfully. In their case of four eyes, hypotony was relieved in all patients with improvement in the visual acuity. Of these four patients, three were

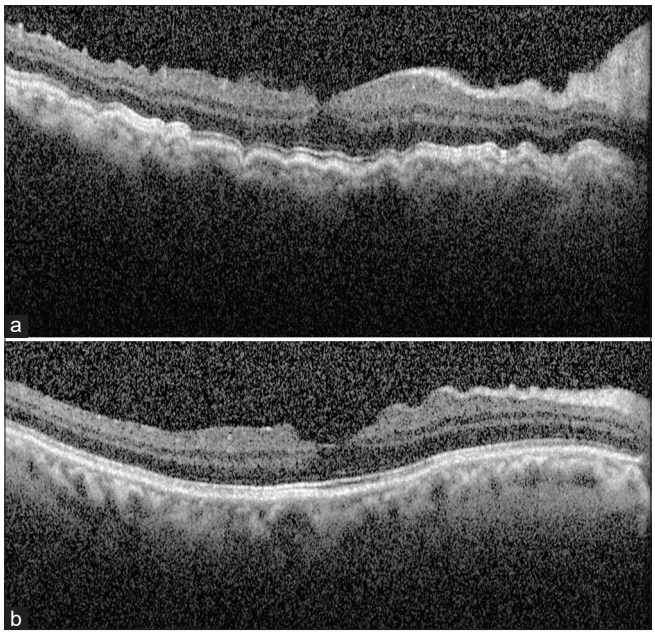

Figure 1: (a) Optical coherence tomography of the right eye before first attempt at direct cyclopexy. (b) Optical coherence tomography of the right eye 1 year after combined phacovitrectomy with capsular tension ring placement and gas tamponade. Note the significant improvement of choroidal folds

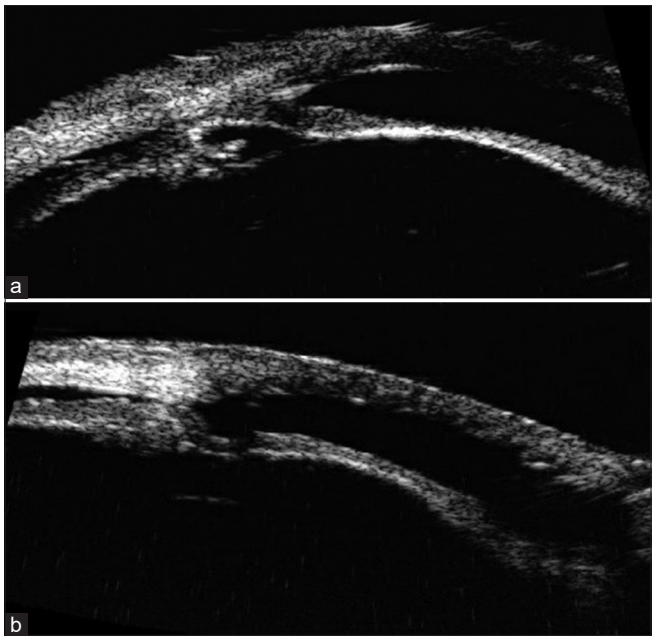

Figure 2: (a) Ultrasound biomicroscopy of the right eye after second direct cyclopexy, between 7 and 8 o'clock, showing atrophic and detached ciliary body. (b) Ultrasound biomicroscopy confirming cleft closure with pressure on the globe

left aphakic. We performed a similar technique to close this patient's chronic cyclodialysis cleft successfully, with simultaneous IOL implantation in the capsule at the time of phacoemulsification and CTR placement. Given the axial length of the affected eye was 3 mm shorter than the contralateral eye, the contralateral eye was used to calculate the diopter of the lens implanted, with −0.50 diopters of error as the target. Other than his short postoperative ocular hypertension, no significant long-term complications were noted after surgical repair. We believe this technique closed the cleft by helping oppose the ciliary body to the scleral spur by two means; with direct bolstering of the ciliary body to the spur through the CTR, and posterior pressure through short-acting gas tamponade when lying supine. The flatter, more pliable diaphragm provided by a CTR-supported capsule works synergistically with posterior pressure while supine through gas tamponade for better apposition. Thorough pars plana vitrectomy, with removal of the posterior hyaloid and vitreous skirt shaving, was performed to maximize surface area for gas tamponade posterior to the capsule and to ensure enough gas at a week of tamponade. Complete vitrectomy also lessens the risk of retinal detachment and possible subsequent proliferative vitreoretinopathy (due to his age) from residual peripheral vitreous that would have been otherwise left with anterior vitrectomy.

This technique provides some advantages over other previously described techniques; given that traumatic cataracts with zonular instability may be present, treatment of both a traumatic cataract and hypotony from a cyclodialysis cleft can be done simultaneously with this technique without the need for CTR suturing with iris cerclage,[9] or placing a CTR or three-piece IOL in the sulcus. Such techniques, while effective, are also very complex to perform and may have long-term complications, such as uveitis-hyphema-glaucoma findings from iris chafing of haptics, potential future malignant glaucoma, and vitreous prolapse. Plus, treatment of a traumatic visually significant cataract and a cyclodialysis cleft may potentially be done simultaneously, instead of leaving the patient aphakic,[14] with this technique. Finally, the less complex anterior segment techniques required may make this technique more approachable by the ophthalmology community. One potential weakness of this technique is that while it appears to have been successful for a refractory cyclodialysis cleft <180°, its effectiveness is unknown for cyclodialysis clefts >180° with significant zonular instability.

In this case, hypotony improved with a corresponding improvement in vision. The choroidal folds, although not completely resolved, did improve significantly. Persistent hypotony may eventually result in irreversibility of the choroidal folds due to fibrotic changes in the retina, choroid, or sclera.[15] Thus, while optimal timing of cyclodialysis clefts repairing is within 3 months after injury, this case showed that it may still be worthwhile to attempt repairing even after 3 months.[16] Reproducible results with additional surgeries would help validate this technique as a way to close chronic cyclodialysis clefts with ciliary body detachment while inserting

an IOL simultaneously. More cases are necessary to help determine the best algorithms in determining IOL power, but using the contralateral eye if no previous measurements are available may be an acceptable alternative. However, a large case series may be difficult owing to the fairly rare incidence of this diagnosis. This surgical technique may serve as a flexible way to close more complex cyclodialysis clefts not amenable to direct cyclopexy, especially for clefts that are chronic.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consents for the patients images and other clinical information to be reported in the journal. The patient understands that his names and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interests of this paper.

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