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CASE REPORT

Management challenges arising from a traumatic 360 degree cyclodialysis cleft

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Abstract: We describe the case of a 28-year-old naval officer who attended the ophthalmology service following blunt ocular trauma to the left eye. Clinical examination revealed a shallow anterior chamber, hypotony, and a 360° cyclodialysis cleft. We discuss the management options in this case, with an overview of the current literature.

Keywords: cyclodialysis, cleft, hypotony, cryotherapy, trauma

Case report

We report the case of a 28-year-old naval officer who attended our emergency eye clinic following an alleged assault. He had been punched and kicked repeatedly to the left side of his face. His acuities were 6/6 OD and 6/60 OS. Examination revealed a very shallow anterior chamber with iridocorneal touch, microhyphema, and intraocular pressure of 0 mmHg in the left eye. Gonioscopic evaluation was deemed difficult (Figure 1), and a limited funduscopic view showed no evidence of choroidal folds or posterior globe rupture.

The following day, the intraocular pressure was again found to be 0 mmHg, with "count fingers" vision and the development of hypotonous maculopathy noted on clinical examination. Indentation gonioscopy with mydriasis revealed a 360° cyclodialysis cleft (Figure 2). Following consideration of the management options, 270° cryotherapy was used, 2 mm from the limbus. Eight hours following the procedure, the intraocular pressure was 9 mmHg, and 3 days later (Figure 3), the visual acuity had improved to 6/6, with complete resolution of the hypotonous maculopathy. At 2-month review, the cleft appeared to have closed completely (Figure 4).

Discussion

Cyclodialysis clefts are a rare complication of severe blunt ocular trauma or intraocular surgical manipulation, and their diagnosis and management can often be difficult. Characteristically, they represent complete disruption of the circumferential insertion of the meridional ciliary muscle fibers to the scleral spur.[1] This can result in hypotony due to the creation of an abnormal drainage pathway of aqueous humor into the suprachoroidal space. Treatment is often required due to the chronic low pressure, and secondary complications can result. These include a shallow anterior chamber, cataract formation, hypermetropic refractive shift, choroidal effusions, optic disc swelling, and, occasionally, visual loss. There are over 20 reported management

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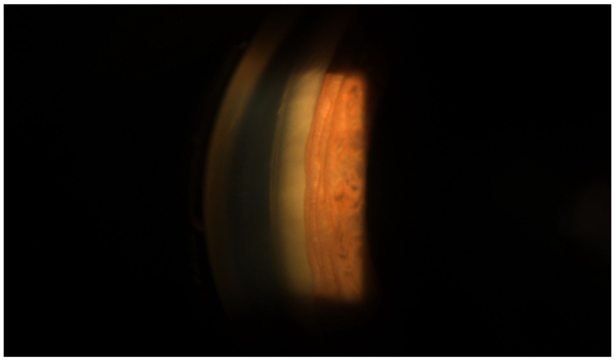

Figure 1 With conventional gonioscopy, the angle appears occluded.

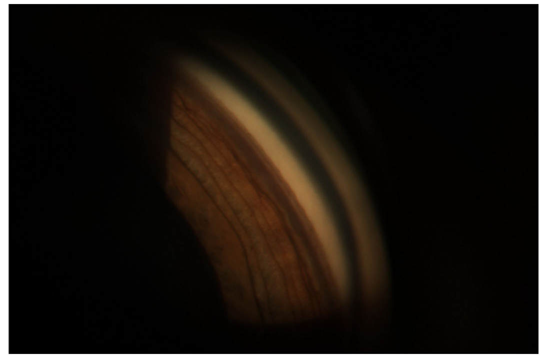

Figure 3 One week following cryotherapy, the anterior chamber is formed.

techniques in the literature, all with the essential aim of inducing appositional closure of the cleft and thereby increasing the intraocular pressure.

Prior to meticulous gonioscopy, the differential diagnosis included posterior globe rupture, angle recession, tractional ciliary body detachment, and ciliary body shutdown, as well as a cyclodialysis cleft. There was no subconjunctival hemorrhage or chemosis, and posterior globe rupture may not always be clinically obvious, with imaging modalities such as B scan ultrasonography or high-resolution computerized tomography often a requirement. Angle recession, whereby a disinsertion between the longitudinal and meridional ciliary body muscle fibers occurs due to blunt ocular trauma, can often result in hypotony. It is hypothesized that anterior-posterior globe compression and equatorial expansion occurs, resulting in a shearing force at the ciliary body.[1] This can lead to trabecular outflow dysfunction resulting in a rise in intraocular pressure. Therefore, close monitoring is required, because traumatic secondary glaucoma can result, even years later. A tractional ciliary body detachment must also be kept in mind in such cases, although visualization is often difficult. Similarly, the presence of iridocyclitis may result in hypotony; there is an increase in permeability of the blood-aqueous barrier and impairment of ciliary body function which, in synergy, act to reduce the intraocular pressure.

Clinical examination has traditionally relied upon accurate gonioscopy to identify the site and size of the cleft, and in this instance the cleft was initially undetected because the anterior chamber was shallow and the conventional gonioscopy view was limited by a hyphema. Mydriasis enables a "deepening" of the anterior chamber and, therefore, the cleft was visible with indentation gonioscopy (see Figure 2). This serves as a useful tip for ophthalmologists suspecting a cyclodialysis cleft. Elsewhere, intracameral viscoelastic has also been recommended for use prior to gonioscopy, although this use should be reserved for nontraumatic cases only.[1] Of note, it is necessary to perform gonioscopy on the fellow eye, where possible, to evaluate and compare the morphology of the iridocorneal angle, because this can often be variable.

Recent advances in diagnostic imaging, including ultrasound biomicroscopy and anterior segment optical

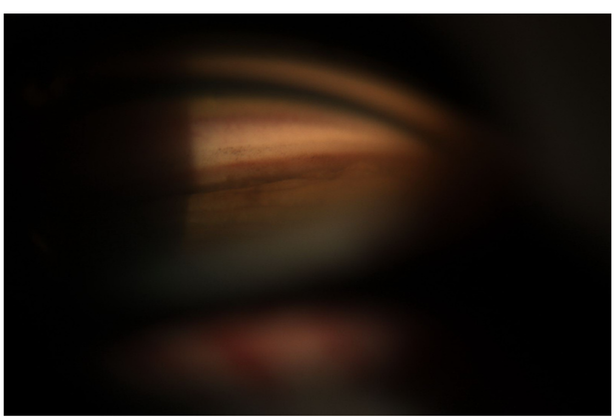

Figure 2 Cyclodialysis cleft is demonstrated using indentation gonioscopy.

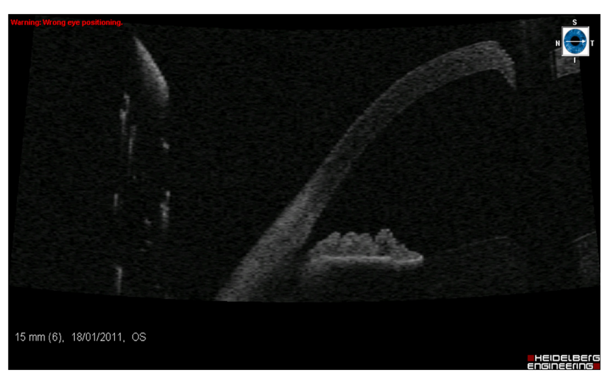

Figure 4 Anterior segment OCT 2 months following cryotherapy, showing closure of the cyclodialysis cleft. The patient had a contact intraocular pressure of 12 mmHg, with unaided Snellen visual acuity of 6/5.
Abbreviation: OCT, optical coherence tomography.

coherence tomography have aided the identification of the exact position and size of the cyclodialysis cleft.[2] Anterior segment optical coherence tomography has the secondary advantage of being a noncontact device, thereby minimizing patient discomfort. The high resolution and accuracy of ultrasound biomicroscopy allows ciliary body visualization, permitting the differentiation between a cyclodialysis cleft and the suprachoroidal space.[3] The modality is accurate, with Nolan describing a 100% success rate in the detection of 32 clefts in 32 eyes, although ultrasound biomicroscopy was not compared with gonioscopy directly.[3] Similarly, Jewelewicz et al have described a technique using scleral transillumination, verified with high frequency ultrasound biomicroscopy to identify the site and size of the cleft.[4] Accuracy in identification is pivotal in subsequent decision-making about management, because this will help determine the surgical approach required.

Treatment modalities

Whilst medical treatment of cyclodialysis clefts has generally been disappointing, use of atropine 1% for 6–8 days has been reported to close small clefts in some instances by allowing the apposition of the detached meridional muscle to sclera.[1] Reducing the postoperative steroid dose to increase scarring and facilitate closure has been reported.[5]

External and internal laser-based techniques received recognition in the 1990s. Joondeph used argon laser photocoagulation to achieve closure in small clefts by using a gonioscopy lens within the cleft site.[6] Yttrium aluminium garnet (YAG) lasers have also been used via transcleral application.[7] Furthermore, external diode laser therapy has been reported to be as effective by Brooks et al. The technique involves the application of two rows of burns, for a duration of 1500 msec, using a power of approximately 1500 mW, thereby inducing a localized inflammatory reaction and permitting closure.[7] In recent years, endoscopic cyclophotocoagulation has been developed for the treatment of open-angle glaucoma, and this technology may be useful in achieving appositional cleft closure in the future.

Transcleral diathermy involves the creation of a partial thickness scleral flap prior to the application of a diathermy probe. This technique is based on the creation of a thermal burn and resultant inflammatory reaction, similar to that created by laser photocoagulation. Scleral ectasia and lens damage have been reported with these techniques.[8]

Cryotherapy application has achieved popularity in recent times, because this technique has the advantage of not damaging sclera. Using a cryotherapy probe 2–3 mm from the limbus, a series of overlapping applications can be performed (temperature approximately −50°C to −60°C).[9] Success rates have been variable. For the purposes of our case, we felt that this technique was most suitable in order to minimize damage to the sclera in view of the size of the cleft.

Surgical therapy

Surgical treatment may be considered, particularly in the case of large clefts, where initial laser-based and medical measures have failed.[10]

Suture-based techniques

Ab externo suture placement has received much consideration, and has been shown to be useful in both pseudophakic and aphakic patients. However, concern remains about the rebound rise in intraocular pressure. Full thickness or partial thickness flaps have been described, depending on the size and extent of the cyclodialysis cleft. Similarly, McCannel explained an alternative technique whereby a suture is placed through the sclera and ciliary body base, and then radially through the cornea.[11]

Vitreoretinal procedures

Various external and internal approaches have been described in the literature, including use of anterior buckling techniques and endotamponade. Silicone rods have been placed under a partial thickness scleral flap with some success.[14] Furthermore, use of mattress sutures with a sponge buckle, in addition to cryotherapy, has been described by Mandava et al.[12] The buckle is removed after a few weeks to prevent astigmatism and Dellen formation. However, this technique may be a little technically challenging due to the risk of globe perforation when placing sutures in a hypotonous eye. In 1999, Hoerauf et al described a technique of vitrectomy, fluid-gas exchange, and cryotherapy in a patient with a cyclodialysis cleft.[15] The aim was for the cleft to be opposed by mechanical means (using endotamponade for 5 days), in the form of the gas bubble, and scar induction from the cryotherapy. This technique would appear favorable if there is lens dislocation or coexisting posterior segment problems.

Phacoemulsification/lensectomy surgery with intraocular lens placement

Yuen et al recently reported effective management of a 360° cyclodialysis cleft by standard phacoemulsification, followed by insertion of a Morcher capsular tension ring sutured with 10-0 Prolene at two points to the sclera. A posterior chamber implant was inserted.[13] Similarly, other techniques including using larger intraocular lenses with large haptics to compress the cleft have been described, along with haptic rotation towards the cyclodialysis cleft area by Malandrini et al.[2]

Conclusion

Management of cyclodialysis clefts requires a careful and logical approach. Due to its rarity, many ophthalmologists may not see such cases, and the use of indentation gonioscopy with mydriasis helps to deepen the anterior chamber and aids detection. This case highlights the importance of prompt recognition of the size and location of the cleft, thereby facilitating early management and preventing long-term sequelae. The development of newer imaging techniques, notably ultrasound biomicroscopy and anterior segment optical coherence tomography, have aided diagnostic clarification considerably. Conservative and noninvasive management appears to be the best approach initially, followed by more invasive surgical interventions for recalcitrant hypotony. Patients must be kept fully informed of the possible risks and benefits of treatment throughout their management. A literature review has failed to identify a clear "gold standard", and multiple techniques have been described. In this particular case, we elected to perform minimal cryotherapy, taking into account the possible risks, which could include the failure of treatment and a rebound excessively high intraocular pressure. At 3 months the intraocular pressure has been stable, with no further procedures required. Currently, insufficient research exists regarding ideal management of cyclodialysis clefts, due again to the rarity of the condition. Until robust and long-term data are available, management will continue to be determined by the local availability of imaging, equipment, and expertise.

Disclosure

The authors report no conflicts of interest in this work.

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