American Journal of Ophthalmology Case Reports 26 (2022) 101571

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Retina-sparing suprachoroidal intraocular foreign body resulting in cyclodialysis cleft

Colin P. Kane [a], Thomas V. Johnson [b], Mira M. Sachdeva [c,*]

[a] Baltimore Veterans Affairs Medical Center, USA
[b] Glaucoma Center of Excellence, Wilmer Eye Institute, Johns Hopkins University School of Medicine, USA
[c] Retina Division, Wilmer Eye Institute, Johns Hopkins University School of Medicine, USA

ARTICLE INFO

Keywords:
Suprachoroidal intraocular foreign body
Cyclodialysis cleft
Trauma
Hypotony

ABSTRACT

Purpose: Suprachoroidal intraocular foreign bodies (IOFBs) are an exceedingly rare manifestation of ocular trauma. Here we present a unique case of a metallic wire tracking from the cornea through the suprachoroidal space, and remarkably sparing the retina and lens. The patient attained an excellent visual outcome after management of resultant cyclodialysis cleft.

Observations: A 34-year-old male experienced a penetrating IOFB while operating a rotary wire brush. He presented to the emergency department where posterior involvement of the IOFB was confirmed on CT scan. He underwent emergent pars plana vitrectomy, during which the IOFB was found to be located underneath intact retina and choroid on scleral depression. The wire was removed through the entry wound, which was self-sealing. At follow up, intraocular pressure was 3 mmHg with findings of hypotony. A cyclodialysis cleft was confirmed with ultrasound biomicroscopy. Cycloplegic and photocoagulation treatments were attempted, but ultimately direct cyclopexy was performed to successfully repair the cleft. One year after the initial incident, visual acuity is 20/25 and IOP is 17 mmHg.

Conclusion and importance: Cyclodialysis cleft is a rare sequela of penetrating ocular injury. Clinicians should consider the presence of a cyclodialysis cleft in the setting of postoperative hypotony and confirm either with gonioscopy or other anterior segment imaging methods. Despite failure of conservative therapies, our patient had an excellent visual outcome following surgical closure of the cleft.

1. Introduction

Intraocular foreign bodies (IOFB) are associated with 18–41% of all open globe injuries and have a highly variable outcome depending on several factors, including IOFB characteristics, zone of injury and ocular structures involved.[1] Suprachoroidal IOFBs are exceedingly rare, with a single existing report involving scleral penetration posterior to the limbus, causing a retinochoroidal tear.[2] Here we describe an extraordinary case of a suprachoroidal IOFB in a phakic patient, tracking from a corneal entry wound precisely through the anterior chamber angle and into the suprachoroidal space (SCS). The IOFB spared the retina but created a cyclodialysis cleft (CDC), which was successfully managed with a staged external cyclopexy.

2. Case report

A 34-year old man with noncontributory past medical history was transferred from an outside hospital to the Johns Hopkins emergency department for evaluation of acute-onset blurred vision and pain in the right eye while cleaning an electrical pole with a rotary wire brush. At the time, he was wearing his habitual spectacles and not using safety glasses. He endorsed additional symptoms of nausea, pain with eye movement, and headache. Initial visual acuity (VA) in the right eye was 20/400 and examination revealed a metallic wire penetrating through the central cornea, extending temporally through the anterior chamber with apparent posterior segment extension (Fig. 1A). Computed tomography (CT) scan confirmed tracking of the foreign body posteriorly, presumably into the vitreous cavity, however the posterior aspect of the IOFB was unable to be directly visualized preoperatively as fundus examination was limited by the patient's significant discomfort (Fig. 1B).

* Corresponding author. Wilmer Eye Institute, Johns Hopkins University School of Medicine, 600 North Wolfe Street, Maumenee 748, Baltimore, MD, 21287, USA.
E-mail address: msachde4@jhmi.edu (M.M. Sachdeva).

https://doi.org/10.1016/j.ajoc.2022.101571
Received 23 September 2021; Received in revised form 23 April 2022; Accepted 28 April 2022
Available online 3 May 2022

Due to the open globe nature of the injury, scleral depression was contraindicated as well, precluding a thorough peripheral retinal evaluation. The patient was taken emergently to the operating room for pars plana vitrectomy (PPV), removal of the IOFB, closure of open globe, and intravitreal injection of antibiotics/antifungals. As the eye pressure was maintained due to plugging of the entry wound by the wire, the PPV was performed first to remove vitreous from the posterior aspect of the wire and minimize potential tractional damage to the retina upon subsequent removal from the eye. However, no foreign body was identified within the vitreous cavity intraoperatively. Instead, during scleral depression, the presence of a linear foreign body underlying the intact retina was noted, without evidence of subretinal or choroidal hemorrhage, indicating that the wire had tracked through the SCS (Fig. 1C). The 22 mm wire was carefully removed through the original corneal entry wound without damage to the crystalline lens and without need to suture the cornea (Fig. 1D).

At one-month follow-up, VA had improved to 20/250 and the globe was formed, though the patient endorsed blurred central vision, photophobia, and pain. Intraocular pressure (IOP) was 3 mmHg and dilated examination revealed choroidal folds in the macula, disc edema, and peripheral choroidal detachments associated with hypotony (Fig. 2A). OCT demonstrated undulations of the choroid with wrinkling of the retina (Fig. 2B). UBM identified a CDC at the 8 o'clock position where the foreign body had entered the SCS (Fig. 2C). Topical cycloplegia and then subsequent laser photocoagulation of the cleft were initially attempted without success. The patient ultimately underwent surgical repair of the CDC approximately 2 months later. Intraoperative gonioscopy prior to repair demonstrated 1.5 clock-hours of cyclodialysis with adjacent angle recession (Fig. 3A). The cleft was repaired with direct external cyclopexy using interrupted 10-0 nylon sutures under a partial thickness scleral flap, confirmed with gonioscopy at the end of the case (Fig. 3B). Two weeks post-operatively, IOP was 14 mmHg and UBM demonstrated successful closure of the cleft and resolution of choroidal detachment (Fig. 3C).

During the next several months, there was resolution of the hypotony maculopathy and peripheral choroidal detachments (Fig. 4). One year after initial injury, best-corrected VA in the right eye was 20/25 with IOP of 17 mmHg and normal-appearing fundus.

3. Discussion

Eye injuries represent a significant portion of all work-related injuries in the United States. Approximately 280,000 work-related eye injuries present to emergency departments annually, most commonly due to foreign bodies and chemical burns.[3] IOFB resulting in an open globe occurs overwhelmingly in young men and the majority of these occur in the workplace (54%–72%).[1] Several studies report a significant lack of appropriate eyewear protection use in these injuries (68.3%–97.8%), which is represented in this case as the patient was only wearing his habitual glasses.[4–6] High-risk activities undertaken in any setting may also require a specific standard of eye protection and in many cases, the incorrect type is being used.[6]

Retention of metallic IOFBs may present long term complications due to direct or indirect damage to ocular structures; therefore, precise localization and complete removal is critical. Pre-operative examination in trauma patients and therefore direct visualization of posterior segment IOFBs may be limited. As in our case, while CT scan or B scan ultrasound can reveal the presence of an IOFB and suggest its location, ultimately the exact ocular structures involved may not be evident until surgical removal.

Suprachoroidal IOFBs are exceptionally rare and, to our knowledge, this is the first reported case of IOFB penetration through the anterior chamber angle into the SCS creating a CDC without directly damaging the retina. A shallow trajectory of the foreign body relative to the sclera was suggested by the location of the corneal and angle entry sites and the SCS likely offered the path of least resistance as the IOFB extended posteriorly. A CDC forms when the longitudinal fibers of the ciliary body detach from the scleral spur. This creates a direct channel for aqueous flow from the anterior chamber to the SCS, leading to hypotony. Chronic hypotony may lead to the development of hypotony maculopathy, retinal folds, choroidal effusion, disc edema, hyperopic shift, anterior chamber shallowing, corneal edema and if untreated, permanent vision loss.[7] A CDC may result from blunt trauma, or less commonly, following intraocular surgery.[8] Even more rare, there have been cases reported of CDC following open globe injury.[9]

Direct visualization of the cleft with gonioscopy provides the primary clinical method of diagnosis. However, in very hypotonous eyes this proves difficult as there may not be enough outward force to stabilize the cornea during examination, leading to anterior chamber

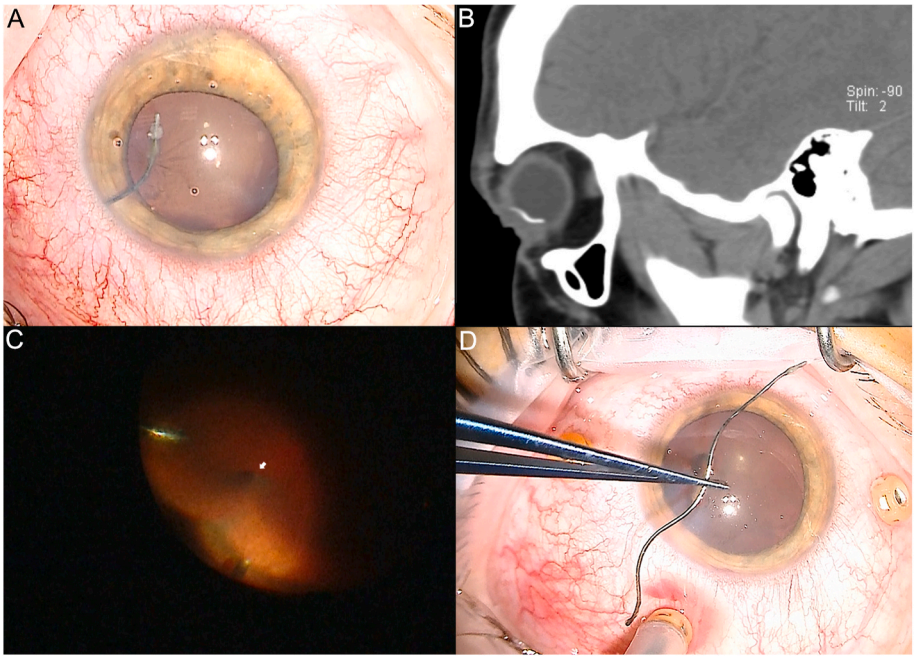

Fig. 1. Suprachoroidal Intraocular Foreign Body. Intraocular foreign body (IOFB) with penetration through the cornea, tracking through the anterior chamber towards the angle (pupil pharmacologically dilated) (A). CT scan demonstrating posterior extension of metallic IOFB (B). Intraoperative photo demonstrating an irregular contour on scleral depression (arrow), indicating the presence of an IOFB underneath intact retina (C). Successful removal of 22 mm IOFB through self-sealing corneal entry wound (D).

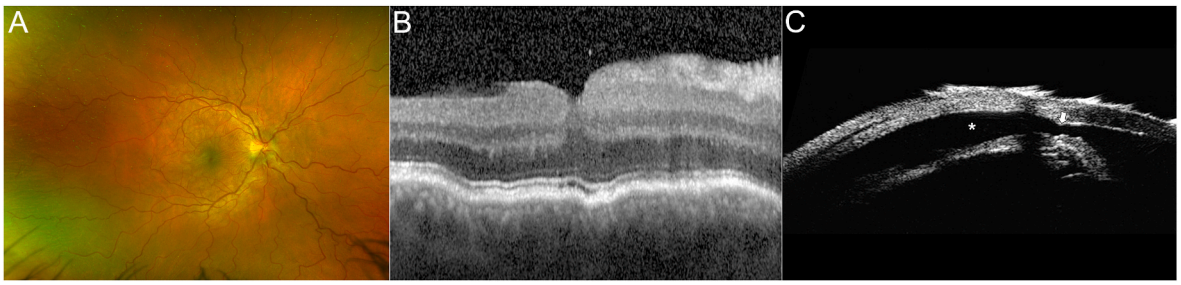

Fig. 2. Multimodal Imaging Demonstrating Hypotony. Choroidal folds, vascular tortuosity, disc edema and peripheral choroidal detachments indicative of hypotony maculopathy in fundus photograph (A). Choroidal and retinal folds can be seen through the macula on OCT (B). Ultrasound biomicroscopy (C) demonstrates choroidal detachment (asterisk) and cyclodialysis cleft (arrow).

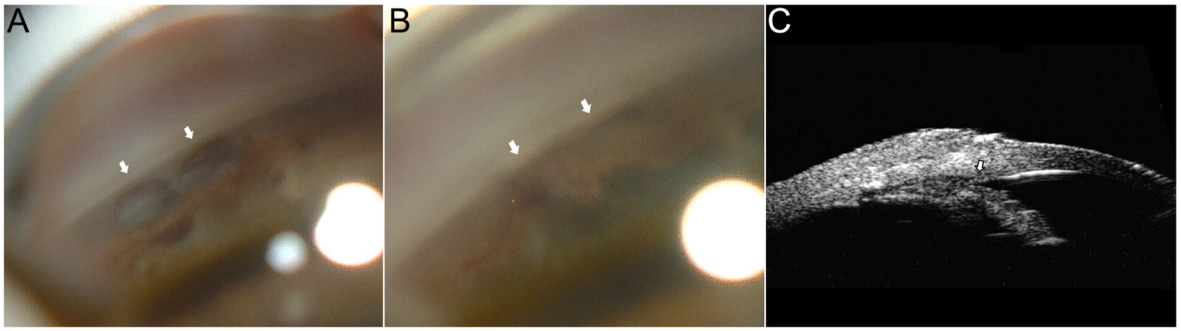

Fig. 3. Cyclodialysis Cleft Repair. Intraoperative gonioscopy (A) visualizing cyclodialysis cleft (arrows) with strand of tissue centrally and adjacent angle recession. Intraoperative gonioscopy following direct cyclopexy with closure of cleft (B, arrows). Two week postoperative UBM (C) shows successful closure of cleft (arrow) with overlying scleral thickening at the site of flap closure and resolution of choroidal detachment.

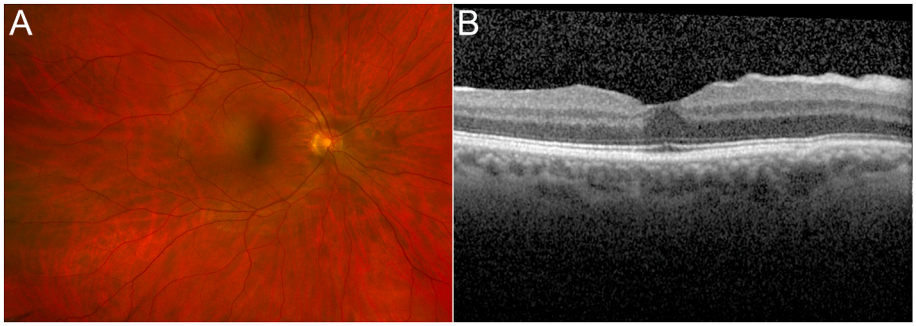

Fig. 4. Postoperative Imaging. Postoperative widefield imaging (A) and OCT (B) demonstrating resolution of hypotony and choroidal detachment.

collapse, corneal folds and loss of angle visualization. Viscoelastic injected via paracentesis has been used as a method to reform the anterior chamber temporarily for gonioscopy and, if indicated, laser treatment.[10,11] UBM and anterior segment OCT (AS-OCT) have also both been shown to be reliable means of diagnosing CDCs, with the benefit of AS-OCT being noninvasive and not requiring any contact with the patient's eye.[12,13] AS-OCT did not provide enough signal penetration to confidently image the angle in our patient, and diagnosis was confirmed with UBM.

Initial conservative management of CDCs can include topical cycloplegia to encourage the ciliary body to relax and appose to the scleral spur, sometimes closing the cleft. This may be successful in smaller clefts, but most cases require further intervention.[14,15] Procedural options include laser photocoagulation, cryotherapy, transscleral diathermy, direct external or internal cyclopexy, and PPV with silicone oil tamponade with or without cryotherapy.[7,16] Sulcus support with a capsular tension ring or intraocular lens has also been utilized to induce cleft closure.[8] Karkhur et al. describe a novel technique in repairing a post-traumatic CDC with anterior scleral band-buckle encirclage without cryotherapy.[17] Photocoagulation was unsuccessful in our patient due to light pigmentation of the ciliary body and sizeable gap between the ciliary body and sclera. In one series, surgical closure was necessary in 38.9% of patients that failed laser therapy.[16] In our case, the patient achieved an excellent visual outcome following surgical IOFB removal and CDC repair with direct external cyclopexy.

4. Conclusions

Prevention of eye injury remains a significant behavioral obstacle during high-risk activities both in and outside the workplace, with inconsistent utilization of proper eye protection that, when used correctly, can reduce the incidence of open globe injury and IOFB. Penetration of an IOFB into the SCS, as in this rare case, may result in a CDC.

There are many potential approaches to the management of post-traumatic CDCs and given their rare occurrence and variable

characteristics, no gold standard has been established. When topical treatment and laser are unsuccessful, surgical intervention may be necessary. When deciding which technique to use in surgical closure, the size of the CDC must be considered. If amenable, direct closure (direct cyclopexy) has been demonstrated to have a high likelihood of success,[7] though a formal comparison of surgical techniques may help define optimal surgical management guidelines. Fortunately for the patient, appropriate surgical and medical treatment resulted in an excellent recovery of vision in the injured eye.

Patient's consent

The patient consented to publication of the case in writing. This report contains no identifying personal information.

Funding

No funding or grant support.

Declaration of competing interest

All authors have no financial disclosures or conflicts of interest.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

References

1. Loporchio D, Mukkamala L, Gorukanti K, Zarbin M, Langer P, Bhagat N. Intraocular foreign bodies: a review. *Surv Ophthalmol.* 2016;61(5):582–596. https://doi.org/10.1016/j.survophthal.2016.03.005.
2. Hashim H, Lim KS, Choong YY, Nor NM. Hypotensive anesthesia in the management of a posterior suprachoroidal foreign body. *Retina Phila Pa.* 2005;25(1):87–89. https://doi.org/10.1097/00006982-200501000-00015.
3. Xiang H, Stallones L, Chen G, Smith GA. Work-related eye injuries treated in hospital emergency departments in the US. *Am J Ind Med.* 2005;48(1):57–62. https://doi.org/10.1002/ajim.20179.
4. Limbu B, Moore G, Marvasti AH, Poole ME, Saiju R. Work related ocular injury: Nepal. *Nepal J Ophthalmol Biannu Peer-Rev Acad J Nepal Ophthalmic Soc NEPJOPH.* 2018;10(19):47–56. https://doi.org/10.3126/nepjoph.v10i1.21689.
5. Mansouri MR, Hosseini M, Mohebi M, Alipour F, Mehrdad R. Work-related eye injury: the main cause of ocular trauma in Iran. *Eur J Ophthalmol.* 2010;20(4):770–775. https://doi.org/10.1177/112067211002000420.
6. Fong LP, Taouk Y. The role of eye protection in work-related eye injuries. *Aust N Z J Ophthalmol.* 1995;23(2):101–106. https://doi.org/10.1111/j.1442-9071.1995.tb00137.x.
7. Ioannidis AS, Barton K. Cyclodialysis cleft: causes and repair. *Curr Opin Ophthalmol.* 2010;21(2):150–154. https://doi.org/10.1097/ICU.0b013e3283366a4d.
8. Malandrini A, Balestrazzi A, Martone G, Tosi GM, Caporossi A. Diagnosis and management of traumatic cyclodialysis cleft. *J Cataract Refract Surg.* 2008;34(7):1213–1216. https://doi.org/10.1016/j.jcrs.2008.02.038.
9. Selvan H, Yadav S, Gupta V, Gupta S. Case report: cyclodialysis cleft in a case of open-globe injury and role of swept-source anterior segment optical coherence tomography in diagnosis. *Optom Vis Sci Off Publ Am Acad Optom.* 2020;97(6):395–399. https://doi.org/10.1097/OPX.0000000000001518.
10. Zhao R, Lou B, Yang Y, et al. Risk factors associated with failure of direct cyclopexy in the treatment of small to moderate tramatic cyclodialysis clefts. *Curr Eye Res.* 2020;45(7):797–804. https://doi.org/10.1080/02713683.2019.1698052.
11. Shue A, Levine RM, Gallousis GM, Teng CC. Cyclodialysis cleft associated with Kahook dual blade goniotomy. *J Curr Glaucoma Pract.* 2019;13(2):74–76. https://doi.org/10.5005/jp-journals-10078-1255.
12. Mateo-Montoya A, Dreifuss S. Anterior segment optical coherence tomography as a diagnostic tool for cyclodialysis clefts. *Arch Ophthalmol.* 2009;127(1):109–116. https://doi.org/10.1001/archophthalmol.2008.561.
13. Hwang JM, Ahn K, Kim C, Park KA, Kee C. Ultrasonic biomicroscopic evaluation of cyclodialysis before and after direct cyclopexy. *Arch Ophthalmol Chic Ill.* 2008;126(9):1222–1225. https://doi.org/10.1001/archopht.126.9.1222, 1960.
14. Ceruti P, Tosi R, Marchini G. Gas tamponade and cyclocryotherapy of a chronic cyclodialysis cleft. *Br J Ophthalmol.* 2009;93(3):414–416. https://doi.org/10.1136/bjo.2008.146266.
15. Ormerod LD, Baerveldt G, Sunalp MA, Riekhof FT. Management of the hypotonous cyclodialysis cleft. *Ophthalmology.* 1991;98(9):1384–1393. https://doi.org/10.1016/s0161-6420(91)32121-3.
16. Popovic M, Shareef S, Mura JJ, et al. Cyclodialysis cleft repair: a multi-centred, retrospective case series. *Clin Exp Ophthalmol.* 2019;47(2):201–211. https://doi.org/10.1111/ceo.13378.
17. Karkhur S, Vigil E, Shenoy P, et al. Cyclodialysis cleft repair with scleral band-buckle encirclage without cryopexy in the management of traumatic hypotony maculopathy. *Am J Ophthalmol Case Rep.* 2020;20:100946. https://doi.org/10.1016/j.ajoc.2020.100946.