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Scleral melt and uveal prolapse following 23-gauge pars plana vitrectomy

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ABSTRACT

Purpose: To report a case of uncontrolled juvenile open angle glaucoma (JOAG), with secondary high axial myopia who presented with scleral melting and uveal prolapse post pars plana-vitrectomy.

Observations: A 17-year-old male juvenile glaucoma patient, not known to have any systemic disease underwent a right eye 23-gauge-pars plana vitrectomy for retinal detachment repair. Three weeks following his surgery he presented complaining of tearing and photophobia in the operated eye in the absence of any ocular pain. Clinical exam revealed enlarged sclerotomy sites with localized conjunctival and episcleral injection, scleral thinning and uveal prolapse. Infectious and serologic work up were obtained to rule out an infectious etiology or underlying autoimmune disease. Patient was successfully managed with topical steroids and a donor scleral patch graft.

Conclusion and importance: This report addresses multiple risk factors for a devastating complication that may occur in predisposed patients, with primary or secondary axial myopia and a compromised sclera. This group of patients can be at risk of post-operative scleral melting and thinning and should be identified pre-operatively and monitored closely during their post-operative course.

1. Introduction

Scleral thinning and melting is a rare postoperative complication reported to occur after different ocular surgeries including pterygium excision,[1] cataract surgery,[2] vitrectomy[3] and cosmetic ocular-whitening procedure (I-BRITE®).[4] Possible intra-operative risk factors include the intraoperative use of MMC or adjunctive irradiation.[5,6] Progressive scleral thinning may eventually perforate and lead to the devastating complication of uveal prolapse; an ocular emergency that requires prompt management to prevent the adverse sequelae of endophthalmitis and sympathetic ophthalmia.

We here present a patient with juvenile open angle glaucoma (JOAG), buphthalmos with secondary high axial myopia and no other associated systemic disease who presented with scleral melting and uveal prolapse post a pars plana-vitrectomy procedure.

2. Case description

This report was approved by the Institutional Review Board of King Khaled Eye Specialist.

Hospital (KKESH) and adhered to the tenets of the Declaration of Helsinki. A 17-year-old male patient not known to have any systemic medical diseases, presented to our institute with a sudden history of loss of vision in his right eye associated with flashes and floaters for five days. His past ocular history included a diagnosis of juvenile open angle glaucoma (JOAG) with uncontrolled intraocular pressure (IOP) of 55 mmhg in his right eye, for which he underwent an uneventful superonasal deep sclerectomy (DS) two weeks prior to his drop of vision. The DS procedure was augmented with mitomycin C (MMC 0.02%), where after the formation of a superior fornix based conjunctival flap and the dissection of a superficial scleral flap (5mm × 5mm), cellulose sponges (Weck-cel®, USA) soaked with MMC were applied at the posterior subconjunctival space and over the scleral flap, for 2 minutes after which the field was irrigated thoroughly with balanced salt solution. He had no other previous ocular surgeries.

On presentation, his uncorrected visual acuity (UCVA) was hand motion in the right eye and 20/20 in the left eye. IOP was 12 and 19 mmhg. Ocular biometry readings showed an axial length of 31.37 in the right eye and 25.58 mm in the left eye. Scleral thickness across 4 meridians (superior, inferior, nasal and temporal) was measured using ultrasound biometry (UBM) and noted to be abnormally thin in both eyes with a range of (0.35–0.43 mm) in the right eye and (0.39–0.45 mm) in the left eye. Anterior segment exam was within normal limits and dilated fundus exam revealed an inferotemporal retinal detachment involving the macula with a temporal giant tear extending around 160°.

The patient under-went an uneventful retinal detachment repair

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through a standard 3-port pars plana vitrectomy with injection of 1300 CS Silicone oil as a tamponade. Sclerotomies were fashioned using 23-gauge vitrectomy system, 3–4 mm from the limbus and at the end of the surgery, the three sclerotomy sites were closed using 8-0 Polyglactin 910 (PG910) sutures. His postoperative assessment showed an attached retina under silicone oil, secured wounds, an UCVA of 20/200 and a controlled IOP of 12 mmhg using 4 anti-glaucoma agents.

Three weeks following his surgery he presented to the emergency room with a complaint of excessive tearing in his right eye. He reported no pain, photophobia or foreign body sensation. UCVA and IOP in the right eye were 20/200 and 32 mmhg respectively, and his clinical exam revealed scleral thinning over the recent sclerotomy sites with a localized conjunctival and episcleral injection. The 23-gauge sclerotomy sites that measured around 0.6 mm were noted to be enlarged to approximately 3 mm wide Inferotemporally and 2 mm superonasally and superotemporally with uveal prolapse through the inferotemporal sclerotomy (Fig. 1). The rest of his ocular exam was within normal limits including the absence of intraocular inflammation.

The patient was admitted and an infectious etiology was ruled out with scleral scrapings that showed a negative gram stain and no bacterial growth. Subsequently, patient was started on topical moxifloxacin 0.5% q.i.d, topical prednisolone acetate 1% q.2hr, in addition to full topical anti glaucoma eye drops (dorzolamide, timolol maleate 2, 0.5% b.i.d, brimonidine tartrate 0.15% b.i.d, bimatoprost 0.01% q.h.s.) and preservative-free lubricant eye drops and ointment.

He underwent scleral patch grafting where full thickness scleral grafts were tailored to fit the defects and cover the exposed uveal tissue, then were stabilized in place using 10-0 nylon non-absorbable sutures. A group of serologic work up were obtained to rule out an associated systemic vasculitis or infection (including syphilis and tuberculosis serology, angiotensin converting enzyme (ACE), serum lysozyme, serum rheumatoid factor, ANA, p-ANCA, and c-ANCA) which all revealed negative results. On post-operative day 1, patient was comfortable, reporting improvement of his symptoms and ocular exam showed secured wounds with well positioned scleral patch grafts (see Fig. 2). Intraocular pressure was stable at 16 mmhg and it was strictly controlled during his early post-operative period using topical antiglaucoma agents, targeting an IOP of less than 20 mmhg. Topical steroids were tapered over a period of 8 weeks, and the patient was followed up closely where no complications were observed during the 6-month-post-operative follow up period.

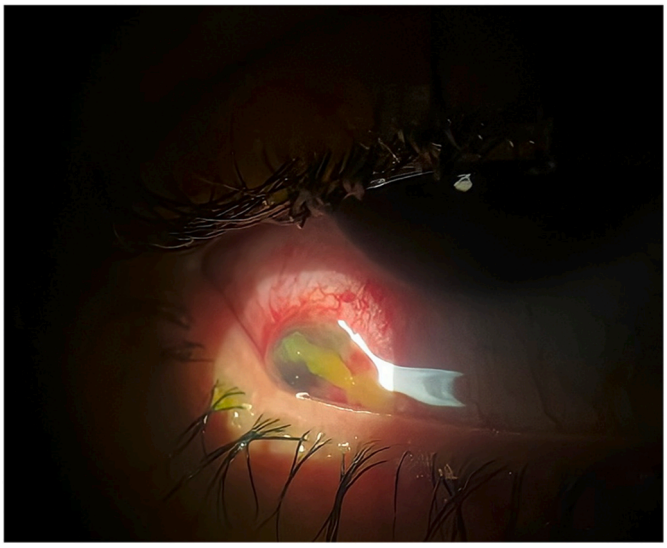

Fig. 1. Slit lamp photo of the right eye showing an inferonasal area of conjunctival and episcleral injection with enlarged sclerotomy site and prolapsed uveal tissue and mucoid discharge.

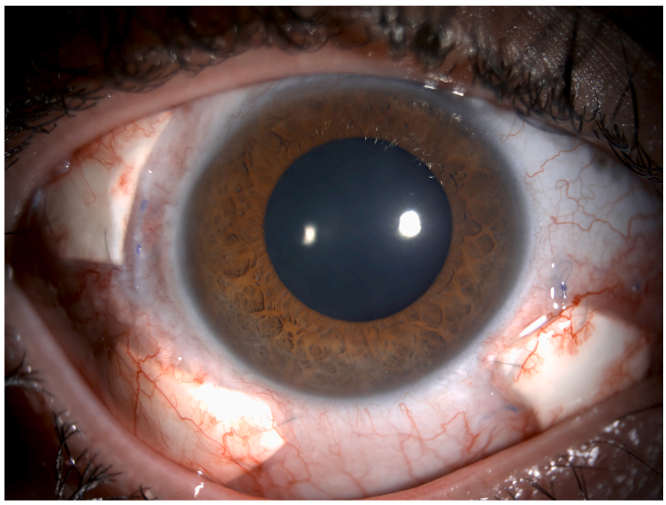

Fig. 2. Postoperative slit lamp photo showing three scleral graft patches secured in place with 10-0 Nylon non absorbable sutures.

3. Discussion

Human sclera is a relatively avascular dense structure made primarily of tightly packed collagenous extracellular matrix.[7] It has an un-uniform thickness, being thickest at the posterior pole (1–1.35 mm), and thinnest under the recti muscles (0.3 mm).[7] Patients with high myopia undergo structural scleral remodeling where collagen fiber bundles across the sclera gets lesser and narrower, resulting in a progressive scleral thinning and tissue loss.[8]

Similarly, patients with childhood glaucoma and buphthalmos are vulnerable to stretching and thinning of the sclera due to collagen immaturity with subsequent secondary axial myopia.[9] Eyes with primary open angle glaucoma (POAG) were also found to have thinner anterior scleral thickness compared to healthy eyes.[10] Previous studies showed that scleral weakening in eyes with primary axial myopia is predominantly found at the posterior pole of the eye,[11] compared to eyes with secondary high axial myopia where the sclera gets thinner anterior and posterior to the equator, especially at the pars plana region.[9,12]

As the reported patient had no systemic disorder that would result in connective tissue abnormalities or scleral thinning, we speculate that the cause behind this patient's presentation is the underlying mechanical and biochemical changes that occur in the sclera of eyes with secondary axial myopia, which was later compromised with placement of pars plana sclerotomies. Additionally, the concurrence of an uncontrolled intraocular pressure at the early post-operative period, could have played as an additional mechanical factor that further weakened the scleral tissue and resulted in prolapsing of intraocular uveal tissue.

Myopia was reported as a risk factor for sclerotomy leakage and early post pars plana hypotony in a retrospective case series.[13] Several precautionary intraoperative techniques were advocated to reduce the risk of sclerotomy leak and promote a better healing of the architecturally altered myopic scleras. This includes the use of 27-G vitrectomy (small incision size) with longer tunnels and a bi or tri-planar oblique architecture of trocar insertion.[14–17] Moreover, a parallel instead of perpendicular incision to the limbus, would lessen the cutting of scleral fibers, promoting a better healing of the ocular surface.[18] A surgeon should have a low threshold to place sclerotomy sutures in such eyes with high risk of leakage.[19]

Suture hypersensitivity refers to an exaggerated immunologic response triggered by the presence of suture material. Polyglactin 910 (Vicryl, Ethicon, Somerville, NJ) is a synthetic multifilament absorbable suture that loses approximately 50% of its tensile strength between 2 and 3 weeks through hydrolysis and enzymatic degradation.[20,21] Despite having low antigenicity, it was reported to elicit a foreign body

inflammatory response at the site of suture placement.[22,23] Previous studies found that incidence of scleral inflammation post 23-gauge pars plana vitrectomy was significantly higher at PG910 suture sites compared to other types of sutures.[24–27] The use of PG910 sutures for pars plana sclerotomy closure in the presented case is hypothesized to be an additional intraoperative risk factor which elicited an early post-operative surgical site inflammatory response resulting in thinning and poor healing of sclera. It's worth mentioning that our case was operated cautery free, however, another possible risk factor for such a complication is the use of excessive scleral cauterization with secondary thermal damage.

MMC is an alkylating agent used in several ophthalmic fields with antifibrotic properties that help in lessening the wound healing response[28] and enhance the success rates of glaucoma, pterygium excision and other ophthalmic procedures.[29] The intraoperative use of MMC can be associated with several postoperative complications,[30,31] including scleral calcification,[32] thinning and melting.[33,34] The patient's recent exposure to MMC prior to this presentation can work as an additional risk factor. Scleral thinning after pterygium excision was reported following a single application of 0.02% of MMC for 30 seconds,[34] which is shorter than the exposure time for our patient (2 minutes). Although there was no direct application of MMC to the inferior sclera, the possibility remains that it has diffused inferiorly from the superior quadrants (site of primary glaucoma surgery) during the application of the soaked cellulose sponges.

Surgically induced necrotizing scleritis (SINS) is a described entity of post-operative necrotizing scleritis with clinical evidence of scleral whitening, ischemia and non-perfusion.[35] It is suspected to be immune in origin and presumed to be directly related to the surgical trauma rather than the use of surgical adjuncts (antimetabolites, cautery or radiation) and typically managed with early institution of systemic steroids and immunosuppressants as needed.[35] The lack of ocular pain and scleral inflammation and whitening at the initial presentation of the reported case, as well as the rapid control of inflammatory signs with topical management only, made this diagnosis unlikely.

Lastly, it is worth mentioning the possible contributory effect of chronic use of topical Prostaglandin analogues (PGA) in the presentation of the reported case. A recent study by Park et al. reported a marked reduction in the anterior scleral thickness of patients with newly diagnosed POAG using PGA for one year, compared to fellow patients using other anti-glaucoma agents.[36] The pathophysiology behind this is related to the induction of matrix metalloproteinase (MMP) activity by prostaglandins after binding to the intraocular prostaglandin receptors,[37] which in turn, alters the extracellular matrix of the ciliary muscle, iris and sclera, and reduces the collagen density of the sclera.[38,39] This will eventually decrease the resistance at the uveoscleral pathway[39] and increase the permeability of the sclera.[40] The accompanying structural changes of reduced collagen fibrils' density at the sclera adjacent to the uveoscleral pathway[41] may explain the noted scleral thinning in those patients.

To the best of our knowledge, this is the first report of scleral thinning with uveal prolapse post 23-gauge pars plana vitrectomy in a glaucoma patient with secondary axial myopia. This report is intended to address multiple risk factors for a devastating complication that may occur in predisposed patients, with primary or secondary axial myopia and a compromised sclera. A careful scleral assessment, possibly with the aid of anterior segment imaging modalities such as UBM and anterior segment optical coherence tomography (AS OCT), can have a vital role in visualizing the sclera and assessing its thickness pre-operatively. Patients with previous intra-vitreal surgeries may also be at higher risk, and surgeons should work to avoid the sites of previous scleral wounds. In patients with buphthalmos and uncontrolled glaucoma, a close observation during the early post-operative period with a strict control of intraocular pressure is advocated. The use of alternative less allergenic types of sutures, such as plain gut, may be protective.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could identify the patient.

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Authorship

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

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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