Case Report

Scleral avulsion after Ahmed valve M4 removal

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Abstract

We report a case of intraoperative scleral avulsion that occurred during explantation of an Ahmed M4 valve. A 79-year-old female with open angle glaucoma with a history of glaucoma drainage device (GDD) implantation presented for routine follow-up. The ophthalmic examination indicated a focal implant exposure. The patient was scheduled for explantation of tube and plate and placement of alternate GDD. During implant removal, a horse-shoe shaped scleral avulsion was noted with softening of the globe and uveal and vitreous prolapse. The case was converted to an open globe repair and further glaucoma intervention was deferred. The vitreoretinal service was consulted, and glaucoma drops were added as needed to control intraocular pressure. Removal of Ahmed M4 implant can carry the risk of intraoperative scleral avulsion.

Keywords: Ahmed M4 implant, Scleral avulsion, Exposure

Introduction

The Ahmed and Baerveldt implants are the most commonly used glaucoma drainage devices (GDD). However, some late complications common to both devices have been reported including, corneal decompensation, diplopia and tube/plate exposure.1,2

The Tube versus Trabeculectomy study reported a 5% device exposure rate over five years.4 Tube exposure represents a major risk factor for the development of vision-threatening endophthalmitis and prompt surgical intervention is critical to managing this complication.3 A recent case series of postoperative complications of the Ahmed M4 implant reported 4 cases of tube exposure, plate exposure, diplopia and suprachoroidal hemorrhage.5

In this report, we present, to our knowledge, the first case of intraoperative scleral avulsion while explanting an exposed Ahmed M4 implant. We present the surgical technique to manage this complication and the postoperative course.

Case report

A 79-year-old female with open angle glaucoma and a history of GDD implantation in the right eye was evaluated during a routine follow-up visit. On examination, the visual acuity was 20/30 with well-controlled intraocular pressure (IOP) and a focal area of implant exposure was noted anteriorly with very mild conjunctival inflammation (Fig. 1a). There were no signs of infection or endophthalmitis. The patient was admitted and placed on topical fluoroquinolones and scheduled for surgical removal of tube and plate with placement of alternate GDD in the inferonasal quadrant. During surgery, careful dissection of the implant was performed on the scleral surface and underside of the implant due to the notable absence of a thick avascular capsule. During dissection of the implant away from the sclera a 4–5 mm horse-shoe shaped scleral avulsion was noted with softening of the globe and mild uveal and vitreous prolapse. Viscoelastic was promptly injected in the anterior chamber and over the...
underside of avulsed sclera followed by placement of ante-
orior chamber infusion. The vitreoretinal service was unavail-
able and the case was converted to an open globe repair. Red reflex was intact and careful closure of the scleral defect with a combination of interrupted 9–0 and 10–0 nylon sutures was performed in a water tight fashion with a dry weck cell vitrectomy to avoid any vitreous incarceration in the scleral wound. Once the globe stabilized, explantation of the M4 device was completed. Human donor sclera was trimmed and used to cover the entire area of scleral avulsion to include the anterior sclerotomy from the tube entry site (Fig. 1b). Further glaucoma intervention was deferred. At day 1 postoper-
atively, the vision was count fingers at 2 ft with a deep AC and IOP was 17 mmHg.

The vitreoretinal service was consulted. There was a good view to the fundus with an area of subretinal hemorrhage and focal retinal ischemia with mild vitreous hemorrhage (Fig. 2a). Observation was recommended and 2 months postopera-
tively, patient started to complain of floaters. A repeat exam-
ination showed vitreomacular traction with tractional retinal detachmen (Fig. 3b). Pars plana vitrectomy with membrane peeling and SF6 tamponade was performed. Glaucoma drops were added as needed for IOP control. At two years postoperatively, the patient is doing well with good vision (20/50) and controlled IOP on Dorzolamide/Timolol and Bimatoprost drops.

Discussion

The Ahmed M4 implant was the first commercially avail-
able device constructed of a porous biocompatible material which allowed rapid tissue integration and vascularization. The M4 includes the same valve mechanism as the Ahmed S2 implant. Due to this integration within the host tissue, the typical fibrovascular capsule seen with other devices is absent. This lack of encapsulation in addition to the presence of a sharp rigid anterior plate may predispose the M4 device to earlier exposures. In their case series, Hu et al reported exposure with the M4 devices within 9 months of implantation, which is much earlier than that reported for other GDD.5

Hu et al described the successful removal of the M4 implant in 4 cases (3 due to exposure, 1 due to diplopia).5 They recommend the use of retrobulbar block or general anesthesia in these potentially complex cases due to the extensive dissection and potentially unforeseen circum-
stances that can occur similar to our case. If our case had been performed under topical/peribulbar anesthesia, conver-
sion to general anesthesia may have been warranted. Con-
version to general anesthesia can be logistically challenging in the middle of a surgical case with an open globe.

Both the Ahmed FP7 and Baerveldt GDD are curved and made of silicone with smooth edges. This contrasts with the Ahmed M4 which is somewhat flatter with a sharp and well defined rigid anterior edge (Fig. 3) which may predispose to plate exposure.

The typical fibrovascular capsule that is present with the Ahmed FP7 and the Baerveldt implant is absent in the M4 device. Perhaps this capsule provided a layer of protection against device exposure compared to the M4 device which seems to be devoid of this thick fibrous layer.

In our case implant exposure occurred at the anterior edge of the M4 device. This observation is similar to 3 cases

Fig. 1. Focal tube exposure (a); Superotemporal sclera patch graft (b).

Fig. 2. Intraretinal hemorrhage, ischemic retina (a); Retinal detachment, old vitreous hemorrhage (b).
described by Hu et al.\textsuperscript{5} The sharp anterior edges of the M4 device with the rigid plate combined with the absence of a capsule may all be contributing factors that increase the risk of exposure with this implant.

These observations contrast with Kim et al’s study that compared the M4, FP7 and S2 models of the Ahmed implant.\textsuperscript{6} In their retrospective study, there were no cases of exposure in the M4 group. Variations in the surgical techniques could explain the lack of exposure with the M4 device reported by Kim et al compared to other studies.\textsuperscript{5,6} Kim et al used a limbal based approach for implantation with an incision 4 mm posterior to the limbus, whereas Hu et al utilized a fornix-based approach with incisions at the limbus.\textsuperscript{5,6}

Perhaps tension is lower over the anterior edge of the M4 plate with limbal versus fornix-based surgery. Further study is needed to identify potential risk factors for erosion with the M4 device.

In our case, nearly half of the implant had been dissected away from host sclera prior to detecting the avulsion. Prompt recognition with reformation of the anterior chamber with viscoelastic and mobilization of the wound resulted in a favorable outcome. Once the scleral wound was secured and the globe regained its integrity, further dissection and completion of implant removal was facilitated.

In summary, we report a case of intraoperative scleral avulsion during Ahmed M4 implant removal. Careful examination of patients to detect subtle implant exposure is critical and although uncommon, explantation of the device can be accomplished with the availability of proper anesthesia support and donor tissue. Further studies are warranted to help identify possible risk factors for exposure that may be unique to the M4 device.

Conflict of interest

The authors declared that there is no conflict of interest.

References

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