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Case report

Polymicrobial infection confined to Ahmed glaucoma shunt

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ABSTRACT

Purpose: To present a case of a unique complication of an Ahmed glaucoma shunt. The pathological and immunohistochemical findings will also be discussed.

Observations: A 58-year-old woman with glaucoma secondary to Marfan syndrome and cataract surgery developed exposure of an Ahmed glaucoma tube, intraluminal white inflammatory material, and low-grade endophthalmitis five years after insertion. The patient was treated with topical and oral antibiotics and successfully underwent removal and replacement of the shunt. Pathologic analysis of the intraluminal contents revealed a bacterial infiltrate of mixed morphology.

Conclusions and Importance: Concurrent tube exposure, intraluminal exudates, and endophthalmitis is a rare but potentially serious complication of glaucoma drainage device surgery. When this complication is encountered, prompt medical and surgical intervention is necessary to prevent significant vision loss. Ultimately, the glaucoma shunt may be revised, replaced, or removed altogether from the eye.

1. Introduction

Secondary glaucoma has multifactorial etiologies and besides treating the offending cause, the main focus is on reducing intraocular pressure (IOP) with medication or surgery. For patients with refractory or high-risk secondary glaucoma, drainage devices have quickly emerged as an effective surgical alternative. Over the past two decades, rates of trabeculectomy have decreased concurrently with an increase in glaucoma drainage device usage, according to surveys by the American Glaucoma Society.[1]

Glaucoma drainage devices are aqueous shunts that function by diverting aqueous humor from the anterior chamber into the conjunctival/sub-Tenon's space through a tube connected to an endplate. The two most commonly used models include the Ahmed Valve FP7 or 8 (New World Medical, Rancho Cucamonga, California, USA) and the Baerveldt BG 101–350 (Johnson & Johnson Vision, Santa Ana, California, USA). Several studies have compared the two models, concluding both effectively lower IOP and decrease the need for glaucoma medications.[2,3] Complications of glaucoma shunts have also been well-documented in the literature, ranging from mild conjunctival irritation to more severe cases of endophthalmitis.[4–6] However, to our knowledge, the constellation of tube exposure, dense white material filling the shunt tube, and endophthalmitis is not a well-known complication of glaucoma shunts. We present this case to not only raise awareness that this multipart complication can occur but also to guide work-up, management, and treatment.

2. Case report

A 58-year-old woman with Marfan syndrome and secondary glaucoma was referred to us for further evaluation. Her past medical history was significant for left eye anterior chamber intraocular lens implantation in 1999, insertion of an Ex-Press® shunt (Alcon, Fort Worth, Texas, USA) in 2005, and insertion of an Ahmed shunt in 2013. She reported a two-week history of irritation and blurred vision of the left eye prior to seeing her retina specialist. The retina specialist diagnosed low-grade endophthalmitis and treated her with hourly moxifloxacin 0.5% (Vigamox®) eye drops one week prior to seeing us. No intraocular sampling or antibiotic injections were felt to be necessary by the retina specialist. Our examination of the left eye showed visual acuity of 20/70, IOP of 14 mmHg, widespread keratic precipitates, punctate epithelial erosions, and normal extraocular movements. The Ahmed tube was exposed supratemporally with evidence of white exudates in the tube lumen (Fig. 1A–C). The Seidel test was negative. The patient was continued on Vigamox® eye drops with the additions of prednisolone acetate 1% four times a day, Polysporin® (polymyxin B 10,000 units,

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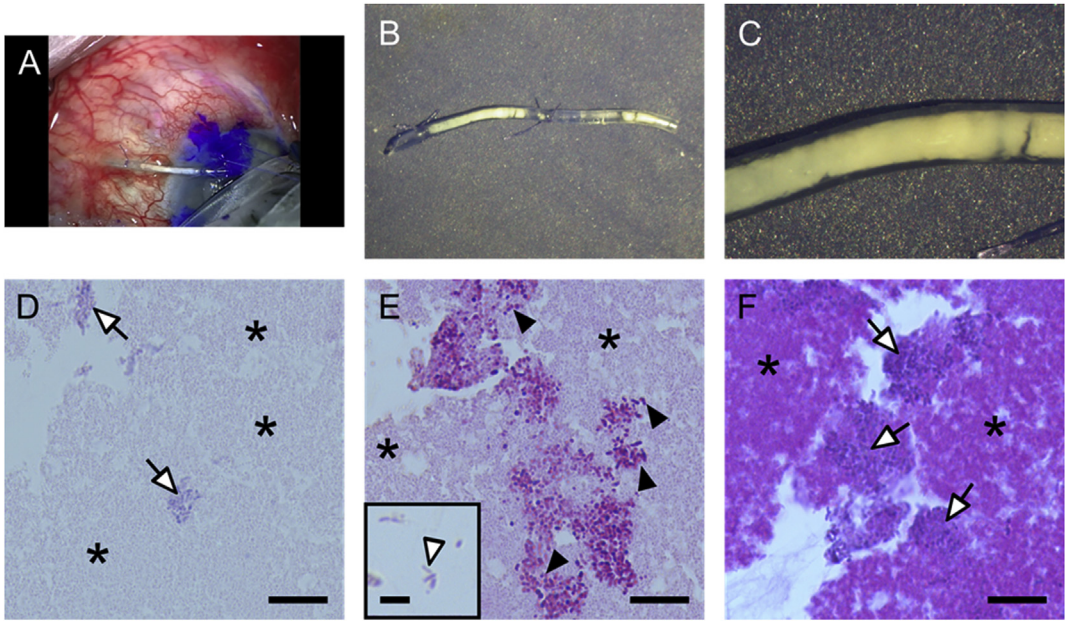

Fig. 1. Gross photographs and photopictomicrographs of the Ahmed shunt. (**A-C**) White flocculent material present within the lumen of the Ahmed shunt. (**D-F**) H&E (**D**), Gram (**E**), and PAS (**F**) staining of the intraluminal contents of the Ahmed shunt revealed collections of bacteria of mixed morphologies (white arrows in **D** and **F**), including Gram-positive rods and cocci (black arrowheads in **E**) and Gram-negative rods (white arrowhead in inset in **E**). Eosinophilic material, likely representing necrotic debris, was identified (asterisks in **D-F**). Scale bars represent 20 μm (**D-F**) and 2μm (inset in **E**).

bacitracin 500 units) ointment and oral ampicillin 500 mg twice daily. Oral ampicillin was selected based on evidence of blepharitis and the patient's body weight.

During surgery, and before removing the tube, the intraluminal white material was secured with a proximal and distal suture to prevent spillage (Fig. 1A and B). The old shunt and tube were removed and were placed in neutral-buffered formalin for pathologic analysis. The tube entry site in the limbal area was sutured with a 10–0 nylon and conjunctiva was reapproximated with a continuous 8–0 polyglactin. The new shunt was placed in the supranasal quadrant. At the conclusion of surgery, the patient received 1 g of intravenous cefazolin (Ancef®) followed by subconjunctival injections of gentamycin, Ancef®, and methylprednisolone (Solu-Medrol®). Pathologic analysis of the intraluminal contents of the Ahmed shunt revealed Gram-negative rods, Gram-positive rods, and Gram-positive cocci in a background of eosinophilic debris, which likely represents necrotic material (Fig. 1D and E). Periodic acid-Schiff (PAS) staining highlighted collections of bacteria (Fig. 1F). At six months post-operative exam, the eye had healed well, with visual acuity of 20/70 and an intraocular pressure of 12 mmHg.

3. Discussion

This case presents an interesting complication involving tube exposure, intraluminal white exudates, and endophthalmitis. After conjunctival complications (hyperemia, conjunctival hemorrhage, and dehiscence), tube exposure represents the second most common complication of glaucoma drainage devices, occurring in 5.0–14.3% of cases.[4] In contrast, endophthalmitis, though rare, is one of the most dreaded complications of glaucoma implant surgery and is encountered in 1.7% of patients.[5] Tube exposure is the most significant risk factor for endophthalmitis, as an exposed tube may provide a direct channel for intraocular passage of conjunctival flora.[6] The most common etiologies of endophthalmitis or external infection following Ahmed glaucoma shunt include *Streptococcus* species and *Hemophilus influenzae,* with rare reports of tube exposures associated with methicillin-resistant *Staphylococcus aureus* and *Aspergillus niger* infections.[5,7,8]

Our patient experienced low-grade endophthalmitis secondary to polymicrobial infection and tube exposure at five years postoperatively. Previous studies have found tube exposure with endophthalmitis occurring at a mean of 1.43 ± 1.5 years and a median of 260 days after surgery.[5,9]

4. Conclusions

Cases of glaucoma tube exposure, inflammatory exudates in the tube lumen, and associated endophthalmitis are dire emergencies with potential vision loss. Early diagnosis and treatment with appropriate antimicrobial therapy are fundamental to optimize visual outcome. Depending on severity, some patients may require intraocular sampling, intravitreal injection of antimicrobial agents, as well as the possibility of vitrectomy. A thorough ocular examination should include assessing vision, IOP, anterior and posterior segments, and extraocular structures, including those associated with eye movements. Clinically, conjunctival swabs are initially taken and sent for microbiological analysis. Additionally, if intraluminal infection is suspected, the contents should be secured during surgery by two sutures prior to sending for analysis to avoid spillage into the eye (Fig. 1A and B). A preoperative consultation with a pathologist to determine appropriate transportation medium is crucial, which we unfortunately, were not able to obtain in this case. Once the infection is contained, prompt shunt revision or replacement is critical.

Patient consent

The patient described herein consented to publication of the case in writing.

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Authorship

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

Declaration of competing interest

The authors have no conflicts of interest to disclose.

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