Late-onset Subconjunctival Abscess Secondary to *Serratia marcescens* Associated With Unexposed Ahmed Glaucoma Valve Implant

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**Purpose:** The purpose of this study was to report a rare case of late-onset subconjunctival abscess associated with an unexposed Ahmed glaucoma valve implant secondary to *Serratia marcescens*, a rare conjunctival pathogen.

**Methods:** Case description including clinical imaging and literature review of glaucoma drainage device (GDD)-related infections.

**Case Presentation:** A 73-year-old man presented with blurring of vision, redness, and pain on his right eye 2 months after Ahmed glaucoma valve implantation for advanced postpenetrating-keratoplasty glaucoma. The patient was a nonsmoker, had fairly controlled type 2 diabetes mellitus on insulin, and had undergone multiple eye surgeries on the right eye. On ocular examination, the conjunctiva was injected with fairly delineated yellowish-white subconjunctival material in the superotemporal quadrant with no associated tube exposure or leak, and the anterior chamber was quiet. The patient was assessed with Ahmed glaucoma valve infection with subconjunctival abscess and was treated by Ahmed glaucoma valve explant with directed systemic and topical antimicrobial therapy. The culture and sensitivity results revealed *S. marcescens* sensitive to ciprofloxacin, ceftazidime, gentamicin, and amikacin. Despite the virulence of the pathogen, the eye was saved.

**Conclusions:** Ahmed glaucoma valve infection with subconjunctival abscess secondary to *S. marcescens* is rare. GDD-related infections should be suspected in patients presenting with blurring of vision, pain, and redness even in the absence of tube exposure. Early diagnosis and treatment with culture-guided antimicrobial therapy combined with GDD explant is fundamental in optimizing the visual outcome.

**Key Words:** subconjunctival abscess, Ahmed glaucoma valve, *Serratia marcescens* (J Glaucoma 2020;29:e110–e112)

**BACKGROUND**

The advances in glaucoma drainage devices (GDDs) paved way to its currently broader indications and usages in glaucoma surgeries. GDDs are widely used in refractory glaucoma and many secondary glaucoma cases, such as inflammatory and neovascular glaucomas. GDD comprises a silicone tube that directs aqueous fluid from the anterior chamber to a reservoir plate attached to the equator of the globe, and is divided based on the presence or absence of a valve that modulates aqueous fluid flow to prevent hypotony into valved and nonvalved implants.1 The Ahmed glaucoma valve (New World Medical, Rancho Cucamonga, CA) is the only available valved implant today, while Baerveldt (Johnson and Johnson Vision, Santa Ana, CA) is the most frequently used nonvalved implant. The complications of GDD have been well-documented in the literature, which include mild conjunctival irritation, hypotony, choroidal detachment, intraocular bleeding, corneal decompensation, cataract, failure to control intraocular pressure (IOP), strabismus, tube exposure, and endophthalmitis.2–5

In this case, late-onset (>6 wk) infection of the Ahmed glaucoma valve developed despite the absence of tube exposure. We report what we believe is the first case of late-onset subconjunctival abscess secondary to *Serratia marcescens* associated with an unexposed Ahmed glaucoma valve implant. We present this case to increase awareness of this complication and to discuss its management.

**CASE PRESENTATION**

A 73-year-old man was referred to our service for uncontrolled IOP on the right eye, despite being on brimonidine-timolol eye drops twice a day, dorzolamide eye drops thrice a day, and oral acetazolamide 250 mg/tablets twice a day. The patient was a nonsmoker and a retired businessman living with his wife in a house with a backyard farm, and had fairly controlled type 2 diabetes mellitus on insulin. The patient had undergone multiple eye surgeries on the right eye, which include complicated phacoemulsification with sulcus intraocular lens (IOL) implantation 5 years before presentation, penetrating keratoplasty for pseudophakic bullous keratopathy 2 years before presentation, and IOL explant with transscleral sutured intraocular lens (TSS-IOL) implantation for subluxated IOL 1 year before presentation. On examination, the best-corrected visual acuity of the right eye was 20/400 and 20/20 for the left eye. The right eye had clear corneal graft, formed and quiet anterior chamber, TSS-IOL in place, IOP of 24 mm Hg, and synechial angle closure on all quadrants. The fundus examination of the right eye showed advanced cupping of 0.9 with no signs of diabetic retinopathy. The left eye examination was essentially normal. The patient was managed as a case of advanced postpenetrating keratoplasty glaucoma of the right eye. The patient underwent an uneventful Ahmed glaucoma valve implantation on the superotemporal quadrant of the eye. The tube was inserted into the anterior chamber through a scleral graft-free tube insertion technique using a 5-mm long scleral tunnel created with a gauge 23 needle. The patient initially had an unremarkable postoperative course, and he was only on prednisolone acetate eye drops and moxifloxacin eye drops on tapering dose for 8 weeks.

On the eighth postoperative week follow-up, the patient presented complaining of blurring of vision, redness, and pain on his right eye for the preceding 3 days. The patient had no history of recent eye trauma, and he was last seen 3 weeks prior with a visual acuity of 20/400, IOP of 13 mm Hg, and unremarkable ocular examination of the right eye. The review of systems revealed no recent respiratory, genitourinary and gastrointestinal symptoms. The right eye was currently on moxifloxacin eye drops 4 times a day and prednisolone acetate eye drops 4 times a day. On ocular examination, the visual acuity decreased to hand movement for the right eye, and it was 20/20 for the left eye. The IOPs were 15 and 12.
in right and left eyes, respectively. On slit-lamp examination, the right eye (Fig. 1) showed matted eyelids, conjunctival injection with fairly delineated yellowish-white subconjunctival material in the superotemporal quadrant, no tube exposure and leak, clear corneal graft, no anterior chamber reaction, tube in place with no corneal touch and TSS-IOL in place. The fundus examination of the right eye showed advanced cupping with no signs of vitritis and diabetic retinopathy. The left eye examination was essentially normal. The extraocular muscle movements were full for both eyes.

The patient was diagnosed with Ahmed glaucoma valve infection with subconjunctival abscess of the right eye. The patient was prescribed with moxifloxacin and tobramycin eye drops every hour together with oral clindamycin 300 mg 4 times a day and oral cefixime 400 mg once a day. The right eye underwent emergency Ahmed glaucoma valve explant. Mucopurulent material found upon opening the conjunctiva was evacuated and sent for culture and sensitivity together with the Ahmed glaucoma valve. The explanted Ahmed glaucoma valve (Fig. 2) showed yellowish-white fluffy material in the valve area. Moxifloxacin and gentamicin wash was carried out before closing the conjunctiva. On follow-up, 3 days later, the visual acuity in the right eye was still hand movement with an IOP of 21. The ocular examination (Fig. 3) showed less conjunctival injection, no anterior chamber reaction, TSS-IOL in place, and no signs of vitritis. The culture and sensitivity results revealed S. marcescens sensitive to ciprofloxacin, ceftazidine, gentamicin, and amikacin. The medications were adjusted as follows: oral clindamycin and moxifloxacin eye drops were discontinued; oral cefixime 400 mg once a day was completed for 10 days, tobramycin eye drops were reduced to 6 times a day for 2 weeks then 4 times a day for another 2 weeks; timolol-brimonidine eye drops were started twice a day; prednisolone acetate eye drops were started 4 times a day. At 3 months’ postoperative examination, the eye had healed well, with visual acuity of 20/400 and an IOP of 12 mm Hg on timolol-brimonidine eye drops twice a day and loteprednol eye drops twice a day. The patient was also advised that controlled transscleral cyclophotocoagulation may be needed in the future if IOP becomes elevated.

DISCUSSION

This case presents a rare presentation of infection with an unusual etiologic agent. Conjunctival complications such as hyperemia, hemorrhage, and dehiscence are the most common complications of GDD implantation followed by tube exposure occurring in 5% to 14.3% of all the cases.2 The most significant risk factor in developing infection, particularly the most devastating infection, endophthalmitis, is tube exposure. The exposed tube provides a direct passageway for intraocular transmission of the normal ocular flora. Although endophthalmitis is rarely encountered and is seen only in 1.7% of the cases, this is the most dreaded complication because the microbial agents causing the infection are so virulent that most cases often result in poor vision.3,4 The most common etiologic agents of infections following GDD implantation include Streptococcus pneumoniae and Haemophilus influenzae.4 Staphylococcus aureus, Staphylococcus epidermidis, Pseudomonas aeruginosa, and Aspergillus niger infections have been reported in the literature.1,6

FIGURE 1. The slit-lamp examination showing matted eyelids, conjunctival injection with fairly delineated yellowish-white subconjunctival material (black arrow) in the superotemporal quadrant, no tube exposure, clear corneal graft, no anterior chamber reaction, and intraocular lens in place.

FIGURE 2. The explanted Ahmed valve showing yellowish-white fluffy (black arrows) material in the valve area.

FIGURE 3. Three days postoperatively, the ocular examination showed less conjunctival injection and no anterior chamber reaction.
The risk factors for tube exposure and infection include smoking, history of dry eye syndrome, diabetes, young age, and inflammation.4,8 As the patient had multiple ocular surgeries exposing him to different antibiotic treatments and as he had chronic steroid therapy for his penetrating keratoplasty, his normal ocular flora is probably altered. The patient also had diabetes and unhealthy ocular surface from his repeated surgeries, which may cause conjunctival microerosions. The patient’s ocular barrier was weakened from the altered normal ocular flora and conjunctival microerosions; consequently, invasion of the subconjunctival space of a ubiquitous exogenous microorganism such as S. marcescens was enhanced and accelerated. The subsequent colonization resulted in infection and subconjunctival abscess formation. The presence of 1-way flow valve of the Ahmed glaucoma valve prevented the rapid intraocular passage of this exogenous microorganism.

S. marcescens is a gram-negative facultative anaerobic cocobacilli of the family Enterobacteriaceae, and is ubiquitously found in soil, water, and the human gastrointestinal and urinary tract. The risk factors for S. marcescens infection include diabetes mellitus, renal failure, alcoholism, contact lens wearing, and previous eye surgery. Lacrimal duct infections, conjunctivitis, keratitis, and endophthalmitis from S. marcescens have been documented.9,10 The uniform natural sensitivity of S. marcescens was found most to aminoglycosides, carbapenems, aztreonam, and quinolones, and was found to be resistant to benzylpenicillin, macrolides, glycopeptides, and fusidic acid.11

In this case, we opted to remove the infected Ahmed glaucoma valve, as we felt it served as a reservoir of the infection. Moxifloxacin and gentamicin wash was carried out before closing to decrease the bacterial load in the subconjunctival area. Empiric treatment was also given to cover gram-positive, gram-negative, and anaerobic organisms but was subsequently adjusted after 3 days on the basis of the result of the culture and sensitivity tests. On review of literature, the most documented GDD-related infection was endophthalmitis. It was frequently preceded by tube exposure and was caused by S. pneumoniae or H. influenzae. The management of endophthalmitis ranged from intravitreal antibiotics to evisceration. Studies have recommended to remove the GDD, as it may be the source of infection.3,12 The authors also believe that the inflammation probably may have caused ciliary hyposecretion and ciliary body atrophy; thus, the IOP was controlled with brimonidine-timolol eye drops at 3 months postoperatively, but a controlled transscleral cyclophotocoagulation may be needed if the IOP becomes elevated in the future despite medical management.

We believe that this case was from inadvertent inoculation of a ubiquitous S. marcescens into the ocular surface of the patient with weakened ocular barrier from multiple factors resulting in invasion and subsequent infection and development of a subconjunctival abscess. A combination of expedient Ahmed glaucoma valve explant and culture-guided antibiotic treatment was able to save the remaining vision of the patient.

CONCLUSIONS

Ahmed glaucoma valve infection with subconjunctival abscess is rare, but it may develop into endophthalmitis if not managed timely. GDD-related infections should be suspected in patients presenting with blurring of vision, pain, and redness even in the absence of tube exposure. Early diagnosis and treatment with culture-guided antimicrobial therapy combined with GDD explant is fundamental in optimizing the visual outcome.

REFERENCES

1. Salim NL, Azhany Y, Abdul Rahman Z, et al. Infected Baerveldt glaucoma drainage device by Aspergillus Niger. Case Rep Ophthalmol Med. 2015;2015:249419.
2. Riva I, Roberti G, Oddone F, et al. Ahmed glaucoma valve implant: surgical technique and complications. Clin Ophthalmol. 2017;11:357–367.
3. Al-Torbak AA, Al-Shahwan S, Al-Jadaan I, et al. Endophthalmitis associated with the Ahmed glaucoma valve implant. Br J Ophthalmol. 2005;89:454–458.
4. Levinson JD, Giangiacoimo AL, Beck AD, et al. Glaucoma drainage devices: risk of exposure and infection. Am J Ophthalmol. 2015;160:516–521.
5. Mandalos A, Sung V. Glaucoma drainage device surgery in children and adults: a comparative study of outcomes and complications. Graefes Arch Clin Exp Ophthalmol. 2017;255:1003–1011.
6. Pansegrau ML, Mengarelli E, Dersu H. Complication of an Ahmed glaucoma valve implant: tube exposure with methicillin-resistant Staphylococcus aureus infection. Digit J Ophthalmol. 2015;21:1–9.
7. Netland P, Chaku M, Ishida K, et al. Risk factors for tube exposure as a late complication of glaucoma drainage implant surgery. Clin Ophthalmol. 2016;10:547–553.
8. Trubnik V, Zangalli C, Moster MR, et al. Evaluation of risk factors for glaucoma drainage device-related infections: a retrospective case-control study. J Glaucoma. 2015;24:498–502.
9. Singh G, Wilson MR, Foster CS. Mitomycin eye drops as treatment for pterygium. Ophthalmology. 1988;95:813–821.
10. Rhiu S, Shim J, Kim EK, et al. Complications of cosmetic wide conjunctivectomy combined with postoperative mitomycin C application. Cornea. 2012;31:245–252.
11. Stock I, Grüeger T, Wiedemann B. Natural antibiotic susceptibility of strains of Serratia marcescens and the S. liquefaciens complex: S. liquefaciens sensu stricto, S. proteamaculans and S. grimesii. Int J Antimicrob Agents. 2003;22:35–47.
12. Gedde SJ, Herndon LW, Brandt JD, et al. Postoperative complications in the tube versus trabeculectomy (TVT) study during five years of follow-up. Am J Ophthalmol. 2012;153:804–814.