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Video

Late-onset *Pseudomonas aeruginosa* orbital cellulitis following glaucoma drainage device implantation☆

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ABSTRACT

Purpose: To present a rare case of late-onset *Pseudomonas aeruginosa* orbital cellulitis following glaucoma drainage device (GDD) implantation due to suture erosion.

Observations: A 65-year-old male with a history of aphakic glaucoma and two remote prior glaucoma drainage device (GDD) surgeries of the right eye presented with right orbital signs. On examination, exposed securing Gore-Tex suture material over the plate of a GDD in the inferotemporal quadrant was present. Computed tomography (CT) scan demonstrated right orbital fat stranding, lateral rectus enlargement, and an intracapsular abscess consistent with orbital cellulitis. Cultures grew *Pseudomonas aeruginosa*. Treatment with intravenous and topical fortified antibiotics, incision and drainage of the abscess, and removal of the inferotemporal GDD was successful in resolving the infection. At post-operative month three, the patient underwent uncomplicated transscleral cyclophotocoagulation for further intraocular pressure control.

Conclusions and Importance: Orbital cellulitis is an uncommon complication of GDD implantation, and typically occurs in the early post-operative period. To our knowledge, this is the first report of late-onset orbital cellulitis resulting from *Pseudomonas aeruginosa,* as well as the first case of GDD orbital cellulitis related to suture erosion.

1. Introduction

Orbital cellulitis is a rare infectious complication following glaucoma drainage device (GDD) implantation. Management typically consists of hospitalization, intravenous antibiotics based on culture sensitivities, and frequently, adjunctive topical antibiotics. GDD removal is required in the majority of cases, however if no device exposure or orbital abscess is present, medical management alone may occasionally suffice in achieving control of the infection.[1]

Orbital cellulitis related to GDD implantation typically occurs in the immediate postoperative period. Of the eleven previously reported cases in the literature, only four presented after post-operative month three (range three months – fifteen months), with underlying tube exposure in three of these four cases. Among these cases, positive cultures isolated group A streptococcus, *Streptococcus pneumoniae*, *Staphylococcus epidermidis*, and in a single case, *Pseudomonas aeruginosa*.[1] Herein, we report an unusual case of a patient with a very delayed *Pseudomonas aeruginosa* orbital cellulitis resulting from exposed GDD plate suture material.

2. Case report

A 65-year-old male presented with right eye pain, blurred vision, and discharge for one day's duration. Review of systems was notable for nausea, rhinorrhea, and sinus pressure and negative for fever/chills. His past ocular history was significant for congenital cataracts in both eyes, aphakic glaucoma in both eyes, and amblyopia in the left eye. His past medical history was otherwise unremarkable. The right eye was status post two glaucoma drainage device (GDD) surgeries in the early 2000s (exact dates unknown), penetrating keratoplasty, and cataract

☆ Claims of Priority: After performing a literature search on 01/13/24 of Google Scholar and PubMed using the terms "orbital cellulitis" and "glaucoma drainage device," we did not find any prior reports of delayed-onset orbital cellulitis secondary to Pseudomonas aeruginosa, or any cases related to suture erosion. Additionally, to our knowledge this case is only the second reported Pseudomonas aeruginosa orbital cellulitis infection following GDD surgery, and the first in an immunocompetent patient. We also believe that our case is the most delayed presentation of any prior described orbital cellulitis following GDD surgery to date (estimated greater than ten years by patient history) and the twelfth reported case of orbital cellulitis following GDD surgery to date.

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extraction with secondary intraocular lens (IOL) implantation with an outside provider.

At presentation, his uncorrected vision in the right eye was 20/100 with a pinhole visual acuity of 20/80 and 20/200 in his left eye. His intraocular pressures (IOP) were 15 mm Hg in both eyes on no glaucoma medications. Externally the right eye demonstrated proptosis and limited extraocular motility. Slit lamp examination of the right eye revealed eyelid erythema/edema, mucoid eyelash discharge, conjunctival injection, chemosis, and superotemporal and inferotemporal GDDs (Fig. 1). Exposed Gore-Tex suture material was protruding from the inferolateral bulbar conjunctiva where the plate of the inferotemporal GDD was secured to the sclera and the corneal donor graft was edematous. There was no focal infiltrate or exposure associated with the superotemporal GDD and no purulence was noted in the superotemporal quadrant. The anterior chamber was shallow with diffuse peripheral iridocorneal contact and a three-piece intraocular lens implant in the ciliary sulcus. On dilated fundus exam, the optic nerve showed glaucomatous optic nerve cupping with a cup to disc ratio of 0.9. The left eye exam demonstrated highly irregular iris tissue and aphakia resulting in a very poor dilated view of the fundus.

The site of suture exposure and a specimen of suture material were immediately cultured at presentation. The patient was sent to the emergency department, where a computed tomography (CT) scan of the orbits and sinuses with and without intravenous contrast demonstrated right-sided proptosis, fat stranding within the right orbit, and thickening of the right lateral rectus muscle. A heterogenous fluid collection within the inferotemporal GDD capsule was identified (Fig. 2). The patient was hospitalized, blood cultures were obtained, and intravenous broad spectrum antibiotic coverage was initiated with vancomycin, ampicillin/sulbactam and topical hourly fortified vancomycin and tobramycin.

The following day, the patient underwent surgical removal of the infected inferotemporal GDD. Gross purulence was drained when incising the capsule and was cultured. A Molteno3 GDD (Nova Eye Medical, Adelaide, Australia) was removed, capsular tissue was excised, and the site was thoroughly irrigated with 5 % povidone iodine solution. Watertight closure of the sclerostomy was achieved with 7-0 polyglactin suture and the site was reinforced with a partial thickness irradiated corneal allograft. Intracameral moxifloxacin and subconjunctival dexamethasone and vancomycin injections were additionally administered.

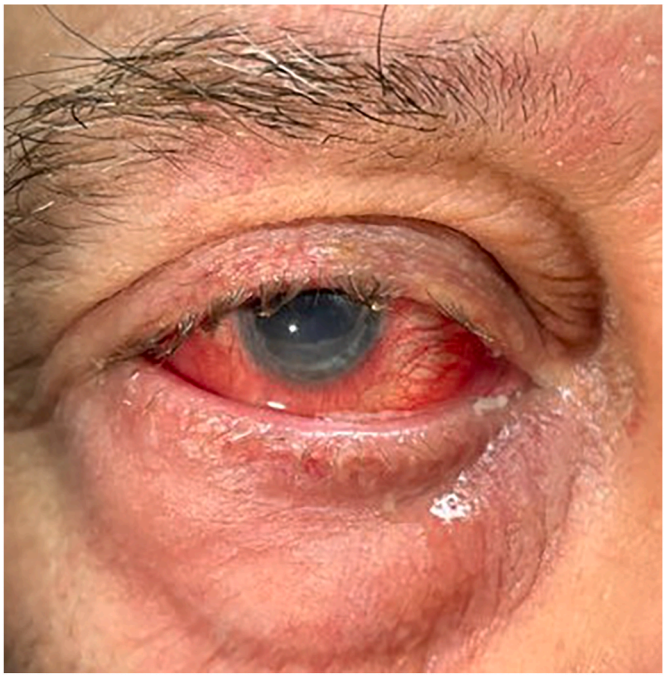

Fig. 1. External photograph of right eye at presentation showing conjunctival injection and periorbital edema and erythema.

At post-operative day one, sterile cultures obtained in clinic and in the operating room grew pan-sensitive *Pseudomonas Aeruginosa*. The visual acuity was count fingers at one foot with an IOP of 18 mm Hg. Antimicrobial coverage was transitioned from ampicillin/sulbactam to intravenous cefepime. On post-operative day three, the orbital CT scan was repeated due to worsening pain and chemosis and redemonstrated orbital fat stranding, an inferolateral fluid collection with air foci, and worsening lateral rectus enhancement. Antimicrobial coverage was broadened to include metronidazole for anaerobic coverage due to the presence of air foci as per infectious disease consultation. Due to concern for a worsening clinical course, additional adjunctive injections of subconjunctival moxifloxacin and cefuroxime were also administered on post-operative day three. B-scan ultrasonography demonstrated heterogenous serosanguineous choroidal effusions in the inferonasal and supertemporal quadrants. On post-operative day five, the patient was discharged on a two-week course of oral ciprofloxacin and doxycycline.

At the patient's post-operative week one appointment, his vision had improved to 20/200 with improved choroidal effusions, and an IOP of 15 mm Hg. Topical antibiotic coverage was narrowed to tobramycin, and topical steroids were tapered. At the one-month post-operative visit, the patient's symptoms had completely resolved. Ocular hypotensives were started due to an IOP of 26 mm Hg. At post-operative month three status post GDD removal, the inferotemporal quadrant was completely healed (Fig. 3). The patient's visual acuity had returned to his baseline vision of 20/80 but the IOP was 22 mm Hg on maximal topical glaucoma therapy. The patient subsequently underwent uncomplicated transscleral diode cyclophotocoagulation (TSCPC) for further intraocular pressure control, achieving an IOP of 9 mm Hg at his one-month post-operative visit. At last follow-up post-operative month three status post TSCPC, the patient's IOP was 11 mm Hg on three topical ocular hypotensive medications.

3. Discussion

We believe that this presentation of *Pseudomonas aeruginosa* orbital cellulitis following GDD surgery is unique in several ways. After performing a literature search on 01/13/24 of Google Scholar and PubMed using the terms "orbital cellulitis" and "glaucoma drainage device," we did not find any prior reports of delayed-onset orbital cellulitis secondary to *Pseudomonas aeruginosa,* or any cases related to suture erosion. Additionally, to our knowledge this case is only the second reported *Pseudomonas aeruginosa* orbital cellulitis infection following GDD surgery, and the first in an immunocompetent patient. Goldfarb et al. previously described a case of a 64-year-old diabetic female who developed *Pseudomonas aeruginosa* orbital cellulitis in the immediate post-operative period (three days) after Ahmed GDD implantation. After failing initial management with topical and intravenous antibiotics, the tube was explanted to achieve infection control, as in our case.[2] We also believe that our case is the most delayed presentation of any prior described orbital cellulitis following GDD surgery to date (estimated greater than ten years by patient history). Previously, the latest known presentation was described by Laviña et al. at fifteen months after uncomplicated implantation of a Baerveldt 350mm^2 device.[3] We believe this case represents the twelfth reported case of orbital cellulitis following GDD surgery.[1]

Suture erosion and exposure was the suspected nidus for infection by providing a direct portal of entry into the aqueous collection in the intracapsular space. Both the inferotemporal GDD location and choice of suture material to secure the plate are likely to have contributed to the infection and resultant orbital cellulitis. Although commonly used in scleral fixation of intraocular lenses,[4] use of Gore-Tex suture material in ophthalmic surgery is currently off-label use and has been rarely reported to be associated with conjunctival erosion and resultant endophthalmitis.[5] Inferior GDD location, as in our patient, has

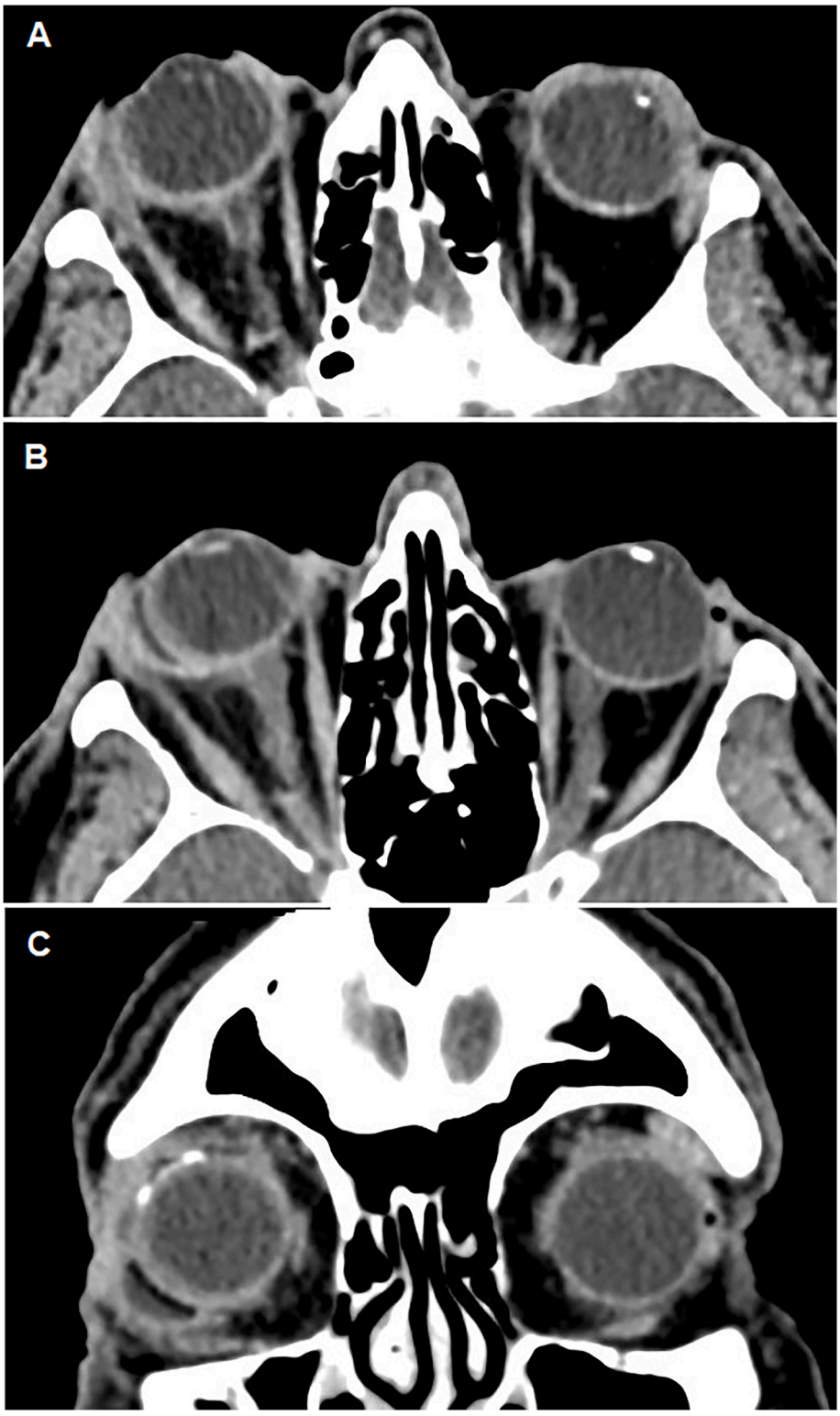

Fig. 2. Contrast-enhanced computed tomography (CT) of the orbits demonstrates radiographic evidence of orbital cellulitis including right proptosis, scleral thickening and enhancement of lateral rectus along tendinous insertion (A, B). Coronal view of superotemporal and inferotemporal glaucoma drainage devices in the right globe with heterogenous fluid collection overlying inferotemporal glaucoma drainage device (C).

previously been shown to be associated with a higher risk of exposure.[6] Furthermore, the risk of infection associated with exposure is significantly higher among glaucoma drainage implants in inferior locations compared to superior locations.[7] Of note, although a second GDD was also present in the superotemporal quadrant in our case, this implant was spared from development of infection and the orbital cellulitis was able to be successfully treated without removal of this device.

4. Conclusions

Orbital cellulitis is a rare complication after GDD implantation, and delayed presentations are often related to exposure. GDD exposure and

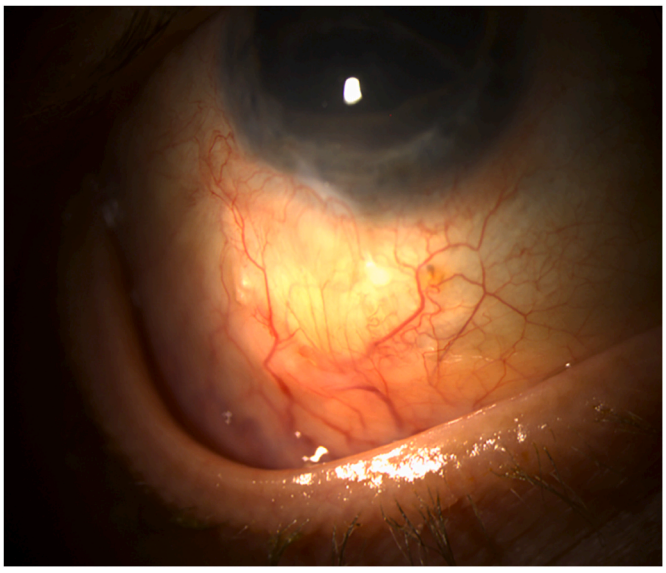

Fig. 3. Slit lamp photograph demonstrating healed conjunctiva of inferotemporal quadrant status post removal of infected Molteno3 glaucoma drainage device at post-operative month three.

associated infection is more common among inferiorly located implants. Orbital imaging, wound cultures, and intravenous antibiotics should be promptly initiated. Surgical removal of the GDD is typically required when exposed hardware is the suspected infectious source.

Patient consent

Written consent to publish the data presented in this case report was obtained from the patient.

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Authorship

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

CRediT authorship contribution statement

Shayma Jawad: Writing – original draft, Writing – review & editing. **Kevin Halenda:** Conceptualization, Writing – original draft, Writing – review & editing.

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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