



## Case report

Endogenous *Serratia marcescens* panophthalmitis: A case series

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## ABSTRACT

**Purpose:** – Two rare and unusual cases of endogenous panophthalmitis from *Serratia marcescens* are presented with mechanisms for infection explored.

**Observations** – The first patient had history of intravenous drug use (IVDU) without any medical implants. The second patient, in addition to IVDU, had a history of end-stage renal disease with upper extremity arteriovenous fistula graft infection from *Serratia marcescens* confirmed by wound culture. One patient had a history of licking the needles prior to IV drug injection. Clinical exam in both cases revealed light perception vision, relative afferent pupillary defect, periorbital edema with limited extraocular motility, and hypopyon in the affected eyes. Cultures from the anterior chamber aspirate were positive for *Serratia marcescens* in the first case and demonstrated Gram-negative rods in the second. Attempted vitreous aspiration was unsuccessful at obtaining specimens. Computed tomography demonstrated orbital fat stranding without abscess, and histopathology showed intense neutrophilic infiltration in all layers of enucleated specimen in case one.

**Conclusions and Importance:** Needle licking may be an underappreciated mechanism for endogenous endophthalmitis in intravenous drug users. This report includes the first case in the literature, to authors' knowledge, of non-nosocomial endogenous *Serratia marcescens* panophthalmitis with orbital cellulitis. The second case illustrates a rare consequence of the rise in arteriovenous fistula placement and dialysis across the United States, which may predispose to future cases of endogenous *Serratia marcescens* endophthalmitis. This series supports previous observations of *Serratia marcescens* endogenous endophthalmitis exhibiting a generally poor visual prognosis.

## 1. Introduction

The endogenous form of endophthalmitis and panophthalmitis is relatively uncommon overall.<sup>1</sup> *Serratia marcescens* is rarely the culprit of endophthalmitis, and when causative, the source is usually exogenous.<sup>2,3</sup> Herein, risk factors germane to this series of endogenous *Serratia* panophthalmitis such as intravenous drug use (IVDU) and presence of an arteriovenous fistula are explored.<sup>4,5</sup>

## 2. Findings

## 2.1. Case 1

A 50 year-old homeless man with history of non-insulin-dependent diabetes mellitus and IVDU presented with 2-day history of pain and progressive vision loss in the left eye. Pain was first noted 2 nights prior with normal vision. Per outside hospital's emergency room record, the patient was seen with a "painful red eye" without proptosis or periorbital edema and discharged with prescriptions for oral and topical antibiotics. The patient did not fill these and returned the following day with worsening symptoms. He was noted to be "unable to open the eye" and have "light perception vision," prompting transfer to our

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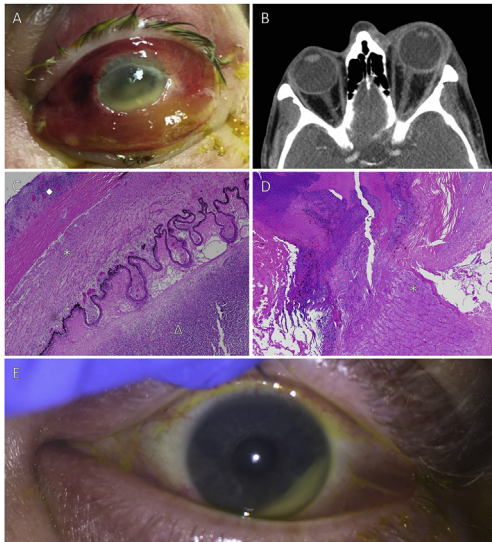
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**Fig. 1.** Clinical photographs and histopathology. The left eye of Case 1 illustrated proptosis, periorbital edema, circumferential hemorrhagic chemosis, hazy cornea with ring infiltrate, and whitish-tan hypopyon (A). Computed tomography (digitally processed, axial section) demonstrated left-sided proptosis with periocular swelling and retrobulbar fat-stranding (B). Histopathology (H&E, 40x) of Case 1 demonstrated inflammation at all layers of the globe from vitreous cavity ( $\Delta$ ) through uveal (\*) and extra-scleral ( $\blacklozenge$ ) tissue with dense polymorphonuclear invasion (C). Posterior segment (D) similarly showed extensive neutrophilic infiltration in all tissues, including the optic nerve (\*). Clinical photograph of left eye (Case 2) with assisted lid retraction demonstrated periorbital erythema and edema with chemosis and whitish-tan, layered, 2 mm hypopyon (E).

institution. Evaluation and treatment was performed accordingly. The patient admitted to recent intravenous heroin relapse. Right eye examination was normal with 20/20 vision. Left eye examination revealed inconsistent light perception vision, relative afferent pupillary defect, intraocular pressure of 42 mm Hg, marked proptosis, periorbital edema, markedly limited extraocular motility, diffuse corneal haze with ring infiltrate, 3 mm whitish-tan hypopyon, and no fundus view (Fig. 1A, Left). B-scan ultrasonography revealed dense, loculated vitreous debris. Computed tomography revealed sphenoid sinusitis and orbital fat stranding without abscess (Fig. 1B, Right). Pars plana vitrectomy was deferred given severity of inflammation and obstructed posterior visualization. A vitreous tap was unsuccessful at obtaining a specimen; an anterior chamber (AC) paracentesis was performed and cultured. Intravitreal vancomycin 1 mg, ceftazidime 2 mg, and moxifloxacin 160 mcg were injected. Intravenous vancomycin 750 mg every 8 h, cefepime 2 g every 12 h, moxifloxacin 400 mg daily and oral fluconazole 400 mg daily, were initiated along with frequent topical fortified tobramycin and vancomycin, and ocular hypotensives. Toxicology and laboratory testing were positive for cannabis, opiates and Hepatitis C antibody, but negative for cocaine and human immunodeficiency virus (HIV). Blood and urine cultures were negative and echocardiography revealed no vegetations.

A repeat injection of intravitreal ceftazidime 2 mg was performed 3 days later upon positive culture of Gram-negative rods from the AC paracentesis identified as *Serratia marcescens*. The hypopyon developed a pink color. Antibiotics were narrowed based on susceptibility testing. With no light perception vision, refractory ocular hypertension, persistent pain, and progressive proptosis, the patient underwent enucleation on day 6. Surgical specimen cultures also confirmed *S. marcescens*, though organisms were not detectable amidst diffuse inflammation seen on histopathology (Fig. 1C and D).

## 2.2. Case 2

A 45 year-old man with history of end-stage renal disease status post – left arm arteriovenous fistula graft thrombectomy 9 days prior, IVDU, hepatitis C, and insulin-dependent diabetes mellitus, presented from an outside hospital with one-day history of left eye pain and vision loss. Two days before presentation, *Serratia marcescens* was detected on blood cultures in a setting of fevers and chills as well as erythema surrounding left arm graft, prompting treatment with intravenous meropenem. Right eye examination was normal with 20/25 Snellen acuity and 12 mm Hg intraocular pressure. Left eye demonstrated light perception vision, afferent pupillary defect, 26 mm Hg intraocular pressure, ptosis, – 1 motility limitation, and mild periorbital erythema and edema. Anterior segment was significant for moderate chemosis, injection, and 2 mm layered whitish-tan hypopyon (Fig. 1E). Ultrasonography demonstrated vitreous debris with attached retina. Vitreous aspiration was unsuccessful at obtaining a specimen; thus, AC paracentesis was performed for culture (demonstrating Gram-negative rods), followed by intravitreal injections of vancomycin 1 mg, moxifloxacin 160 mcg, ceftazidime 2 mg, and voriconazole 50  $\mu$ g. Topical moxifloxacin and prednisolone acetate four times daily as well as ocular hypotensive agents were given in addition to intravenous vancomycin 1 g every 12 hours and meropenem 500 mg each day. Hepatitis C IgG titer and polymerase chain reaction were both positive. Echocardiogram was negative for vegetation.

Five days later, a pars plana vitrectomy was performed with repeat intravitreal antibiotic injections. Retrieved fibrinous material was culture-negative. The patient remained with light perception vision and mild ocular hypertension by post-operative day 2. The arteriovenous graft was removed with culture returning positive for *Serratia marcescens* sensitive to ceftriaxone. Antibiotic therapy was narrowed accordingly. Following systemic clinical improvement, the patient was discharged; despite multiple contact attempts, the patient was lost to follow-up.

## 3. Discussion

Endogenous endophthalmitis accounts for only 5–10% of endophthalmitis cases; it occurs by hematogenous dissemination in patients as seen here with risk factors including diabetes mellitus, homelessness, Hepatitis C, renal failure on dialysis, and IVDU.<sup>1,3,6</sup> *Serratia marcescens* is a rare but highly virulent cause of endophthalmitis, typically exogenous with its source being damp environments such as bathrooms, tile grout, shower corners and dirt<sup>3</sup>; it can also be a hospital-acquired infection.<sup>2</sup> It is also found in the subgingival biofilm of the teeth, where it causes pink-orange staining due to production of a reddish-orange tripyrrole pigment.<sup>4</sup> In one case of endogenous *S. marcescens* endophthalmitis, severe periodontal disease was noted in an HIV-negative, intravenous drug user.<sup>5</sup> Our HIV-negative, intravenous drug-using patient (Case 1) too exhibited poor dentition and had the habit of licking the needles prior to intravenous use. The possible predisposition to *S. marcescens* endophthalmitis based on its role in oral biofilm appears to be real. Approximately 30% of IV drug users may lick needles before injecting for reasons ranging from ritual practice, needle “cleaning,” drug taste, and “quality check,” thereby providing a likely mechanism for endogenous infection by oropharyngeal flora in cases like ours.<sup>7</sup>

Simultaneous endogenous endophthalmitis and orbital cellulitis has been reported in only a few cases with *Escherichia coli*<sup>8</sup> and *Pseudomonas aeruginosa*,<sup>9</sup> although isolated endogenous endophthalmitis is much more common. It is likely that the bacteria seeded both the retinal and orbital vessels in our cases. The high virulence of the organism resulted in progressive infection at both sites. Hypertensive endophthalmitis has been described secondary to *Listeria monocytogenes*, including one with concurrent fulminant orbital cellulitis.<sup>10</sup> Nosocomial infections are not uncommon for endogenous endophthalmitis with *Serratia marcescens*,<sup>11</sup>

and have been known to involve extremity dialysis ports<sup>12</sup> like Case 2. Additional reports of endogenous *Serratia marcescens* endophthalmitis and panophthalmitis may be expected now that arteriovenous fistula placement is recommended as first-line management for dialysis initiation and has approximately doubled in the past decade in the United States.<sup>13</sup> However, to our knowledge, our first case may be the only description to date of exclusively non-nosocomial *Serratia marcescens* causing rapidly progressing hypertensive, endogenous panophthalmitis with orbital cellulitis.

*S. marcescens* endophthalmitis can present with hypopyon varying between dark pink and tan hues<sup>12</sup> due to its ability to produce the reddish-orange tripyrrole pigment.<sup>4</sup> The hypopyons here varied from whitish-tan to pink. Pink hypopyon without hyphema is rare and must alert one to possible endophthalmitis caused by Enterobacteriaceae, classically *Klebsiella* or *Serratia* species.<sup>14</sup> The persistently elevated intraocular pressures in both patients is likely the result of multiple mechanisms including infiltration of the ciliary body and angle with inflammatory cells causing swelling, thick hypopyon blocking the trabecular meshwork, and increased pressure in the episcleral vessels due to orbital congestion and infiltration. The persistently elevated intraocular pressure and severe toxicity from the virulence of the organism likely caused the rapid progression to no light perception and bare light perception in the two patients. This underscores the need for identification of the condition by the primary physician who first encounters the patient. Decision for vitreous aspiration with intravitreal injection and/or vitrectomy for endogenous endophthalmitis is typically made on a case-by-case basis with various influencing factors.<sup>6</sup> Vitrectomy was not pursued in the first case given the severity of inflammation and inadequate visualization concurrent with panophthalmitis and rapid progression to no light perception. In comparison, the eye in the second case was more amenable to vitrectomy, given less inflammation, and still with light perception vision after vitreous aspiration and intravitreal injection.

While typically exogenous,<sup>4</sup> these cases illustrate that *Serratia marcescens* is an important cause of endogenous endophthalmitis. Proper and timely diagnosis and treatment may be essential for maximizing outcomes, especially in cases of virulent organisms like *S. marcescens* that rapidly progress to involve all eye structures, though sample size and reports are limited. *Serratia marcescens* may progress before the ophthalmologist is consulted.<sup>15</sup> Thus, swift recognition and referral for signs of endophthalmitis could be favorable, especially in high-risk individuals with multiple co-morbidities.

#### 4. Conclusions

*Serratia marcescens* is a rare cause of endogenous endophthalmitis, and included here may be the first case associated with non-nosocomial hypertensive panophthalmitis and orbital cellulitis. Intravenous drug use may be an important risk factor, especially with “needle licking” behavior. Furthermore, the rise in the number of patients with end-stage renal disease and first-line implementation of arteriovenous fistulae for dialysis treatment may lead to an increase in reported cases for this rare and devastating infection.

#### Patient consent

Consent to publish each case was not obtained. This report does not

contain any personal information that could lead to the identification of the patients. Vanderbilt IRB does not require approval to publish case series of three or less patients.

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##### Conflicts of interest

None of the authors have any financial disclosures. There are no conflicts of interest to report by any author.

##### Authorship

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

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