Staphylococcal endogenous endophthalmitis in association with pyogenic vertebral osteomyelitis

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Abstract

Purpose To describe pyogenic vertebral osteomyelitis as a rare infection associated with endogenous endophthalmitis.

Methods A retrospective review of three patients with endogenous endophthalmitis and sepsis due to underlying Staphylococcal vertebral osteomyelitis presenting during a 21-month time period. The ophthalmic and systemic features and management and outcomes are presented.

Results One patient developed unilateral endophthalmitis with cervical spine osteomyelitis, *Staphylococcus aureus* being isolated from blood cultures. The second presented with bilateral endophthalmitis with disseminated Methicillin-resistant *S. aureus* (MRSA) infection, with thoracic and lumbar discitis and para-spinal abscesses. MRSA was cultured from vitreous, blood, and synovial fluid. Both patients received prolonged courses of intravenous antibiotics. Intravitreal antibiotic therapy was used in the second patient. Excellent visual and systemic outcomes were achieved in both cases with no ocular complications. The third patient developed lumbar osteomyelitis following spinal surgery and presented with disseminated *S. aureus* sepsis including unilateral endogenous endophthalmitis. Despite systemic antibiotics and intensive care the patient died.

Conclusions Endogenous endophthalmitis should be suspected in septic patients developing eye symptoms. Endogenous endophthalmitis with staphylococcal bone infection is a rare but serious condition. Osteomyelitis should be considered as an infective source in any such patient reporting bone pain or reduced spinal mobility. Prompt investigation and

treatment can achieve favourable visual and systemic outcomes.

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Introduction

Endogenous bacterial endophthalmitis (EBE) accounts for 2–8% of all reported cases of endophthalmitis.¹ It is associated with poor visual outcomes and high mortality rates.² *Staphylococcus aureus* and *Streptococcus* species account for most cases in Western countries.^{1,2}

In the largest published series of 342 EBE cases, the commonest foci of infection were lung, liver, endocardium, and urinary tract.² However, only 2 (0.58%) occurred in association with osteomyelitis. Spinal osteomyelitis is a highly unusual association, with very few published case reports.^{3–5} All involved *Streptococcus* species rather than *S. aureus*.

Case reports

Case 1

A 71-year-old female presented with floaters and reduced vision in her left eye and a 1-week history of neck pain. The left visual acuity (VA) was 6/36. The left eye had panuveitis with significant vitritis and a focus of retinitis superonasally (Figure 1a). EBE was not initially considered but she subsequently developed pyrexia (38.3 °C) with raised inflammatory markers (ESR 124 mm/h, CRP 369 mg/l). Bacterial sepsis and EBE was now most the probable diagnosis. Empirical intravenous ceftriaxone (2 g daily) was initiated. Blood cultures identified gram-positive cocci. Intravenous teicoplanin (600 mg daily) and

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oral rifampicin (450 mg BD) were added following microbiology advice to cover for probable *Staphylococcal* infection. Her uveitis improved significantly after 24 h of treatment. Magnetic resonance imaging (MRI) of cervical spine performed 2 days later showed C3/4 osteomyelitis with a large para-spinal collection and epidural abscess (Figures 2a and b). Methicillin-sensitive *Staphylococcus aureus* (MSSA) was cultured from blood. Treatment with a cervical collar and a 3-month course of antibiotic therapy was given (Table 1). She made a full recovery with 6/9 acuity.

Case 2

A 65-year-old-male with a 1-week history of bilateral floaters was diagnosed with intermediate uveitis and treated with topical corticosteroids in a different centre. He reported a 3-week history of new lower back pain and intermittent fever. He was referred to our tertiary centre with worsening uveitis and reduced VAs of counting fingers right and 6/36 left. The right eye had substantial vitritis. The left eye had significant panuveitis with a focus of retinitis and widespread vasculitis (Figure 1b). He was pyrexial with unilateral wrist septic arthritis.

Figure 1 (a) Case 1, fundal photograph of the left eye at presentation with vitreous opacities and a supero-nasal focus of retinitis and surrounding haemorrhage. (b) Case 2, fundal photograph of the left eye at presentation with a focus of retinitis superior to the disc, widespread peripheral vasculitis and patchy retinal haemorrhage.

Figure 2 (a) Case 1, sagittal MRI images of the cervical spine demonstrating loculated para-spinal collection, extending from the skull base to C5 and centred on the tissues posterior to C3–C4 (long arrow) with osteomyelitis involving the C3 vertebral body and C3/C4 facet joints (short arrows). (b) Case 1, post-contrast MRI image illustrating epidural enhancement in the C1–C3 region. (c) Case 2, sagittal MRI images illustrating thoracic and lumbar osteomyelitis involving T8/9 and L4/5 vertebral bodies (long arrows) with discitis (short arrows).

Table 1 Clinical summary of the three cases including presentation and management

	Case 1	Case 2	Case 3
Predisposing illness	None	None	Spinal surgery Former IVDU, HIV negative
Primary focus of infection	Cervical spine (C3/4) osteomyelitis with epidural abscess and paraspinal abscess	Thoracic (T8/9) and lumbar (L4/5) spine osteomyelitis with discitis and epidural abscess	Lumbar spine osteomyelitis
Affected eye, initial VA	L 6/36	R CF, L 6/36	L N/A
Ocular classification	L panuveitis with posterior focus	R vitritis, L panuveitis with posterior focus	L panuveitis, no fundal view
Vitreous culture	Not taken	+	+
Blood culture	+	+	+
Other culture-positive foci	None	Wrist, urine, and skin	Spinal wound
Micro-organism	MSSA	MRSA	MSSA
Intravitreal treatment	None	V (2 separate doses)	V, C
Systemic antibiotic	CTX, T, Ri	V, Ri, D	T, Ri
Affected eye: final VA	L 6/9	R 6/12, L 6/6	N/A
Systemic outcome	No long-term neurological or musculoskeletal sequelae	Chronic back pain No long-term neurological sequelae	Death
Late ocular sequelae	None	None	N/A

Abbreviations: C, ceftazidime; CTX, ceftriaxone; CF, counting fingers; D, Doxycycline; F, female; HIV, human immunodeficiency virus; IVDU, intravenous drug abuse; L, left; M, male; MRSA, methicillin-resistant *Staphylococcal aureus*; MSSA, methicillin-sensitive *S. aureus*; N/A, not available; +, positive; R, right; Ri, rifampicin; T, teicoplanin; V, vancomycin; VA, visual acuity.

Inflammatory markers were elevated (CRP 333 mg/l, ESR 90 mm/h). Intravenous gentamicin and vancomycin and oral rifampicin were started empirically due to severity of presentation, covering for suspected *Staphylococcal* infection. He underwent left vitreous sampling and intravitreal vancomycin (1 mg/0.1 ml) injection. MRSA was isolated from blood, vitreous and multiple extra-ocular sites (Table 1). MRI revealed thoracic and lumbar spine osteomyelitis and discitis (Figure 2c). Cauda equina syndrome developed with progressive lower limb weakness and hypoaesthesia. A 3-month course of antibiotic therapy was necessary. The final VA was 6/12 right and 6/6 left, and full leg mobility was regained.

Case 3

A 62-year-old female was admitted to intensive care with septic shock having been found unconscious at home. She had undergone lumbar laminectomy surgery 6-weeks earlier. MRI showed lumbar spine osteomyelitis. Her left eye had total hypopyon with marked vitreous opacification on ultrasound scan. Intravitreal ceftazidime (2 mg/0.1 ml) and vancomycin (1 mg/0.1 ml) were administered. MSSA was identified from blood, vitreous and spinal wound cultures. Despite intensive management the patient died three days later.

Discussion

To our knowledge this is the first series describing an association between *Staphylococcal* vertebral

osteomyelitis and EBE. Pyogenic vertebral osteomyelitis (PVO) may cause severe local effects, including cord compression, and systemic effects related to bacteraemia and disseminated infection. The leading cause of PVO is *S.aureus*,^{6,7} and the incidence of PVO is rising, particularly in the elderly.⁷

Up to 25% of EBE cases are initially misdiagnosed,² and PVO diagnosis is often delayed.⁷ Early recognition of EBE associated with PVO may therefore be challenging. In cases 1 and 2, a link between back pain and ocular presentation was not initially recognised. Subsequently, both patients developed sepsis.⁸ In case 2, sight-threatening ocular disease and disseminated infection was evident at presentation to our unit. Despite delays in initiation of antibiotic therapy both patients achieved excellent visual outcomes and osteomyelitis was managed conservatively with antibiotic therapy.

Many patients with EBE have underlying disease, such as diabetes, predisposing to infection.² Cases 1 and 2 are unusual with no predisposing conditions. In case 3, infection was a complication of surgery and she may have been immunocompromised following previous intravenous drug abuse.

Prompt identification of the responsible organism and any foci of infection are paramount in EBE. Blood, urine and stool cultures and inflammatory markers are important. Further sampling and imaging of any suspected tissue/organs is required. Urgent intraocular sampling is necessary if the responsible organism is not identified and should precede administration of systemic antibiotics. Despite substantial risks to both vision and

life, prompt investigation and treatment can achieve favourable visual and systemic outcomes.

Summary

What was known before

- Bacterial endogenous endophthalmitis is a sight-threatening ophthalmic emergency.
- The condition should be suspected in any septic patient developing eye symptoms.
- Common primary sources of infections are endocardium, liver, lung, urinary tract, and meninges.

What this study adds

- Spinal bone infections are a rare source of infection in endogenous endophthalmitis.
- Osteomyelitis should be considered as an infective source in any such patient reporting bone pain.
- Pyogenic vertebral infections are typically a disease of older people (>60 years) and should particularly be considered in older patients with endogenous endophthalmitis; in this group *S. aureus* is a common organism.

Conflict of interest

The authors declare no conflict of interest.

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