A case of bilateral endogenous bacterial endophthalmitis from *Streptococcus pneumoniae* bacteraemia

**Clinical record**

A 55-year-old woman was admitted to an orthopaedic unit of a metropolitan hospital in Australia with right shoulder septic arthritis. She had been experiencing 3 days of right shoulder pain, fevers, rigors and delirium. These occurred in the context of a right rotator cuff repair 3 months previously. Her medical history included hypertension, hypercholesterolemia and an L4-S1 spinal fusion for lumbar spine degeneration. Her medications included hydrochlorothiazide, olmesartan and atorvastatin.

On examination, she was febrile with a temperature of 38.9°C, with a painful, erythematous and swollen right shoulder with movement limited by pain. Her chest and abdominal examinations were normal. Her relevant admission blood test results were white cell count, $30 \times 10^9/L$ (reference interval [RI], $4 \times 10^9/L$); neutrophil count, $21.9 \times 10^9$ (RI, $2 \times 10^9/L$); and C-reactive protein level, $438 \text{ mg/L}$ (RI, $0 \text{ mg/L}$). Platelet, haemoglobin, uric acid and blood sugar levels were all normal. Her shoulder and chest x-rays were unremarkable. Several sets of blood cultures as well as a shoulder aspirate showed gram-positive cocci and she was empirically commenced on intravenous (IV) flucloxacillin 2 g four times a day and vancomycin 1.5 g twice daily.

Shortly after admission, she revealed that she had been experiencing 3 days of blurred vision and pain in her left eye. Further history revealed that aside from mild myopia, her vision was previously normal and she had never undergone any ophthalmic procedures. Her right eye was asymptomatic and only mildly injected but otherwise normal. Fundoscopy showed a vitreous haze (Figure, A). Visual acuity (VA) was 6/12 in her right eye, but only hand movements were appreciated in her left eye. Fundoscopy was not possible on the left eye owing to the severity of the corneal haze; however, in the right eye, fundoscopy showed a vitreous haze.

An urgent assessment by an ophthalmologist found that she had bilateral endogenous bacterial endophthalmitis. Despite appearing mostly unremarkable on external inspection, the right eye was deemed to be in the early stages of infection owing to the presence of vitreous haze on fundoscopy. After aqueous humour samples were taken, she was given bilateral intravitreal antibiotic injections of 1 mg vancomycin and 2 mg ceftazidime. This was followed up with intravitreal injections of 1 mg vancomycin every second day for three further doses. The cultures from her shoulder, blood and eyes all grew *Streptococcus pneumoniae*. Her antibiotics were changed to IV benzylpenicillin and vancomycin; IV azithromycin was also added, as evidence has shown that it has a survival benefit in *S. pneumoniae* infections. Further investigations performed to exclude immunosuppression and locate the source of the septicemia included HIV, tuberculosis and hepatitis serology; glycated haemoglobin testing; vasculitic screening; a transthoracic echocardiogram; computed tomography of the chest, abdomen and pelvis to look for malignancy or abscesses; and a magnetic resonance imaging scan of her lumbosacral spine to exclude infection of the implants from her spinal fusion. The results of these tests were unremarkable and no cause was found to explain the *S. pneumoniae* septicemia.

Twelve days after admission, she was transferred to another centre with a vitreoretinal unit, where she underwent a left vitrectomy to debride the posterior chamber of her eye. Unfortunately, the vision in her left eye only made a small recovery and, 6 months later, the VA was limited to counting fingers. Fortunately, VA in her right eye remained at its baseline and she has been managing well in the community.

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**A** The patient’s right eye (A) showing mild scleral injection but appearing otherwise unremarkable on initial assessment, and left eye (B) showing corneal haze, circumferential hypopyon and injected left sclera.
Bacterial endophthalmitis is an infection of the eye involving the aqueous and/or vitreous humour. It is an ophthalmic emergency and requires urgent treatment to prevent permanent blindness. The vast majority of cases are due to exogenous inoculation of microbes into the eye via trauma, surgery, intravitreal injections or an invasive corneal infection. Rarely, in 2–6% of cases, it can occur from haematogenous spread of organisms to the eye, which is referred to as endogenous or metastatic endophthalmitis. Endogenous spread is associated with immunosuppressive predisposing factors such as diabetes or malignancy in 90% of cases.2

Patients usually experience 12–24 hours of eye pain and decreasing vision. They are rarely systemically unwell. However, patients with the endogenous variant are usually unwell from the underlying bacteraemia. On examination, there is often conjunctival injection or oedema of the cornea. VA will be decreased. Slit-lamp examination of the anterior chamber may show cells and flare (small floating particles and a generalised haziness, respectively, in the anterior chamber representing inflammation). As in this patient, it may be also be associated with a hypopyon. Hypopyon is pus in the anterior chamber of the eye which will collect inferiorly and form a horizontal layer in an erect patient (Figure, B shows a circumferential hypopyon in our patient as she was supine at the time she was photographed; the Box highlights the difference between hypopyon in erect and supine patients). On fundoscopy, there is usually poor visualisation of the retina secondary to vitreous haze.2,3 The diagnosis can be confirmed via aqueous or vitreous culture, but it should be noted that history and examination are the main diagnostic tools, as a negative culture cannot reliably exclude the condition.4

Bacterial endophthalmitis is usually exogenous and postoperative. It is most commonly caused by coagulase-negative staphylococci (the most common normal flora of the ocular surface).5 The organisms for the endogenous form depend on the underlying infection. A major study showed only 30% of patients with streptococcal endophthalmitis had a final VA of 6/30 or better, which is worse than for Staphylococcus aureus, gram-negative bacteria (50% for both) and coagulase-negative staphylococci (80%).6 Regardless of the organism involved, the strongest indicator of visual prognosis is VA at presentation.5

Treatment of endophthalmitis requires prompt referral to an ophthalmology team. Treatment of bacterial endophthalmitis involves intravitreal antibiotic injections as the intravenous route does not deliver sufficient concentrations to the relatively avascular posterior chamber of the eye. Empirical therapy is usually vancomycin with ceftazidime or amikacin. This is often combined with vitrectomy, which debrides the vitreous, reducing the bacterial load. Patients should also be treated with systemic antibiotics for sufficient duration to clear the underlying infection.7

Bilateral endogenous bacterial endophthalmitis is very rare, with one study estimating that only around 12% of patients with endophthalmitis had both eyes infected.6 A rare bilateral case like ours, where one eye is severely infected and the other is in the early stages of infection, serves to demonstrate the importance of early diagnosis, as once vision has been lost it is far less likely to return. Further, our case is unusual in that no immunosuppression was found in a relatively young patient.

**Lessons from practice**

- Endogenous bacterial endophthalmitis can rapidly cause blindness and should be considered in all bacteraemic patients with decreased visual acuity or ocular pain.
- Risk factors include diabetes, malignancy and immunosuppression.
- Early diagnosis is important as visual acuity on diagnosis is the strongest indicator of final visual prognosis.
- Early ophthalmology involvement and intravitreal antibiotic injections are essential, as intravenous therapy alone will not deliver adequate concentrations to the relatively avascular vitreous.

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References are available online at www.mja.com.au.


