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Major review

Systematic review of 342 cases of endogenous bacterial endophthalmitis



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ABSTRACT

We review a total of 342 cases of endogenous bacterial endophthalmitis reported between 1986 and 2012. Predisposing conditions were present in 60%, most commonly diabetes, intravenous drug use, and malignancy. The most common sources of infection were liver, lung, endocardium, urinary tract, and meninges. Systemic features such as fever were present in 74%, hypopyon in 35%, and an absent fundal view in 40%. Diagnostic delay occurred in 26%. Blood cultures were positive in 56%, and at least one intraocular sample was positive in 58% (comprising 26% anterior chamber samples, 59% vitreous taps, and 41% vitrectomy specimens). Worldwide, Gram negative infections (55%) were more frequent than Gram positive (45%) infections, particularly in Asia. Over the last decade, 11% of eyes were treated with systemic antibiotics alone, 10% intravitreal antibiotics alone, 36% systemic plus intravitreal antibiotics, and 20% systemic plus intravitreal antibiotics plus pars plana vitrectomy. The most commonly used intravitreal antibiotics were vancomycin (for Gram positive infection) and ceftazidime (Gram negative). The median final visual acuity was 20/100, with 44% worse than 20/200. Among all cases, 24% required evisceration or enucleation, and mortality was 4%. Both intravitreal dexamethasone and vitrectomy were each associated with a significantly greater chance of retaining 20/200 or better and significantly fewer eviscerations or enucleations—these warrant further study. For most patients, treatment should include a thorough systemic evaluation and prompt intravitreal and systemic antibiotics.

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1. Introduction

The term endophthalmitis refers to any inflammation in the eye, but in clinical practice it most usually refers to intraocular bacterial or fungal infection. Endophthalmitis is divided into two types, exogenous and endogenous, depending on the

route of the infection. *Exogenous* endophthalmitis occurs when microorganisms are directly inoculated into the eye—after ocular surgery, by penetrating trauma, or from retained foreign bodies. *Endogenous* endophthalmitis occurs when organisms reach the eye via the bloodstream, and then cross the blood–ocular barrier.

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Endogenous bacterial endophthalmitis (EBE), first reported in 1856,⁷⁰ is a rare but severe intraocular infection with a poor visual prognosis and an appreciable mortality rate. Endogenous bacterial endophthalmitis constitutes 2–8% of all cases of endophthalmitis.⁵³ Many patients have known or latent immunocompromise.³⁶ The clinical course is typically acute, requiring prompt diagnosis and treatment. Unfortunately, 25% of cases are initially misdiagnosed.

Since our literature review of 267 EBE cases published a decade ago, a further 75 cases have been reported. We update our initial analysis to accommodate these further reports and to reconsider the management of EBE.

2. Patient characteristics

In the current analysis the mean patient age was 52 years (range, 2 days–85 years), similar to other reviews.^{28,53,75} Both sexes were equally affected (37 male; 36 female; 2 not provided), in contrast to a male predisposition reported previously in the literature.^{36,53,75}

A slight right eye predominance was noted (54%), whereas the prior literature found that left eyes were more commonly affected.³⁶

If current data were combined with our prior analysis,³⁶ then the mean age was 51 years (standard deviation ± 23.01 ; range, 2 days–91 years). There were 206 males and 140 females (15 not stated) ($p = 0.0005$) and 114 right eyes and 137 left eyes involved ($p = 0.1659$).

Of 75 patients (89 eyes) in the current analysis,^{1,2,5–12,14–17,20–25,27,29–32,35,38,41–47,49–52,55,56,58,59,61–67,69,71,72,76–78} 58 (77%) had a medical condition predisposing to infection (Table 1). Table 1 also shows the current and previous data³⁶ combined and reveals that 207 of 342 (60%) patients had a predisposing medical condition. Diabetes, intravenous drug use, and malignancy were the most common predisposing conditions, but there were several others.

In the current review, an extraocular focus of infection was found in 39 cases (52%). The most common sites were liver, urinary tract, and endocardium. A combination of the current

Table 1 – Predisposing medical conditions

Predisposing medical condition	1986–2001 n = 267 (%)	2001–2012 n = 75 (%)	1986–2012 n = 342 (%)
Diabetes	93 (35)	22 (29)	115 (33)
Type 1	14 (5)	1 (1)	15 (4)
Type 2	31 (12)	10 (13)	41 (12)
Type not stated	48 (18)	11 (15)	59 (17)
Intravenous drug use	15 (5)	3 (4)	18 (5)
HIV infection	11 (4)	1 (1)	12 (3)
Malignancy	5 (2)	7 (9)	12 (3)
Autoimmune disease	8 (3)	3 (4)	11 (3)
Others	17 ^a (6)	23 ^b (30)	40 (12)
Total	149 (56)	58 (77)	207 (60)

a Including alcohol abuse (5), asplenia (5), not stated (7).³⁶

b Including lung disease (4), various medical procedures (4), hepatitis C (3), meningitis (3), transplantation (2), prematurity (2), renal disease (1), pregnancy (1), cardiovascular disease (1), otitis (1), endocarditis (1).

Table 2 – Sources of infection

Infection	1986–2001 n = 267 (%)	2001–2012 n = 75 (%)	1986–2012 n = 342 (%)
Liver abscess	60 (22)	7 (9)	67 (19)
Lung	27 (10)	2 (3)	29 (8)
Endocarditis	24 (9)	5 (7)	29 (8)
Soft tissue infection	21 (8)	3 (4)	24 (7)
Urinary tract infection	17 (6)	5 (7)	22 (6)
Meningitis	18 (7)	4 (5)	22 (6)
Septic arthritis	12 (4)	4 (5)	16 (5)
Orbital cellulitis	10 (4)	0 (0)	10 (3)
Renal abscess	6 (2)	2 (3)	8 (2)
Brain abscess	6 (2)	2 (3)	8 (2)
Other sites	28 ^a (10)	5 ^b (7)	33 (10)
Total	229 (85)	39 (52)	268 (78)

a Peritonitis (3), prostate infection (3), lung abscess (2), osteomyelitis (2), pancreatic abscess or pancreatitis (2), mediastinal infection (2), splenic emboli (1), cholecystitis (1), abdominal abscess (1), gastroenteritis (1), perinephric-psoas abscess (1), pericarditis (1), testicular abscess (1), pneumonitis (1), empyema (1), pleural abscess (1), epidural abscess (1), chorioamnionitis (1), infected hemodialysis fistula (1), sinusitis (1).³⁶

b Aortic aneurysma (1), heart valves (1), central nervous system (1), gingival abscess (1), internal jugular vein thrombosis (1).

and previous data³⁶ revealed that an extraocular focus of infection was detected in 219 patients (64%). The most common sites in the combined analysis were liver, lung, and endocardium, as shown in Table 2.

3. Clinical features

The most commonly reported ocular symptoms were blurred vision (89% of 66 adult cases in the present series) and pain (48% of 66 adult cases). The most common ocular sign was the absence of a fundus view (40% of 75 cases). Other common signs included hypopyon (35%), vitritis (33%), and anterior chamber inflammation (32%). Fever (37%) and influenza-like symptoms (20%) were the most common systemic findings. These figures were not reported in our prior literature review, other than in relation to our own case series. In 73% of 75 cases there were systemic features preceding or accompanying ocular symptoms (74% of 342 cases in the combined analysis).

4. Diagnosis

4.1. Incidence of diagnostic errors

The clinical features listed in the previous section facilitate a diagnosis of EBE, often in combination with predisposing medical conditions. Nonetheless, diagnosing EBE can be difficult, as it is a rare condition, predisposing systemic conditions may be undiagnosed at presentation, and many of the ocular features are nonspecific. In the present analysis, 33% of 75 cases appeared to have delayed diagnosis or an initial misdiagnosis, higher than our previous review (24% of 267 cases). Combining both analyses gave a figure of 26% of 342 cases. We estimated the mean duration of delay as 3.2 days,

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