

# POSTOPERATIVE INFECTIOUS ENDOPHTHALMITIS: EVOLVING TRENDS AND TECHNIQUES

Practices have changed since publication of the EVS in the 1990s.

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Infectious endophthalmitis is a devastating vision-threatening condition involving inflammation of the entire globe and its intraocular contents (Figure 1). The most common form of infectious endophthalmitis tends to result

from direct inoculation of an organism from outside the body (ie, exogenous as opposed to endogenous), most commonly after cataract surgery or intravitreal injection. It tends to present acutely within 3 to 21 days after the procedure.

Acute-onset endophthalmitis (within 6 weeks of an intraocular procedure) is typically caused by coagulase-negative *Staphylococcus* and *Streptococcus* species, and less commonly by gram-negative organisms.<sup>1</sup> Chronic or delayed-onset endophthalmitis (beyond 6 weeks after intraocular surgery) is typically due to *Propionibacterium acnes*, but may also involve coagulase-negative *Staphylococcus* or fungi.<sup>2</sup> Bleb-associated endophthalmitis can occur months to years after filtering surgery and is most commonly caused by *Streptococcus*, *Haemophilus*, or gram-positive organisms. We previously reviewed 10 years of endophthalmitis cases (n = 758) and found gram-positive organisms to be the causative pathogen in 80%

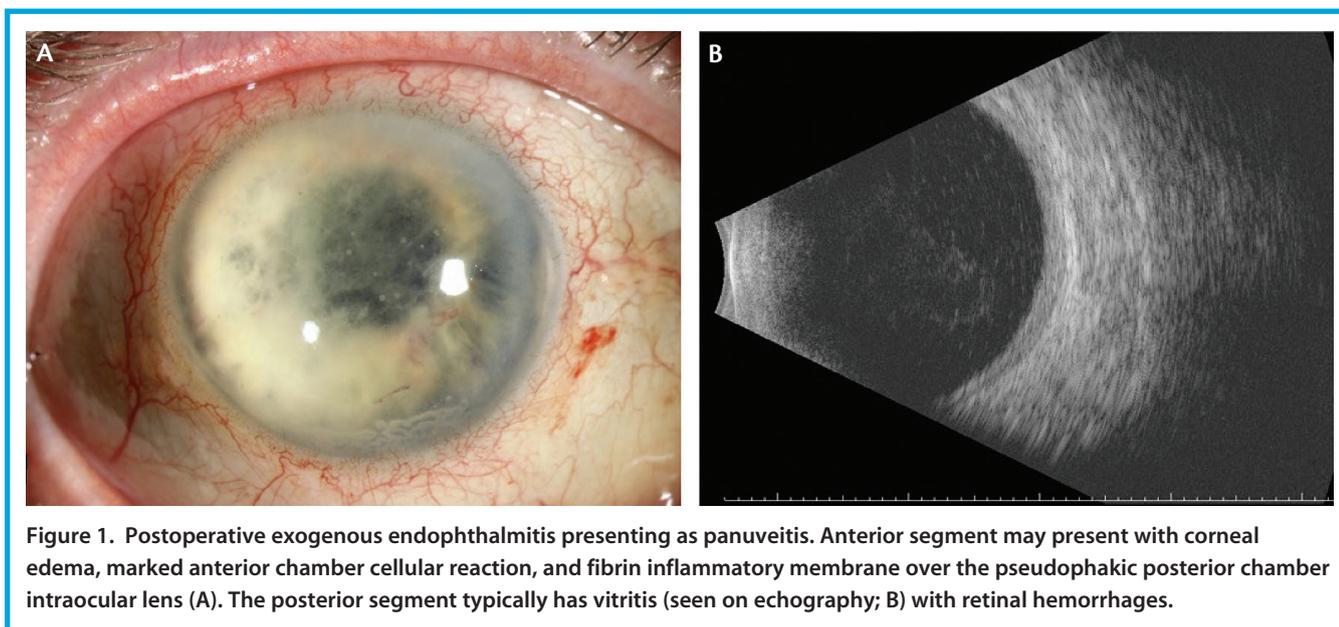
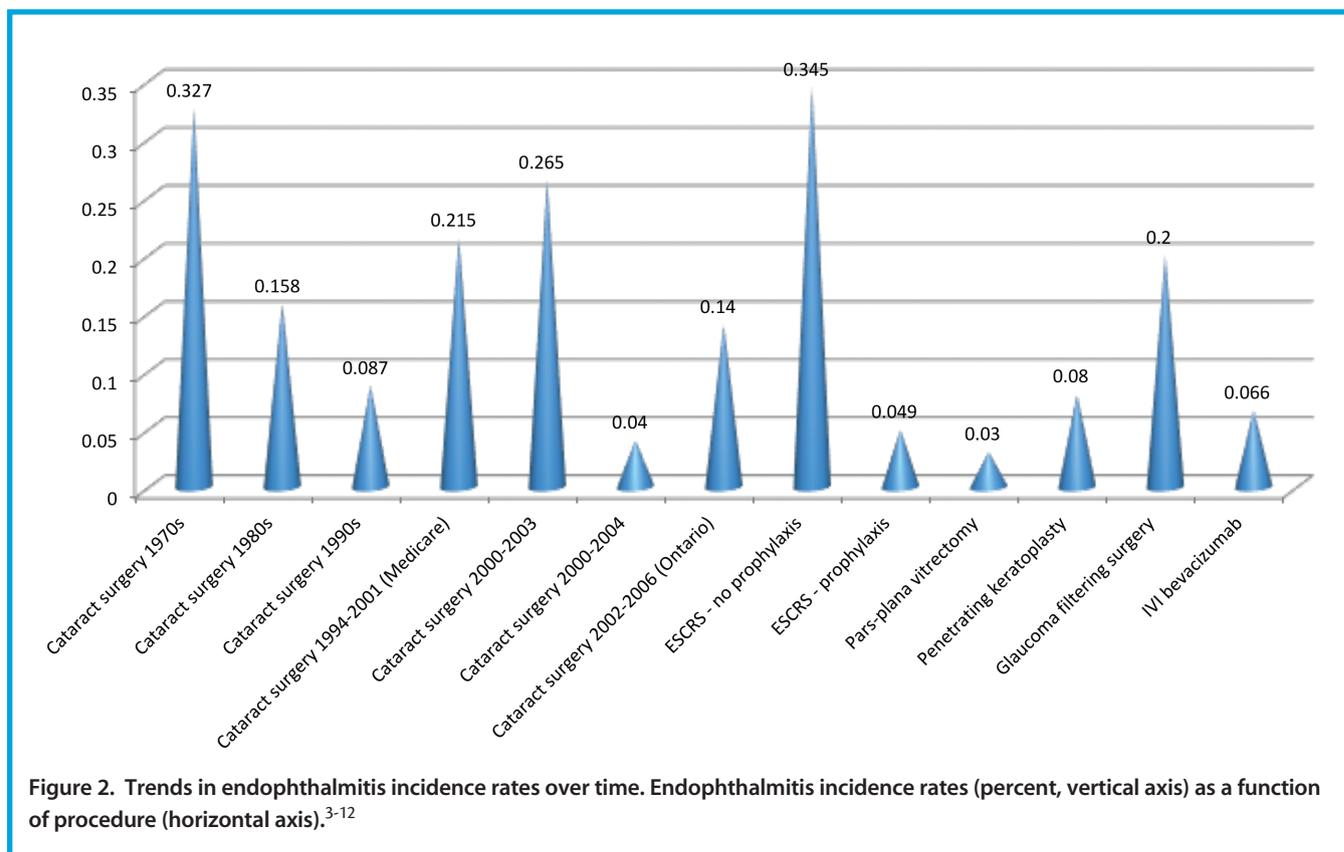


Figure 1. Postoperative exogenous endophthalmitis presenting as panuveitis. Anterior segment may present with corneal edema, marked anterior chamber cellular reaction, and fibrin inflammatory membrane over the pseudophakic posterior chamber intraocular lens (A). The posterior segment typically has vitritis (seen on echography; B) with retinal hemorrhages.



of cases, followed by gram-negative (11%) and fungi (9%).<sup>1</sup>

It is inherently difficult to acquire top-tier evidence for endophthalmitis incidence rates because studies are usually of low power, owing to the rare incidence rate (ie, one per several thousand) of endophthalmitis in the setting of cataract surgery or intravitreal injection. Additionally, nonhomogeneous study populations, differing surgical techniques (eg, clear corneal vs. scleral incision; use of a speculum, oral or facial mask, and/or sterile gloves), and differing methods of reporting make extrapolation difficult. Nonetheless, Figure 2 shows a summary of evolving endophthalmitis incidence rates.<sup>3-11</sup>

With regard to prophylaxis during intravitreal injection, the best evidence currently is for preoperative povidone-iodine antisepsis, with a grade B recommendation, indicating that this practice is moderately important to clinical outcome.<sup>12</sup> With regard to post-cataract surgery endophthalmitis, the value of intraoperative intracameral antibiotics is the subject of significant debate, and recent evidence suggests that adoption of this practice may reduce the incidence of this devastating complication.<sup>13,14</sup>

### VALUE OF VITRECTOMY

The Endophthalmitis Vitrectomy Study (EVS) taught us that immediate vitrectomy did not produce significantly different visual outcomes in patients with better than light

perception vision at presentation.<sup>3</sup> Interesting findings of the EVS included that more than one fourth (26%) of patients had no pain on presentation and 14% did not have a hypopyon.<sup>3</sup> Additionally, 94.2% of culture-confirmed cases involved gram-positive bacteria, of which 70% were coagulase-negative *Staphylococcus epidermidis*.<sup>3</sup>

The EVS represented large-gauge vitrectomy, and its results may not be applicable to the smaller-gauge



## AT A GLANCE

- Infectious endophthalmitis is a vision-threatening condition that involves inflammation of the entire globe and its intraocular contents.
- In the era of MIVS, early vitrectomy for endophthalmitis may be of significant benefit in removing infectious material and vitreous debris.
- Active communication with patients and close follow-up of evolving clinical response are paramount in order to achieve the best outcomes.

“ The EVS relied on older vitrectomy techniques with known increased rates and severity of complications ... . By contrast, MIVS techniques provide faster and safer surgical options for eyes with severe inflammation.

microincisional vitrectomy surgery (MIVS) techniques widely performed today. We believe that, in the era of MIVS, early vitrectomy for endophthalmitis may be of significant benefit in removing infectious material and vitreous debris, which are paramount, respectively, for accelerating infection clearance and optimizing visual outcomes.

The EVS relied on older vitrectomy techniques with known increased rates and severity of complications, such as retinal detachment and vitreous hemorrhage. By contrast, MIVS techniques provide faster and safer surgical options for eyes with severe inflammation. We recently reported 10-year data showing that small-gauge vitrectomy for endophthalmitis yields final visual outcomes comparable to those of vitrectomy using 20-gauge instrumentation.<sup>15</sup> In vitro laboratory testing revealed no significant difference in rates of culture growth with different vitrectomy gauge sizes or vitreous cutting speeds.<sup>15</sup>

### PREFERRED TECHNIQUE

Our preferred technique for infectious endogenous endophthalmitis is vitreous biopsy, or tap, via a short 25-gauge needle on a 3- or 5-mL syringe. This is followed by injection with intravitreal antibiotics at the pars plana in the clinic setting. The antibiotics we use most commonly are intravitreal ceftazidime 2.25 mg/0.1 mL and vancomycin 1 mg/0.1 mL. In patients with known serious penicillin allergy, intravitreal amikacin 400 µg/0.1 mL can be considered. Additionally, intravitreal dexamethasone 400 µg/0.1 mL is often used as an adjunct to address the severe secondary inflammatory state when the suspicion for fungal etiologies is low.

If a vitreous sample cannot be obtained due to the viscosity of the vitreous fluid, an anterior chamber aqueous sample is obtained for cultures via a short 30-gauge needle on a 1-mL syringe at the limbus. Note that, in the EVS, aqueous samples were positive in only 42% of eyes.<sup>3</sup>

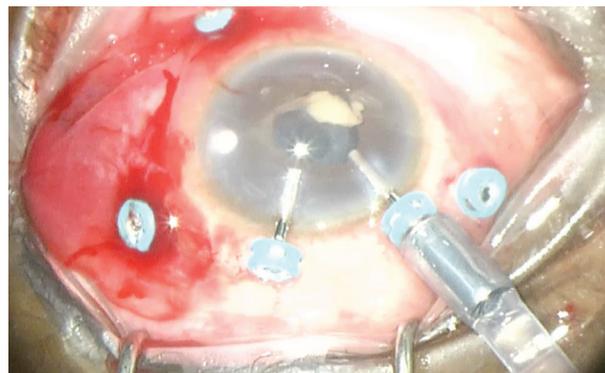
We expect the clinical presentation to sometimes

worsen within 24 hours of the injection of antibiotics. If no clinical improvement is seen, we typically perform pars plana vitrectomy within 48 to 72 hours of initial presentation with the idea that the vitreous acts as a culture medium for microorganisms. This is most likely the reason for the low incidence of endophthalmitis following routine pars plana vitrectomy surgery.

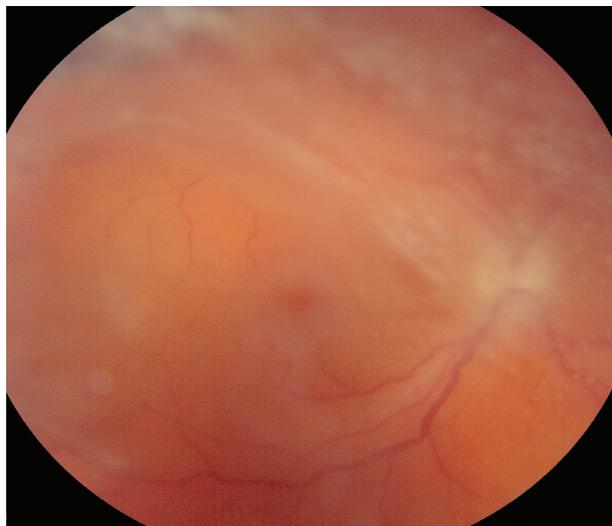
Our surgical technique for endophthalmitis recalcitrant to the clinical treatment described above includes a five-trocar setup using three standard pars plana trocar-cannulas and two limbal anterior trocar-cannulas (Figure 3).

The two limbal ports are typically necessary in cases of endophthalmitis that are complicated by significant anterior segment inflammatory reaction and/or media opacity. Anterior infusion is established and verified at the corneal limbus while the second anterior cannula is used for anterior chamber washout and membranectomy of fibrin and inflammatory membranes with the vitreous cutter and/or retinal forceps.

When media clarity is improved and the posterior segment can be better visualized, the infusion line of balanced saline solution can be moved to the pars plana, and a complete posterior vitrectomy can then be performed. In eyes in which pars plana infusion still cannot be visualized, posterior vitrectomy can be performed with the anterior infusion cannula. To see this technique in its entirety, please see the Video.



**Figure 3.** Early vitrectomy for postoperative infectious endophthalmitis. The standard three-port posterior vitrectomy technique is modified with two additional trocar-cannulas at the corneal limbus. This allows anterior infusion placement, which is preferred in eyes in which the media do not allow a posterior infusion line to be verified and checked. The second limbal cannula can be used for the vitrector or forceps for anterior chamber washout and membranectomy of inflammatory membranes. The infusion line can then be moved to the pars plana for posterior vitrectomy, or posterior vitrectomy can be performed with the anterior infusion in place.



**Figure 4. Atypical panuveitis after penetrating keratoplasty.** Patient presented with vitritis and retinitis. Pathology showed *Acanthamoeba* cysts in all ocular layers.

### ROLE OF SYSTEMIC ANTIBIOTICS

Another point of contrast between contemporary practice and the techniques used in the EVS concerns the use of systemic antibiotics. Although systemic antibiotic treatment was found not to provide additional treatment benefit in the EVS, the study took place before the availability of oral fourth-generation fluoroquinolones (eg, moxifloxacin), which have excellent ocular and vitreous penetration.<sup>16-18</sup> In the event of endophthalmitis, a 10- or 14-day course of oral moxifloxacin 400 mg daily provides additional broad-spectrum coverage with good vitreous penetration. We tend to supplement this

in a similar manner with topical fluoroquinolones, steroids, and cycloplegic agents for added antimicrobial, antiinflammatory, and analgesic effects, respectively.

Although bacteria comprise the majority of causative pathogens in postoperative exogenous endophthalmitis, other organisms such as fungi must be considered.<sup>2</sup> Additionally, we recently showed that *Acanthamoeba* caused an atypical postoperative panuveitis in a patient who underwent multiple penetrating keratoplasty surgeries (Figure 4). For the first time, we histologically documented *Acanthamoeba* involvement in all ocular layers, including the choroid.<sup>19</sup> This case example serves as a reminder to keep one's mind open when suspected cases of infectious endophthalmitis are encountered. Active communication with patients and close follow-up of evolving clinical response are paramount in order to achieve the best outcomes. ■



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**Vitrectomy for endophthalmitis performed with anterior cannulas for infusion, anterior chamber washout, and membranectomy.**

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