
MANAGEMENT OF POST SURGICAL ENDOPHTHALMITIS

Dr. Nazimul Hussain MS, DNB
Dr. S Natarajan DO
Dr. Anjali Hussain MS
Dr. Sonal L Jadhav DO, DOMS, DNB
Dr. Anupam Malpani MS
Aditya Jyot Eye Hospital

INTRODUCTION:

Endophthalmitis is an inflammatory reaction of the intraocular fluids or tissues. Infectious endophthalmitis is one of the most serious complications of ophthalmic surgery. Successful management depends on timely diagnosis and institution of appropriate therapy. Infectious endophthalmitis can be classified on the basis of clinical setting and the time of onset of clinically apparent inflammation. However we will confine our discussion to the management of post surgical endophthalmitis.

INCIDENCE:

Postoperative infectious endophthalmitis can occur after any intraocular procedure. The reported incidences after different intraocular procedures are as follows:

Surgery	Incidence
Cataract Surgery	0.07-0.13%
PARs Plana Vitrectomy	0.046-0.07%
Penetrating Keratoplasty	0.11-0.18%
Combined Penetrating Keratoplasty and Cataract Surgery	0.194%
Glaucoma Filtering Surgery	0.06-1.8%

The incidence of endophthalmitis after cataract surgery also varies on the surgical procedure. After phacoemulsification or extracapsular cataract extraction (ECCE) and intraocular lens (IOL) implantation, the incidence is between 0.07-0.12% whereas after secondary IOL implantation it is approximately 0.4%

MICROBIOLOGY:

Fungi and gram positive and gram negative bacteria are known to cause infectious endophthalmitis. Gram positive aerobic bacteria account for 76-90% of cases of culture positive postoperative endophthalmitis. 7-10% of cases are due to gram negative bacilli and 3-8% are of fungal origin. Staphylococcus epidermidis is the causative agent in 20-50% of cases of postoperative infection. Pseudomonas aeruginosa is the commonest gram negative organism isolated while fungal

endophthalmitis is rare and usually caused by both saprophytes and opportunistic pathogens

Acute postoperative endophthalmitis:

Postoperative infectious endophthalmitis that occurs within 6 weeks of surgery is classified as acute. The most commonly cultured microorganism is *S. epidermidis*, which is less virulent than the others. *Propionibacterium acnes* and fungi, commonly considered among the causes of more delayed onset infections, may also cause acute infections. *Bacillus* species are rarely associated with postoperative endophthalmitis. The Endophthalmitis Vitrectomy Study (EVS) determined that of 69% of patients with confirmed microbiologic growth, 70% were infected with coagulase negative micrococci (mostly *S. epidermidis*), 10% with *Staph. aureus*, 9% with streptococcus species, 2% with enterococcus, 3% with other gram positive species and 6% with gram negative species.

The relationship between visual outcome and identity of the infecting organism was also investigated by the EVS study group. The rates of achieving final visual acuity of 20/100 or better for more common isolates were as follows: gram positive coagulase negative micrococci- 84%, *S. aureus*- 50%, Streptococci- 30%, Enterococci- 14% and gram negative organisms- 56%. A positive gram stain and infection with species other than gram positive, coagulase negative micrococci was significantly associated with poorer visual outcome. However initial visual acuity was more powerful than microbiologic factors in predicting visual outcome and favourable response to vitrectomy.

Chronic postoperative endophthalmitis

Postoperative endophthalmitis that presents more than 6 weeks after surgery is classified as chronic. This definition is arbitrary, as the time of onset can be influenced by the use of anti-inflammatory medications, by host characteristics, and in the case of infectious endophthalmitis, by the virulence of the offending organism and the inoculum size. The most commonly cultured organisms include *S. epidermidis* (and other coagulase negative staphylococcus species), *P. acnes*, fungi (primarily *Candida* species), anaerobic streptococcus species, actinomyces species and *Nocardia asteroides*. *P. acnes* endophthalmitis is usually a delayed onset infection.

Post trabeculectomy Endophthalmitis:

The incidence of endophthalmitis after Glaucoma filtering surgery is estimated to be between 0.06% and 1.8%. There are two types of infection: blebitis which describes presumed bleb infection without vitreous involvement and Bleb associated Endophthalmitis with vitreous involvement. The most likely pathogens that colonize an intact bleb are streptococcus species (57%) and Hemophilus influenzae (23%); however, *S. aureus*, *Pseudomonas*, fungi and other organisms may be causative. In a recent study evaluating the causative organisms in delayed onset endophthalmitis associated with filtering blebs, the most commonly cultured species was streptococcus viridans.

TREATMENT:

Acute postoperative Endophthalmitis:

The intraocular concentration of antibiotics after intravitreal injection is greater than that achieved by any other modality. The infection is almost always seated in the vitreous cavity and other routes of drug administration, in particular topical and subconjunctival, generally do not achieve satisfactory drug levels. As rapid initiation of therapy is important for successful treatment, antibiotics must be administered before culture reports are available.

Vancomycin is considered the drug for gram positive organisms including methicillin resistant staphylococcus species and *Bacillus cereus*. It is not toxic, and recommended intravitreal dose is 1.0 mg/0.1 ml. The EVS has found that 100% of gram positive organisms are sensitive to Vancomycin, including methicillin resistant *S. aureus*.

The best choice for antimicrobial treatment of gram negative organisms is controversial. In the EVS, all patients received intravitreal amikacin (0.4 microgm/0.1ml) and Vancomycin (1.0 mg/0.1ml). Out of 420 patients in the EVS, only one case was reported of macular infarction following intravitreal injection of amikacin. Ceftazidime has been recommended as an alternative antibiotic to cover gram negative organisms because of its broad therapeutic spectrum, lower risk of retinal toxicity and in vitro antimicrobial activity, which is as effective as the aminoglycosides against gram-negative organisms. The EVS has also found that gram negative isolates were equally sensitive to amikacin and ceftazidime.

Ceftazidime has been reported to be physically incompatible with Vancomycin, causing the drugs to precipitate out of solution when combined. This can be avoided by injecting in separate syringes. Subconjunctival and topical antibiotics are often used with intravitreal antibiotics. The rationale underlying this approach is to increase the number of routes of antibiotic delivery to increase the likelihood of achieving high concentration of antibiotics within the eye and also in the anterior

segment.

The EVS has shown that intravenous systemic antibiotics (Ceftazidime and Amikacin) are most used adjuncts to intravitreal antibiotics in the setting of acute and subacute operative endophthalmitis but there was no difference in final visual acuity or media clarity with or without use of systemic antibiotics.

Systemic, topical, subconjunctival and intravitreal corticosteroids are often used in combination with antibiotics to reduce the destructive effect of significant inflammation that co exists with endophthalmitis. Several clinical and experimental reports that intravitreal corticosteroid therapy, when used in conjunction with antibiotics with or without vitrectomy reduces the inflammatory process and secondary complications associated with microbial endophthalmitis. Due to lack of randomized clinical trial or evaluation, the use of intravitreal corticosteroids remains controversial. Despite these uncertainties, systemic and intravitreal corticosteroids may be beneficial and are unlikely to be harmful.

Vitrectomy:

Vitrectomy has the potential advantage of removing the infecting organism and associated toxins, removing vitreous membrane that would lead to retinal detachment and improving intraocular distribution of antibiotics.

The EVS has shown that in a setting of acute endophthalmitis, after cataract surgery or secondary IOL placement, initial vitrectomy did not achieve better results than simple vitreous biopsy and intravitreal antibiotics, if initial VA was greater than or equal to hand motions. For patients with a visual acuity of light perception, 33% achieved VA of greater than or equal to 20/40 and 70% were less likely to get a VA of 5/200 or worse. The EVS enrolled only patients who developed bacterial endophthalmitis within 6 weeks of cataract surgery.

The findings support the hypothesis that vitrectomy plus intravitreal antibiotics is more effective in sterilizing the eye than a vitreous tap and intravitreal antibiotics. The need for additional procedures is a marker of more severe disease and is usually associated with worse visual outcomes. However, management of patients should be individualized and should be based on clinical judgement. Currently most surgeons reserve therapeutic vitrectomy for severe cases, defined as vitreous inflammation severe enough to obstruct view of the posterior pole on indirect ophthalmoscopy, progressive inflammation despite initial antibiotic therapy, and/or cases that have not improved despite initial therapy.

Chronic postoperative endophthalmitis:

If inflammation is not severe, therapy can be delayed until smear, culture and sensitivity data are available from aqueous samples. If inflammation is severe, then management should proceed according to the protocol for acute endophthalmitis.

If *P.acnes* or fungal endophthalmitis is suspected (clinical findings/smear/culture) then all areas of involved lens capsule and retained lens cortex should be excised. This is done along with pars plana vitrectomy. It is reasonable to preserve the areas of lens capsule that stabilize the IOL. Antibiotics can be injected into the capsular bag at the time of vitrectomy. Removal of the IOL and capsular bag should be considered in patients who do not respond adequately to limited capsulectomy, removal of sequestrum and injection of antibiotics into the capsular bag.

Vancomycin is a better choice of antibiotic as it is effective against *P. acnes* and also has a better coverage for other causes of delayed onset endophthalmitis. Therapy should be guided by culture and sensitivity when available. Intravitreal Amphotericin B (5-10µg/0.1ml) is usually effective against fungi. Intravitreal therapy may be repeated, as single dose administration may be insufficient.

Post trabeculectomy Endophthalmitis:

Blebitis can usually be treated with frequent topical as well as periocular antibiotic injections and have good prognosis. Since blebitis may be prodromal to endophthalmitis, aggressive systemic antibiotics have also been advocated. Acute cases can be managed similar to acute postoperative endophthalmitis. However, late onset endophthalmitis should be treated with pars plana vitrectomy/biopsy and intravitreal Vancomycin and Ceftazidime or Amikacin. It has been reported that patients treated with initial pars plana vitrectomy and intravitreal antibiotics may have better visual acuity than those treated with initial vitreous tap. Patients with bleb associated endophthalmitis tend to have the worst visual prognosis.

Special points with vitrectomy:

1. Fibrin pupillary membrane can be removed with 26 G needle, sharp blade or vitrectomy probe in aphakic and pseudophakic eyes.
2. In phakic eyes, fibrin can be retracted with an aspiration cannula.
3. If choroidal detachment precludes placement of an infusion cannula, 2 port pars plana vitrectomy can be useful.
4. Rarely crystalline lens or IOL requires to be removed to aid in visualization during pars plana vitrectomy.
5. During vitrectomy, core vitreous should be removed and no attempt should be made to remove the cortical or peripheral vitreous.

6. Attempt to remove core vitreous should continue until retina is visible or a bright red reflex is visible but not if visualization is inadequate.

CONCLUSION:

Effective treatment of endophthalmitis depends on early recognition and timing of initial therapy or intervention. The prognosis in endophthalmitis depends on culture results, time of onset and virulence of the pathogen. It is emphasized that every case should be taken seriously as infectious endophthalmitis is potentially devastating.

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A single doctor like a sculler plies,
 And all his art and all his physics tries;
 But two physicians, like a pair of oars,
 Conducts you soonest to the Stygian shores.
 Booth, John
 Epigrams Ancient and Modern (p. 144)