Post-traumatic and postoperative endophthalmitis: a comparison of visual outcomes

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SUMMARY We retrospectively studied 50 consecutive cases of exogenous endophthalmitis treated between 1972 and 1985. Twenty-two of these cases occurred after penetrating ocular trauma and the remaining 28 followed ocular surgery. Thirty-two (64%) of the cases were culture-positive. A wide variety of organisms were identified in the post-traumatic cases, while the isolated agent in the majority of postoperative cases was Staphylococcus epidermidis. Twenty-nine of the 50 patients received treatment with vitrectomy and intraocular antibiotics; of these, 14 (48%) achieved final visual acuities better than or equal to 20/400. Of the 21 patients who were treated with parenteral, topical, and subconjunctival antibiotics alone eight (38%) reached this same final visual acuity. Culture-negative cases, postoperative cases, and cases treated with vitrectomy and intraocular antibiotics were associated with improved visual outcomes.

Endophthalmitis complicating penetrating ocular injury generally has a worse visual prognosis than does postsurgical endophthalmitis. Several factors may account for the differences in final visual acuities between these groups, such as the virulence of the infecting organisms, the severity of any associated ocular trauma, and the rapidity of diagnosis and institution of appropriate therapy.

The use of intravitreal antibiotics and vitrectomy has improved success rates in the treatment of experimental and clinical endophthalmitis in selected cases. To understand better the factors affecting the prognosis of traumatic versus postoperative endophthalmitis we retrospectively reviewed 50 consecutive cases of exogenous endophthalmitis.

Subjects and methods

This study included 50 consecutive cases of exogenous endophthalmitis that had presented to the Department of Ophthalmology, University of Southern California School of Medicine, between July 1972 and July 1985. Criteria for clinical exogenous endophthalmitis included the following: a history of traumatic or surgical ocular penetration; ocular pain; decreased visual acuity; conjunctival chemosis and hyperaemia; and anterior chamber or intravitreal inflammation.

Aspirates from either the aqueous or vitreous were obtained in each case. These samples were routinely placed on the following culture media: blood agar and chocolate agar (both incubated at 35°C in a 5% CO₂ atmosphere), thioglycolate broth (incubated at 35°C in air atmosphere), and Sabouraud’s agar (incubated at room temperature in air atmosphere). If anaerobic bacterial cultures were requested, a bruccella blood agar plate supplemented with vitamin K and haemin plus a laked blood agar plate with kanamycin and vancomycin were also inoculated and incubated anaerobically. A positive culture was interpreted as either growth of the identical organism on two or more media or confluent growth on one medium at the inoculation site. Identification of micro-organisms was carried out according to the Manual of Clinical Microbiology.

All patients received extraocular (parenteral, fortified topical, and subconjunctival) antibiotics (EOABS). At our institution the addition of vitrectomy and intraocular antibiotics (IOABS) to the treatment regimens of selected cases began in 1977. Generally eyes with poor visual acuity (hand motions and worse) and advanced vitreous inflammation suggestive of infection were treated with
vitrectomy and IOABs. In most instances, intravitreal administration of both a cephalosporin and an aminoglycoside was undertaken in these cases. B scan ultrasonography was routinely performed to assist in making the diagnosis of endophthalmitis and in planning for potential vitrectomy. Patients with painful, totally blind eyes underwent primary enucleation.

**Results**

Of the 50 cases 22 (44%) occurred after trauma and 28 (56%) occurred after ocular surgery. Twenty-eight (56%) of the patients were male and 22 (44%) were female. The mean age was 52 years with a range of one to 91 years. Thirty-two of the 50 cases (64%) had positive intraocular cultures.

Overall, 22 of the 50 patients (40%) achieved successful final visual acuities (‘success’ defined as a visual acuity of 20/400 or better). Of the 34 cases treated after 1977, 19 (56%) achieved successful visual acuities. Over the entire course of the study the visual outcome was successful in 14 of the 29 patients (48%) who were treated with vitrectomy and IOABs and in eight of the 21 patients (38%) treated with EOABs alone.

**POST-TRAUMATIC GROUP** (Table 1)

Of the 22 patients with post-traumatic endophthalmitis 15 (68%) were males and seven (32%) were females. The mean age was 29 years, with a range of one to 83 years. The severity of ocular trauma varied greatly: four patients sustained corneal lacerations with prolapse of intraocular contents; four patients had corneal or scleral lacerations with intraocular foreign bodies; and 14 patients had relatively uncomplicated corneal or scleral lacerations. The visual outcome was successful in six of the 14 cases (43%) treated with vitrectomy and IOABs and in three of the eight cases (38%) treated with EOABs alone.

We were able to isolate and identify a wide variety of organisms from the intraocular aspirations in 13 of the 22 cases (59%) that had positive cultures. In four of these 13 cases (31%) multiple organisms were isolated; these included: *Klebsiella*, *Streptococcus*, *Escherichia coli*, *Clostridium*, *Neisseria*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. In the remaining nine cases the only single organisms were isolated; among these were *Staphylococcus epidermidis*, *Streptococcus*, *Candida*, *Propionibacterium acnes*, anaerobic diptheroids, *Staphylococcus aureus*, and *Bacillus cereus*.

Of the 13 cases that had positive intraocular cultures the visual outcome was successful in three of the nine (33%) that had been treated with vitrectomy and IOABs and in one of the four cases (25%) that had received EOABs alone. Of the nine cases that had negative intraocular cultures successful visual outcomes were noted in three of the five (60%) that had been treated with vitrectomy and IOABs and in two of the four cases (50%) that had received only EOABs.

Among the 12 eyes with final visual acuities worse than 20/400 five had initial trauma directly involving the posterior segment, two had an infection by a known virulent organism that responded poorly to treatment, and one had a retinal detachment after vitrectomy. In the remaining four cases there was no obvious factor predisposing to poor visual results; IOABs and vitrectomy had been utilised in the treatment of only one of these four cases.

**POSTOPERATIVE GROUP** (Table 1)

Of the 28 patients having postoperative endophthalmitis 13 (46%) were male and 15 (54%) were female. The mean age was 70 years with a range of 42 to 91 years. All of the primary operations involved the anterior segment only. These included: extracapsular cataract extraction plus intraocular lens (IOL) implantation, intracapsular cataract extraction plus IOL implantation, extracapsular cataract extraction alone, intracapsular cataract extraction alone, and glaucoma filtering procedures. The final visual acuity was successful in eight of the 15 patients (53%) treated with vitrectomy and IOABs and in five of the 13 patients (38%) treated with EOABs alone.

We were able to isolate and identify organisms from intraocular aspirations in 19 of the 28 cases (68%) of postoperative endophthalmitis. In three of these 19 cases (16%) multiple organisms were isolated; the remaining 16 (84%) had pure isolates of a single organism. *Staphylococcus epidermidis* was most frequently isolated (seven of 16 eyes). Other single isolates included: *Streptococcus pneumoniae*,

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**Table 1 Post-traumatic versus postoperative endophthalmitis**

<table>
<thead>
<tr>
<th></th>
<th>Post-traumatic</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=22)</td>
<td>(n=28)</td>
</tr>
<tr>
<td>Male: female</td>
<td>2:1</td>
<td>1:1</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>29</td>
<td>70</td>
</tr>
<tr>
<td>Mean onset to clinical evaluation (days)</td>
<td>3:4</td>
<td>1:6</td>
</tr>
<tr>
<td>Single aetiological agent: multiple aetiological agents</td>
<td>2:1</td>
<td>5:1</td>
</tr>
<tr>
<td><em>Staphylococcus epidermidis</em> aetiology</td>
<td>23% (3/13)</td>
<td>47% (9/19)</td>
</tr>
<tr>
<td>Final VA&gt;20/400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cases treated with VIT/IOAB</td>
<td>43% (6/14)</td>
<td>53% (8/15)</td>
</tr>
<tr>
<td>Cases treated without VIT/IOAB</td>
<td>38% (3/8)</td>
<td>38% (5/13)</td>
</tr>
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</table>

*For culture-proved cases. VIT=vitrectomy, IOAB=intracocular antibiotics, VA=visual acuity.


**Staphylococcus aureus, Proteus, and Streptococcus.** Combinations of staphylococci and streptococci were isolated from all three of the eyes with mixed infections.

Of the 19 cases with positive intraocular cultures visual success was achieved in six of the 11 (55%) treated by vitrectomy and IOABs and in only three of the eight (38%) not receiving this treatment. Of the nine cases with negative intraocular cultures two of the four cases (50%) that were treated by vitrectomy and IOABs and two of the five cases (40%) receiving only EOABs achieved a final visual acuity of 20/400 or better.

Final visual acuities worse than 20/400 could be attributed to complications of surgical management (four eyes), patient refusal of therapeutic vitrectomy (two eyes), or infection by known virulent organisms that responded poorly to treatment (three eyes). The remaining six eyes that had a poor visual outcome did not have any obvious predisposing factors; IOABs and vitrectomy had been used in the treatment of only one of these six cases.

**Discussion**

Prior to the early 1970s infectious endophthalmitis often resulted in phthisis bulbi or evisceration. In 1974 Peyman and colleagues demonstrated the safety and efficacy of IOABs in experimental endophthalmitis. Cottingham and Forster subsequently reported that treatment with IOABs in conjunction with pars plana vitrectomy was more beneficial than IOABs alone in cases of severe experimental endophthalmitis. Recently the use of both IOABs and vitrectomy in the management of infectious endophthalmitis has been shown to improve the visual outcome in most reported clinical series. 4-7

In our series we reviewed 50 consecutive cases of exogenous endophthalmitis presenting between 1972 and 1985. The cases treated with vitrectomy and IOABs had better visual outcomes than did those treated with EOABs alone. This differential in visual outcome was observed in both culture-positive and culture-negative cases. Vitrectomy and IOAB administration thus appear to be rational therapeutic choices in selected cases with severe vitreal involvement, whether or not an aetiologic agent is identified. Our overall success rate of 56% in cases of exogenous endophthalmitis treated after 1977 is similar to other recently reported series. 12,3

The reported success rates in treatment of post-traumatic endophthalmitis vary greatly, from 17% to 83%. In our series we noted a success rate of 43% for 14 cases of post-traumatic endophthalmitis treated with vitrectomy and IOABs. Numerous prognostic factors may affect the visual outcome in cases of post-traumatic endophthalmitis, including severity of the initial trauma, time interval between trauma and treatment, and virulence of the infecting organisms. These factors may account for the wide range of visual outcomes between reported series.

In contrast the success rates in cases of postoperative endophthalmitis vary little between recently reported series. Generally, these patients had all undergone primary anterior segment operations and were examined frequently in the postoperative period. Our success rate of 53% in cases of postoperative endophthalmitis treated with vitrectomy and IOABs compares favourably with these reports.

In our series the patients with postoperative endophthalmitis had better visual outcomes than did those with post-traumatic endophthalmitis (Table 1). In addition to the direct and delayed effects of ocular trauma itself the worse visual prognosis in the post-traumatic group may be accounted for by the fact that these patients tended to wait longer before seeking treatment than did those with postoperative endophthalmitis. Furthermore, the post-traumatic infections were more likely to have been caused by multiple organisms. Rowsey and colleagues similarly observed that mixed infections occurred more frequently in post-traumatic than in postoperative cases of endophthalmitis; they also suggested that the combination of organisms may cause more visual loss than does any one species of organisms.

In summary, the results of this retrospective study support the use of vitrectomy and IOABs in cases of endophthalmitis with severe vitreal involvement. We found that the visual prognosis for eyes with post-traumatic endophthalmitis was worse than that for eyes with postoperative endophthalmitis. The increased virulence and multiplicity of organisms identified in the post-traumatic cases, as well as longer delays in seeking medical attention by patients in the post-traumatic group, are some of the factors that may explain these differences in visual prognoses.

**References**

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