Endophthalmitis Following Pediatric Intraocular Surgery for Congenital Cataracts and Congenital Glaucoma

David T. Wheeler, MD, David R. Stager, MD, and David R. Weakley, Jr, MD

ABSTRACT

The incidence of endophthalmitis following pediatric anterior segment surgery is currently unknown. The paucity of reports of this entity has led some observers to recommend simultaneous bilateral surgery for congenital cataracts or glaucoma. In this study, we surveyed over 500 pediatric ophthalmologists and glaucoma specialists concerning their knowledge of, or involvement with, endophthalmitis following pediatric intraocular surgery. Seventeen cases of endophthalmitis were documented to occur out of 24,000 reported surgical cases. This results in an incidence estimate of 0.071%, or 7 cases per 10,000, which is similar to that recently reported following adult extracapsular cataract extraction.

The presence of infection was diagnosed by the 3rd postoperative day in 82% of cases. An organism was documented by culture in 65% of cases. The organism was gram positive in all cases.

Visual outcome was generally poor with 65% having no light perception.

The presence of possible concurrent risk factors for postoperative endophthalmitis, including nasolacrimal duct obstruction and upper respiratory infection, was noted in 8 of the 17 cases.

INTRODUCTION

Currently, the incidence of endophthalmitis following pediatric intraocular surgery is unknown. While its existence has been documented, only a single recently published report has addressed the issue. The conspicuous lack of reported cases has been cited by previous authors in support of simultaneous bilateral surgery for congenital cataracts or glaucoma.

To address this issue, we have surveyed over 500 pediatric ophthalmologists and glaucoma specialists to attempt to evaluate the true incidence, demographics, management, and outcome of documented cases of endophthalmitis following intraocular surgery in infants and children. Our survey has documented 17 cases of endophthalmitis following pediatric intraocular surgery. This report discusses the incidence, etiology, treatment, and outcome of these cases.

MATERIALS AND METHODS

Approximately 350 pediatric ophthalmologists and 150 glaucoma specialists were contacted by mail concerning cases of endophthalmitis in infants and children following elective intraocular surgery. A follow-up request was mailed out several weeks later to physicians failing to respond initially. A second detailed questionnaire was mailed to those who reported being the primary or consulting physician on a case of endophthalmitis. Every effort was made to contact these physicians and to obtain as much information as possible regarding these cases of endophthalmitis. Specific information requested included the patient's age, postoperative day of onset of signs or symptoms of endophthalmitis, causative organism, perioperative routine, treatment, and ultimate visual outcome. Potentially associated causative factors such as concurrent upper respiratory tract infections or nasolacrimal duct obstruction were sought.

Only documented cases of endophthalmitis clinically consistent with or culturally proven to be bacterial endophthalmitis following anterior segment surgery were included. Three cases of suspected endophthalmitis following trauma, trabeculectomy, and combined procedures were excluded, as were three late infections following filtering procedures. Three cases of "viral" endophthalmitis believed due to congenital rubella were also excluded. Furthermore, 18 possible cases were excluded because of insufficient clinical history to document bacterial endophthalmitis.

RESULTS

The Table includes available data on the 17 cases identified as meeting survey inclusion criteria. Age at surgery ranged from 2 weeks to 8 years with a mean of 28.9 months. In all cases reporting these data, the onset of endophthalmitis was noted between postoperative days 1.
### TABLE
Clinical Data From All 17 Patients With a Diagnosis of Endophthalmitis

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (Mos)</th>
<th>Postop Day</th>
<th>Diagnosis</th>
<th>Organism</th>
<th>Preop ABX</th>
<th>Surg Prep</th>
<th>Postop ABX</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>3</td>
<td>cataract</td>
<td>Sta Epi</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Ivit</td>
<td>CSM</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>3</td>
<td>cataract</td>
<td>Str Vir</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
<td>cataract</td>
<td>Str Vir</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>20/40</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>5</td>
<td>cataract</td>
<td>Str Pneu</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>5</td>
<td>2.5</td>
<td>2</td>
<td>cataract</td>
<td>Str Pneu</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>1</td>
<td>cataract</td>
<td>Sta Epi</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>IV only</td>
<td>NLP</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>2</td>
<td>cataract</td>
<td>Cx Neg</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>CSM</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>2</td>
<td>cataract</td>
<td>N/A*</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>N/A</td>
<td>NLP</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
<td>8</td>
<td>glaucoma</td>
<td>Strep</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
<td>7</td>
<td>cataract</td>
<td>Sta Aur</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>11</td>
<td>32</td>
<td>2</td>
<td>glaucoma</td>
<td>Cx Neg</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>IV, Vtx, Ivit</td>
<td>NLP</td>
</tr>
<tr>
<td>12</td>
<td>54</td>
<td>3</td>
<td>glaucoma</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>NLP</td>
</tr>
<tr>
<td>13</td>
<td>54</td>
<td>1</td>
<td>glaucoma</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>NLP</td>
</tr>
<tr>
<td>14</td>
<td>60</td>
<td>1</td>
<td>glaucoma</td>
<td>N/A</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV only</td>
<td>20/80</td>
</tr>
<tr>
<td>15</td>
<td>60</td>
<td>2</td>
<td>glaucoma</td>
<td>N/A</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>IV only</td>
<td>20/50</td>
</tr>
<tr>
<td>16</td>
<td>73</td>
<td>2</td>
<td>cataract</td>
<td>Sta Epi</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV, Ivit</td>
<td>20/50</td>
</tr>
<tr>
<td>17</td>
<td>96</td>
<td>2</td>
<td>glaucoma</td>
<td>Str Pneu</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>IV only</td>
<td>NLP</td>
</tr>
</tbody>
</table>

Sta Epi = Staphylococcus epidermidis; Str Vir = Streptococcus viridans; Str Pneu = Streptococcus pneumoniae; Cx Neg = culture negative; Sta Aur = Staphylococcus aureus; IV = Intravenous antibiotics; Ivit = injection of intravitreal antibiotics; Vtx = vitrectomy; CSM = central, steady, and maintained; HM = hand motion; NLP = no light perception.

N/A indicates this data was not available.

and 8 with only 2 of 16 patients being diagnosed after the 3rd postoperative day. In 11 eyes, endophthalmitis followed surgery for removal of cataract or pupillary membrane following previous cataract surgery. In six eyes, endophthalmitis followed goniotomy or trabeculotomy. Cases 12 and 13 represent two eyes of the same patient who underwent bilateral trabeculotomy for congenital glaucoma. All other cases followed unilateral surgery.

The presence of an organism was documented by culture in 11 of 17 cases (65%). Two cases (12%) were culture negative and data were unavailable in four others (23%). In all 11 cases with positive cultures, gram-positive organisms were identified. The most frequently encountered agents were *Staphylococcus epidermidis* and *Streptococcus pneumoniae*.

Preoperative antibiotics were used in only 2 of the 14 cases reporting perioperative routine, while all used standard povidone-iodine (Betadine) preparation. Postoperative antibiotic coverage was prescribed in 11 of these 14 cases, usually consisting of an aminoglycoside or chloramphenicol with or without steroid. In addition, subconjunctival aminoglycoside was injected in nine cases at the conclusion of surgery.

Treatment following diagnosis of endophthalmitis included intravenous antibiotics in all of the 14 cases reporting treatment regimens. Vitrectomy and intravitreal antibiotics were employed in 8 (57%) and 9 (64%) of these 14 cases, respectively. Additionally, some responders noted that repeated subconjunctival antibiotic injections were used during the acute phase of treatment.

Visual outcome was generally poor with only 5 (29%) of the 17 cases having 20/80 or better vision. Of the remaining 12 cases, 1 (6%) was hand motion only and the rest (65%) had no light perception.

Data on concurrent risk factors were available on 14 of the 17 cases and are discussed below.

### DISCUSSION

Bilateral intraocular surgery in adults is rarely, if ever, undertaken, primarily due to the perceived risk of endophthalmitis which, while uncommon, can be visually devastating. The relative paucity of reported endophthalmitis cases in infants has led some authors to suggest simultaneous bilateral surgery in infants with congenital cataracts or glaucoma.2,3

The rationale for this mode of therapy has been minimizing cost and anesthetic risk while maximizing early visual rehabilitation. Such a recommendation does not address the significance of endophthalmitis and potential visual loss reported here.

While multiple studies report the estimated incidence of endophthalmitis following intraocular surgery in adults, such estimates are lacking in infants and children. Incidence estimates in adults vary (from 6 to 70 per 10,000) and were summarized by Jaffe to be approximately 0.35% following cataract extraction.4 A recent survey of endophthalmitis in patients undergoing extracapsular cataract extraction at Bascom Palmer Eye Institute revealed a postoperative infection rate of 0.072%.5 In glaucoma patients, this figure increases to around 1% with long-term follow up of full-thickness filtering procedures in adults.6 Good et al1 have recently reported the incidence of endoph-
Thalassitonitis following cataract surgery in infants to be 0.45%; however, this figure was based on only 671 procedures of three surgeons.

The lack of estimates of postoperative endophthalmitis in infants and children may, in part, be due to the far fewer numbers of such procedures performed. The Framingham study found that 15% of adults aged 52 to 85 years had cataracts that reduced their visual acuity to 20/30 or less. In contrast, congenital cataracts are present in only approximately 0.4% of the newborn population and are visually significant in only a small portion of these. Furthermore, while the frequency of glaucoma in the elderly population may approach 5%, primary congenital glaucoma is extremely rare, such that the average ophthalmologist will only see approximately one case in 5 years, and estimates of its incidence have been in the range of 1 in 20,000.

The results of our survey reveal an incidence of postoperative endophthalmitis following anterior segment surgery in children of 0.071%, an incidence lower than that suggested by Good et al, and lower than most estimates of endophthalmitis in adults. Our estimate may be artificially low, as we excluded cases which were incompletely reported because some surgeons chose not to respond to our survey, and others did so in an anonymous manner, making further documentation of suspected cases impossible. This estimate is, however, based on the practice of over 500 ophthalmologists, representing more than 24,000 cases, over 2900 surgeon years, or approximately 8 cases per surgeon per year.

In all cases in which an organism was identified, the endophthalmitis was secondary to gram-positive organisms that are part of the normal flora of the conjunctiva or ocular adnexae of healthy individuals. These organisms are also frequently isolated from children with nasolacrimal duct obstruction or upper respiratory infection.

We strongly recommend routine postoperative antibiotic administration, and treatment must provide adequate gram-positive coverage. Aminoglycosides alone are generally considered to be inadequate in this regard. We favor the use of cefazolin or, alternatively, vancomycin along with aminoglycoside with or without steroid.

In an effort to identify sources of infection potentially contributing to these cases of endophthalmitis, our survey questioned about nasolacrimal duct obstruction, upper respiratory tract infection, or other likely concurrent risk factors. Coexisting upper respiratory tract infection and nasolacrimal duct obstruction were each noted in three instances, including the three cases previously reported by Good et al. Other possible risk factors included a Silsoft contact lens left in place until 1 day prior to surgery; nasal secretions present following intraoperative resuscitation which when cultured were identical to the intraocular organism; postoperative contact lens fitting performed 2 days prior to the diagnosis of endophthalmitis; and frequent postoperative eye rubbing noted by parents on the return visit. Thus, in all, 8 of the 17 cases were felt to have one or more associated risk factors that could have been modified or avoided.

Careful preoperative examination is vital to rule out concurrent infection. Consideration should be given to routine nasolacrimal duct probing, although we agree with Good et al that this should not be done on the operating table immediately prior to intraocular surgery. Certainly, in those patients suspected of having subacute infection, appropriate antibiotic coverage or even surgical postponement should be considered.

Treatment of pediatric endophthalmitis is similar to that of adults and included intravenous and other subconjunctival antibiotics with or without vitrectomy and/or intravitreal antibiotics. Any suspected infection must be treated aggressively, and a posterior segment surgeon should be consulted at an early stage if indicated. Prompt control of infection may allow preservation of useful vision in some patients.

**SUMMARY**

Our survey suggests that the incidence of endophthalmitis in pediatric intraocular surgery is approximately 0.071% or 7 cases per 10 000. This incidence estimate is, perhaps, low but certainly documents the existence of endophthalmitis in the pediatric population. Based on these findings, we cannot recommend bilateral simultaneous surgery because of the generally poor visual outcomes in patients developing endophthalmitis and because of the attendant risk of bilateral endophthalmitis in performing bilateral surgery.

**REFERENCES**