Association between Aphakia and Endophthalmitis after Pediatric Cataract Surgery

Endophthalmitis is a rare but devastating complication of cataract surgery. The IRIS Registry (Intelligent Research in Sight) reported a significantly higher incidence of endophthalmitis in children compared with adults (0.37% vs. 0.04%). Other studies have reported rates of 0.45% and 0.51%, but associated factors remain largely unknown. The purpose of this study was to assess factors associated with endophthalmitis after pediatric cataract surgery using a large claims database.

This was a population-based retrospective cohort study using the IBM MarketScan Research Database (IBM), approved by the University of Chicago Institutional Review Board.

Patients aged 0 to 18 years were included based on International Classification of Diseases and Current Procedural Terminology codes from 2004 to 2017. Cases suspicious for endophthalmitis were identified by International Classification of Diseases codes, among whom definite cases were confirmed by Current Procedural Terminology codes within 7 days of the endophthalmitis diagnosis (Fig S1, available at www.aaojournal.org). Patients were excluded if endophthalmitis was diagnosed before, on the same day, or > 90 days after cataract surgery (late diagnoses).

Statistical analyses were performed using Stata version 17.0 (StataCorp LP). Assuming endophthalmitis risk is independent between eyes of the same patient, the cumulative incidence was reported using the total number of cataract surgeries. To assess factors associated, univariate and multivariate logistic regressions included the first eye of each patient. To protect individual beneficiaries, cells with < 11 patients were suppressed (http://www.resdac.org). Suspicious cases (n = 33) were the primary outcome measure. Confirmatory analyses were repeated using exclusively unilateral cases (n = 24), definite cases (n = 18), late diagnoses (n = 50), or excluding < 11 cases with penetrating trauma. P values < 0.05 were considered significant.

There were 6835 cataract surgeries among 5304 beneficiaries. The incidence of endophthalmitis was 0.48% for suspect cases (33/6835, 95% confidence interval [CI] 0.33–0.68) and 0.26% for definite cases (18/6835, CI 0.16–0.42).

Patients with endophthalmitis were more likely to have a history of aphakia or trauma (Table 1). Concomitant vitrectomy was common among patients aged less than 5 years (58%) and not associated with endophthalmitis. Younger age was related to aphakia (P < 0.001).

Given the relationship between age and aphakia, a differential effect by age was explored. The probability of endophthalmitis was higher among patients aged ≥ 1 year who were aphakic compared with all other groups (Fig S2, available at www.aaojournal.org).

Aphakia was not linked to general ocular trauma (P = 0.15) but was strongly associated with penetrating trauma (P < 0.001). The relationship between aphakia and endophthalmitis among patients aged ≥ 1 year persisted after adjusting for penetrating trauma (odds ratio 2.7, CI 1.2–6.0, P = 0.017). Excluding penetrating eye injuries, odds were 4.3 times higher among older children (CI 1.8–9.0, P = 0.001).

Aphakia was significantly associated with retinal detachment (RD), vitreous hemorrhage (VH), wound revision, and secondary intraocular lenses (IOLs); of these, VH and RD were linked to endophthalmitis. Among patients who had endophthalmitis, most cases of VH or RD were diagnosed either before cataract surgery, or after the diagnosis of endophthalmitis.

Analyses were repeated for definite cases, with higher odds ratios and increased significance. Likewise, evaluating late diagnoses or exclusively unilateral cases, aphakia remained an independent predictor of endophthalmitis in the older age group.

Overall, only 3% had J codes for antibiotics on the day of surgery. There was no significant difference by IOL status.

In this population-based retrospective cohort study, the rate of endophthalmitis was higher than previously reported among adults and consistent with recent data for children. Among older patients, aphakia may independently predict endophthalmitis.

The Infant Aphakia Treatment Study showed a significant increase in surgical complications when an IOL was placed before 7 months. As a result, aphakia is standard practice for infants younger than 7 months of age. Because MarketScan does not include months of age, this analysis was unable to evaluate for a differential effect before and after 7 months. If anything, using 1 year as the cutoff would potentially diminish the ability of this study to detect an association between age and aphakia, yet findings remained significant.

Although a unicameral eye may potentially increase endophthalmitis risk, these data do not necessarily imply that an IOL is protective. Because older children are more likely to receive an IOL, the inability to place an IOL among older children may reflect complex baseline ocular comorbidities or surgical complications; the presence of VH and RD before cataract surgery suggests the former.

The IRIS registry study considered that opening the posterior capsule might account for the increased risk of endophthalmitis in children. By using same-day anterior vitrectomy as a proxy for capsular rupture, posterior capsule tears have been associated with 10 times increased odds of endophthalmitis in adults. By contrast, this analysis did not demonstrate such a relationship, perhaps because anterior vitrectomy is often a planned step of pediatric cataract surgery. Although surgical complications are associated with endophthalmitis, aphakia in this data set seems more closely aligned with baseline rather than surgical complications.

The main drawback of this study is the small number of cases, which prevented elaborate multivariable analyses or discussion of data including < 11 beneficiaries. In addition, modifiers were not frequently applied for left and right eyes. As a measure of caution, analyses were repeated excluding bilateral cases.
Table 1. Factors Associated with Cataract Surgery–Related Endophthalmitis in Children

<table>
<thead>
<tr>
<th></th>
<th>Endophthalmitis (n = 33)</th>
<th>No Endophthalmitis (n = 5271)</th>
<th>OR, 95% CI, P Value*</th>
<th>Adjusted OR, 95% CI, P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median age at surgery, yrs (IQR)</strong></td>
<td>9 (2–13)</td>
<td>8 (3–14)</td>
<td>0.98 (0.93–1.04)</td>
<td>0.63</td>
</tr>
<tr>
<td><strong>Age Group (yrs)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 yr</td>
<td>&lt;11†</td>
<td>821 (17%)</td>
<td>1.98 (0.60–6.50)</td>
<td></td>
</tr>
<tr>
<td>1–18 yrs</td>
<td>&gt;22†</td>
<td>4420 (83%)</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td><strong>Gender, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12 (36%)</td>
<td>2253 (43%)</td>
<td>0.78 (0.38–1.56)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21 (63%)</td>
<td>3018 (57%)</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td><strong>IOL status, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aphakic</td>
<td>14 (42%)</td>
<td>1273 (24%)</td>
<td>2.31 (1.16–4.63)</td>
<td>2.27 (1.13–4.54)</td>
</tr>
<tr>
<td>Pseudophakic</td>
<td>19 (58%)</td>
<td>3998 (76%)</td>
<td>0.018</td>
<td>0.021</td>
</tr>
<tr>
<td><strong>Concomitant vitrectomy, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>12 (36%)</td>
<td>1786 (34%)</td>
<td>1.12 (0.55–2.27)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>21 (63%)</td>
<td>3485 (66%)</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td><strong>Ocular trauma</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15 (45%)</td>
<td>987 (19%)</td>
<td>3.62 (1.81–7.20)</td>
<td>3.57 (1.79–7.11), 0.001</td>
</tr>
<tr>
<td>No</td>
<td>18 (54%)</td>
<td>4284 (81%)</td>
<td>P &lt; 0.001</td>
<td></td>
</tr>
</tbody>
</table>

CI = confidence interval; IOL = intraocular lens; IQR = interquartile range; OR = odds ratio.

*P value by logistic regression, adjusted for aphakia and trauma.
†Suppressed to comply with Centers for Medicare & Medicaid Services guidelines in data reporting.

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Despite these limitations, endophthalmitis is a devastating complication of cataract surgery, and children seem to have an increased risk. This may be particularly true for older pediatric patients, particularly those with complex baseline presentations that preclude IOL placement.

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Footnotes and Disclosures

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HUMAN SUBJECTS: This study does not contain human subjects. This report was approved by the University of Chicago Institutional Review Board. All research adhered to the tenets of the Declaration of Helsinki. Individual patient-level consent was not required.

No animal subjects were used in this study.

Author Contributions:

Conception and design: Rodriguez
Data collection: Liao
Analysis and interpretation: Rodriguez, Liao
Obtained funding: Rodriguez
Overall responsibility: Rodriguez, Chun, Skondra, Liao

Abbreviations and Acronyms:

CI = confidence interval; IOL = intraocular lens; IRIS = Intelligent Research in Sight; RD = retinal detachment; VH = vitreous hemorrhage.

Keywords:

Aphakia, Endophthalmitis, Pediatric cataract surgery, Surgical complications, Trauma.

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**References**


