Advances in the management of the surgical complications for congenital cataract

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Abstract The greatest concern in children with cataracts is irreversible visual loss. The timing of congenital cataract surgery is critical for the visual rehabilitation. Cataract surgery in children remains complex and challenging. The incidence of complications during or after operation is higher in children than adults. Some complications could be avoided by meticulous attention to surgical technique and postoperative care, and others were caused by more exuberant inflammatory response associated with surgery on an immature eye or the intrinsic eyes abnormalities. Utilizing of advanced techniques and timely applying topical corticosteroids and cycloplegic agents can reduce the occurrence of visual axis opacification. Operation on children with strabismus or nystagmus, and applying occlusion therapy on amblyopic eyes can balance the visual inputs to the two eyes. Diagnosis of glaucoma following congenital cataract surgery requires lifelong surveillance and continuous assessment of the problem. So cataract surgeries in children are not the end of journey, but one step on the long road to visual rehabilitation. This paper describes recent evidence from the literature regarding the advance of management after congenital cataract surgery.

Keywords cataract/congenital; surgery; cataract/complication

Introduction

The aim of the pediatric cataract surgery is to provide and maintain a clear visual axis and a focused retinal image. Children have reduced sclera and corneal rigidity, more inflammation after surgery, and a propensity to develop opacification of the visual axial [1]. The treatment of pediatric cataracts is a difficult and continuously evolving area in the ophthalmology. Ophthalmologists treating this special group of patients should be experienced and comfortable with the potential problems related to these children [2].

Advances of surgery

The surgical treatment of pediatric cataracts is a constantly evolving area in ophthalmology [2]. Now, the procedures are performed as the manual continuous curvilinear capsulorhexis (CCC) of anterior capsule, and then the lens material are removed using a vitrectomy handpiece, phacoemulsification handpiece, or automated irrigation and aspiration handpiece after hydrodissection. Posterior continuous capsule capsulorhexis (PCCC) and anterior vitrectomy are performed for patients younger than 8 years of age. Intraocular lens (IOL) implantation is performed in children older than 1 year of age with unilateral cataract and in those older than 2 years of age with bilateral cataract [3,4].

The basic technics of lens removal have not changed greatly in recent years other than the use of the 23-gauge or 25-gauge vitrectomy system [5,6]. The pars plicata entry is made 1.0 to 1.5 mm behind the limbus. It can be used to create a posterior capsulotomy of a desirable size in a controlled manner to avoid destabilization of the IOL. Lentectomy was performed via a pars plana or pars plicata approach using the 23-gauge or 25-gauge vitrectomy system. Vasavada and Meier reported that pars plana/plicata lentectomy using 23-gauge instruments is a safe, effective, and minimally invasive method for treating cataract in babies [7,8].

Postoperative complications

A much higher incidence of complications occurs in children
after cataract surgery than in adults. Whereas some complications are preventable by meticulous attention to surgical technique and postoperative care, others arise due to the intrinsic abnormalities of these eyes or the more exuberant inflammatory response associated with surgery on an immature eye. The incidences of postoperative complications for congenital cataract among different Asiatic countries/regions are shown in Table 1.

Amblyopia and refractive correction

Amblyopia is the greatest threat to vision following infantile cataract. Screening with early detection followed by surgery before the end of the third month is important to decrease the risk of marked acuity loss [12]. Individual visual acuity development is related to age at surgery and type of cataract. In spite of optimized care and surgery before 9 months, the best-corrected visual acuity (BCVA) was subnormal compared to healthy children [12]. Total or unilateral cataract, nystagmus or strabismus, and inadequate amblyopic therapy were predictors of poor BCVA [13]. More than two-thirds of congenital cataract children did not develop acuity better than 0.6 LogMAR in aphakic eye [14]. Significant myopic shifts occurred especially in infants in the first year of surgery [13]. Final refraction in the unilateral cataract was significantly more myopic than in the bilateral cataract [15].

Thoumazet reported that primary intraocular lens implantation provides significantly better final visual acuity than aphakic contact lens-corrected eyes and provides better stabilization over time whatever the age [16]. The best acuities were achieved in the eyes which had been treated with early primary IOL, but they had a higher rate of complications, thus requiring reoperation [15]. In the Infant Aphakia Treatment Study (IATS), the rates of intraoperative complications (ICs), adverse events (AEs), and additional intraocular surgeries (AIs) 1 year after surgery were numerically higher in the IOL group than in the aphakia group, but their functional impact does not clearly favor either treatment group [17,18].

Occlusion therapy is started in unilateral cases as soon as the media is clear and the aphakia is corrected. In cases with bilateral cataract, occlusion therapy does not usually need to be as aggressive as in unilateral cases, and is sometimes useful if one eye is more amblyopic than the other. Close follow-up is mandatory until the patient is 7 years of age [19]. Adherence to patching during the first 6 months after surgery is associated with better grating visual acuity at 12 months of age after treatment for unilateral cataract and implanting an intraocular lens is not associated with adherence [20]. The type of correction (intraocular lens vs. contact lens) was not associated with the amount of patching achieved, whereas family socioeconomic status and maternal stress appeared to play a role [21].

Glaucoma

Development of glaucoma in aphakia and pseudophakia after congenital cataract surgery is multifactorial. The risk factors include the age at surgery, pre-existing ocular abnormalities, type of cataract, and the effect of lens particles, lens proteins, inflammatory cells, secondary membrane surgery, microcornea, primary posterior capsulotomy with anterior vitrectomy, and retained lens material [22–24].

Characteristics of early-onset and delayed-onset glaucoma were described by Kang et al. [25]. Of the twenty-four patients (37 eyes) identified with glaucoma after cataract surgery, 15 eyes had an early onset of glaucoma (1 week to 13 months after cataract surgery) and 22 eyes had delayed-onset glaucoma (70 to 177 months after cataract surgery). The average interval between cataract surgery and glaucoma onset of early-onset group is 0.16 year and that of delayed-onset group is 11.75 years. Early-onset glaucoma was significantly more likely to be due to angle closure than delayed-onset glaucoma. Mills and Robb [26] noted that glaucoma with an angle-closure mechanism frequently occurs within the first few months after surgery and open-angle glaucoma has a later onset (average 7.4 years). Asrani reported an average interval between pediatric cataract surgery and the onset of open angle glaucoma of 12.2 years [27]. Open-angle glaucoma was the most common type of aphakic glaucoma [28]. Asrani reported a decreased incidence of open-angle glaucoma in pseudophakic eyes compared to aphakic after cataract surgery [27]. Some eyes have some degree of peripheral anterior synechiae. Some eyes showed increased pigmentation and a glazed appearance of the trabecular meshwork. Closer

Table 1 The incidences of postoperative complications for congenital cataract among different Asiatic countries/regions

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of patients</th>
<th>Mean age at operation (months)</th>
<th>Mean follow-up (months)</th>
<th>PCO* (%)</th>
<th>Secondary glaucoma (%)</th>
<th>Synechia (%)</th>
<th>Setinal detachment (%)</th>
<th>IOL decentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China [3]</td>
<td>486</td>
<td>58.60±48.00</td>
<td>53.22</td>
<td>8.00</td>
<td>3.40</td>
<td>–</td>
<td>0.25</td>
<td>–</td>
</tr>
<tr>
<td>China [9] **</td>
<td>246 (399 eye)</td>
<td>37.88</td>
<td>41.30</td>
<td>21.6</td>
<td>5.80</td>
<td>0.50</td>
<td>0.50</td>
<td>–</td>
</tr>
<tr>
<td>Korea [10]</td>
<td>61</td>
<td>38.0±42.36</td>
<td>40.02±29.99</td>
<td>14.10</td>
<td>3.57</td>
<td>16.70</td>
<td>1.19</td>
<td>2.38</td>
</tr>
<tr>
<td>Nepal [11]</td>
<td>85</td>
<td>74.40±51.60</td>
<td>5.40±5.30</td>
<td>19.64</td>
<td>–</td>
<td>&lt;10.00</td>
<td>0.00</td>
<td>1.78</td>
</tr>
</tbody>
</table>

* PCO, posterior capsular opacification.
** Taiwan, China.