

# Congenital cataract surgery with intracameral triamcinolone: Pre- and postoperative central corneal thickness and intraocular pressure

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<b>PURPOSE</b>	To evaluate the change in intraocular pressure (IOP) and central corneal thickness (CCT) of children who underwent congenital cataract surgery with injection of triamcinolone acetonide into the anterior chamber at the end of the procedure.
<b>METHODS</b>	Fifty-three eyes of 34 children <2 years of age who underwent congenital cataract surgery with injection of 1.2 mg/0.03 mL of preservative-free triamcinolone acetonide into the anterior chamber at the end of the procedure were included in this study. IOP and CCT were measured preoperatively and at a mean of 2 and 12 months' follow-up.
<b>RESULTS</b>	The mean IOP was $8.7 \pm 0.4$ mm Hg preoperatively, $8.4 \pm 0.6$ mm Hg at the 2-month follow-up, and $8.1 \pm 0.3$ mm Hg at the 12-month follow-up. The mean CCT was $562 \pm 11$ $\mu$ m preoperatively, $563 \pm 10$ $\mu$ m at the 2-month follow-up, and $570 \pm 10$ $\mu$ m at the 12-month follow-up. There was no significant change in either pre- or postoperative IOP ( $P = 0.700$ ) or CCT ( $P = 0.419$ ) over the study period.
<b>CONCLUSIONS</b>	Injection of 1.2 mg triamcinolone acetonide at the end of congenital cataract surgery in children <2 years of age did not significantly affect IOP or CCT in the first year after surgery. (J AAPOS 2012;16:441-444)

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Postoperative inflammation following congenital cataract surgery can be reduced with oral corticosteroids; however, administering drugs orally can induce adverse systemic events.<sup>1</sup> Moreover, poor adherence to a postoperative drug regimen can lead to complications that compromise visual prognosis.<sup>2</sup> Direct intraocular injection of corticosteroids leads to the desired drug concentration in the eye without risk of adverse extraocular events. Triamcinolone acetonide is used increasingly to treat uveitis and cystoid macular edema and following phacoaspiration in adults.<sup>3-7</sup> In congenital cataract surgery, it has been used as a vitreous dye to ensure a thorough anterior vitrectomy in young children.<sup>8</sup> In addition, it has been used to modulate postoperative inflammation in patients <15 years of age with different types of infantile cataract.<sup>9</sup> Although these articles reported no increase in intraocular pressure (IOP) after

surgery, postoperative ocular hypertension is a possible complication of this drug,<sup>10</sup> as well as of congenital cataract surgery itself.<sup>11-13</sup> The authors who have investigated the effects of triamcinolone on the corneal endothelium have suggested possible microstructural damage resulting in thicker corneas that could have an effect on the IOP measurement.<sup>14-16</sup> The purpose of the current study was to assess the IOP and central corneal thickness (CCT) in children <2 years of age who underwent congenital cataract surgery with an injection of 1.2 mg/0.03 mL of preservative-free triamcinolone acetonide into the anterior chamber at the end of the procedure to modulate postoperative inflammation.

## Subjects and Methods

This retrospective interventional case series was approved by the Institutional Review Board of the Altino Ventura Foundation. This study followed the tenets of the Declaration of Helsinki. The patients' guardians received an explanation concerning the surgical treatment and provided written informed consent prior to surgery.

The study included consecutive patients with a unilateral or bilateral congenital cataract that underwent phacoaspiration with primary intraocular lens (IOL) implantation before the age of 2 years at the Altino Ventura Foundation during the period of August 2007 to July 2010. All patients received intracameral triamcinolone at the end of the procedure. Patients with corneal opacity, glaucoma, aniridia, subluxated cataract, traumatic cataract, complex microphthalmia, persistent hyperplastic primary

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vitreous, retinal detachment, or an IOL implanted in the sulcus were excluded.

Preoperative measurements were taken within the first 4 minutes of general anesthesia. An experienced ophthalmic technician measured the CCT using an ultrasonic pachymeter (DGH 4000B; DGH Technology Inc, Exton, PA) before applanation tonometry. The mean value of three consecutive readings within 5  $\mu\text{m}$  of one another was recorded. One physician (MCV) measured the IOP using the same calibrated Perkins applanation tonometer (Clement Clarke Ltd, London, UK).

One surgeon (MCV) performed all the surgeries. The standardized surgical technique included phacoaspiration, posterior capsulorhexis, anterior vitrectomy, and primary IOL implantation in the capsular bag. After closing the scleral incision with two interrupted 10-0 nylon sutures, miosis was achieved by an injection of 0.01% carbachol into the anterior chamber. Part of the balanced salt solution in the anterior chamber was exchanged for a single air bubble, followed by an injection of 1.2 mg/0.03 mL of preservative-free triamcinolone acetonide into the anterior chamber. The triamcinolone occupied the 360-degree circumference of the space between the angle of the anterior chamber and the air bubble.

The conjunctiva was approximated using bipolar cautery. A subconjunctival injection of 0.3 mL of 4% dexamethasone was administered. At the end of surgery, topical moxifloxacin 0.5% eye drops were instilled in the eye and an occlusive bandage was applied for 24 hours.

The patients were administered topical moxifloxacin 0.5% four times daily for 10 days; tropicamide 1% diluted 1:1 with artificial tears twice daily for 10 days; betaxolol 0.5% twice daily for 30 days; and prednisolone acetate 1% every 3 hours daily for 1 week, tapered over the next 6 weeks.

At the 2- and 12-month postoperative follow-up, patients underwent an ophthalmologic examination under anesthesia that included an external examination, indirect binocular ophthalmoscopy, and measurement of the CCT and IOP as described above. Routinely, children that are submitted to a first postoperative examination before completing 30 days of surgery stop the betaxolol 0.5% 2 days prior to the examination to avoid an IOP measurement under the influence of this topical drug.<sup>17</sup>

SPSS version 16.0 (version 16.0; SPSS Inc, Chicago, IL) was used for data analysis. In patients with bilateral cataracts, both eyes were enrolled in the study; generalized estimating equation models were used to account for the correlation between the eyes of the same patient and for the repeated measures during the follow-up period. Pre- and postoperative mean IOP and CCT were compared. Normal IOP was defined as  $<21$  mm Hg.<sup>18</sup> A mean postoperative change in CCT of  $<27.4$   $\mu\text{m}$ , which corresponds to a change in CCT after congenital cataract surgery without triamcinolone, was considered normal.<sup>19</sup> Continuous variables are expressed as the mean  $\pm$  SE and the maximal and minimal values. A *P* value  $<0.05$  was considered significant.

## Results

A total of 53 eyes of 34 children  $<2$  years of age (19 boys [56%]) who underwent surgery to treat a congenital cata-

ract were included in this study. Of the 34 children, 15 (44%) had unilateral cataract; 19 (56%) had bilateral cataracts. The mean patient age at the time of surgery was  $11 \pm 1$  months (range, 2-23 months). The mean time of the first postoperative examination under anesthesia was  $57 \pm 4$  days (range, 30-90 days). Of the 53 eyes, 7 (13%) were analyzed 30 days after the surgery, instead of at 2 months. The second examination under anesthesia was performed at a mean of  $372 \pm 11$  days (range, 300-438 days) after surgery.

No patient experienced secondary obscuration of the optical zone across the pupil or needed an additional intervention during the follow-up period. There was no significant difference between the pre- and postoperative mean IOP values ( $P = 0.700$ ; Table 1). Comparing each eye's preoperative IOP with the IOP at 2 months, of the 53 studied eyes, only 2 (4%) had a change  $>5$  mm Hg: 1 (3%) eye had a variation of 7 mm Hg and 1 (3%) had a variation of 9 mm Hg. At the 12-month follow-up all 53 eyes (100%) had an IOP measurement within 5 mm Hg of the preoperative value. No patient had postoperative ocular hypertension or glaucoma.

There was no significant difference between the pre- and postoperative mean CCT values 2 and 12 months postoperatively ( $P = 0.419$ ; Table 1).

## Discussion

Previous studies<sup>6,7</sup> have described the safety of maintaining triamcinolone in the anterior chamber at the end of phacoemulsification in adults. In the current study, triamcinolone was injected into the anterior chamber at the end of congenital cataract surgery in children  $<2$  years of age and absorbed during the postoperative period. No eye developed secondary opacification or required additional surgery, corroborating the findings of a previous study<sup>8</sup> in which triamcinolone was injected into the anterior chamber, used during congenital cataract surgery as a vitreous dye, and removed from the eye before the close of surgery.

Children have an enhanced ocular inflammatory response and a more reactive vitreous face than adults.<sup>20</sup> Postoperative modulation of inflammation in congenital cataract surgery is essential for improving visual outcomes. Although subconjunctival, topical, and oral steroids can be used, subconjunctival injections may cause subconjunctival hemorrhage and chemosis; topical and oral steroids require frequent doses and strict compliance.<sup>2</sup> Injection of steroids into the anterior chamber immediately after surgery avoids these possible disadvantages and provides higher concentrations of the drug.

The exact time at which the eye is free of triamcinolone acetonide crystals is unknown, especially in children's eyes.<sup>7</sup> Beer and colleagues<sup>1</sup> calculated that triamcinolone concentrations are present in the aqueous humor for  $93 \pm 28$  days in nonvitrectomized adult eyes after an intravitreal injection, an estimate others have corroborated.<sup>21</sup> In

Table 1. Pre- and postoperative IOP and CCT in children <2 years of age who underwent congenital cataract surgery with intracameral injection of triamcinolone acetonide

	Preop	2 mo postoperative	12 mo postoperative	P value
IOP, mm Hg				
Mean ± SEM <sup>a</sup>	8.7 ± 0.4	8.4 ± 0.6	8.1 ± 0.3	0.700
Range	4-12	2-18	4-11	
95% CI <sup>a</sup>		7.2-9.5	7.5-8.8	
CCT, μm				
Mean ± SEM <sup>a</sup>	562 ± 11	563 ± 10	570 ± 10	0.419
Range	495-662	501-653	458-701	
95% CI <sup>a</sup>		542-583	549-590	

CCT, central corneal thickness; CI, confidence interval; IOP, intraocular pressure; SEM, standard error of the mean.

<sup>a</sup>Estimated by generalized estimating equation models.

the current study, the first examination under anesthesia was performed after the antiglaucomatous drug was discontinued and during the postoperative period in which there likely was still some direct triamcinolone ocular effect. A direct drug effect was no longer expected by 12 months after surgery.

Compared to preoperative IOP, no significant difference was found between the mean IOP values of our patients obtained at 2 or 12 months. Also, postoperative changes in IOP did not reach statistical significance, corroborating the literature.<sup>6,8,9</sup> Dixit and colleagues<sup>8</sup> did not observe an IOP increase 1 month and 1 year after congenital cataract surgery in which triamcinolone was injected into the anterior chamber to ensure a complete anterior vitrectomy. Likewise, Cleary and colleagues<sup>9</sup> reported no postoperative increase in IOP after cataract surgery with triamcinolone injection into the anterior chamber in children <15 years of age. Nevertheless, as with all corticosteroids, adverse events are possible; a previous study,<sup>10</sup> in which adults received an intravitreal triamcinolone injection, reported ocular hypertension in 40% of the patients.

The triamcinolone ocular hypertensive effect occurs because of its immediate intraocular bioavailability and its relatively slow elimination.<sup>1</sup> Published studies have reported varied incidences of ocular hypertension secondary to triamcinolone use, ranging from 21% after sub-Tenon's injections<sup>3-5</sup> to 56% after intravitreal injections.<sup>10,22,23</sup> In addition to the risk of increased IOP due to triamcinolone use, pseudophakic children face a greater risk of developing ocular hypertension and glaucoma after the congenital cataract surgery itself,<sup>11,12</sup> which has been reported in up to 24.4% of patients.<sup>12</sup>

There was no significant difference in the mean CCT before and after surgery in the current study. Authors who have investigated the effects of triamcinolone on the corneal endothelium have suggested possible microstructural damage as a result of the preservatives and not from the triamcinolone itself.<sup>15,16</sup> Our patients' mean postoperative CCT was within the normal values for children <2 years of age<sup>24,25</sup>; the result agrees with some studies regarding pseudophakic children<sup>26</sup> but differs

from others that have reported thicker corneas after surgery.<sup>13,27</sup>

The current study is limited by its retrospective nature. In summary, 1.2 mg of preservative-free triamcinolone acetonide injected into the anterior chamber at the end of congenital cataract surgery with primary IOL implantation in patients younger than 2 years of age did not increase the IOP or CCT on the second postoperative month and a year after the procedure.

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