CLINICAL STUDY

Changes in astigmatism after cataract extraction and intraocular lens implantation in children

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Abstract

Purpose **To evaluate the post-operative changes in astigmatism in pseudophakic eyes in children.**
Methods **The charts of children who had undergone surgery for non-traumatic cataract were retrospectively reviewed. In 10 eyes with astigmatism of 3.0 D or more, the refraction was tested and recorded at 1 week, 3 months and 5 months post-operatively.**
Results **Mean astigmatism 1 week post-operatively was 6.2 ± 2.7 D (range 3.0–11.0 D). Thereafter, the astigmatic component of the refractive error underwent a spontaneous steady decline, reaching a mean value of 1.2 ± 1.1 D (range 0–3.0 D) 5 months after surgery. The change in the difference between the mean values at 1 week and at 5 months was statistically significant (p = 0.0002).**
Conclusions **Children who underwent cataract extraction and intraocular lens implantation showed a significant spontaneous reduction in astigmatism post-operatively. This finding suggests that there is no need to remove sutures in order to achieve reduction of post-operative astigmatism in these children.**

Key words Astigmatism, Cataract extraction

Corneal astigmatism is a well-documented sequela of cataract surgery in adults. The amount of astigmatism depends on various factors, such as the type and location of the surgical incision, the suturing material and suture placement.[1–3] Only mild spontaneous changes in the amount of astigmatism have been described in adults.[4,5] An effective way to reduce or eliminate the post-operative astigmatism is by the removal of one or more interrupted or continuous sutures.[6–9] Removal of sutures was recommended only in eyes with astigmatism of at least 3.0 D.[7,10] Suture removal relieves wound compression, thereby altering the corneal curvature. In this study we describe the changes in astigmatism that occurred without suture cutting after cataract extraction and intraocular lens implantation in children.

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Received: 4 November 1998
Accepted: 26 January 1999

Materials and methods

The charts of 27 children (45 eyes) who underwent surgery for congenital cataract between 1992 and 1994 were reviewed. All eyes with astigmatism of 3.0 D or more 1 week after surgery were included in the study. There were no other ocular or systemic abnormalities in the study population. All patients had undergone a uniform procedure for extracapsular cataract extraction and intraocular lens implantation. A fornix-based conjunctival flap had been formed, and after mild local diathermy a partial-thickness incision was made at the limbus with a no. 64 Beaver blade. A keratome was introduced into the anterior chamber at the limbus at 2 and 10 o'clock. An anterior chamber maintainer (Visitec) was used and capsulorhexis was performed with a bent 25 gauge needle. All lens material was aspirated with the Anis aspirating cannula (Storz). Posterior capsulotomy and anterior vitrectomy were performed with the ocutome (Coopervision) in all cases but two cases (nos. 4 and 6) (Table 1). The corneal incision was enlarged by the use of scissors (Storz), with the blades rotated so that bevelled cuts were made. An intraocular lens (Hanita) was implanted in the bag. The limbal incision was closed with five or six interrupted 10/0 Mersilene sutures (Ethicon), and the conjunctiva was replaced without suturing. All operations were performed by the same surgeon (A.S.), using the same surgical technique.

The refractive error of the operated eye was tested (as part of the complete eye examination) at 1 week and then on average every 1–2 months for 6 months, after dilation of the pupil with 0.5% tropicamide. All refractive errors were corrected with spectacles 1 month after surgery, and treatment for amblyopia was instituted when indicated. No sutures were removed during follow-up.

Results

When examined 1 week after surgery, 10 eyes (9 children) had astigmatic error of 3.0 D or more, and were therefore included in the study. The age range of these children was 2.5–11

Table 1. *Astigmatism in children after cataract extraction and intraocular lens implantation*

Eye no.	Age (years)	Post-operative astigmatism		
		At 1 week	At 3 months	At 5 months
1	8.5	−3.0 × 165°	−3.0 × 180°	0
2	2.5	−6.0 × 10°	−4.0 × 180°	−1.5 × 165°
3	11	−6.0 × 15°	−4.0 × 10°	−3.0 × 180°
4	11	−6.0 × 10°	−2.0 × 180°	−1.0 × 180°
5	5.5	−11.0 × 150°	0	0
6	7	−3.0 × 150°	−1.0 × 160°	−1.0 × 45°
7	7	−8.0 × 180°	0	0
8	4	−3.0 × 150°	0	−1.0 × 90°
9	4	−7.0 × 180°	−6.0 × 145°	−3.0 × 130°
10	6	−9.0 × 180°	−5.0 × 175°	−1.5 × 70°
Mean ± SD	6.7	−6.2 ± 2.7	−2.5 ± 2.2	−1.2 ± 1.1

years. In all cases the surgical and post-operative course was uneventful, and no complications were noted.

One week after surgery mean astigmatism was 6.2 ± 2.7 D. The mean refractive error declined to 2.5 ± 2.2 D at 3 months post-operatively, and to 1.2 ± 1.1 D at 5 months post-operatively. No significant further decline was recorded 1 year after surgery. The refractive errors of the individual patients are summarised in Table 1.

The observed changes in astigmatism were statistically significant: $p = 0.0035$ between 1 week and 3 months, $p = 0.0145$ between 3 months and 5 months, and $p = 0.0002$ between 1 week and 5 months.

Discussion

Post-operative corneal astigmatism is an integral part of the refractive error measured after cataract surgery in both adults and children. The amount of immediate post-operative astigmatism and its subsequent changes are affected by factors such as the surgical technique, type of suture used, and the experience of the surgeon.[1–3,11] The present series was comprised of children who had undergone surgery performed by the same surgeon using the identical surgical technique, sutures and intraocular lens type in each case. Any changes that occurred in this uniformly operated group in astigmatism could, therefore, be considered as spontaneous, and not affected by any specific surgically dependent variable. Most of the eyes in the series had post-operative with-the-rule astigmatism and in three the astigmatism shifted towards against-the-rule. This shifting phenomenon has previously been described in adults.[10]

The finding of post-operative astigmatism is important, especially in children, because of its adverse effect on vision development and the attendant risk of amblyopia.[12] In adults, a few months of delay in refractive error correction has no effect on the final visual acuity, whereas in children precise refractive optical correction must be made as soon as possible. Accordingly, all our patients received their refractive correction after surgery, and any further changes in astigmatism were promptly followed by changes in the refractive correction. On the other hand, whereas post-operative surgical astigmatism in adults can be corrected by removal of one or more sutures in a simple office procedure,[6,7] in children the procedure usually requires general anaesthesia. Only mild spontaneous regression of post-operative astigmatism has been described in adults. Without suture cutting, mean changes of only 0.5 D[4] and 1.25 D[5] were reported during the first year after cataract surgery. In our paediatric series, an average spontaneous decline in astigmatism of 5.0 D was observed 5 months after surgery. The following factors might have contributed to this marked spontaneous regression in post-operative astigmatism: (1) The ocular tissues in children exhibit a high degree of elasticity. In adults, wound compression caused by the sutures does not change over time, whereas in children, because of the elasticity of the cornea and sclera, the tissue tension may spread evenly to neighbouring areas, reducing the amount of astigmatism. (2) Growth of the globe continues in children (but not in adults) under constant centrifugal intraocular pressure, and results in a more spherical growth of the eye, thereby diminishing the amount of astigmatism. This factor may be particularly important in young children.

Correction of refractive errors in children is essential in order to avoid development of amblyopia. Astigmatism should therefore be promptly treated, and this is normally done either by adequate optical correction or by suture removal. The findings of the present study strongly suggest that removal of sutures is not required, since ocular astigmatism spontaneously regresses a few months after surgery. This also eliminates the need for the general anaesthesia that is usually necessary for suture removal in children.

We are currently using a scleral tunnel incision and comparing the results with those obtained using a corneal incision. It was recently reported[3] that the mean astigmatism 1 month after surgery in adult eyes operated on through a corneal incision was significantly higher than in eyes operated on through a scleral incision. However, the mean final astigmatism did not differ significantly between these two groups.

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