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# The relationship between patient age and astigmatism magnitude after congenital cataract surgery

*SHAI M. BAR-SELA, YOSEPH GLOVINSKY, TAMARA WYGNANSKI-JAFFE, ABRAHAM SPIERER*

Goldschleger Eye Institute, Sheba Medical Center, Tel-Hashomer and
The Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv - Israel

PURPOSE. *To evaluate the magnitude of refractive astigmatism after congenital cataract surgery and to define its correlation with patient age.*

METHODS. *The authors retrospectively reviewed the charts of all pediatric patients who underwent congenital cataract extraction with intraocular lens (IOL) implantation through a 3.0-mm clear corneal incision from 1998 to 2003, and had no suture removal for 5 months afterward. Thirty-four children were included, aged 2 months to 15 years. Refractive astigmatism was assessed manually 1 week, 3 months, and 5 months after surgery by an experienced optometrist. The paired t test was used to compare the magnitude of postoperative astigmatism at different postoperative periods. Spearman correlation was used to determine the correlation between patient age and the postoperative refractive astigmatism.*

RESULTS. *Mean refractive astigmatism in all patients was 1.8±1.5 diopters (D) at 1 week postoperatively. It significantly decreased to 1.0±0.7 D at 3 months postoperatively (p=0.001), and to 0.8±0.7 D at 5 months postoperatively (p=0.03). The change in astigmatism was significantly greater during the first 3 postoperative months than during the following 2 months (p=0.04). Patient age was significantly correlated with 1 week postoperative astigmatism (Spearman coefficient, r = –0.46; p=0.006) and with 3 months postoperative astigmatism (Spearman coefficient, r =–0.37; p=0.03).*

CONCLUSIONS. *Congenital cataract surgery using a small, clear corneal incision for IOL implantation caused high early postoperative astigmatism, which spontaneously regressed thereafter. Younger patients had higher early postoperative astigmatism. (Eur J Ophthalmol 2009; 19: 376-9)*

KEY WORDS. *Astigmatism, Cataract, Surgery*

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## INTRODUCTION

Corneal astigmatism is a well-documented by-product of cataract surgery (1). The magnitude of astigmatism depends on various factors, including the type, location, and size of the surgical incision, amount of scleral cauterization, suture type, and suture placement.

In adults, only mild spontaneous changes in the amount of astigmatism have been described (2-4). An effective way to decrease or eliminate postoperative astigmatism is by removal of one or more interrupted or continuous sutures (5). Suture removal is recommended only in eyes with postoperative astigmatism of at least 3 D (5, 6).

Postoperative astigmatism is of greater importance in children than in adults because of its adverse effect on vision development and the risk of amblyopia (7). Previous

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reports have documented that children who underwent extraction of cataract and intraocular lens (IOL) implantation showed high early postoperative astigmatism, which reduced spontaneously (8, 9).

However, those reports did not describe the influence of the patient's age on the expected postoperative astigmatism. Dealing with this question is of crucial importance for two reasons. First, important features of children's eyes, such as scleral elasticity, which are changed during development, may influence postoperative astigmatism. Second, due to the risk of refractive amblyopia in young children, postoperative refraction error should be addressed more aggressively in those patients.

In this study we analyzed the relationship between patient age and the magnitude of refractive astigmatism among all the patients, who underwent extraction of congenital cataract and IOL implantation using a 3.0 mm clear corneal incision.

## METHODS

The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study.

In the period between 1998 and 2003, 34 children underwent extracapsular extraction of a congenital cataract and implantation of an IOL using a 3.0 mm clear corneal incision for IOL implantation. Patients were excluded if they had systemic or ocular abnormalities other than the cataract, or had undergone suture removal or other surgical intervention during 5 months follow-up. All operations were performed by one surgeon (A.S.).

The surgical technique consisted of opening two paracentesis ports at 1:30 and 10:30. An anterior chamber maintainer (Visitec, Warwickshire, England) was incorporated, and capsulorrhexis was performed with a bent 25-gauge needle. Lens material was aspirated with an aspirating cannula (Anis; Storz, St. Louis, MO). In some eyes, posterior capsulotomy and anterior vitrectomy were performed with a vitrector instrument (Occutome; CooperVision, Irvine, CA).

For IOL implantation, a 3.0-mm corneal incision was made at the 12 o'clock meridian just anterior to the terminal ends of the conjunctival blood vessels as they cross the limbus. A 6.0-mm optic, three-piece foldable hydrophobic acrylic IOL (AcrySof, Alcon, TX) was implanted. In most cases the IOL was implanted in the capsular bag, but in some cases it was placed in the sulcus. The corneal incision was closed with interrupted 10-0 sutures (Mersilene; Ethicon, Edinburgh, Scotland).

Postoperatively, all patients were treated with dexamethasone and neomycin eyedrops 6 times a day for 1 week and 4 times a day for 2 more weeks. The refractive error of the operated eye was tested (as part of the complete eye examination) with a streak retinoscope after dilation of the pupil with 0.5% tropicamide at 1 week, and then on average every 1 to 2 months for a 6-month period. All refractions were performed by an experienced optometrist. In all patients the refractive error was corrected with spectacles 1 month after surgery, and treatment for amblyopia was instituted when indicated.

The paired *t* test was used to compare the magnitude of postoperative astigmatism at different postoperative periods. Spearman correlation was used to determine the correlation between patient age and the postoperative refractive astigmatism, with patient age as the nondependent variable. Postoperative refractive astigmatism assessed at 1 week, 3 months, and 5 months post-operatively was given as the dependent variables. p Values less than 0.05 were considered significant.

## RESULTS

Thirty-four children were included in this study. In 12 patients, both eyes were operated. In these cases, only the first operated eye was included in the study. The children were aged 2 months to 15 years (mean ± SD, 4.8±3.5 years). Mean refractive astigmatism in all patients was 1.8±1.5 diopters (D) (range 0.0–6.0 D) at 1 week postoperatively. It significantly decreased to 1.0±0.7 D (range 0.0–3.0 D) at 3 months postoperatively (p=0.001). Afterwards, it significantly regressed to 0.8±0.7 D (range 0.0–2.5 D) at 5 months after surgery (p=0.03). The change in astigmatism was significantly greater during the first 3 postoperative months compared to the following 2 months (p=0.04).

Table I and Figure 1 present the correlation of patient age to the magnitude of refractive astigmatism and its change during the 5 postoperative months. Patient age was significantly correlated with the 1 week postoperative astigmatism (Spearman coefficient, r=–0.46; p=0.006) and with the 3 months postoperative refractive astigmatism (Spearman coefficient, r=–0.37; p=0.03).

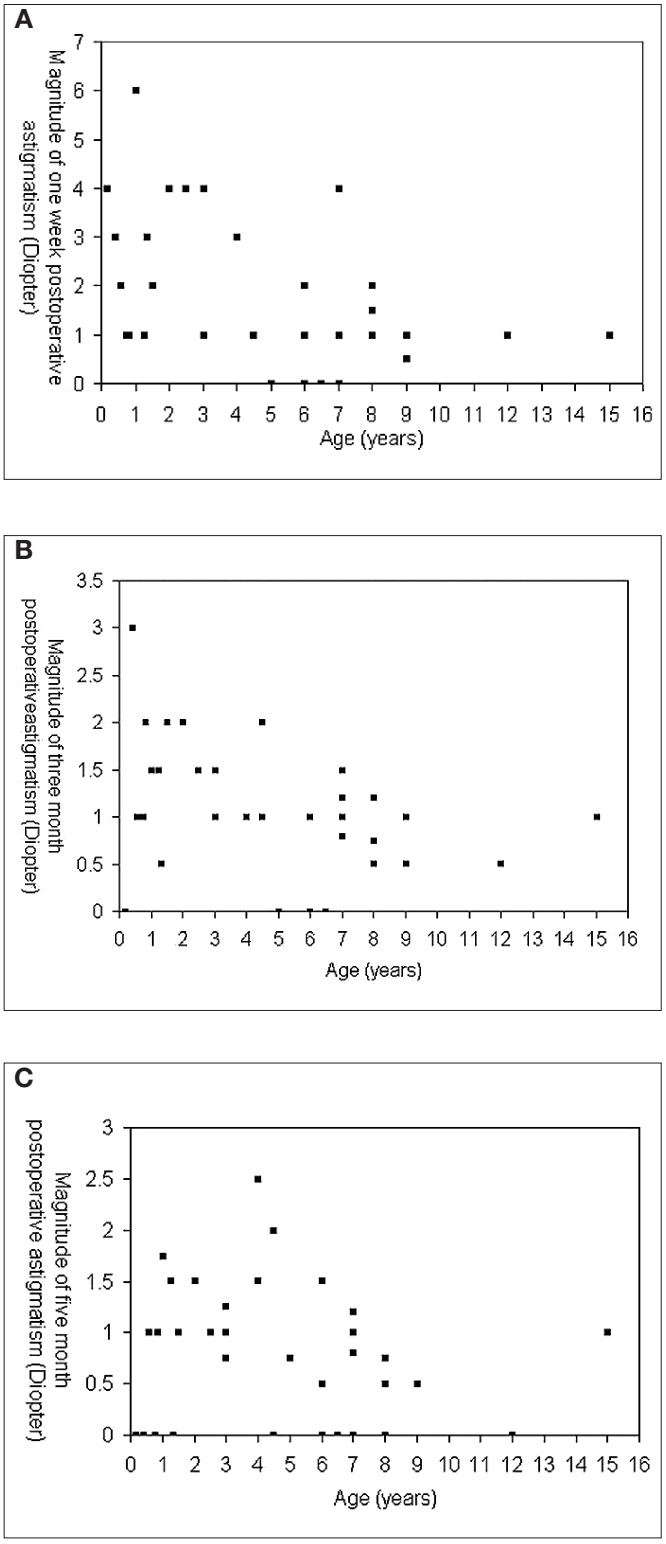


**Fig. 1 -** *Correlation of patient age to magnitudes of refractive astigmatism at 1 week* **(A)**, *3 months* **(B)**, *and 5 months* **(C)** *after congenital cataract surgery.*

**TABLE I -** CORRELATION OF PATIENT AGE TO MAGNITUDE OF REFRACTIVE ASTIGMATISM DURING 5 MONTHS AFTER CONGENITAL CATARACT SURGERY

| Dependent variable: Postoperative refractive astigmatism | Correlation with patient age | |
|---|---|---|
| | r value* | p value† |
| At 1 week | –0.46 | 0.006‡ |
| At 3 months | –0.37 | 0.03‡ |
| At 5 months | –0.18 | 0.32 |

*The r values represent Spearman coefficient of the correlation between patient age and the dependent variables.
†The p values represent the statistical significance of the correlation between patient age and the dependent variables.
‡Significant ($p<0.05$).

## DISCUSSION

Postoperative astigmatism is a significant side effect of cataract surgery. Our results show that young age is associated with high early postoperative astigmatism after congenital cataract surgery. Fortunately, the operated children showed a significant spontaneous reduction in the amount of astigmatism during the 5-month postoperative period.

The results of this study have two important consequences. First, we have shown that children who undergo congenital cataract extraction with IOL implantation through a 3.0 mm clear corneal incision may be expected to have a considerable amount of astigmatism at 1 week postoperatively. Furthermore, the astigmatic component of the refractive error undergoes a significant spontaneous regression, which mostly occurs during the first 3 months after the surgery.

Second, we proved that the younger the patient, the higher the risk for high early postoperative astigmatism.

These findings are of crucial importance, since young patients are more vulnerable to developing refractive amblyopia. Accordingly, the refractive error must be corrected in these cases early after the surgery. The fact that significant spontaneous astigmatism regression took place during the first months after the operation necessitates close monitoring of the refractive error, which must be treated by modification of the spectacles' optical correction. Nevertheless, due to spontaneous astigmatism regression, suture removal for correction of refractive error is not indi-


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cated after congenital cataract surgery.

Previous studies have reported regression of absolute postoperative astigmatism after congenital cataract surgery (8, 9). Brown and coworkers described spontaneous relaxation of postoperative astigmatism in children after lens implantation through a 6.25-mm scleral wound (8). Those authors concluded that surgeons should not be dissuaded from securing scleral wounds meticulously in children for fear of a permanent undesirable refractive outcome.

The differences between different age groups in the pediatric population, which were shown in this study, can be explained by important features of children's eyes, which are altered during development. The high elasticity of the sclera in young patients may explain the high early astigmatism after cataract surgery. As shown by Sekundo et al (10), a very fast and stable postoperative refraction with low induced astigmatism can be achieved even with a 7 mm scleral incision, when performed through a rigid sclera of an elderly patient. The sclera in young children exhibits a high degree of elasticity, which necessitates careful wound closure and, consequently, may cause early postoperative astigmatism.

Cataract surgery in children, either with or without anterior vitrectomy, can be performed through a small limbal incision. Enlargement of the incision is required for IOL implantation, the size of which is proportional to the IOL diameter. The use of foldable IOL in children enables surgery with a smaller incision as compared with nonfoldable IOL. Foldable lenses are also easier to insert into small eyes.

The small incision used for the foldable lenses probably has a beneficial effect on the resultant corneal astigmatism and its spontaneous postoperative regression. This study included only eyes that underwent cataract extraction with IOL implantation through a 3.0-mm clear corneal incision, and therefore cannot prove this assumption. We plan further study of eyes with cataract surgery and IOL implantation using larger scleral tunnel or limbal incisions.

In conclusion, congenital cataract surgery using a small, clear corneal incision for IOL implantation caused high early postoperative astigmatism, which spontaneously regressed thereafter. Young patients had higher early postoperative astigmatism. Therefore, close monitoring and prompt refraction correction, but not sutures removal, is needed postoperatively in those patients.

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Reprint requests to:
Shai M. Bar-Sela, MD
14/6 Ben-Zion
Jerusalem, 95423, Israel
barselashai@gmail.com

## REFERENCES

1. Jaffe NS. Cataract Surgery and its Complications, 3rd ed. St. Louis: CV Mosby; 1981: 92-110.
2. Barequet IS, Yu E, Vitale S, Cassard S, Azar DT, Stark WJ. Astigmatism outcomes after horizontal temporal versus nasal clear corneal incision cataract surgery. J Cataract Refract Surg 2004; 30: 418-23.
3. Kronish JW, Forster RK. Control of corneal astigmatism following cataract extraction by selective suture cutting. Arch Ophthalmol 1987; 105: 1650-5.
4. Richards SC, Brodstein RS, Richards WL, et al. Long-term course of surgically induced astigmatism. J Cataract Refract Surg 1988; 14: 270-6.
5. Talamo JH, Stark WJ, Gottsch JD, et al. Natural history of corneal astigmatism after cataract surgery. J Cataract Refract Surg 1991; 17: 313-8.
6. Stanford MR, Fenech T, Hunter PA. Timing of removal of sutures in control of post-operative astigmatism. Eye 1993; 7: 143-7.
7. Fulton AB, Dobson V, Salem D, et al. Cycloplegic refractions in infants and young children. Am J Ophthalmol 1980; 90: 239-47.
8. Brown SM, Hodges MR, Corona J. Relaxation of postoperative astigmatism after lens implantation through a 6.25 mm scleral wound in children. J Cataract Refract Surg 2001; 27: 2012-6.
9. Spierer A, Bar-Sela S. Changes in astigmatism after congenital cataract surgery and intraocular lens implantation. J Pediatr Ophthalmol Strabismus 2004; 41: 35-8.
10. Sekundo W, Böker T, Fimmers R. Induced corneal astigmatism using an asymmetric corneoscleral tunnel and a large-optic intraocular lens. J Cataract Refract Surg 2000; 26: 79-82.