Central Corneal Thickness, Corneal Endothelial Characteristics and Intraocular Pressure after Pediatric Cataract Surgery

Naveed Nilforushan, MD[1]; Khalil Ghasemi Falavarjani, MD[1]; Mohammad-Reza Razeghinejad, MD[2]; Pejman Bakhtiari, MD[1]

[1]Iran Medical University, Tehran, Iran; [2]Shiraz Medical University, Shiraz, Iran

Purpose: To investigate central corneal thickness (CCT), endothelial cell characteristics and intraocular pressure (IOP) in eyes with prior pediatric cataract surgery and to compare them with eyes of normal age and sex matched controls.

Methods: Specular microscopy CCT and IOP measurements were performed in 31 eyes of 17 patients with prior congenital cataract extraction and 40 eyes of 20 age and sex matched subjects. The mean of three pachymetric and specular microscopic measurements were recorded. IOP was measured using Goldmann applanation tonometry.

Results: Mean CCT was 632±45 µm in eyes with prior pediatric cataract surgery vs 546±33 µm in control eyes (P<0.001, independent *t* test and Mann Whitney U-test). Mean IOP was 22.1±3.9 mmHg in eyes with prior pediatric cataract surgery and 14.0±1.6 mmHg in the control group (P<0.001, independent *t*-test). There was no significant difference between the two groups in cell count, polymegethism and mean cell area of corneal endothelial cells.

Conclusions: Although the corneas were clinically clear and there was no significant difference in endothelial characteristics in eyes with prior pediatric cataract surgery as compared to normal controls, central corneal thickness in the operated eyes was significantly greater. To differentiate actual glaucoma from artifactual IOP increase, CCT measurement should be performed in these patients.

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Correspondence to: Khalil Ghasemi Falavarjani, MD. Ophthalmologist; Ophthalmic Research Center, Rasoul Akram Hospital, Niayesh St., Sattarkhan Ave., Tehran 1455-364, Iran; Tel.-Fax: +98 21 66509162, e-mail: drghasemi@irimc.org

INTRODUCTION

Congenital cataracts are an important cause of visual impairment in infancy and childhood and early management is of great importance for visual rehabilitation.[1] Pediatric cataract surgery is associated with certain anatomical changes which greatly influence visual outcomes in these cases.[2-6] The most important of such anatomical changes include changes in corneal structure and axial length.[2-4]

One cause of visual loss in these patients is glaucoma which has been reported in up to 32% of aphakic eyes in various studies.[7-9] The diagnosis of glaucoma in these studies was mainly based on intraocular pressure (IOP) measurements.[7,10] Increasing evidence underscores the effect of central corneal thickness (CCT) on IOP measurement. Goldmann applanation tonometry, the gold-standard for IOP measurement, tends to overestimate pressure readings in eyes with thick corneas while the

opposite occurs with thin corneas.[11-15] We have frequently encountered increased IOP in eyes with prior pediatric cataract surgery in the absence of other evidence of glaucoma. The correct diagnosis of glaucoma is of vital importance in any patient and in pediatric cases in particular. The purpose of the current study was to determine CCT, endothelial cell characteristics and IOP in eyes with prior pediatric cataract surgery and to compare them with those of normal age and sex matched controls.

METHODS

This study included 31 eyes of 17 patients aged 4 to 22 years who had undergone translimbal anterior lensectomy-vitrectomy for congenital cataract at infancy or childhood as cases and 40 eyes of 20 normal age and sex matched individuals selected as controls. All cases had clear corneas without any surgery-related complication at the time of enrollment into the study. Eyes with other conditions such as congenital glaucoma or any corneal abnormality, cup-disc ratio greater than 0.5, cup asymmetry exceeding 0.2, loss of nerve fiber layer or rim notching were also excluded from the study.

CCT was measured using an ultrasonic pachymeter (Paxis, Biovision, France) by the same person (K.G.F) at 10 AM to 2 PM. The mean of three measurements from the central cornea with standard deviation less than 0.005 mm was recorded. Endothelial characteristics were evaluated using a specular microscope (SP-2000, Topcon Corporation, Japan). The mean of 3 specular microscopic measurements was recorded for endothelial cell characteristics. IOP was measured once in every patient using a Goldmann applanation tonometer at 10 AM to 2 PM by one examiner (N.N.). Independent sample *t*-test and Mann Whitney U-test were used for comparing mean values between the two groups with significance set at 0.05.

RESULTS

The case group comprised of 31 eyes of 17 patients including 9 female and 8 male subjects with mean age of 12.7±6.6 (range 4-22) years at the time of the study and 19.6±19 (range 2-72) months at the time of pediatric cataract surgery. Mean IOP was 22.1±3.9 (range 14-25) mmHg in cases vs 14.0±1.6 (range 12-16) mmHg in controls (P<0.001). Mean CCT was 632±45 µm in cases vs 546±33 µm in controls (P<0.001). There was no statistically significant difference between the two groups regarding corneal endothelial cell density, polymegethism (the coefficient of variability of cell size) and mean cell area. After modifying IOP according to CCT, mean corrected IOP was 18.7±3.0 mmHg in cases vs 13.9±1.2 mmHg in controls (P<0.001). Table 1 summarizes the main outcome measures.

Table 1 Comparison of central corneal thickness, corneal endothelial characteristics and intraocular pressure between the cases and controls

	Mean ±standard deviation		P value*
	Cases	Controls	
Central corneal thickness (µm)	632±45	546±33	<0.001
Intraocular pressure (mmHg)	22.1±3.9	14.0±1.6	0.001
Endothelial cell count (cell/mm^2)	3454±450	3470±527	0.93
Polymegethism (%)	19.5±6.0	22.0±5.0	0.4
Mean cell area (µm^2)	311±26	306±36	0.71

**t*-test

DISCUSSION

Congenital cataracts account for 10% of childhood visual impairment worldwide.[1] Timely intervention is of great importance in achieving favorable visual outcomes in these patients. Aphakic glaucoma is a sight-threatening postoperative complication in eyes with prior pedi-

atric cataract surgery and requires early diagnosis and management.[1,7] Thicker corneas are associated with overestimation of IOP using applanation tonometer.[12-15] The diagnosis of glaucoma in eyes with prior pediatric cataract surgery, which seem to have thicker corneas, based on IOP measurements alone without modifying the effect of CCT may not be accurate.

Limited studies have addressed CCT and corneal endothelial cell characteristics in relation with IOP in eyes with prior pediatric cataract surgery and suggested intra- or postoperative endothelial cell damage as the cause of increased corneal thickness in these eyes.[6,10,16,17] Simon et al[10] reported intraoperative manipulation or solutions as the causative factor for corneal endothelial cell dysfunction. However they did not perform specular microscopy to verify these effects. Amino et al[6] evaluated CCT in 24 eyes following pars plana lensectomy and compared them to 15 normal eyes and reported that CCT increased postoperatively. They also found significant changes in endothelial cell pleomorphism (relative frequency of hexagonal cells) and polymegethism concluding that intraoperative mechanical trauma to the endothelial cells results in increased corneal thickness. However, our study revealed that corneal endothelial cell characteristics are not significantly different in eyes with prior congenital cataract surgery and control eyes implying other causative factors for the increased CCT in eyes with prior pediatric cataract surgery. This discrepancy in specular microscopic findings may be explained in part by technical differences in specular microscopy, limited co-operation of young patients and differences in sample size or control selection in the two studies.

Our study confirmed that eyes with prior pediatric cataract surgery have thicker corneas compared to age and sex matched controls despite the normal appearance of the cornea. Moreover, these eyes had higher measured IOP than normal controls without any evidence of glaucomatous optic disc changes or any difference in corneal endothelial cell characteristics. One reason for the increased corneal thickness in this setting may simply be the coexistence of these two conditions. Another explanation is certain growth abnormalities in the cornea of aphakic eyes. Griener et al[2] revealed that cataract extraction in childhood affects globe growth. Embryologic investigations have shown that corneal shape and growth is induced by the crystalline lens.[18] Lens extraction in childhood can alter the normal corneal growth resulting in a thicker cornea.

The present study suffers from certain limitations such as lack of preoperative CCT and corneal endothelial characteristics as well as small sample size. Despite these limitations we believed that in eyes with prior pediatric cataract surgery and high IOP but no other evidence of glaucoma, CCT measurement is of great value in the interpretation of the condition and adopting an appropriate management plan.

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