Commentary: Causes of delayed presentation of pediatric cataract: A questionnaire-based prospective study at a tertiary eye care center in central rural India

Pediatric cataract is a treatable leading cause of childhood blindness. Pediatric cataract managed earlier can have a tremendous impact on the lives of individuals, their families, communities, and the socioeconomic status of the country.[1-3] Children who are visually impaired have social, emotional, and economic difficulties. They have to overcome this poor vision lifelong. The incidence ranges from 1.8 to 3.6 per 10,000 per year.[4] The prevalence of childhood cataract is higher in low-income economies (0.63–13.6/10,000) compared to that of high-income economies (0.42–2.05/10,000).[5] Rubella or Cytomegalovirus infections are mostly responsible for higher incidence in lower socioeconomic group. Another important cause is ocular trauma in rural and semi-urban setting. If not detected or treated on time, it can lead to poor vision and, hence, amblyopia.

The factors responsible for the delayed presentation of pediatric cataract include lack of education and awareness among lower socioeconomic strata, financial problems, inability to travel to higher centers, lack of health care facilities, and screening in the periphery.

Since the magnitude of problem is huge, it needs to be addressed timely. The problem must be taken care of by creating awareness among general population especially where there is lack of education. Professional societies in partnership with government agencies should take initiative and conduct programmes for awareness and screening of children periodically so that there can be early diagnosis, treatment, and visual rehabilitation. Lack of support from industry is one of the causes for this not taking off. But we should realize that we owe it to our children for them to lead a happy and useful life. There should be a routine protocol to examine eyes of all neonates along with physical examination after birth.

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Original Article

Surgically induced astigmatism and refractive outcomes following phacotrabeculectomy

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Purpose: To objectively evaluate surgically induced astigmatism (SIA) after phacotrabeculectomy using keratometry and topography and to compare the magnitude of SIA and the refractive outcomes of single-site and twin-site phacotrabeculectomies. **Methods:** Forty prospective subjects were enrolled in the study and were randomized into single-site and twin-site cohorts. SIA was objectively assessed using keratometry and Orbscan before and at three months after surgery. For both cohorts, the changes in SIA were assessed using power vector analysis compared at the third month after surgery. **Results:** Each cohort consisted of 20 eyes. The preoperative parameters and postoperative IOP were comparable and similar, respectively, in both the cohorts ($P = 0.1$). Majority of the patients in both the cohorts had preoperative against-the-rule (ATR) astigmatism. The median change in SIA at the three-month postoperative visit was similar in both the cohorts, with a small increase in ATR astigmatism. Although the SIA change measured by keratometry in the J0 component was similar in both the groups ($P = 0.54$), that of J45 was significantly different ($P = 0.01$). However, the median change in SIA was similar in both the groups for both the J0 ($P = 0.52$) and J45 components ($P = 0.94$) when measured by Orbscan. The SIA in both the groups measured with keratometry ($P = 0.62$) and topography ($P = 0.52$) were clinically and statistically similar. In both the groups, the refraction was similar at 1 month and 3 months. **Conclusion:** The SIA as measured with keratometry and topography was similar in the single-site and twin-site phacotrabeculectomy cohorts at the end of 3-months. The postoperative refraction was stabilized in 1-month in both the groups.

Key words: Combined surgery, phacotrabeculectomy, surgically induced astigmatism, single-site, twin-site

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Phacotrabeculectomy is the preferred technique in which combined cataract and glaucoma surgery are[1-3] performed either with single-site incision for both the procedures or separate incisions for each procedure.[4] Most studies have shown no difference in the intraocular pressure (IOP) control and the need for antiglaucoma medications with both the techniques.[1,5] Astigmatism induced after surgery [referred here as surgically induced astigmatism (SIA)] is an important factor because it influences the quality of vision and visual rehabilitation after surgery.[4] Trabeculectomy causes a steepening in the curvature of corneal radius along the vertical meridian, thus either inducing with-the-rule astigmatism or reducing any preoperative against-the-rule astigmatism.[6,7] Although similar SIA is expected with combined phacotrabeculectomy also, the available literature is limited,[6,8-10] with even fewer studies providing objective comparison of refractive outcomes with single-site and twin-site phacotrabeculectomies.[6] Astigmatism induced by single-site and twin-site procedures is likely to be different as the incision site for cataract removal can alter the corneal curvature,[11,12] independent of the incision for trabeculotomy. Earlier studies have shown lesser SIA and better IOP control in case of twin-site surgery.[6,10] Although Rosetti *et al.* recommended separate incisions for cataract and glaucoma surgery to decrease SIA,[6] these studies involved multiple surgeons and lacked the objective method of estimating astigmatism. The current study aims to objectively estimate SIA following combined phacotrabeculectomy and also to evaluate the impact of single versus twin incision on the SIA three months after surgery in the management of coexisting glaucoma and cataract.

Methods

SIA and the refractive outcomes of single-site and twin-site phacotrabeculectomies were compared in a randomized clinical trial, from June 2012 to March 2015. A single surgeon performed all the surgeries. The study was approved by the Institutional review board and was conducted in accordance with the Declaration of Helsinki. Written, informed consent was obtained from all the participants before enrollment.

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Patient enrollment and treatment assignment

To detect a 0.5-diopter (D) difference of SIA, with a power of 80% and a type-I error of 0.5, the required sample size was 20 eyes in each cohort. Forty adult subjects with either primary open-angle glaucoma (POAG) or primary angle-closure glaucoma (PACG) and requiring surgery for visually significant cataract were enrolled in the study. Exclusion criteria include previous incisional surgery in the same eye; preoperative astigmatism >3 D; indication of adjunctive antimetabolites (Mitomycin C) usage; and implantation of a nonfoldable intraocular lens. Patients with all types of secondary glaucomas were also excluded.

Enrolled patients were randomly assigned to two groups of 20 each and underwent either single-site (Group 1) or twin-site (Group 2) phacotrabeculectomy. Simple randomization with allocation concealment was used. Patients were free to withdraw from the study any time without affecting their clinical management. The postoperative outcome data of 3 months was analyzed.

Surgical technique

Trabeculectomy was performed under peribulbar anesthesia with a superior fornix-based conjunctival flap. A 4 × 3 mm triangular scleral flap was made for all surgeries. In single-site surgery, phacoemulsification was performed by anterior chamber (AC) entry with a 2.8-mm keratome under the triangular scleral flap. In the twin-site procedure, phacoemulsification and intraocular lens (IOL) implantation were completed through a temporal 2.8-mm clear corneal incision and closed with a single 10-0 nylon suture. All eyes received a foldable in-the-bag IOL. A 2 × 2 mm deep block was excised and peripheral iridectomy was performed. The viscoelastic was thoroughly washed and the scleral flap was closed with one or two10’0 nylon sutures. The conjunctiva were closed with 8-0 polyglactin suture using a round-bodied needle with wing sutures.

Postoperative regime was topical antibiotic for 1-week, topical cycloplegic for 2–3 weeks, and topical prednisolone acetate 1% tapered over 6–8 weeks. All patients underwent 1-day, 1-week, 1-month, 3- month, and additional evaluations as needed.

Data collection

Preoperative data included demographics and clinical details of glaucoma. Comprehensive ocular examination was conducted preoperatively and at each postoperative visit. Data collection included subjective refraction, best-corrected Log MAR visual acuity (BCVA), manual keratometry (Bausch and Lomb manual keratometer), corneal topography (Bausch and Lomb OrbscanIIz), and IOP (Goldmann applanation tonometer). Use of antiglaucoma medications and complications if any were recorded. Two optometrists obtained keratometry and topography measurements preoperatively and after 1-and 3-months postoperatively.

Analysis of surgically induced astigmatism

Astigmatic refractive error is a vector with a magnitude and axis, and these may change independent of each other within and across groups.[13-16] Therefore, comparison of the magnitude of astigmatism pre- and postsurgery can be performed only after it is transformed to a common set of axes. The Power Vector analysis proposed by Thibos *et al.*[14] allows this to be done for two cross-cylinder axes, one oriented at 180 degrees (J0) and the other oriented at 45 degrees (J45). The third term, M, represents the spherical equivalent of refraction. Once transformed, astigmatism can be compared for absolute magnitude, with a larger number indicating greater magnitude. With-the-rule astigmatism (WTR) represents increased corneal curvature in the vertical meridian (positive value of J0) and against-the-rule astigmatism (ATR) represents decreased corneal curvature (negative value of J0). Similarly, a nonzero value of J45 indicates the presence of an oblique astigmatism, with a positive J45 value indicating that its axis is closer to 45° and a negative J45 value indicating that the axis is closer to 135°.[14,15] The corneas in the eyes of an individual display mirror symmetry; thus, an axis of 45° in the right eye has the same anatomic orientation with respect to the eyelids and other facial structures as an orientation of 135° in the left eye. Therefore, oblique astigmatism, J_x, was defined as $J_{x} = J_{45}$ in right eye and $J_x = -J_{45}$ in left eye. In our study, the cylindrical values of the refractive errors obtained after standard subjective refraction technique, using Keratometer and Orbscan, were converted into power vectors using published equation.[13,14] Since the aim was to compare the astigmatism outcomes in the two cohorts, the results were focused on the data of J0 and J45 power vector terms obtained in the study. The M-component of the Power vectors are not presented.

Outcome measures

The primary outcome of the study is the difference in SIA between the two groups at 3-months and the secondary outcome is the variation in postoperative refraction at 1-month and 3-months of both the single-site and twin-site groups.

Statistical analysis

The datasets were nonparametric and, hence, the results are presented as median and interquartile range (IQR). Categorical values between groups were compared with Chi-squared test. Data was analyzed with Mann Whitney ‘U’ test to determine the statistically significant difference between the groups in the induction of astigmatism at each time point. Differences between the two groups were compared using Student *t*-test and a P value <0.05 was considered as a statistically significant difference. All the calculations and charts were made using Microsoft Excel 2016. Statistical analysis was done using R Core Team (R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.2017).

Results

The preoperative characteristics of the single-site and the twin-site groups were similar. There were 20 eyes in each group. The median (interquartile range) preoperative IOP was similar in the two groups (single-site: 20.5 (18, 24) mm Hg; twin-site: 18 (15.5, 23) mm Hg, $P = 0.29$). The median number of preoperative antiglaucoma medications were similar in the two groups (single-site: 2 (1,3), twin-site: 2 (1.5, 2), $P = 0.35$). There were 8 eyes with POAG and 12 eyes with PACG in the single-site group and 11 eyes with POAG and 9 eyes with PACG in the twin-site group, ($P = 0.34$). The median age at surgery was 62 years (59, 68.5) in the single-site group and 66.5 years (60.5, 71) in the twin-site group, $P = 0.20$.