Corneal thickness and intraocular pressure changes after anterior and posterior approaches in congenital cataract surgeries

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Short title: Corneal Thickness and Intraocular Pressure Changes after Congenital cataract surgeries.

Purpose: to evaluate changes in corneal thickness and intraocular pressure after anterior and posterior approaches in congenital cataract surgeries.

Methods: The study was conducted at Mansoura Ophthalmic Center, Mansoura University, Egypt from July 2021 to December 2023. It included 24 eyes of children less than 24 months planned for congenital cataract surgery. They were randomly classified into two equal groups (12 eyes each) using closed envelope method, Group 1 included eyes operated through anterior approach and group II included eyes operated through posterior approach. Preoperatively, EUA was done as regard anterior segment and fundus examination, IOP and CCT and corrected IOP values were calculated. The patients were followed up at (1 week, 3 weeks, 7 weeks and 12 weeks) postoperatively as regard IOP and CCT and corrected IOP values.

Results: IOP decreased significantly one week postoperatively as compared to pre-operative value ($p<0.001$) with percent of change 13.8% that increased afterward through follow up periods among group (I) and group (II). As regard CCT, all postoperative readings demonstrate statistically significant increase as compared to preoperative value among group (I) and group (II). This study demonstrates no statistically significant difference between the studied groups as regard IOP ($p=0.259$), CCT ($P=0.235$) and IOP correction ($p=0.410$).

Conclusion: The increase of corneal thickness and the decrease in IOP was observed after congenital cataract surgery. The increase in CCT and its effect on IOP should be considered in cases having congenital cataract surgery.

Keywords: IOL, Central Corneal Thickness, Congenital Cataract, Anterior Approach, Posterior Approach.

INTRODUCTION:

There is a significant difference in child's eyes compared to adult ones. They are smaller in size, axial length (AL) and corneal curvature are changing over time. A newborn's average AL is 16.5mm. Pediatric eyes grow quickly in the first 18 months of life reaching 23 mm in diameter by 13 years of age. Similarly, corneal curvature changes from 51.2 D in newborns to 43.5 D in adults in average. Their sclera is thinner and less rigid, their capsule is more elastic, and they are susceptible to a significant inflammatory reaction following surgery[1].

Children's eyes are more liable for inflammation and glaucoma following cataract surgeries[2].

Lens extraction can be performed via an anterior approach by manual irrigation and aspiration or via the pars plana using a vitrector[3].

Endothelial cell count (ECC) is nearly 6000 cells/mm throughout the first month of life which decreases to be 3500 cells/mm by 5 years of age and 3400 cells/mm by 15 years of age. Endothelial cell loss's average rate is 0.6% a year[4].

Endothelial cell loss, following surgical trauma, can be compensated by alterations in size and shape of endothelial cells and increase in central corneal thickness (CCT). The endothelial cells of the eyes undergo cataract surgery decrease by about 2.5% a year for several years[4,5].

Anterior segment structures and intraocular pressure (IOP) are altered after surgical intervention. There are various studies reporting such alterations following phacoemulsification[6].

Several studies reported an increase in CCT following congenital cataract (CC) surgery[7,8]. The most important factor affecting CCT is age at surgery, with younger children having a higher increase in CCT than older children[8].

Several studies have showed that cataract removal has been associated with deepening of the anterior chamber (AC), broadening of the anterior chamber angle (ACA), and a considerable reduction in IOP[9]. Cataract extraction permanently reduce IOP particularly in eyes with narrow angles[10,11]. On the other hand, IOP values weren't corrected for CCT, in these studies[2].

IOP measured by Goldmann applanation tonometer is overestimated in cases of thick corneas and underestimated in cases of thin corneas, any variable that influences IOP could cause an incorrect diagnosis of glaucoma[12].

Many pediatric cataract surgeons nowadays underline the importance of postoperative evaluation of IOP, CCT, anterior chamber anatomical changes, axial length and corneal biomechanics[13].

PATIENTS AND METHODS:

Study Design: Prospective interventional comparative study.

Study Setting and Population:

The study was performed at Mansoura Ophthalmic Center, Mansoura University, Egypt from July 2021 to December 2023. This study included sample of 24 eyes with maximum age of 24 months. Approval of ethical committee, Faculty of medicine, Mansoura University (IRB) under code number (MS.21.03.1398) was obtained. Informed written and verbal consent was given by parents of the participating children after assuring confidentiality.

Patients were randomly classified into two equal groups (12 eyes each) using closed envelope method:

Group I (anterior approach): The procedure was done via 2 corneal side ports using 20-gauge MVR.

Group II (posterior approach): The procedure was done via pars plana approach.

Inclusion criteria: Infants younger than two years of age with unilateral or lateral, surgically significant congenital cataract as: Cataract greater than 3-4 mm in the central visual axis, cataract near to the nodal point and cataract obscuring fundus details.

Exclusion criteria: Associated anterior segment pathology as microphthalmia, corneal opacity, corneal congenital diseases, uveitis and glaucoma. Associated posterior segment disease as persistent fetal vasculature (PFV), retinopathy of prematurity (ROP), retinal detachment (RD), and retinoblastoma. Lens subluxation, traumatic and complicated cataract. Pervious ocular surgery.

All patients were subjected to:

General and ophthalmic history which include age, sex, any systemic or genetic diseases, consanguinity, family history, low birth weight (LBW), prematurity, neonatal intensive care unit admission, postnatal trauma, prenatal history of the mother of any diseases or drug use. Examination under anesthesia (EUA) including: assessment of external appearance (presence of squint, nystagmus or any associated external anomalies), intraocular pressure measurement using hand held Tono-Pen® XL applanation tonometer (Medtronic Tonometer, Florida, USA). Anterior segment examination (cornea for any associated pathology, corneal diameter, anterior chamber, pupil for degree of dilatation, lens for degree and laterality and significance of cataract), fundus examination, cycloplegic refraction, automated keratometry, A-B scan ultrasonography was done using Nidek ® Al-Scan Optical Biometer (US-4000 ECHOSCAN, Japan) for evaluation of vitreous and retina and CCT measurement, corrected IOP values were estimated using correction formula: Ehler's formula: measured IOP+0.071*(545-CCT).

Operative technique:

The pupil was dilated with cyclopentolate eye drops (Cyclopentolate 0.5% in infants younger than 6 months of age and cyclopentolate 1% for older children) one hour before surgery to reach maximum pupillary dilatation. All surgeries were done under general anesthesia, induced by inhalation using 8% Sevoflurane in 100% O2 delivered by face mask, pulse oximetry was applied. Insertion of endotracheal tube and spontaneous ventilation was allowed then anesthesia was maintained using Sevoflurane (2-3%), O_2:air (40%:60%) during the whole operation. The periocular skin was sterilized with povidone iodine 10% and draping was applied. Lid speculum was used to hold the eye open and the conjunctival sac was sterilized with povidone iodine 5% then washed out by irrigation solution.

Anterior approach (group I) (Figure 1):

Two corneal side ports were made, at the 3 and 9 o'clock positions. They were made with a 20-gauge micro-vitreoretinal (MVR) blade. Adrenalin solution (1.0 ml) was used when needed for maximum pupillary dilatation. Capsule was stained using Trypan blue 0.1% for more visibility then washed out with BSS. Sodium hyaluronate 1.4% (Optiflex®) was injected. Manual continuous curvilinear capsulorhexis (CCC) was fashioned using a micro-capsulorhexis. A 6-7 mm diameter anterior capsulorhexis was done. Multi quadrant hydro-dissection under anterior lens capsule was done using Lactated Ringer's. Lens matter was aspirated using irrigation-aspiration (I/A) and a meticulous polishing of the lens remnants and anterior capsule was done. The capsular bag and anterior chamber were filled with sodium hyaluronate (Optiflex®). A cystotome was used to make a small central flap in the posterior capsule and posterior continuous curvilinear capsulorhexis (PCCC) was started. Sodium hyaluronate was injected through the puncture hole. A micro-capsulorhexis was used to form a 6-7 mm diameter posterior capsulorhexis. A 23-G vitrectomy cutter was inserted in the side port and inserted down to remove the anterior one third of the vitreous using triamcinolone assisted anterior vitrectomy, cutting rate was 800 cuts/minute and suction pressure of 150 mmHg. Sodium hyaluronate was removed with I/A mode. Side ports were sutured using nylon 10/0.

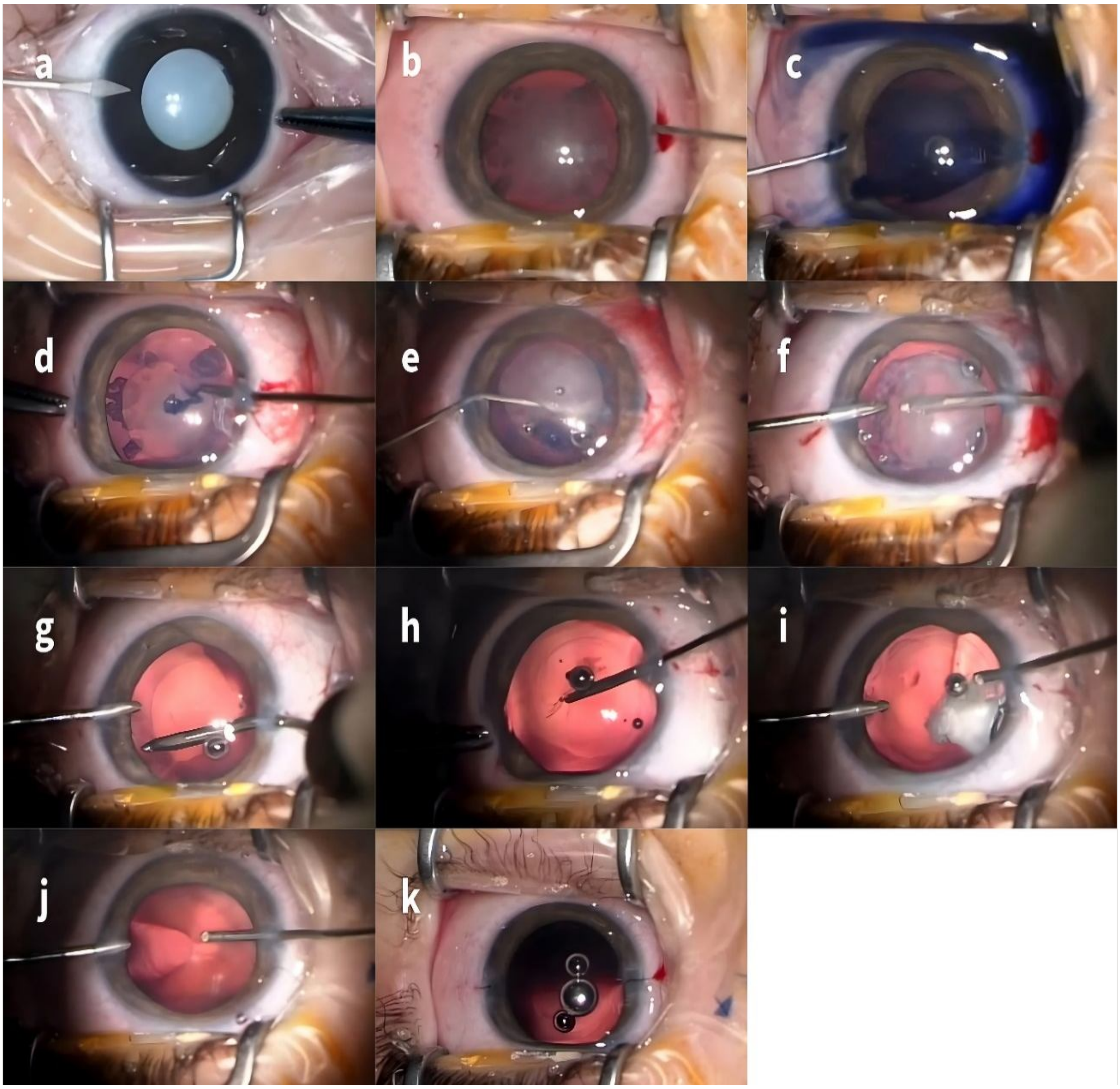

Fig. (1): Anterior approach. (a) side ports, (b) injecting adrenaline, (c) injecting trypan blue, (d) anterior capsulorhexis, (e) lens hydration, (f) lens aspiration by I/A, (g) polishing anterior capsule, (h) posterior capsulorhexis, (i) and (j) triamcinolone assisted anterior vitrectomy, (k) suturing side ports with nylon 10/0.

Posterior approach (group II) (Figure 2):

Two trans-conjunctival sclerotomies have been made with 23-G trocars using a micro cannula at the pars plana. They were fashioned at 10 and 2 o'clock. A stab incision through the lens equator was done using a 23G MVR or 26G needle. Hydration to the lens matter was done by an infusion cannula. A 23-gauge vitrectomy cutter was inserted parallel to iris plane into the lens through the stab incision done at the lens equator. Lens matter was removed with vitrectomy settings at a cutting rate 800 cuts/minute and suction pressure of 250 mmHg. A 6-7 mm diameter anterior capsulotomy (vitrectorhexis) was done. Capsule remnants were polished with low vacuum of 50 mmHg. A 6-7 mm diameter posterior capsulotomy was done with the vitrectomy cutter. Anterior vitrectomy of the anterior one third of the vitreous was done (triamcinolone assisted) with a cutting rate 800 cuts/minute and suction pressure of 150 mmHg. Prolapsed vitreous through scleral incisions was carefully cut and removed. The micro cannulas were removed and the two sclerotomies were closed using vicryl 7/0.

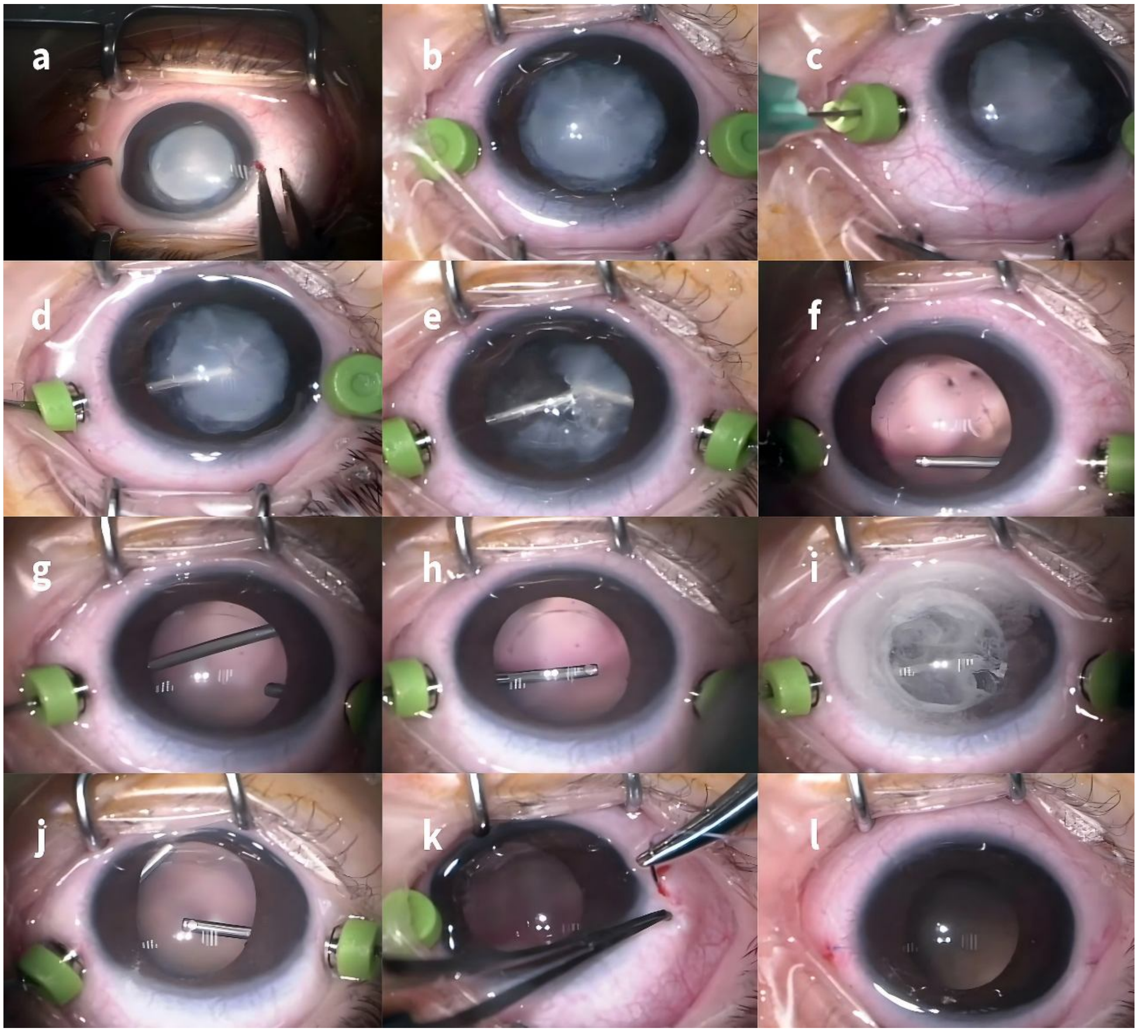

Fig. (2): Posterior approach. (a) sclerotomy site, (b) trocars insertion, (c) stab incision at lens equator, (d) hydration of lens, (e) lens removal by vitrectomy, (f) anterior vitrectorhexis, (g) polishing anterior capsule, (h) posterior vitrectorhexis, (i) and (j) triamcinolone assisted anterior vitrectomy, (k) and (l) suturing sclerotomies with vicryl 7/0.

Postoperative regimen:

Topical Moxifloxacin antibiotic ophthalmic solution 0.5% every 2 hours for the 1st week post operative, then six times daily afterwards for one week. Topical dexamethasone ophthalmic suspension 0.1% was given every 2 hours. Mydriatic cycloplegic; cyclopentolate eyedrops three times daily. Gradual withdrawal of steroid and cycloplegic eyedrops over a period of 2 months.

Follow up visits:

EUA was done at (1 wk, 3 wks, 7 wks and 12 wks) postoperatively with evaluation of intraocular pressure, central corneal thickness. Postoperative signs of inflammation as aqueous flare and cells, iris synechiae, vitreous escape in anterior chamber or incarceration in the wound. In addition, posterior capsular opacification.

Statistical Data Analysis

Data were analyzed using the statistical package SPSS version 24.0 (SPSS Inc., Chicago, IL, USA). A normal distribution of variables was assessed using the Kolmogorov–Smirnov test. Two groups were created based on the value of the mean ± SD. Multiple analysis of variance (ANOVA) with the Bonferroni correction (post hoc comparisons) were used to analyze differences between the two groups. The Pearson correlation coefficient was also calculated to determine the relationship among the study variables.

RESULTS:

The present study was prospective interventional comparative study the aim of which is to determine changes in corneal thickness and intraocular pressure after anterior and posterior approaches in congenital cataract surgeries.

This study involved 24 eyes of 13 infants having congenital cataract surgery, 2 patients had unilateral cataract and 11 patients had bilateral cataract. They were classified into two equal groups each of 12 eyes, group (I) included 7 patients, 5 patients had bilateral cataract and 2 patients had unilateral cataract while group (II) included 5 patients had bilateral cataract.

Group (I) had mean age of 6.33 ± 4.49 months and group (II) had mean age of 7.125 ± 4.25 months. patients of group (I) were 3 males (42.9%) and 4 females (57.1%), while group (II) were 3 males (50%) and 3 females (50%) (Table 1).

Table (1): Comparison of demographic characters between studied groups.

	Group I (anterior app)	Group II (posterior app)	Test of significance
Age / months Mean ±SD	6.33±4.49	7.13±4.25	t=0.443 p=0.662
Sex			
Male	3(42.9)	3(50)	χ^2=0.002
Female	4(57.1)	3(50)	P=0.943

t: Student t test, χ^2: Chi-Square test

Most of the cases had total cataract 6 cases (50%) and 5 cases (41.7%) in group (I) and (II), respectively. Nuclear cataract was found in 3 cases (25%) in each group. Lamellar cataract was found in only one case (8.33%) in group (I) and two cases (16.7%) in group (II). Posterior polar cataract was found in 2 cases (16.7%) of group (I), while membranous and stem of cactus was found in 1 case (8.33%) of group (II).

Keratometry, corneal diameter, axial length and laterality were statistically insignificant in comparison between the two groups. The current study shows that IOP decreased significantly one week postoperatively as compared to preoperative value (p<0.001) with percent of change 13.8% that increased afterward to be 14.47±1.30 three weeks postoperatively with percent of change 7.7% (p=0.006), then insignificantly increased in the 7th and 12th week post-operatively to be 16.37±1.29 with percent of change 4.5% (p=0.196) among group (I); However, among group (II) there was a statistically significant decrease in IOP one week postoperatively as compared to preoperative IOP (p<0.001) that increased significantly afterward to be 16.46±2.17 assessed at seven weeks postoperatively then 17.20±1.65 twelve weeks postoperatively with percent of change 5.6% and 10.4% (p=0.03 & p<0.001, respectively (Table 2).

Table (2): Comparison of intraocular pressure change preoperative and during follow up.

IOP	Group I (anterior app) N=12	Group II (posterior app) N=12	Test of significance	% of change
Preoperative	15.67±1.20	15.58±1.65		
1 week postop	13.51±1.44	12.88±1.19	T1=<0.001* T2=<0.001*	P1=13.8% P2=17.4%
3 weeks postop	14.47±1.30	15.49±2.50	T1=0.006* T2=0.846	P1=7.7% P2=0.6%
7 weeks postop	15.41±1.02	16.46±2.17	T1=0.489 T3=0.03*	P1=1.7% P2=5.6%
12 weeks postop	16.37±1.29	17.20±1.65	T1=0.196 T2=<0.001*	P1=4.5% P2=10.4%

used test: Paired t test, *statistically significant

The current study shows that CCT was significantly increased one week postoperatively as compared to preoperative value (p<0.001) that decrease afterward at three, seven and twelve weeks postoperatively but still higher than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 11.4%, 8.7%, 6.8% and 5.8%, for first, second, third and fourth readings, respectively among group (I); However, among group (II) CCT is significantly increased one week postoperative as compared to preoperative value (p=0.003) that decrease afterward at three, seven and twelve weeks post operative but still higher than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 6.2, 6.1%, 5.8% and 4.9%, for first, second, third and fourth readings, respectively (Table 3).

Table (3): Comparison of CCT change preoperative and during follow.

CCT	Group I (anterior app) N=12	Group II (posterior app) N=12	Test of significance	% of change
Pre-operative	518.08±47.37	523.33±47.82		
1 week postop	577.17±38.94	555.92±46.05	T1=<0.001* T2=0.003*	P1=11.4% P2=6.2%
3 weeks postop	563.0±39.91	555.42±42.77	T1=<0.001* T2=0.007*	P1=8.7% P2=6.1%
7 weeks postop	553.75±41.57	553.67±40.66	T1=<0.001* T2=0.007*	P1=6.8% P2=5.8%
12 weeks postop	548.33±40.50	549.33±39.98	T1<0.001* T2=0.012*	P1=5.8% P2=4.9%

used test: Paired t test, *statistically significant

The current study shows that the corrected IOP value decreased significantly one week postoperative as compared to preoperative (p=0.001) that increased afterward at three, seven and twelve weeks postoperatively but still lower than preoperative value among group (I). All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 36.2%, 24.9%, 15.9% and 8.2%, for first, second, third and fourth readings, respectively; However, among group (II) there was a statistically significant decrease in IOP correction one week postoperatively as compared to preoperative (p=0.004) that increased afterward at three, seven and twelve weeks postoperatively but still lower than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 29.3%, 13.8%, 7.5% and 1.3%, for first, second, third and fourth readings, respectively (Table 4).

Table (4): Comparison of IOP correction change preoperative and during follow up.

IOP Correction	Group I (anterior app) N=12	Group II (posterior app) N=12	Test of significance	% of change
Pre-operative	17.58±2.54	17.12±3.37		
1 week postop	11.22±2.46	12.11±2.68	T1=0.001* T2=0.004*	P1=36.2% P2=29.3%
3 weeks postop	13.20±2.47	14.75±3.29	T1=0.001* T2=0.004*	P1=24.9% P2=13.8%
7 weeks postop	14.78±2.74	15.84±2.80	T1=0.001* T2=0.046*	P1=15.9% P2=7.5%
12 weeks postop	16.13±3.11	16.89±2.76	T1=0.003* T2=0.685	P1=8.2% P2=1.3%

used test: Paired t test, *statistically significant

The decrease in IOP one week postoperatively is higher in group (II) compared to group (I) with percent of change 17.4% and 13.8% respectively. However, it is statistically insignificant (Figure 3).

The increase in CCT in the 1st week postoperatively is higher in group (I) compared to group (II) with percent of change 11.40% and 6.20% respectively; However, it is statistically insignificant (Figure 4).

The decrease in the corrected IOP value one week postoperatively is higher in group (I) compared to group (II) with percent of change 36.2% and 29.3% respectively; however, it is statistically insignificant (Figure 5).

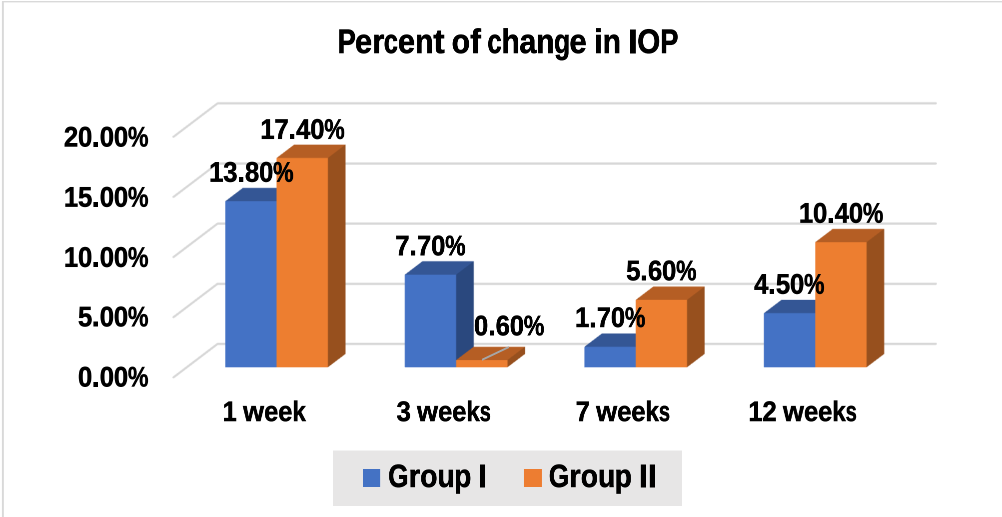

Fig. (3): Percent of change in intraocular pressure among the studied groups.

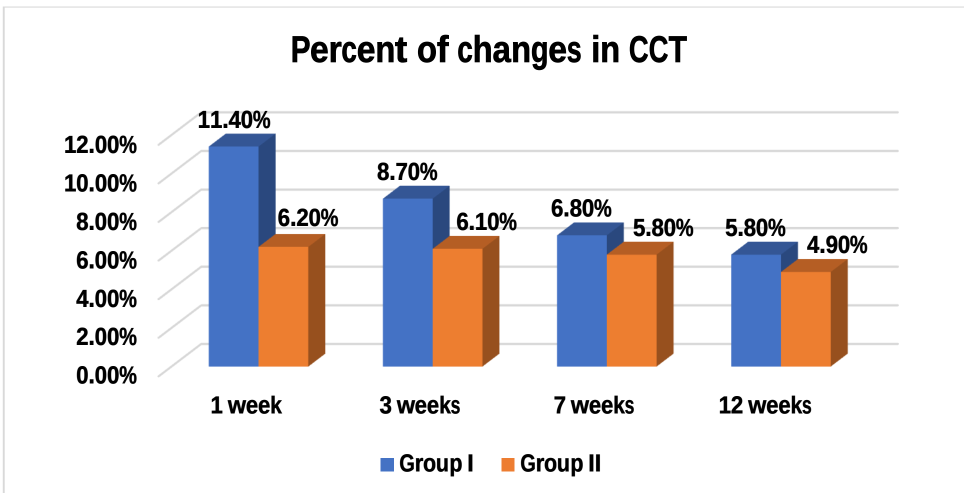

Fig. (4): Percent of change in CCT among the studied groups.

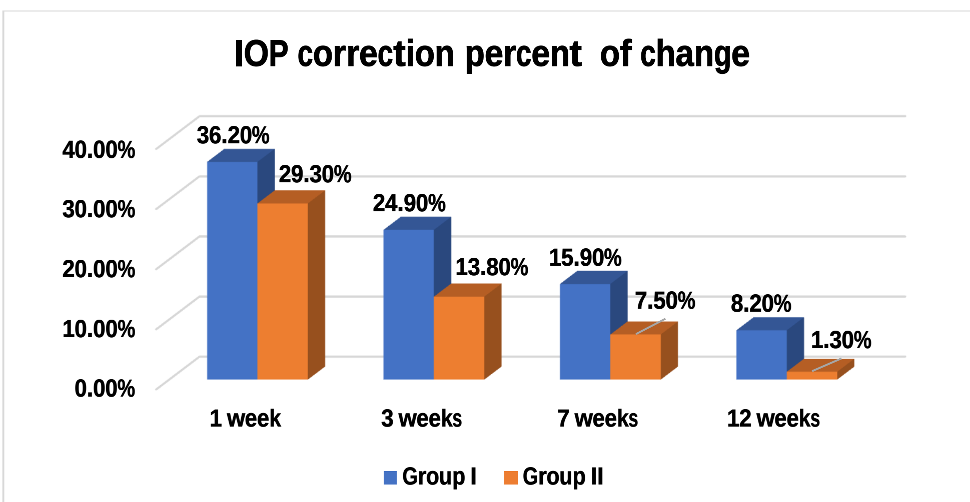

Fig. (5): Percent of change in IOP correction among the studied groups.

This study demonstrates no statistically significant difference between studied groups as regard intra-ocular pressure (p=0.259), CCT (P=0.235) and IOP correction (p=0.410) assessed at one week postoperatively and at the following follow up periods.

No complications were recorded postoperatively in the studied groups.

No cases with post cataract surgery glaucoma were recorded within the mentioned follow up period.

DISCUSSION:

Childhood blindness is commonly caused by congenital cataract[14]. There are many types of congenital cataract which not all are surgically significant. Early diagnosis and treatment of visually significant cataract is essential to prevent amblyopia. Congenital cataract is treated surgically with resulting aphakia and pseudophakia that leave children at great risk to develop glaucoma[15,16].

Children's eyes are more liable for inflammation and glaucoma following cataract surgeries[2]. Several studies reported an increase in CCT following congenital cataract (CC) surgery[8,17,18]. The most important factor affecting CCT is age at surgery, with younger children having a higher increase in CCT than older children[8].

All previous studies of children with wide range of age; however, no longitudinal study of CCT in children less than 2 years of age. Children undergo surgery at earlier age have greater incidence of developing glaucoma[19].

Current methods of measuring IOP have variables that are affected by CCT. Over or underestimation of IOP result from high or low CCT, respectively[20].

Aphakic or pseudophakic eyes are associated with increased CCT. There are many theories explaining this finding such as anterior segment inflammation and endothelial cell dysfunction as a result of surgical procedure; however, the cause is greatly unknown[8,19].

The study involved 24 eyes having congenital cataract surgery. They are classified into two equal groups each of 12 eyes according to surgical approach; anterior approach group (I) in which the procedure was done via 2 corneal side ports and posterior approach group (II) in which procedure was done via pars plana approach.

The current study shows that IOP decreased significantly one week postoperatively as compared to preoperative value (p<0.001) with percent of change 13.8% that increased afterward to be 14.47±1.30 three weeks postoperatively with percent of change 7.7% (p=0.006), then insignificantly increased in the 7th and 12th week post-operatively to be 16.37±1.29 with percent of change 4.5% (p=0.196) among group (I). However, among group (II) there was a statistically significant decrease in intraocular pressure one week postoperatively as compared to preoperative value (p<0.001) that increased significantly afterward to be 16.46±2.17 assessed at seven weeks postoperatively then 17.20±1.65 twelve weeks postoperatively with percent of change 5.6% and 10.4% (p=0.03 & p<0.001, respectively). The decrease in IOP one week postoperatively is higher in group (II) compared to group (I) with percent of change 17.4% and 13.8% respectively, however it is statistically insignificant.

The current study shows that the corrected IOP value decreased significantly one week postoperative as compared to preoperative value (p=0.001) that increased afterward at three, seven and twelve weeks postoperatively but still lower than preoperative value among group (I). All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 36.2%, 24.9%, 15.9% and 8.2%, for first, second, third and fourth readings, respectively. However, among group (II) there was a statistically significant decrease in IOP Correction one week postoperatively as compared to preoperative value (p=0.004) that increased afterward at three, seven and twelve weeks postoperatively but still lower than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 29.3%, 13.8%, 7.5% and 1.3%, for first, second, third and fourth readings, respectively. The decrease in the corrected IOP value one week postoperatively is higher in group (I) compared to group (II) with percent of change 36.2% and 29.3% respectively, however it is statistically insignificant. This can be attributed to the more CCT increase among group (I) postoperatively.

In agreement with our study, Dooley et al.[21] noticed a decrease in IOP following cataract surgery. They recorded decrease in IOP by more than or equal to 2 mmHg after surgery. They assume that this decrease in IOP could be related to anterior chamber depth (ACD) and anterior chamber angle (ACA).

IOP measured by Goldmann applanation tonometer tend to be overestimated in eyes with high CCT in normal eyes of adults and children. Similarly, this could be true in children with cataract. So, it is important to evaluate CCT following congenital cataract surgery to accurately measure IOP[19].

A study carried out in Cairo University Hospitals on infants had congenital cataract surgery showed changes in IOP and in the ACA[2]. They recorded IOP increase >18 mmHg postoperatively in 23 eyes of 206 eyes (11%), after the 1st year and in 9 (13%) of 86 eyes after the 2nd year. Risk factors recorded for IOP increase were higher preoperative CCT (P=0.01) in the 1st year, and earlier age at surgery (P=0.01), and aphakia (P=0.05) in the 2nd year. They concluded that increased pre-operative CCT associated with early onset IOP elevation. However, surgery after 2 months of age had lower incidence to late onset IOP elevation.

The present study shows that central corneal thickness (CCT) is significantly increased one week postoperatively as compared to preoperative value (p<0.001) that decrease afterward at three, seven and twelve weeks postoperatively but still higher than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 11.4%, 8.7%, 6.8% and 5.8%, for first, second, third and fourth readings, respectively among group (I). However, among group (II) CCT is significantly increased one week postoperative as compared to preoperative value (p=0.003) that decrease afterward at three, seven and twelve weeks post operative but still higher than preoperative value. All postoperative readings demonstrate statistically significant change as compared to preoperative value with percent of change were; 6.2, 6.1%, 5.8% and 4.9%, for first, second, third and fourth readings, respectively. The increase in CCT in the 1st week postoperatively is higher in group (I), this can be attributed to the more corneal edema in anterior approach.

In agreement to our study, Chang et al.[22] studied 76 children (152 eyes); 33 eyes were healthy, 77 were aphakic, and 42 were pseudophakic. Mean CCT increased by 31.14 ± 44.32 µm at 1 year postoperatively and 33.09 ± 35.42 µm at 2 years postoperatively in aphakic group; this increase was significantly higher than that of pseudophakic eyes 1 year postoperatively (8.36 ± 19.91 µm; P < 0.001) and 2 years postoperatively (0.31 ± 14.19 µm; P = 0.024). However, no significant differences in IOP were recorded between phakic states at 12 and 24 months postoperatively (P = 0.672 and P = 0.080, respectively). They concluded that the mean CCT peaked at 12 months, and the mean IOP returned normal in both the aphakic and pseudophakic eyes during this study. There was positive correlation between CCT and IOP, the phakic status or age were not involved, this necessitates a close monitoring of these parameters following surgery for 1 year, so it may affect early glaucoma diagnosis.

Nilforushan et al.[23] analyzed the influence of CC extraction on the CCT, IOP and endothelial cells. In their study, 17 patients undergone an anterior approach cataract surgery. They observed that in aphakic group the mean CCT (632 µm) and IOP (22.8 mm Hg) were greater than in controls (546 µm and 14.1 mm Hg, respectively). While endothelial cell count and characteristics between the groups were statistically insignificant.

In accordance of our study, corneal thickness was significantly increased after 12 months in children less than 2 years of age following congenital cataract surgery and IOL implantation[19].

Several studies have observed CCT increase in aphakic eyes after congenital cataract surgery[7,23-26]. Muir et al.[24] compared 23 pseudophakic eyes, 41 aphakic eyes and 30 cataractous eyes with 118 controls, finding a significantly higher CCT among aphakic (642 ± 88 µm) and pseudophakic (598 ± 56 µm) groups. While eyes with congenital cataract had mean CCT of (564 ± 34 µm), compared with controls having mean (CCT 552 ± 38 µm), p = 0.07 with controls, there was no significant difference.

In contrary to our study, Faramarzi et al.[17] showed no significant change in CCT after 6 months in children and suggested a longer follow-up. Our study evaluated children at one of the earliest ages in the literature; our cohort involved children less than 2 years with a shorter follow-up period (3 months).

The normal corneal development might be affected by cataract surgery and so, CCT increases. This increase might be caused by surgery. In Sukhija and Kaur[19] study, they observed no significant difference in CCT between the eyes with cataract and fellow normal eyes in cases with unilateral cataract pre-surgically. Subclinical corneal edema could have caused the temporary increase in CCT at 3 mo. The development of the cornea is influenced by the crystalline lens that’s why CCT is affected more when the lens is removed earlier[24]. Age at surgery is inversely related to CCT increase[8].

Surgical stress and trauma could be accounted for endothelial cell damage that might cause CCT increase[23,27]. Endothelial cells loss after surgery is compensated by effective proliferation in very young children. Nevertheless, pediatric cataract is usually soft and aspiration of the lens don’t cause much damage.

Postsurgical inflammation could cause endothelial cell dysfunction thus increasing corneal thickness as shown in cases with fibrinous complications[28,29].

Several explanations for increased CCT following congenital cataract surgery that may be caused by endothelial loss and dysfunction[8,19,30]. Possible explanations include direct manipulation, IOL implantation, adverse irrigation fluids, and postsurgical inflammation[20]. The Infant Aphakia Treatment Study (IATS) offers data on corneal endothelial with corneal thickness changes following cataract surgery[30]. Aphakic and pseudophakic eyes showed corneal thickness increase compared to controls, with a higher increase in the aphakic eyes. Endothelial cell changes were observed in aphakic group, while pseudophakic group was the same as control eyes. This imply that corneal thickness increases may be not related to endothelial cell loss[20].

CONCLUSION:

The CCT value greatly affects IOP measurements in children less than 2 years of age having cataract surgery. This increase in CCT is mainly caused by surgical factors. The increase of corneal thickness and the decrease in IOP was observed after congenital cataract surgery, whether anterior or posterior approach. The increase in CCT and its effect on IOP should be considered in cases having congenital cataract surgery.

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Data Availability: The authors declare that all data supporting the findings of this study are available within the article and its supplementary information file.

Competing interests: The authors declare no competing interests.

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Conflict of interest

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