Treatment and Outcome of Secondary Glaucoma Associated with Pediatric Cataract Surgery

Pediatrik Katarakt Cerrahisi ile İlişkili Sekonder Glokomlarda Tedavi ve Sonuçlar*

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ABSTARCT

Purpose: To report our experience in the management of glaucoma following pediatric cataract surgery.

Material and Methods: Fifty-five eyes of 35 patients with secondary glaucoma after pediatric cataract surgery were included in this retrospective study in age at cataract surgery, interval between cataract surgery and development of glaucoma, best corrected visual acuity (BCVA), intraocular pressure (IOP), central corneal thickness (CCT) were noted. Management of glaucoma and success rates were ascertained. Main outcome measures were treatment type and IOP control.

Results: The mean age was 16.0 years at initial presentation and 3,1 years at cataract surgery. The mean interval between cataract surgery and diagnosis of glaucoma was 138 months. Mean BCVA was 0.24 and CCT was 621.4 µ. IOP decreased from 28.3 to 16.6 mmHg at final visit. IOP control could be achieved with medications alone in 38 eyes, while surgical treatment was required in 17 eyes. Unilaterality and higher IOP at initial presentation were detected as risk factors for surgery. Ten eyes needed supplementary medications following surgery. At final visit, IOP was under 21 mmHg in 48 eyes.

Conclusions: Glaucoma is a delayed complication of pediatric cataract surgery. IOP can be controlled successfully with medications alone in the majority of patients. Remaining cases may require surgical procedures. Unilateral disease and higher IOP at initial presentation were risk factors for surgical intervention. Increased corneal thickness may be a confusing factor in both diagnosis and management of those patients.

Key Words: Pediatric cataract surgery, secondary glaucoma.

ÖZ

Amaç: Pediatrik katarakt cerrahisi sonrası gelişen sekonder glokomlarda tedavi deneyimlerimizi sunmak.

Gereç ve Yöntem: Pediatrik katarakt cerrahisi ile ilişki sekonder glokomu olan 35 hastanın 55 gözü retrospektif olarak incelendi. Katarakt cerrahisi esnasındaki yaş, glokom gelişimi ile katarakt cerrahisi arasındaki süre, düzeltilmiş en iyi görme keskinliği (EİGK; Snellen), göz içi basıncı (GİB), merkezi kornea kalınlığı (MKK) kaydedildi. Tedavi yaklaşımları, GİB kontrolü ve başarı oranları değerlendirildi.

Bulgular: Katarakt cerrahisi sırasında ortalama yaşı 3.1 olan olguların ilk muayenedeki ortalama yaşı 16,0 idi. Katarakt cerrahisi ile glokom tanısı konması arasındaki süre ortalama 138 aydı. Ortalama EİGK 0.24 ve MKK 621.4 µ idi. İlk muayenedeki ortalama GİB 28.3 mmHg iken son muayenede 16.6 mmHg bulundu. Göz içi basıncı kontrolü 38 gözde yalnız medikal tedavi ile sağlanırken, 17 gözde cerrahi tedavi gerekti. Tek taraflı olması ve ilk muayenedeki GİB yüksekliği ile cerrahi tedavi gereksinimi arasında anlamlı ilişki bulundu. On gözde cerrahi sonrası da ilave medikal tedavi gerekti. Son muayenede, 48 gözde, 21 mmHg'nın altında GİB sağlanabildi.

Sonuç: Glokom pediatrik katarakt cerrahisinin geç komplikasyonlarından biridir. Çoğu gözde GİB, yalnız medikal tedavi ile kontrol altına alınabilirken, bir kısmında cerrahi gerekebilir. Tek taraflılık ve ilk visitteki GİB yüksekliği, cerrahi tedavi gerekliliği riskini arttırır. Kornea kalınlığının yüksek olması, bu gözlerde tanı ve tedavide kafa karıştırıcı olabilir.

Anahtar Kelimeler: Pediatrik katarakt cerrahisi, sekonder glokom.

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INTRODUCTION

Glaucoma is one of the most common causes of visual loss after successful pediatric cataract surgery.[1] Its incidence has been reported between 3-41%.[1-11] A higher rate of glaucoma may be correlated with longer follow-up.[1,2]

Several risk factors have been identified; younger age at which cataract surgery was performed,[2,11-14] preexisting ocular abnormalities such as microcornea,[2,4,6,12] retained lens material during surgery,[5] surgery for secondary cataract,[4,5] type of cataract[4] and the effect of lens particles, lens proteins, and inflamatory cells.[12] Chronic postoperative inflammation, the type of lensectomy procedure and instrumentation were also questioned.[6]

Although there is a significant risk of glaucoma following pediatric cataract extraction, its pathogenesis still remains unclear. Some experts have suggested that these eyes might have congenital anterior segment abnormalities that would increase their susseptibility for glaucoma, while others have suggested that the glaucoma may be related to the surgical intervention itself.[15] Acute angle closure episodes have been reported in the early postoperative period as a result of pupillary block.[1,7,16]

However, the most common type of glaucoma following congenital cataract surgery is open angle variant.[1,16] Both chemical and mechanical theories have been implicated in order to explain the pathogenesis. Inflammatory cells, lens remnants and vitreous derived factors might cause intraocular pressure (IOP) elevation by obstructing the trabecular meshwork.[7,15] Mechanical factors such as release of tension on the zonules after removal of the lens might reduce the amount of force necessary for keeping trabecular meshwork open and therefore regulating the outflow facility.[1,7]

There is no well-established and proven strategy for management of that disorder. The majority of studies suggested that the medications should be tried initially. Eyes refractory to medical therapy may be treated with appropriate surgical procedures. The aim of the current study is to report our experience in the management of glaucoma after pediatric cataract surgery.

MATERIAL AND METHODS

Medical records of all patients with glaucoma following pediatric cataract surgery were reviewed retrospectively. Patients were identified by searching the patients' records who were being followed at glaucoma department. The protocol of the study adhered to the tenets of the Declaration of Helsinki.

Patients with ocular anomalies such as anterior segment dysgenesis, microcornea/microphthalmia or persistent fetal vasculature and with the signs of congenital glaucoma such as Haab striae or buphthalmos were excluded from the study.

The following data were collected for each patient: age at clinical presentation with glaucoma, age at cataract surgery, interval between cataract surgery and development of glaucoma, best corrected visual acuity (BCVA), slit lamp examination (aphakic or pseudophakic, pupil status), IOP, optic nerve head cup-to-disc ratio, central corneal thickness and gonioscopic findings, corneal diameter, and visual field if available.

Nerve fiber layer thickness measurement with Stratus OCT (Zeiss) and/or 30-2 static perimetry were also used as diagnostic tools if feasible.

Visual acuities were taken with Snellen chart or illiterate Es and converted to logMAR. IOP measurements were taken with a Goldmann applanation tonometer or pneumotonometer (Medtronic Solan, Jacksonville, U.S.). Central corneal thickness was measured with an ultrasonographic pachymeter (DGH-550, DGH Technology Inc., Exton, PA).

Glaucoma was defined as the presence of glaucomatous optic nerve head cupping (cup-to-disc ratio $\geq$0,5 or by an asymmetry between eyes >0,2), IOP greater than 22 mmHg, history of medical or surgical treatment for glaucoma.[15,17,18]

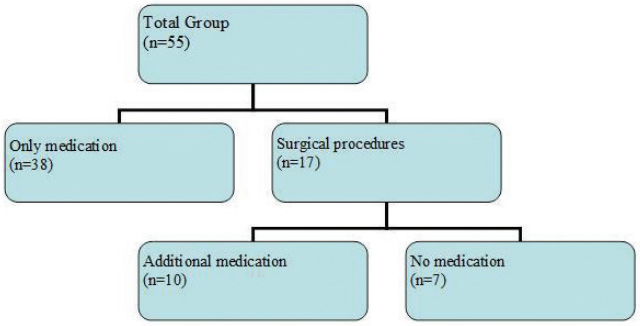
Preferred management for glaucoma such as the type and the number of medications and surgical procedures were noted. The factors that may be assosiated with the need for surgical treatment were also analysed. The target IOP value of 21 mmHg was selected in order to evaluate the success rates.[19]

Glaucoma medications were allowed; therefore no separate analyses were performed to find out the success of surgery alone. evaluate The normality of distribution were evaluated for every continuous variables. Student's T test, Wilcoxon signed rank test, Mann-Whitney U test and Chi-Square were used for statistical analysis.

RESULTS

In total, 55 eyes of 35 patients were included in this study. There were 18 males and 17 females in the group. The mean age at the time of initial presentation was 16.0±11.2 (1-42) years.

The mean age at cataract surgery was 3.1±2.8 (0-9) years. The mean time interval between cataract surgery and diagnosis of glaucoma was 138,0±104,7 months.



Graphic: *Distributions of eyes according to management.*

The mean follow-up was 27.9±32.7 (range 3-130, median 12) months. Fourty eyes were aphakic (72.7%) and 15 eyes were pseudophakic. Mean iridocorneal angle width grade was 2.81±0.23 according to Shaffer clasification. There were synechiae in the angle in 25 eyes and pupillary irregularities in 29 eyes.

Mean BCVA was 0.24±0.31 (logMAR 1.30±1.18) at initial presentation and 0.26±0.32 (logMAR 1.22±1.18) at the final visit (p=0.18). The mean cup/disc ratio was 0.60±0.24 at initial presentation and 0.61±0.27 at final visit (p=0.18).

BCVA's and cup/disk ratios did not change significantly during follow-up (p>0.05). The mean central corneal thickness was 621.4± 81.9 µ (range 530-851). CCT was not significantly correlated with the IOP (Spearman's rho=0.12, p=0.52).

IOP was lowered from 28.3±9.4 mmHg at initial presentation to 16.6±4.1 mmHg at the final visit (p<0.001). IOP was controlled in 38 eyes (69.1%) with medication alone (Graphic). The mean number of antiglaucoma medications were 2.4±0.9.

Beta blockers were prescribed in 10 eyes (26.3 %), latanoprost in five eyes (13.2%), timolol-dorzolamide fixed combination in 26 eyes (68.4 %), brimonidine in 12 (31.6%) eyes and pilocarpine in seven eyes (18.4%).

Table 1: *Surgical procedures.*

Patient no	Number of interventions	Interventions
1	1	AGV implantation
2	1	Cyclocryotherapy
3	1	YAG-laser iridotomy
4	1	AGV implantation
5	1	Goniotomy
6	1	Goniotomy
7	1	Goniotomy
8	1	TSDLC
9	1	AGV implantation
10	1	YAG-laser iridotomy
11	1	Goniosyhnechiolisis
12	2	TSDLC, cyclocryotherapy
13	2	Trabeculectomy with MMC, AGV implantation
14	2	Trabeculectomy with MMC, AGV implantation
15	2	Goniosyhnechiolisis,TPALC
16	2	Goniosyhnechiolisis, AGV implantation
17	3	Trabeculectomy, TPALC, AGV implantation

AGV: *Ahmed Glaucoma Valve,* ***MMC:*** *Mitomicin C,* ***TSDLC:*** *Transscleral Diode Laser Cyclophotocoagulation,* ***TPALC:*** *Transpupillary Argon Laser Cyclophotocoagulation*

Table 2: *Comparison of clinical properties between eyes which required surgical treatment or did not.*

	Eyes that needed surgical intervention (n=17)	Eyes treated only with medication (n=38)	P value
Mean age at cataract surgery	2.9±2.7 Median: 4	5.0±4.9 Median: 1.5	0.16
Mean interval between cataract surgery and development of glaucoma (month)	105.2±99.7 Median: 92	153.9±99.9 Median: 132	0.07
Intraocular lens status	11 aphakic/6 phakic	29 aphakic/9 phakic	0.32
Central corneal thickness	626.5±95.9 Median: 580	619.0±76.8 Median: 586	0.80
Unilateral/Bilateral	9/8	6/32	0.008*
IOP at initial presentation (mmHg)	34.8±11.2 Median: 32	25.3±6.8 Median: 24	0.001*

Table 3: Summary table of the ours and other studies about glaucoma after pediatric cataract surgery.

Study	Number of eyes	Findings
Miyahara, 2002[6]	21	Surgical treatment was required in addition to the medical regimen in 7 eyes (33%)
Wallace, 1998[17]	25	Medications after surgical treatment were required 16 eyes (64%) IOP was controlled in 17 eyes
Asrani, 1995[16]	33	Medication alone was successful in IOP control in 63,6%
Simon, 1991[3]	8	6 eyes were controlled medically with a combination of miotics and beta-blockers
Our study	55	IOP control could be achieved with medications alone in 38 eyes, while surgical treatment was required in 17 eyes. Ten eyes needed supplementary medications after surgery.

At final visit; mean IOP was 16.8±3.59 (11-27) mmHg in this medication-only subgroup. Surgical treatment was required in 17 eyes (30.9%) that were not controlled with medical therapy alone. Eleven eyes underwent one, five eyes underwent two, and one eye underwent three surgical procedures. These procedures are listed in Table 1.

When the factors associated with the need for surgical treatment were analysed, unilateral disease (p=0.008) and higher IOP at initial presentation (p=0.001) were detected as risk factors for surgical intervention (Table 2).

Mean IOP was 16.1±5.1 (6-26) mmHg in surgery group at the last control visit. There were no significant difference with regard to final IOP between medication and surgery groups (p=0.55).

In ten eyes (58.8%), supplementary glaucoma medications were required following surgery while the the remaining seven eyes needed no additional therapy after surgery. The number of medications were one in two eyes, two in four eyes and three in four eyes.

Beta blockers were prescribed in two eyes, latanoprost in three eyes, timolol-dorzolamide fixed combination in seven eyes and pilocarpine in two eyes. There were no serious complications that caused visual loss following surgical interventions.

IOP of equal or less than 21 mmHg could be achieved in 48 eyes (87.3%), while seven eyes failed.

DISCUSSION

Glaucoma is a well known delayed complication of pediatric cataract surgery. It is likely that as the follow-up lenghtens, the percentage of the diagnosis of glaucoma will increase. Simon et al. reported a mean time delay of 6.8 years.[3] Asrani and Wilensky reported 12.2 years and Phelps and Arafat reported an interval ranging from 2 to 45 years.[16,20]

The mean time delay in our study between cataract extraction and the onset of glaucoma is 138.0±104.7 months (11.5±8.6 years). Early diagnosis of glaucoma in those patients may be difficult for a number of reasons. IOP measurements, the visual field, precise biomicroscopic and optic nerve head examinations are often difficult in this group of patients. Furthermore, warning signs such as corneal enlargement and/or cloudiness may not be as prominent as in congenital glaucoma. Usually those patients are without any symptoms despite increased IOP.[1] However, it is widely accepted that patients having cataract surgery in childhood should be followed as glaucoma suspects for the rest of their lives.[1,3,6,9]

Medical treatment is usually preferred with initial diagnosis because the surgery in such eyes is less successful and associated with greater morbidity than in phakic eyes. Beta blockers, carbonic anhydrase inhibitors, prostoglandine analogs, and pilocarpine may be used in medical therapy.[1]

In the series of Miyahara et al., IOP was well controlled below 20 mmHg with medication alone in 14 of 21 eyes (66%).[6] In the series of Asrani and Wilensky, medical therapy alone successfully controlled the IOP in 21 of 33 eyes (63.6%).[20] Simon et al.,[3] reported that six of eight eyes were controlled medically with a combination of miotics and beta blockers (Table 3).

Although secondary glaucomas after pediatric cataract surgery are frequently treated with medications, sometimes medical therapy alone fails to control the IOP. In our study we analysed the factors that may be associated with the need for surgical treatment. A similar analysis was not found in the literature. We found that unilateral disease and higher IOP at initial presentation were detected as risks for surgical intervention. The mean interval between cataract surgery and development of glaucoma, age at cataract surgery, intraocular lens status, central corneal thickness were not associated with the need for surgical therapy.

When surgical intervention is required, controversy exists regarding the procedure of choice for each type of glaucoma. There are relatively few reports of surgical results in secondary glaucomas, in part because success rates are modest and frequently require more than one procedure when compared to primary infantile glaucoma; adjunctive medical therapy is often necessary after surgical intervention to maintain target IOP.[21] The reasons for the modest success rates of surgery in this group might include young age, conjunctival scarring due to prior intraocular surgery, thick and active Tenon's capsule, excessive subconjunctival scarring, aphakia and pseudophakia itself.[1,19,22]

Trabeculectomy or other filtering surgeries are most commonly performed in aphakic and pseudophakic glaucoma following infantile cataract surgery, but its success rate is variable. Recently, intraoperative mitomicin C (MMC) has been shown to be an effective adjunctive drug for trabeculectomy. The success rate of filtering surgery with MMC in glaucoma following congenital cataract surgery varied from 50 percent to 85 percent, an exception to the study by Azuora-Blanco et al.[1,19,23] Mandal et al. reported the largest retrospective series of trabeculectomy with and without MMC performed in 23 Asian Indian aphakic and pseudophakic eyes. They found that overall complete success was achieved in only 37%, qualified success was achieved in 21% of patients and no difference was noted between the two groups, but complications were more common in the group with MMC.[19]

Poor results and serious bleb-related complications with MMC trabeculectomies in aphakic glaucoma have forced surgeons to explore other modalities of treatment.[7] Walton theorised that goniotomy may be successful in open angle cases of aphakic glaucoma.[24] Bothun et al.,[25] reported that trabeculotomy and/or goniotomy can be successful in the majority of eyes and may decrease the need for filtering and shunting procedures. Glaucoma drainage implant surgery is an alternative management when other surgical treatments have a poor prognosis for success.[1,18] The success rate for drainage implants in pediatric aphakic glaucoma ranged between 56%-95%.[1,7] Drainage implants may be a better option than trabeculectomy with MMC for aphakic patients who are contact lens-dependent and at greater risk for late-onset bleb-related endophthalmitis.[7,19] The most commonly performed cyclodestructive procedures include cyclocryotherapy and cyclophotocoagulation. If initial and second surgical treatments fail to control IOP, they may be considered. But it is not easy to titrate the effect, and retreatments are often necessary. They may be reserved for patients with advanced glaucoma and very minimal visual potential.[1] We performed various surgical procedures (Table 1) reported in previous studies on appropriate patients involved in the study. However, we did not compare each surgical procedure because the number of patients was not enough to make a statistical analysis.

In our study, IOP was controlled in 38 eyes with medication alone. Surgical treatment was required in 17 eyes, in addition to medical therapy in order to achieve IOP control. In 10 eyes, supplementary glaucoma medications were required following surgery while glaucoma surgery alone was sufficient in the remaining seven eyes. There were no serious complications and/or reduction of visual acuity was detected following surgical interventions. In all study groups, BCVAs and cup/disk ratios did not change significantly during follow-up and an IOP of 21 mmHg or less could be achieved in 87.3% of eyes.

Although the exact nature of the relationship between corneal thickness and IOP is controversial, many believe that CCT is necessary to interpret applanation tonometry, particularly in eyes with elevated IOPs.[18] In our study, increased corneal thickness is an interesting finding that may lead to problems in diagnosis and management. The mean central corneal thickness was 621.41±81.89 µ in our study. There are several reports in accordance with our finding: Miyahara et al. reported that, although the difference was not statistically significant, there was a tendency for the cornea to be thicker in glaucomatous eyes than in nonglaucomatous eyes after pars plana lensectomy for congenital cataract surgery.[6] In the report of Simsek et al., the mean central corneal thickness among aphakic and pseudophakic patients following congenital cataract surgery was 626 µ and in age-matched control group was 556µ ($p<0.05$).[26] Simon et al.,[18] reported that CCT in aphakic/pseudophakic children is substantially higher than with control patients. Although some have extrapolated "corrected pressures" using nomograms or formulas based on CCT, this subject is controversial.[18] In our study, we did not correct IOP values according to CCT. We should pay attention to thick cornea in these patients.

In conclusion, secondary glaucoma following pediatric cataract surgery is often diagnosed after a relatively long period of time. The longer the follow up, the higher the glaucoma prevelence is expected. Lifelong follow-up of these patients is essential. In contrast to primary congenital glaucoma, IOP can be controlled with medications in the majority of these patients. The remaining cases may require multiple surgical procedures. Unilateral disease and higher IOP at initial presentation were detected as risks for surgical intervention. Increased corneal thickness, an unusual finding, may complicate both the diagnosis and the management. More studies are needed to establish diagnostic and therapeutic strategies for glaucoma following pediatric cataract surgery.

KAYNAKLAR/REFERENCES

1. Mandal AK, Netland PA. Glaucoma in aphakia and pseudophakia after congenital cataract surgery. Curr Opin Ophthalmol 2004;52:185-98.
2. Magnusson G, Abrahamsson M, Sjöstrand J. Glaucoma following congenital cataract surgery: An 18-year longitudinal follow-up. Acta Ophthalmol Scand 2000;78:65-70.
3. Simon JW, Mehta N, Simmons ST, et al. Glaucoma after pediatric lensectomy/vitrectomy. Ophthalmology 1991;98:670-4.
4. Parks MM, Johnson DA, Reed GW. Long-term visual results and complications in children with aphakia. Ophthalmology 1993;100:826-40.
5. Chrousos GA, Parks MM, O'Neill JF. Incidence of chronic glaucoma, retinal detachment and secondary membrane surgery in pediatric aphakic patients. Ophthalmology 1984;91:1238-41.
6. Miyahara S, Amino K, Tanihara H. Glaucoma secondary to pars plana lensectomy for congenital cataract. Graefe's Arch Clin Exp Ophthalmol 2002;240:176-9.
7. Papadopoulos M, Khaw PT. Meeting the challenge of glaucoma after paediatric cataract surgery. Eye 2003;17:1-2.
8. Petric I, Loncar VL. Surgical technique and postoperative complications in pediatric cataract surgery: Retrospective analysis of 21 cases. Croat Med J 2004;45:287-91.
9. Francis PJ, Ionides A, Berry V, et al. Visual outcome in patients with isolated autosomal dominant congenital cataract. Ophthalmology 2001;108:1104-8.
10. Keech RV, Tongue AC, Scott WE. Complications after surgery for congenital and infantile cataracts. Am J Ophthalmol 1989;108:136-41.
11. Michaelides M, Bunce C, Adams GGW. Glaucoma following congenital cataract surgery-the role of early surgery and posterior capsulotomy. BMC Ophthalmology 2007;7:13.
12. Rabiah PK. Frequency and predictors of glaucoma after pediatric cataract surgery.Am J Ophthalmol 2004;137:30-7.
13. Vishwanath M, Cheong-Leen R, Taylor D, et al. Is early surgery for congenital cataract a risk factor for glaucoma? Br J Ophthalmol 2004;88:905-10.
14. Haargaard B, Ritz C, Oudin A, et al. Risk of glaucoma after pediatric cataract surgery. IOVS 2008;49:1791-6.
15. Mori M, Keech RV, Scott WE. Glaucoma and ocular hypertension in pediatric patients with cataracts. Journal of AAPOS 1997;1:98-101.
16. Phelps CD, Arafat NI. Open-angle glaucoma following surgery for congenital cataracts. Arch Ophthalmol 1977;95:1985-7.
17. Egbert JE, Christiansen SP, Wright MM, et al. The natural history of glaucoma and ocular hypertension after pediatric cataract surgery. Journal of AAPOS 2006;10:54-7.
18. Simon JW, O'Malley MR, Gandham SB, et al. Central corneal thickness and glaucoma in aphakic and pseudophakic children. Journal of AAPOS 2005;9:326-9.
19. Mandal AK, Bagga H, Nutheti R, et al. Trabeculectomy with or without mitomycin-C for paediatric glaucoma in aphakia and pseudophakia following congenital cataract surgery. Eye 2003;17:53-62.
20. Asrani SG, Wilensky JT. Glaucoma after congenital cataract surgery. Ophthalmology 1995;102:863-7.
21. Wallace DK, Plager DA, Snyder SK, et al. Surgical results of secondary glaucomas in childhood. Ophthalmology 1998;105:101-11.
22. Sidoti PA, Belmonte SJ, Liebmann JM, et al. Trabeculectomy with mitomycin-C in the treatment of pediatric glaucomas. Ophthalmology 2000;107:422-9.
23. Azuara-Blanco A, Wilson RP, Spaeth GL, et al. Filtration procedures supplemented with mitomycin C in the management of childhood. Br J Ophthalmol 1999;83:151-6.
24. Walton DS. Glaucoma secondary to operation for childhood cataract. In: Epstein DL, ed. Chandler and Grant's Glaucoma, 3rd ed. Philadelphia: Lea&Febiger 1986;43.
25. Bothun ED, Guo Y, Christiansen SP, et al. Outcome of angle surgery in children with aphakic glaucoma. Journal of AAPOS 2010;14:235-9.
26. Simsek T, Mutluay AH, Elgin U, et al. Glaucoma and increased central corneal thickness in aphakic and pseudophakic patients after congenital cataract surgery. Br J Ophthalmol 2006;90:1103-6.