Ophthalmology Research: An International Journal

8(2): 1-8, 2018; Article no.OR.39624
ISSN: 2321-7227

Complications of Phacoemulsification and Extracapsular Cataract Extraction Surgery in Eyes with Pseudoexfoliation Syndrome

Ali Kurt[1*] and Tekin Yaşar[2]

[1]Department of Ophthalmology, Medical School Training and Research Hospital, Ahi Evran University, Kayseri-Ankara Street, Kırşehir, Turkey.
[2]Department of Ophthalmology, Health Sciences University, Istanbul, Turkey.

Authors' contributions

This work was carried out in collaboration between both authors. Author AK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AK and TY managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/OR/2018/39624
Editor(s):
(1) Ahmad M. Mansour, Professor, Department of Ophthalmology, American University of Beirut, Lebanon.
Reviewers:
(1) Engy M. Mostafa, Sohag University, Egypt.
(2) Gabor Nemeth, Borsod-Abaúj-Zemplén County Central Hospital and University Teaching Hospital, Hungary.
Complete Peer review History: http://www.sciencedomain.org/review-history/23140

Original Research Article

Received 24th November 2017
Accepted 7th February 2018
Published 12th February 2018

ABSTRACT

Aim: To evaluate the complications of Phacoemulsification (PE) and Extracapsular Cataract Extraction (ECCE) surgery in eyes with Pseudoexfoliation Syndrome (PES).
Design: A retrospective study.
Methods: We retrospectively evaluated the charts of a total of 135 cataract cases with PES that had undergone PE (62) or ECCE (73) surgery. The intraoperative and postoperative complications of the cases with examination findings on the postoperative days 1, 7, 30, 90, and 180 were evaluated.
Results: The 135 cases consisted of 89 (65.92%) males and 46 (34.07%) females with a mean age of 69.78 ±7.84 (50-92) years. PE had been used as the surgical technique in 45.18% and ECCE in 54.81%. The rate of inadequate dilatation with mydriatics was 23.70% and the rate of iridophacodonesis was 7.40% preoperatively. The most common intraoperative complication was miosis (23.70%), followed by capsule rupture (9.62%). Intraoperative complications were statistically

**Corresponding author: E-mail: dralikurt@gmail.com.*

significantly more common in the ECCE group (p=0.002). The most common early postoperative complication was corneal edema (26.66%), followed by intraocular pressure (IOP) increase (14.81%) and fibrin reaction (8.88%). Early postoperative complications were statistically significantly more common in the ECCE group (p<0.001). In the postoperative late period, we observed posterior capsule opacification (PCO) in 4 cases (2.96%), capsular phimosis in one case (0.74%) and endothelial failure in 2 cases (1.48%). There was no significant difference between the two groups regarding postoperative late complications (p=0.594).

Conclusion: Pseudoexfoliation makes cataract surgery more difficult by causing inadequate mydriasis, zonular weakness and phacodonesis. Taking the complications into account, it can be said that PE is safer than ECCE for the cataract surgery of selected cases with PES. The high rate of ECCE complications in our study could be due to the higher miosis rates in these cases.

Keywords: Cataract; cataract surgery; complication; pseudoexfoliation.

1. INTRODUCTION

Pseudoexfoliation syndrome (PES) is considered a systemic disorder that also has ocular findings [1,2]. It is characterized by the accumulation of a gray-white, dandruff-life fibrilogranular material named pseudoexfoliation material (PEM) on intraocular structures such as the pupillary border and lens anterior capsule in particular, and also the iridocorneal angle, zonules, ciliary body, anterior hyaloid face, trabecular network, corneal endothelium and the conjunctiva in addition to extraocular structures such as the heart, kidney, meninges and liver [3]. PEM has been shown to be produced by the equatorial lens epithelium, the iris pigment epithelium and non-pigmented ciliary epithelium [1].

The incidence of PES increases with age. The general global incidence is 0.5% in those under 60 and 15% in those over 60 years of age [1,2]. The PES incidence in our country has been reported as 10.1-12.2% with cataracts accompanying the disorder in 43.6-88.1% of the cases [3-6]. Some articles report an etiological relationship between PES and cataract development. These cataracts are most commonly of the nuclear and mature type [7-10].

PES can cause inadequate mydriasis due to degenerative changes in the iris stroma and the muscle layer, and the mechanical loosening and enzymatic zonulolysis at the point of adhesion to the lens and ciliary body basal membrane can weaken the zonules. There may also be morphological and functional changes in the corneal endothelium and disturbance of the blood-aqueous barrier [1]. All these structural changes have been reported to make cataract surgery more difficult and increase surgical complications such as zonular dialysis, posterior capsule rupture and vitreous loss and postoperative complications such as increased intraocular pressure (IOP) and corneal edema [1,7-10]. It has also been reported that phacoemulsification (PE) surgery is safer than extracapsular cataract extraction (ECCE) surgery in PES cases and that the complications mostly develop due to intraoperative miosis [1,11,12].

The aim of our study was to evaluate the complications of cataract surgery performed using two surgical techniques (PE and ECCE) in cases with PES.

2. METHODS

We retrospectively reviewed the charts of 135 PES patients who had undergone surgery for cataract at the Yüzüncü Yıl University Faculty of Medicine. A history of ocular surgery, uveitis, glaucoma and ocular trauma were accepted as exclusion criteria. The patients underwent intraocular pressure measurement and an anterior segment and fundus examination before and after the surgery. The cataracts were grouped by type and all anterior and posterior subcapsular, nucleocortical, cortical, and nuclear types were included in the immature cataract group. 0.5% ketorolac drops 3 times a day were started the day before surgery. Cyclopentolate 1% and phenylephrine 2.5% drops were used for pupillary dilatation. Cases with a pupillary diameter of <5.5 mm after these drops were considered to have inadequate mydriasis. Cases with inadequate mydriasis were administered 0.125 mg adrenaline diluted at a ratio of 1:3 with intraocular balanced solution to the anterior chamber during the surgery. If mydriasis was still inadequate, the pupil was dilated with iris hooks or minimal sphincterotomy cuts of the pupillary

border. Subtenon anesthesia was used in most cases and peribulbar anesthesia in a few. Cases with a cataract that was not too dense and stable zonules underwent PE while cases with denser cataracts underwent ECCE. Patients with more than 6 clock hours of zonular dialysis were directly included in the ECCE group while a capsular tension ring (CTR) was placed intraoperatively for patients with up to 6 clock hours of zonular dialysis. An injection of subconjunctival gentamycin and dexamethasone (50%-50%) was administered at the end of surgery. The patients used topical dexamethasone 1% one drop 6 times a day for two weeks, 0.3% ofloxacin 1 drop 6 times a day for two weeks and 0.5% ketorolac one drop 3 times a day for a month. The patients were checked at postoperative day 1, 7, 30, 90 and 180 and any complications evaluated.

2.1 Techniques Used for Cataract Extraction

2.1.1 Phacoemulsification

A corneal tunnel incision was performed at the upper temporal quadrant with a 3.0 slit knife and the anterior chamber filled with a sodium chondroitin sulfate-sodium hyaluronate mixture viscoelastic material (VEM). A continuous curvilinear capsulorhexis was performed. Following hydrodissection and hydro delamination, a paracentesis entry was created. The nucleus and epinucleus were emulsified with PE. PE was performed using the Alcon Legacy 20000 PE device (Alcon Inc., Forth Worth, TX, USA) and a 0.9 mm 30-degree Kelman tip. The "Stop and Chop" technique was used in all cases. The parameters were 80 cm bottle height, 22 ml/min flow rate, 60% ultrasonic power and 20 mm Hg vacuum when creating the groove and 100 cm bottle height, 26 ml/min flow rate, 40-60% ultrasonic power and 450 mm Hg vacuum during emulsification. The cortical remnants were removed with the coaxial irrigation-aspiration (I/A) probe. 1% sodium hyaluronate was injected into the capsule followed by capsular placement of the hydrophobic acrylic foldable intraocular lens (IOL). Anterior vitrectomy was performed if posterior capsule rupture (PCR) developed and a foldable 6 mm optic diameter hydrophobic and acrylic IOL was placed into the sulcus. Anterior vitrectomy was performed, the incision widened and a polymethylmethacrylate anterior chamber (AC) IOL implanted in cases without adequate capsular support. The VEM in the anterior chamber was removed. The incision was closed with hydration or suture.

2.1.2 Extracapsular cataract extraction

An incision was made with a slit knife in the peripheral cornea and the anterior chamber entered. The corneal section was widened with scissors. The anterior chamber was marked with trypan blue and the anterior chamber then filled with VEM consisting of a sodium chondroitin sulfate and sodium hyaluronate mixture. We then performed an "envelope" anterior capsulotomy between the 2 and 10 o'clock quadrants. The nucleus was freed and expressed following hydrodissection. The remaining cortex was removed with an aspiration cannula. IOL implantation was performed after administering 1% sodium hyaluronate within the capsular sac. The VEM was aspirated and the incision closed with a 10/0 suture.

2.2 Statistical Analysis

The SPSS (Statistical Package for Social Sciences) 20 statistical package software was used for statistical analyses. Descriptive statistics were presented as mean ± standard deviation and percentages. The chi-square test was used to compare qualitative data. The Kolmogorov-Smirnov test was used to determine whether quantitative data conformed with a normal distribution. We then used Student's t-test to compare parameters between two groups conforming with a normal distribution. A p-value <0.05 was considered significant

3. RESULTS

The age range of the 135 cases in total was 50-92 years and the mean age was 69.78±7.84 years. The mean age was 67.26±8.16 years in the PE group and 69.96 ±10.07 years in the ECCE group. There was no significant difference between the groups for age ($p=0.116$). There were 89 (65.92%) male and 46 (34.07%) female cases. The PE group consisted of 36 males (58.1%) and 26 females (41.9%) while the ECCE group consisted of 53 males (72.6%) and 20 females (27.4%). The gender distribution did not show a significant difference between the groups ($p=0.076$). Mature cataract was the most common cataract type in our cases (Table 1). Preoperative inadequate mydriasis (<5.5 mm) was found in 32 cases (23.70%) with 12 (19.35%) in the PE group and 20 (27.39%) in the ECCE group.

Table 1. Types of cataract in our cases

Cataract Type	Number of case (n)	Percentage of total number (%)
Immature	60	44.44
Mature	63	46.67
Hypermature	6	4.44
Intumescent	6	4.44
Total	135	99.99

Evaluation of the type of surgery revealed that PE+Posterior Chamber (PC) IOL had been planned for 62 cases (45.92%) and ECCE+PC IOL for 73 cases (54.07%) but problems during the surgery had resulted in PE+PC IOL in 61 cases (45.18%), ECCE+PC IOL in 64 cases (47.40%), ECCE+Anterior Chamber (AC) IOL in 9 cases (6.66%), and ECCE without IOL implantation in 1 case (0.74%). The most common intraoperative complication was miosis, followed by PCR (Table 2). PCR developed in 3 of the PE+IOL patients and an AC IOL was implanted in one case. One of these was due to zonulolysis development while a groove was being created; the incision was widened and the surgery converted to ECCE. The PCR developed during IA while the posterior capsule was being polished in two cases and there was the vitreous loss in only one. PCR developed in 10 of the cases planned to undergo ECCE+IOL. Seven of these were while the cataract was being extracted from the eye, 2 during cortical cleaning and 1 while the IOL was being implanted. An AC IOL was implanted in 8 of these cases and a ciliary sulcus IOL in 1 while one was left aphakic. The ECCE group had a statistically significantly higher rate of intraoperative complications ($p=0.002$) (Table 2). A CTR was placed into 1 case in the PE group (before I/A) and 3 cases in the ECCE group (1 after hydrodissection and 2 after nucleus expression).

The most common complication in the early postoperative period was corneal edema, followed by IOP increase and anterior chamber fibrin reaction. The early postoperative complication rate was statistically significantly much higher in the ECCE group ($p<0.001$) (Table 2). The complications in the PE and ECCE groups have been presented in Table 2. There was no statistically significant difference between the two groups regarding late postoperative complications ($p=0.594$). Table 3 presents the methods used for intraoperative pupil dilatation.

4. DISCUSSION

Eyes with PES are more prone to complications during cataract surgery with a reported rate of 1-25% [13]. Inadequate pupillary dilatation and zonular weakness are most commonly blamed for these complications. The inadequate pupil dilatation has been reported to be the result of degeneration of the iris stroma and muscle layer due to PEM [1]. The local production of PEM in the attachment area of lens zonules to the lens and ciliary body basal membrane leads to mechanical loosening while the released lysosomal enzymes cause zonulolysis and weakening. These changes are believed to be the cause of the spontaneous lens subluxation and dislocation and iridophacodonesis [1,13]. The phacodonesis or lens subluxation rate in PES patients has been reported as 8.4-10.6% [12]. Our total group had a rate of 23.70% for inadequate pupillary dilatation with mydriatics and 7.40% for iridophacodonesis preoperatively.

It is reported that the cataract surgery complications such as PCR and vitreous loss in PES cases are due more to inadequate pupillary dilatation than to zonular instability [8,14]. Lumme et al. [8] found PCR at a rate of 10.2% and zonule dialysis at 14.8% and reported that pupil diameter was a predictable risk factor for zonular dialysis by itself but that zonular dialysis could best be explained only with PES. Guzek et al. [15] have reported that inadequate pupillary dilatation increases the vitreous loss risk 7 times. Demirtaş et al. [16] have recommended ECCE surgery combined with radial iridotomy in cases with a rigid pupilla where preoperative pupillary mydriasis cannot be ensured, so as to avoid potential surgical complications. Drolsum et al. [17] have found a smaller pupil diameter and a higher rate of complications such as PCR and zonule dialysis in PES patients. However, the rate of such complications was independent of the pupillary diameter. They believed the reason was the use of radial iridotomy at a high rate in eyes with a small pupil [17]. The most common intraoperative complication was miosis (23.70%) in our cases. Sphincterotomy, full-thickness iridotomy and iris hooks were used to ensure adequate pupil dilatation when intracameral administration of diluted adrenaline was not sufficient. Sphincterotomy was the most

Table 2. Intraoperative and postoperative early and late period complications of our cases

Complications		PE+IOL (n,%)	ECCE+IOL (n,%)	p
Intraoperative	miosis	12 (19.35%)	20 (27.39%)	0.002*
	PCR	3 (4.83%)	10 (%13.69)	
	vitreous loss	2 (3.22%)	9 (12.32%)	
	zonulolysis	2 (3.22%)	5 (6.84%)	
Early postoperative	IOP increase	3 (4.83%)	17 (23.28%)	<0.001*
	fibrin reaction	2 (3.22%)	10 (13.69%)	
	corneal edema	9 (%14.51)	27 (36.98%)	
Late postoperative	posterior capsule opacification	1 (1.61%)	3 (4.10%)	0.594
	IOL decentralization	1 (1.61%)	0	
	endothelial failure	1 (1.61%)	1 (%1.36)	

PE, Phacoemulsification; IOL, Intraocular lens; ECCE, Extracapsular cataract extraction; PCR, Posterior capsule rupture; IOP, Intraocular pressure. A p value <0.05 was accepted as significant

commonly preferred technique at 8.14%. Sphincterotomy provided adequate dilatation in 4 cases in the PE group and 7 cases in the sphincterotomy group. Full-thickness iridotomy was performed in 3 of our cases and all were in the ECCE group.

Table 3. Methods used for intraoperative pupil dilatation*

Method	PE+IOL	ECCE+IOL
Sphincterotomy	4	7
Full-thickness iridotomy	0	3
Iris hooks	2	0
Total	**6**	**10**

PE, Phacoemulsification; IOL, Intraocular lens; ECCE, Extracapsular cataract extraction.
**These methods have been used to dilate the pupil when intracameral administration of diluted adrenaline could not provide adequate pupil dilatation for surgery*

PE surgery has been reported to be generally safer than ECCE in PES cases [1,11,12]. Freyler et al. [11] have reported the intraoperative complication rate during cataract surgery in PES patients as 26.47% with ECCE and 11.76% with PE surgery, with the most important risk factor being intraoperative miosis. The mydriasis was inadequate with preoperative topical mydriatics in 32 patients (23.70%) in our study with 12 (19.35%) in the PE group and 20 (27.39%) in the ECCE group. The intraoperative complication rate was statistically significantly higher in the ECCE group. The reason could be the higher inadequate preoperative mydriasis rate and intraoperative miosis in the ECCE group. The fact that PE surgery is performed in a closed system could also lead to much less stress on the zonules during nuclear fracture during PE than on the capsule-zonule diaphragm during the expression of the nucleus in ECCE.

An increase in IOP following cataract surgery has been reported in eyes with PES [1,12,18]. The albumin leaking to the anterior chamber has been found to accumulate in the trabecular network due to the disturbed blood-aqueous barrier caused by the damage induced by PEM in the vascular structures, and to make aqueous outflow more difficult [1,18]. Koçak Altıntaş et al. [18] have reported a 17% rate of early period IOP increase in eyes with PES and this rate was statistically significantly higher than in the control group (5%). Uncomplicated cataract surgery has been reported to have no long-term effect on IOP in non-glaucomatous eyes with PES [19]. There was an IOP increase in the early period in 20 cases (14.81%) among the total group and this rate was 4.83% in the PE group and 23.28% in the ECCE group. Eight of these cases had PCR+vitreous loss (2 in the PE group and 6 in the ECCE group). However, all patients in both groups were found to be normotensive in the long term. Careful biomicroscopy evaluation of PES eyes has been reported to reveal some aqueous flare and pigment granules, mostly released from the iris pigment epithelium as findings of the disturbed blood-aqueous barrier [20]. Clinical studies have revealed frequent development of fibrin reaction following cataract extraction in eyes with PES, leading to a risk of inflammation development following intraocular surgery [1,21,22]. Laurell et al. [23] have reported less damage to the blood aqueous

barrier with PE surgery, resulting in less inflammatory reaction than ECCE. Topical nonsteroidal anti-inflammatory drug (NSAID) use is recommended in the postoperative period to prevent fibrin reaction development [12]. Although topical NSAID was used in our study, a fibrin reaction was seen in 2 patients (3.22%) in the PE group and 10 patients (13.69%) in the ECCE group on the first postoperative day. The fibrin reaction rate was lower with PE, possibly because of the less traumatic technique. The endothelial cell count has been reported to be 5-9% lower in PES patients together with disturbed cellular morphology. Corneal edema can also be seen frequently due to surgical trauma and inflammation affecting the endothelial cells [1,12,21]. The postoperative corneal edema rate was 26.66% in all cases, 36.98% in the ECCE group and 14.51% in the PE group. The corneal edema became chronic and resulted in endothelial failure in two cases. The edema resolved within a maximum of 2 weeks in the other cases. The reason for the higher rate of corneal edema with ECCE could be the more traumatic procedure compared to PE. The early postoperative complication rate was statistically significantly higher in the ECCE group in our study.

A higher rate of IOL dislocation in the late postoperative period has been reported in PES patients due to the zonular weakness [24,25]. A capsular tension ring has been reported to facilitate the surgical technique by opening up the capsule that has become wrinkled and encroaching on the pupillary area in cases without zonule support, and also to prevent postoperative IOL decentralization [26]. A capsular tension ring was placed in 1 PE case and 3 ECCE cases in our study. Jehan et al. [25] have found late period spontaneous dislocation of the IOL together with the sac in 8 eyes of 7 patients after a mean duration of 85 months following uncomplicated cataract surgery. IOL dislocation was seen at the 6th month in 1 case (1.61%) in the PE group. A high risk of anterior capsular phimosis and posterior capsule opacification (PCO) has been reported following cataract surgery in PES cases [20,24]. A capsulorhexis diameter less than 5.5 mm increases the risk of anterior capsule phimosis development while the increased inflammation is known to increase the risk of PCO development [12]. Hayashi et al. [24] have reported a significantly lower capsulorhexis diameter at the postoperative 1st month in PES cases compared to those without PES. Nd: YAG laser application was required to obtain an adequate capsular opening in 9.4% of the cases. We found PCO in the postoperative second month in 2 cases (1.48%) and anterior capsule phimosis requiring Nd: YAG laser application in 1 case in the PE group in this study. PCO was determined in 3 cases (2.22%) at the postoperative 3rd month in the ECCE+IOL group. There was no significant difference between the two groups regarding later postoperative complications.

5. CONCLUSION

PES cases have a higher rate of complications including PCR and vitreous loss during cataract surgery due to factors such as inadequate pupillary dilatation, intraoperative miosis and zonulolysis [1,11,12,19]. Taking into account all the complications, we believe PE is a safer technique than ECCE for cataract surgery in selected PES cases. However, the high rate of complications after ECCE in our study may also be due to the higher preoperative and intraoperative miosis rates in this group. Surgical experience is also known to potentially influence results with either surgical technique. In conclusion, PES patients should undergo a detailed evaluation before cataract surgery, the surgery should be performed carefully, and early and late postoperative complications should be anticipated.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Fontana L, Coassin M, Iovieno A, Moramarco A, Cimino L. Cataract surgery in patients with pseudoexfoliation syndrome: Current updates. Clin Ophthalmol. 2017;11:1377-83.
2. Wang W, He M, Zhou M, Zhang X. Ocular pseudoexfoliation syndrome and vascular

disease: A systematic review and meta-analysis. PLoS One. 2014;9(3):e92767.

3. Yalaz M, Othman I, Nas K, Eroğlu A, Homurlu D, Cikintas Z, et al. The frequency of pseudoexfoliation syndrome in the eastern Mediterranean area of Turkey. Acta Ophthalmol. 1992;70(2):209-13.
4. Cumurcu T, Kilic R, Yologlu S. The frequency of pseudoexfoliation syndrome in the middle Black Sea region of Turkey. Eur J Ophthalmol. 2010;20(6):1007-11.
5. Kılıç R, Karagöz N, Çetin AB, Çakmak Y, Sezer H, Özay Y, et al. The prevalence of exfoliation syndrome in Turkey. Acta Ophthalmol. 2016;94(2):e105-8.
6. Kılıç R, Sezer H, Comçalı SÜ, Bayraktar S, Göktolga G, Cakmak Y, et al. The frequency of exfoliation syndrome in the central anatolia region of Turkey. J Ophthalmol. 2014;2014:139826.
7. Drolsum L, Ringvold A, Nicolaissen B. Cataract and glaucoma surgery in pseudoexfoliation syndrome: A review. Acta Ophthalmol Scand. 2007;85(8):810-21.
8. Lumme P, Laatikainen L. Exfoliation syndrome and cataract extraction. Am J Ophthalmol. 1993;116(1):51-5.
9. Babaoğlu B, Küçümen BS, Kubaoğlu B, İçağasıoğlu A. Psödoeksfoliasyon sendromu ve katarakt ekstraksiyonu. TOD XXX. Ulusal Kongresi Antalya. 1996;336-9.
10. Sunay E, Şentürk A, Borataç N, Şendilek B, Erbil H. Katarakt hastalarında eksfoliasyon sıklığı ve cerrahi sonuçlar. T Klin Oftalmoloji. 1997;6(1):31-5.
11. Freyler H, Radax U. Pseudoexfoliation syndrome--a risk factor in modern cataract surgery? Klin Monbl Augenheilkd. 1994;205(5):275-9.
12. Sangal N, Chen TC. Cataract surgery in pseudoexfoliation syndrome. Semin Ophthalmol. 2014;29(5-6):403-8.
13. Schlötzer-Schrehardt U, Naumann GO. A histopathologic study of zonular instability in pseudoexfoliation syndrome. Am J Ophthalmol. 1994;118(6):730-43.
14. Elibol O, Güler C, Alçelik T, Erdoğan T. Eksfoliasyon sendromunun PEKKE ve arka kamara göz içi lens implantasyonuna etkisi. MN Oftalmoloji. 1995;2(4):342-45.
15. Guzek JP, Holm M, Cotter JB, Cameron JA, Rademaker WJ, Wissinger DH, et al. Risk factors for intraoperative complications in 1000 extracapsular cataract cases. Ophthalmology. 1987; 94(5):461-6.
16. Demirtaş F, Nurözler A, Duman S. Radyal iridotomi. MN Oftalmoloji. 1996;3:307-10.
17. Drolsum L, Haaskjold E, Kjell S. Phacoemulsification in eyes with pseudoexfoliation. J Cataract Refract Surg. 1998;24(6):787-92.
18. Koçak Altıntaş AG, Dabıl H, Midillioğlu Koçak İ, Duman S. Katarakt cerrahisinin psödoeksfoliasyonlu gözlerde erken ve geç dönem göz içi basıncına etkisi. T Klin J Ophthalmol. 1999;8(2):122-27.
19. Dosso AA, Bonvin ER, Leuenberger PM. Exfoliation syndrome and phacoemulsification. J Cataract Refract Surg. 1997;23(1):122-5.
20. Küchle M, Vinores SA, Mahlow J, Green WR. Blood-aqueous barrier in pseudoexfoliation syndrome: Evaluation by immunohistochemical staining of endogenous albumin. Graefes Arch Clin Exp Ophthalmol. 1996;234(1):12-8.
21. Zetterström C, Olivestedt G, Lundvall A. Exfoliation syndrome and extracapsular cataract extraction with implantation of posterior chamber lens. Acta Ophthalmol (Copenh). 1992;70(1):85-90.
22. Drolsum L, Davanger M, Haaskjold E. Risk factors for an inflammatory response after extracapsular cataract extraction and posterior chamber IOL. Acta Ophthalmol. 1994;72(1):21-6.
23. Laurell CG, Zetterström C, Philipson B, Syrén-Nordqvist S. Randomized study of the blood-aqueous barrier reaction after phacoemulsification and extracapsular cataract extraction. Acta Ophthalmol Scand. 1998;76(5):573-8.
24. Hayashi H, Hayashi K, Nakao F, Hayashi F. Anterior capsule contraction and intraocular lens dislocation in eyes with pseudoexfoliation syndrome. Br J Ophthalmol. 1998;82(12):1429-32.
25. Jehan FS, Mamalis N, Crandall AS. Spontaneous late dislocation of intraocular lens within the capsular bag in pseudoexfoliation patients. Ophthalmology. 2001;108(10):1727-31.

26. Bayraktar Ş, Altan T, Küçüksümer Y, Yılmaz ÖF. Psödoeksfoliasyon sendromu ile birlikte olan kataraktların fakoemülsifikasyonu sırasında kapsüloreksisi takiben kapsül germe halkası uygulaması. MN Oftalmoloji. 2001;2(8):117-21.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/23140