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Original Article

Pre-, intra- and post-operative management in phacoemulsification surgery for completely monocular cases

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Abstract

Aim: To evaluate the results of phacoemulsification (PE) surgery in completely monocular cases and to emphasize the important points in the pre-, intra- and post-operative periods.

Material and Methods: A total of 42 patients who had no light perception in one eye and had underwent PE surgery in the other eye at our clinic between January 2014 and March 2016 were included in the study. The charts of the patients were evaluated retrospectively. The age and gender of the cases, whether there was an additional pathology in the eye undergoing surgery, the reason of visual loss in the other eye, the type of anesthesia used, pre- and post-operative best corrected visual acuity (BCVA) with the Snellen chart, intraocular pressure and intra- and post-operative complications were investigated.

Results: There were17 (40.5%) female and 25 (59.5%) male patients with a mean age of 74.2±10.5 (45-93) years. The most common causes of the monocular state were glaucoma, cataract and trauma, the most common accompanying pathologies in the eyes undergoing cataract surgery were glaucoma, zonular weakness and age-related macular degeneration. Mean BCVA was 0.07±0.1 (0.01-0.4) pre-operatively and 0.5±0.3 (0.01-1) post-operatively ($p \leq 0.001$). The mean follow-up duration was 3.9±5.6 months (1 week to 24 months). The most common post-operative complication was corneal edema.

Conclusion: The stress created by cataract surgery on the physician and patient is quite high in monocular cases. However, satisfactory results with PE are obtained in these cases by carefully using pre-, intra- and post-operative methods.

Keywords: Phacoemulsification; Cataract surgery; Monocular.

INTRODUCTION

Deciding on surgery is quite difficult both for the patient and the surgeon in monocular patients, especially in the presence of a previous unsuccessful cataract surgery. The decision is usually delayed as the permanent visual loss that could develop with unsuccessful cataract surgery will have a significant effect on the quality of life. Incision sizes have become smallerin parallel with the rapid advances in lens technology in recent years and cataract surgery has become more reliable and comfortable (1,2). However, the presence of additional eye disorders or systemic diseases will affect both the surgery and the post-operative anatomical and visual success (3,4). Furthermore, an increased rate of the problems that have already caused the loss of the other eyeand also a higher rate of surgical complications have been reported in monocular cases (5). In conclusion, even though cataract surgery has become safer with the developing technology and increasing experience, our reservations in monocular patients continue.We evaluated the results of completely monocular cases who had undergone phacoemulsification (PE) during a period of two years at our clinicin this study. We also discuss the pre-, intra- and post-operative significant issues for these cases.

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MATERIAL and METHODS

The charts of 1485 patients who underwent intraocular lens implantation with PE between January 2014 and March 2016 at the İnönü University Medical Faculty, Department of Ophthalmology were retrospectively reviewed. A total of 61 completely monocular cases with no sense of light in the eye that was not being operated on were included in the study. Cases who underwent vitrectomy or glaucoma surgery combined with cataract surgery in the eye undergoing cataract surgery and cases that had previously undergone pars plana vitrectomy were excluded (Figure 1). The age and gender, whether there was an additional pathology in the eye undergoing surgery, the reason of visual loss in the other eye, the eye being operated, the type of anesthesia, pre-operative and post-operative visual acuities, intraocular pressures and pre-operative and post-operative complications were determined for the remaining 42 eyes.

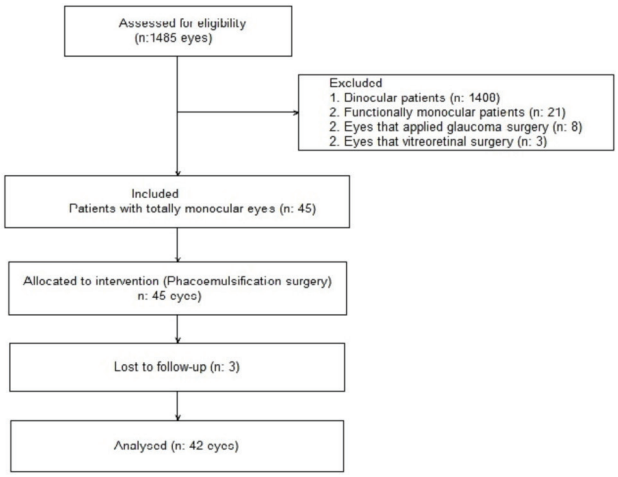

Figure 1. Flow of the participants through the study

The best corrected visual acuity (BCVA) was evaluated with the Snellen chart at our clinic and 1% cyclopentolate (Sikloplejin®, Abdi İbrahim), 1% tropicamide (Tropamid®, Bilim) and 2.5% phenylephrine (Mydfrin®, Alcon) were used for the pre-operative pupillary dilatation. After cleaning the periocular with 10% povidone iodine pre-operatively, a sterile drape wasplacedso as to completely cover the eyelashes. Eyelids opening was ensured with alid speculum and 5% povidone iodine drops were applied to the fornix. General anesthesia was used in 2 cases, topical anesthesia in 17, and a peribulbar or retrobulbar injection in 23 patients. General anesthesia was preferred in patients who could not cooperate. PE was performed with a 2.2 mm clear corneal incision in all cases. 0.5% moxifloxacin was administered to the anterior chamber at the end of surgery. The cases were treated with topical steroid and antibiotic drops afterwards. Post-operative follow-up examinations were performed on the 1st day, 3rd day, 1st week, 2nd week and 1st month and then when necessary. The best corrected visual acuity at least 1 month after the surgery was used as the basis when evaluating the final visual acuity.

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Statistical Analysis

Statistical analyses were performed with SPSS for Windows version 17.0 program. Continuous data are reported as mean ± standard deviation (SD). Categorical data are reported as count (n) and percent (%). Normality for continuous variables in groups was determined by Shapiro-Wilk tests. Student t test on matched pairs was used. A value of $p< 0.05$was considered significant.

RESULTS

There were 17 (40.5%) female and 25(59.5%) male cases included in the study and the mean age was 74.2±10.5 (45-93)years. The surgery was on the right eye in 24cases(57.1%) and the left eye in 18cases (42.9%). The mean follow-up duration was 3.9±5.6 (1-24) months (Table 1). Surgery was performed using iris hooks in 4 quadrants in four cases where sufficient pharmacological pupil dilatation could not be obtained. Stretch pupilloplasty was used in one case and sphincterotomy in one case. A capsular tension ring was inserted in seven cases with zonular weakness. Posterior capsule rupture developed during the surgery in one case and the IOL was placed in the sulcus after anterior vitrectomy. An IOL could not be placed in one case and secondary implantation withinitial correction by glasses was planned. IOL implantation was performed in the capsular pocket in all other cases. No IOL dislocation or decentralization was encounteredduring the post-operative follow-up duration in any of the cases (Table 2).

Tablo 1. Demographic characteristics of patients and other information (n: 42)

Characteristics	Value
Age (years)	
Mean±SD	74.2 ± 10.5
Min-Max	45-93
Gender, n (%)	
Male	17 (40.5)
Female	25 (59.5)
Eye, n (%)	
Right	24 (57.1)
Left	18 (42.9)
Anesthesia, n (%)	
Topical	17 (40.5)
Injection	23 (54.8)
General	2 (4.7)
Follow-up (months)	
Mean ± SD	3.9 ± 5.6
Range	1-24

Table 2. Additional surgery at the time of cataract surgery (n: 42)

Surgery	Number of Eyes (%)
Planned	
Capsular tension ring implantation	7 (16.7)
Iris retractors usage	4 (9.6)
Stretch pupilloplasty	1 (2.4)
Sphincterotomy	1 (2.4)
Unplanned	
Anterior vitrectomy	1 (2.4)
Sulcus IOL placement	1 (2.4)

The visual acuity in the eyes that were not being operated was no perception of light. The pre-operative BCVA in the operated eyes was between 0.4 and hand movements. The pre-operative mean BCVA was 0.07±0.1 (0.01-0.4) and the post-operative mean BCVA was 0.5±0.3 (0.01-1). Pre-operative vision was hand movements in thirteen cases (30.9%). The post-operative VA was not changed in two of these cases, one with age-related macular degeneration (ARMD) and the other with glaucomatous optic atrophy, but was increased in 11 cases. An increase in visual acuity was found in 35 (83.3%) patients in the total group and remained the same in 7 cases (16.7%). No decrease in BCVA was detected in any of these patients. A post-operative visual acuity of 0.5 or better was present in 20 (47.6%) cases and 1.0 or better in 6 (14.3%) cases (Figure 2). An additional problem was present in all the eyes with a visual acuity of 0.5or less.

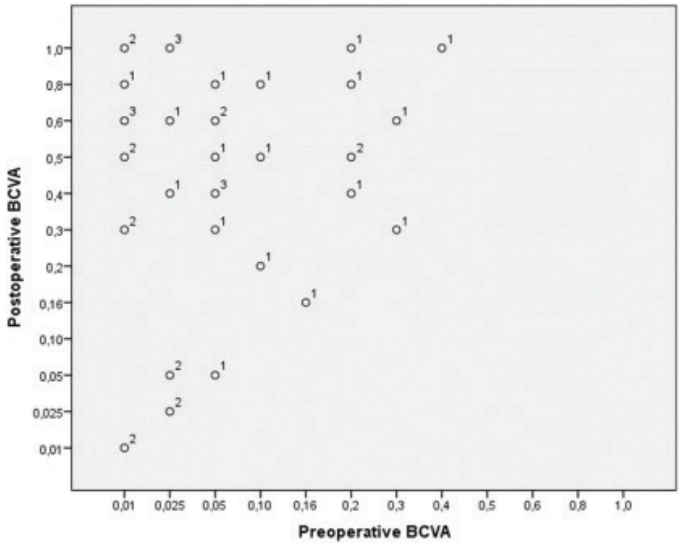

Figure 2. Scattergram of preoperative vs postoperative best-corrected visual acuity (BCVA). The numbers on the scattergram indicate the number of eyes at each point

An accompanying ocular pathology was present in 35 (83.3%) of the operated eyes and glaucoma was the most common as found in 11 cases (26.2%). Other accompanying eye disorders are presented in Table 3.

The cause of being monocular was surgical reasons in 10 (23.8%) and medical reasons in 32 (76.2%) of our cases. While post-operative endophthalmitis was the most common surgical reason, glaucoma as found in 11cases (26.2%) was the most common medical reason. The other reasons are presented in Table 4.

Post-operative corneal edema was seen in 5 cases (11.9%) and medical treatment resulted in improvement in all cases.Post-operative early increase in intraocular pressure occurred in three cases but there was no permanent intraocular increase in any case. Posterior capsule opacification developed in two cases.There was no case of endophthalmitis (Table 5).

Tablo 3. Ocular co-morbidities in eyes having phacoemulsification surgery (n: 42)

Co-morbidity	Number of eyes (%)
Glaucoma	11 (26.2)
Zonular weakness	7 (16.7)
Age-related macular degeneration	7 (16.7)
Pseudoexfoliation syndrome	5 (11.9)
Uveitis	2 (4.8)
Lens subluxation	1 (2.4)
Diabetic retinopathy	1 (2.4)
Pathologic myopia	1 (2.4)
Corneal opacity	1 (2.4)
Nystagmus	1 (2.4)
Toplam	35 (83.3)

Table 4. Reasons for blindness in unoperated eyes (n: 42)

Reason	Number of eyes (%)
Medical	
Glaucoma	11 (26.2)
Cataract	5 (11.8)
Trauma	5 (11.8)
Optic atrophy	4 (9.6)
Uveitis	2 (4.8)
Retinal detachment	2 (4.8)
Enucleation	2 (4.8)
Phthisis bulbi	1 (2.4)
Total	32 (76.2)
Surgical	
Endophthalmitis	3 (7.1)
Postoperative retinal detachment	4 (9.6)
Suprachoroidal hemorrhage	3 (7.1)
Total	10 (23.8)

Table 5. Intraoperative and early postoperative complications (n: 42)

Problem/Complication	Number of Eyes (%)
Thermal corneal injury	5 (11.9)
Intraocular pressure spike	3 (7.1)
Vitreous loss	1 (2.4)
Posterior capsule tear	1 (2.4)
Aphakia	1 (2.4)
Posterior capsule plaque	2 (4.8)
Toplam	13 (31)

DISCUSSION

When deciding on cataract surgery in monocular patients, the visual acuity of the patient and whether it is adequate for daily needs should be carefully assessed. In addition, the age and occupation and the presence of anyadditional ocular or systemic disorders should be considered. A very old patient sitting at home and able to meet eating and drinking and toilet needs can be followed-up at short intervals and surgery performed only when the patient is unable to meet these needs. However, it should not be forgotten that these patients become vulnerable to domestic and outdoor accidents. On the other hand, surgery can be scheduled earlier in a young and active patient who is unable to do his job (6,7). Bergwerk and Miller recommended cataract surgery when daily activities are affected in monocular cases and reported that the approach should be the same as in patients with bilateral functioning eyes (8). However, the incidence of additional problems causing the loss of the other eye with scheduled surgery was reported to be significantly increased (5,8). A more careful pre-operative examination is therefore important in these patients. In addition, preoperative testing (routine medical tests and electrocardiograms) may have a positive impact on ophthalmologic and systemic outcomes (9).We evaluate the deterioration of the patient's quality of life and the difficulty performing daily activities among the criteria for surgery in our monocular cases.

Trotter and Miller reported in their study that being monocular was due to surgical reasons in 13% and medical reasons in 87% of their patients with ARMD, DRP and glaucoma the most common causes (10). Similarly, Bergwerk and Miller reported that being monocular was due to surgical reasons in 14% and medical reasons in 86% of their patients and additional problems were noted in the eye being operated in 75% of the cases (8). In a study, the most common additional disorders in the eyes undergoing surgery were ARMD, open angle glaucoma, pseudoexfolation syndrome and retinal detachment (5). The most common causes of visual loss in the eye without vision in our study where we included fully monocular eyes were glaucoma, phthisis bulbi, corneal leucoma and complications related to cataract and cataract surgery while the most common accompanying problems in the eye undergoing surgery were glaucoma, zonular weakness and pseudoexfoliation syndrome. The cause of being monocular was medical in 76.2% of the cases and surgical in 23.8%. An additional disorder was present in the eye undergoing surgery in 83.3% (35 eyes) of our cases.

In the study of Pomberg and Miller (11), the mean preoperative BCVA was 20/47.3, in the study of Trotter and Miller (10), the median preoperative BCVA was 20/50 and in the study of Bergwerk and Miller (8), the median preoperative BCVA was 20/60, and the mean preoperative BCVA was 0.07±0.1 (it is almost equal to 20/250) in our study. Miller and Miller (5)also reported that BCVA had decreased in 19.2% of the functionally monocular eyes, in 6.3% of the completely monocular eyes. Pre-operative vision was at the handmovement level in thirteen cases (30.9%) in our study. While post-operative VA did not change in two of these cases, one due to ARMD and the other to glaucomatous optic atrophy, it increased in 11 cases. Visual acuity increased in 35 (83.3%) cases among all of the cases and remained the same in 7 (16.7%) cases.Ourpatients' pre-operative and post-operative mean BCVA may be lower than in other publications because patients visitthe physician later in our society and additional problems may have already damaged the eye more significantly.

The above studies report the most common accompanying pathologies in the operated eye in monocular cases as glaucoma, pseudoexfolation syndrome, zonular weakness, age-related macular degeneration and diabetic retinopathy (5,8,10,11). These pathologies can be easily detected during a preoperative careful anterior and posterior segment examination. Additional surgical equipment (capsular tension ring, iris hooks and dilators) and manipulations (sphincterotomy, pupillary stretching) can be required due to zonular weakness and difficult pupillary dilatation in cases with pseudoexfolation and those with glaucoma. Besides, the risk of intra-operative complications increases due to the increased capsule fragility in addition to endothelial sensitivity in these cases. Complications such as corneal edema and fibrinoid reaction are often encountered in the post-operative period in these patients. One should also not forget that there may be severe intraocular pressure elevations in the first 24 hours after the surgery when combined surgery is not performed in glaucoma cases (12,13). The operating room should be prepared meticulously, intra-operative manipulations performed carefully and caution exercised in the post-operative follow-up for these cases.

Although the evidence on whether cataract surgery initiates ARMD symptoms in eyes without ARMD or accelerates neovascular ARMD development in cases with early ARMD is inadequate, there is some concern regarding this issue (14,15). This matter should especially be considered when planning surgery in monocular cases with early ARMD.In patients with uveitis, surgery should only be planned in the period when the inflammation is suppressed and one must be careful in both the intra- and post-operative periods regarding accompanying cornea and iris pathologies, glaucoma, vitritis, epiretinal membrane, cystoid macular edema and post-operative intraocular pressure elevation (16). Post-operative macular edema can develop at a rate of 50-75% in cases with non-proliferative diabetic retinopathy and the rate of progression to proliferative retinopathy is 30%. Iris neovascularization, pupillary block, posterior synechia, pigmentary lens deposits and severe iritis can also be seen in these cases due to cataract surgery (17,18). The cases should therefore be carefully evaluated both during and after surgery to determine the most appropriate treatment regimen.

It is reported that 40% of the cases with a rhegmatogenous retinal detachment have undergone cataract surgery previously. A careful retinal examination should especially be performedin cases that have lost the other eye due to retinal detachment and the necessary prophylactic procedures should be performed in the presence of predisposing peripheral retinal degenerations such as lattice degeneration (19).

CONCLUSION

In conclusion,although cataract surgery has now become safer with the developing technology and increasing experience, our reservations in monocular patients still continue. It is therefore necessary to talk to the patient and relatives in detail regarding the benefits and risks of the surgery, and whether the patient's sight is sufficient for his/her daily activities and work. Satisfactory results can be obtained with PEas long ascareful pre-operative examination and preparation, careful surgical manipulation during the surgery, and attentive post-operative care are ensured.

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REFERENCES

1. Dewey S, Beiko G, Braga-Mele R, et al. Microincisions in cataract surgery. J Cataract Refract Surg 2014;40:1549-57.
2. Alió J, Rodriguez-Prats JL, Galal A. Advances in microincision cataract surgery intraocular lenses. Review. Curr Opin Ophthalmol 2006;17:80-93.
3. Haddad NM, Sun JK, Abujaber S, et al. Cataract surgery and its complications in diabetic patients. Review. Semin Ophthalmol 2014;29:329-37.
4. Mehta S, Linton MM, Kempen JH. Outcomes of cataract surgery in patients with uveitis: a systematic review and meta-analysis. Review. Am J Ophthalmol 2014;158:676-692.e7.
5. Miller AR, Miller KM. Outcomes of cataract extraction in seeing eyes of functionally monocular versus completely monocular patients. J Cataract Refract Surg 2010;36:712-7.
6. Addou-Regnard M, Fajnkuchen F, Bui A, et al. Impact of lens thickness on complications of hypermature cataract surgery: A prospective study. J Fr Ophtalmol 2016;39:631-5.
7. Robinson MS, Olson RJ. Simple approach to prevent capsule tear-out during capsulorhexis creation in hypermature cataracts. J Cataract Refract Surg 2015;41:1353-5.
8. Bergwerk KL, Miller KM. Outcomes of cataract surgery in monocular patients. J Cataract Refract Surg 2000;26:1631-7.
9. Cavallini GM, Saccarola P, D'Amico R, et al. Impact of preoperative testing on ophthalmologic and systemic outcomes in cataract surgery. Eur J Ophthalmol 2004;14:369-74.
10. Trotter WL, Miller KM. Outcomes of cataract extraction in functionally monocular patients; case-control study. J Cataract Refract Surg 2002;28:1348-54.
11. Pomberg ML, Miller KM. Functional visual outcomes of cataract extraction in monocular versus binocular patients. Am J Ophthalmol 2004;138:125-32.
12. Levkovitch-Verbin H, Habot-Wilner Z, Burla N, et al. Intraocular pressure elevation within the first 24 hours after cataract surgery in patients with glaucoma or exfoliation syndrome. Ophthalmology 2008;115:104-8.
13. Verges C, Cazal J, Lavin C. Surgical strategies in patients with cataract and glaucoma. Curr Opin Ophthalmol 2005;16:44-52.
14. Wang JJ, Klein R, Smith W, et al. Cataract surgery and the 5-year incidence of late stage age-related maculopathy: pooled findings from the Beaver Dam and Blue Mountains eye studies. Ophthalmology 2003;110:1960-7.
15. 15.Kaiserman I, Kaiserman N, Elhayany A, et al. Cataract surgery is associated with a higher rate of photodynamic therapy for age-related macular degeneration. Ophthalmology 2007;114:278-82.
16. Mehta S, Kempen JH. Cataract surgery in patients with uveitis. IntOphthalmolClin 2015;55:133-9.
17. Haddad NM, Sun JK, Abujaber S, et al. Cataract surgery and its complications in diabetic patients. Semin Ophthalmol 2014;29:329-37.
18. Peterson SR, Silva PA, Murtha TJ, et al. Cataract surgery in patients with diabetes: Management Strategies. Semin Ophthalmol 2018;33:75-82.
19. Haiman MH, Burton TC, Brown CK. Epidemiology of retinal detachment. Arch Ophthalmol 1982;100:289-92.