Original Article

Stabilization Time of Refractive Errors and Astigmatism after Cataract Surgery Using Phacoemulsification and Foldable Intraocular Lens Implants

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Abstract

Purpose: To evaluate the stabilization time of astigmatism and refractive errors after cataract surgery using phacoemulsification and foldable lens implantation.

Patients and Methods: The present cross-sectional study was carried out with convenience sampling method and included patients who underwent cataract surgery using phacoemulsification and implantation of foldable intraocular lens. The patients were evaluated and their data including age, sex, uncorrected visual acuity, best corrected visual acuity, corneal cylinder, cylinder axis, Sim K, and intra ocular pressure were recorded prior to the surgery as well as in days 2, 3, 4, weeks 1, 2, 5 and day 75 post surgery.

Results: Eighty one eyes of 77 patients with mean age of 61.39 ± 10.9 years were evaluated. The mean follow up time was 60.5 ± 48.86 days. The mean keratometry before surgery was 44.90 ± 1.85 diopters, while the mean axial length, the mean intraocular pressure and the mean astigmatism were 23.15 ± 1.98 mm, 14.01 ± 2.95 mmHg and 0.99 ± 1.10 diopters, respectively. The mean postoperative keratometry at last visit was 45.34 ± 1.80 diopters, and the mean intraocular pressure and astigmatism were, 12.46 ± 2.87 mmHg and 1.14 ± 0.96 diopters, respectively. The mean time for refraction stabilization was 11.46 ± 11.40 days and the mean stabilization time for astigmatism was 10.18 ± 11.34 days.

Conclusion: In the present study the mean stabilization time for refraction and astigmatism after cataract surgery in an Iranian population using phacoemulsification and foldable lens implantation was comparable with previous studies.

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Introduction

Cataract refers a clouding of the lens in the eye and is the dominant cause of blindness worldwide [1]. Age is the most common cause of cataract so its prevalence increases with age [1]. In a recent meta-analysis from Iran a 9.27 % overall frequency of clinical cataract has been reported [2]. Some probable factors affecting the cataract prevalence are gender, trauma, environment and geography, nutrition, toxins, systemic and metabolic diseases (including diabetes mellitus), hereditary diseases, tobacco and alcohol consumption, steroids usage, black race and myopia [3]. Change and degradation of proteins in the lens are considered as the effective factors to create cataract, but the pathogenesis of this phenomenon is not entirely understood [4]. Early findings in cataract are diminished near vision, loss of compliance, decreased visual acuity, blurred vision, reduced contrast vision, and occasional monocular double vision [5].

Today, the phacoemulsification surgery is considered as the most common type of cataract surgery [5].

To achieve the best level of vision following cataract surgery eye glasses or contact lenses may be needed, but before prescribing sunglasses or contact lenses to correct post surgical refraction errors ocular measurements must stabilize. There are few studies evaluating the stabilization time of refraction and astigmatism following cataract surgery [6-9]. The purpose of the present study was to determine the stabilization time for the astigmatism and refractive errors after cataract surgery using phacoemulsification method and foldable lens implantation in an Iranian population.

Patients and Methods

The present cross-sectional study was performed using convenience sampling method and included patients who underwent cataract surgery using phacoemulsification and implantation of foldable intraocular lens. This study was approved by the ethics committee of Kerman University of Medical Sciences, Kerman, Iran, and all participants gave written consent before entering the study. The patients were evaluated and their data including age, sex, uncorrected visual acuity, best corrected visual acuity, corneal cylinder, cylinder axis, Sim K, and intra ocular pressure were recorded prior to the surgery as well as in days 2, 3, 4, weeks 1, 2, 5 and day 75 post surgery. The anteroposterior axis length of the eye was measured using A scan. SRK IJ formula was used for determining the IOL power in eyes with anteroposterior axis length of less than 25 mm and if the anteroposterior axis length of the eye was more than 25 mm SRK T formula was used. The preferred incision for patients was temporal incision, except in patients who had with the rule astigmatism of 1.5 diopters or more in their keratometry reading, in which case the superior incision was applied.

To perform the surgery a 2.3 mm temporal or superior corneal incisions was performed. Then the lens was placed in capsular bag and post-operative incisions were not stitched. At the end of surgery, cefazolin (0.5cc/50mg) and betamethasone (1cc/4mg) were injected under conjunctiva and eyes were dressed for one day. In this study, the device used for the phacoemulsification surgery was Storz, Protégé (Bausch & Lomb, Inc., NY, USA) and a foldable intraocular lens, Akreos Fit (Bausch & Lomb, Inc., New York, USA) was implanted. In the first preoperative examination, patients' approximate vision calculation was performed by slit lamp. In other examinations, the uncorrected visual acuity, determination of refractive error by refractometer, IOP

measurement and slit lamp examination were performed. If, in three consecutive examinations, patient refractive error was unchanged examinations were terminated. In the last examination, visual acuity was corrected and keratometry was also measured. The data for each patient was entered in a special form which was designed for this study. At the end of study data was extracted form the form and analyzed using SPSS software.

Results

The study included 81 eyes of 77 patients who underwent cataract surgery using phacoemulsification and intraocular lens implantation. The average age of patients in this study was 61.35 ± 10.90 years (Table 1). The minimum age was 32 years and the maximum age was 83 years. This study included 40 (49.4 %) male and 41 (50.6 %) female patients.

In the preoperative examinations, the mean keratometry was equal to 44.90 ± 1.85 diopters (Table 1) and its range was 40.50 to 49.75 diopters. The mean preoperative keratometric astigmatism was 0.99 ± 1.10 diopters (Table 1). Astigmatic axis varied from 10 to 180 degrees with a mean of 115.6 ± 52.3 degrees. The mean IOP measured before cataract surgery was 14.01 ± 2.95 mmHg (Table 1) and the IOP range was 9 to 23 mmHg. The mean anteroposterior axis length of eyes undergoing surgery was 23.15 ± 1.98 mm (Table 1).

The mean follow-up period for patients entering this study was 60.5 ± 48.86 days (Table 2).

The mean astigmatism in final examination was 1.14 ± 0.96 diopters (Table 2). In the final examination, the mean keratometry was 45.34 ± 1.80 diopters, which showed more steepness of about 0.5 diopter compared with preoperative keratometry (Table 2). The mean IOP for affected eyes at last visit after surgery was 12.46 ± 2.87 mmHg (Table 2). The post surgical mean UCVA was 7.10 ± 0.19 LogMAR and the mean BCVA was 10.10 ± 0.04 LogMAR (Table 2).

The mean time for refraction stabilization was 11.46 ± 11.40 days (Table 2). The cumulative percent of patients with stabilized refraction in post operative visits is illustrated in table 3. This cumulative percent was 27.2 % at one week, 81.5 % at two weeks and 98.8 % at five weeks post surgery.

Table 1: Demographic characteristics of the patients entering the study

Variable	Reading
Age (years)	* 61.35 ± 10.90
Gender	Male 40 (49.4 %)
	Female 41 (50.6 %)
Axial length (mm)	* 23.15 ± 1.98
Astigmatism (D)	0.99 ± 1.10
Keratometry (D)	* 44.90 ± 1.85
Mean IOP (mmHg)	* 14.01 ± 2.95

* Mean ± SD

Table 2: The mean values at final exam after surgery

Variables	Amounts (Mean)
Follow-up period (days)	60.5 ± 48.86
Astigmatism (D)	1.14 ± 0.96
Keratometry (D)	45.34 ± 1.80
IOP (mmHg)	12.46 ± 2.87
Refraction Stabilization Time (days)	11.46 ± 11.40
Astigmatism Stabilization Time (days)	10.18 ± 11.34
* UCVA (LogMAR)	7.10 ± 0.19
** BCVA (LogMAR)	10.10 ± 0.04

* Uncorrected visual acuity

** Best corrected visual acuity

Table 3: The cumulative percent of patients with stabilized refraction in post operative visits

Day	Cumulative percent
2	13.6
3	22.2
4	24.7
7	27.2
14	81.5
35	98.8
75	100.0

Table 4: The cumulative percent of patients with stabilized astigmatism in post operative visits

Day	Cumulative percent
2	22.2
3	33.3
4	35.8
7	38.3
14	84.0
35	98.8
75.00	100.0

The mean stabilization time for astigmatism was 10.18 ± 11.34 days (Table 2).

The cumulative percent of patients with stabilized astigmatism in post operative visits is illustrated in table 4. This cumulative percent was 38.3 % at one week, 84 % at two weeks and 98.8 % at five weeks post surgery.

Discussion

In the present study, we examined the stabilization time for astigmatism and refractive errors after cataract surgery using phaco-emulsification technique.

A main purpose of modern cataract surgery is to reduce corneal changes following the surgery and, and if possible correct the refractive errors and underlying astigmatism [10].

In the present study, the mean preoperative astigmatism was equal to 0.99 ± 1.10 diopters, which changed to 1.14 ± 0.96 diopters after surgery. Induced astigmatism by surgery in the present study was 0.44 ± 1.02 diopters. Similarly in a study by Masket and Tennen [11] it was equal to 0.5 diopters, and in a study by Simsek et al., [12] it was equal to 0.62 ± 0.28 diopters. The mean post surgical UCVA and BCVA in our study, were to 7.10 ± 0.19 LogMAR and 10.10 ± 0.04 LogMAR respectively.

In the present study the mean time for refraction stabilization was 11.46 ± 11.40 days and the cumulative percent of patients with stabilized refraction in post operative visits was 27.2 % at one week, 81.5 % at two weeks and 98.8 % at five weeks post surgery. Sugar et al., [7] studied refractive stabilization after temporal phacoemulsification with foldable acrylic intraocular lens implantation and observed that refractive error stabilizes rapidly after temporal phacoemulsification and reported no significant difference between week one and week 16 post surgical readings. Also Caglar et al., [6] have reported that refraction stabilizes one week after surgery and changes minimally between the first week and the first month after cataract surgery. They concluded that it is possible to prescribe glasses starting from two weeks after an uneventful phacoemulsification cataract surgery for most patients.

In the present study the mean stabilization time for astigmatism was 10.18 ± 11.34 days and the cumulative percent of patients with stabilized astigmatism in post operative visits was 38.3 % at one week, 84 % at two weeks and 98.8 % at five weeks post surgery. In the study by Caglar et al., [6] the authors observed that although astigmatism changes continued

up to four weeks after surgery, changes were not statistically significant between second and fourth weeks and after the second postsurgical week it was essentially stable. In the study by Masket and Tennen [10] on 45 patients undergoing phacoemulsification and lens implantation through an un-enlarged 3.0 x 2.5 mm self-sealing temporal clear corneal tunnel incision they observed slight differences between post surgical astigmatism at 1 and 2 weeks postoperatively and the 2 and 6 week results were very similar. They concluded that post surgical astigmatism is stable within 2 weeks of surgery.

The present study had some shortcomings including the relatively low number of participants and the use of two different corneal incisions (temporal or superior) which might have affected the post surgical stabilization times.

Conclusion

In the present study the mean stabilization time for refraction and astigmatism after cataract surgery in an Iranian population using phacoemulsification and foldable lens implantation was comparable with previous studies.

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Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present manuscript.