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Multifocal IOL Implantation in Patients with Cataract and Moderate Myopia

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Original Research Article

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Abstract: To evaluate the visual outcomes of multifocal IOL implantation in pantients with cataract and moderate myopia. Seventy-four eyes of 37 patients (19 males, 18 females) with bilateral cataract and moderate myopia, who had undergone bilateral phacoemulsfication and multifocal IOL (Acriva ^{UD} Reviol MF613) implantation surgery between january 2016 and July 2016, were evaluated retrospectively. Their mean age was 57.22±7.68 (43-76) years. Preoperatively axial length and IOL power measurements were made Preoperatively and postoperatively spheric equivalent(SE), astigmatism, intraocular pressure(IOP), fundus examination, uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), uncorrected intermediate visual acuity(UIVA), corrected intermediate visual acuity(CIVA), uncorrected near visual acuity(UNVA), corrected near visual acuity(CNVA), distance corrected intermediate visual acuity(DCIVA) and distance corrected near visual acuity(DCNVA) measurements were performed. The mean follow-up time was 2 year. The mean preoperative UCVA was 1.12±0.18 (0,90-1.50) logMAR and the mean postoperative UCVA was 0.03±0.05 (0.00-0.20) logMAR (p<0.001). The mean preoperative BCVA was 0.44±0.13(0.30-0.90) logMAR and the mean postoperative BCVA was 0.01±0.02 (0.00-0.10) logMAR (p<0.001). The mean preoperative UIVA was 1.10±0.17(1.00-1.50) logMAR and the mean postoperative UIVA was 0.02±0.04(0.00-0.12) logMAR (p<0.001). The mean preoperative CIVA was 0.47±0.16(0.30-0.80)logMAR and the mean postoperative CIVA was 0.01±0.02 (0.00-0.12) logMAR (p<0.001). The mean preoperative UNVA was 1.19±0.15(1.1-1.4) logMAR and the mean postoperative UNVA was 0.05±0.07 (0.00-0.21) logMAR (p<0.001). The mean preoperative CNVA was 0.53±0.13(0.30-0.80) logMAR and the mean postoperative CNVA was 0.01±0.02 (0.00-0.10) logMAR (p<0.001). The diffractive multifocal acrylic Acriva ^{UD} Reviol MF613 IOL provided decreased level of spectacle dependence, high distance, intermediate and near visual acuities and low residual refractive errors.
Keywords : Cataract, moderate myopia, phacoemulsification, multifocal IOL.

INTRODUCTİON

The goal of multifocal IOL implantation is to reduce spectacle dependence after the operation [1, 2]. Multifocal IOLs have refractive or diffractive optical designs. Refractive types have spheric posterior surface and varying optic curvatures to produce focal points on anterior aspheric surface, on the other hand, diffractive types have concentric prism on posterior surface [3,4].

A multifocal IOL forms two images of an object at a certain distance, when one of the images is focused, the other one is superimposed or outside the focus. This causes decrease in contrast sensitivity and photic phenomenon which is halos around the lights and objects and the glare [5,6]. Diffractive apodized multifocal IOLs provide better near visual acuity and improve contrast sensitivity and photic phenomenon [7-10]. In this study, the visual outcomes of multifocal IOL implantation in patients with cataract and moderate myopia are evaluated.

MATERIALS AND METHODS

In this study, 74 eyes of 37 patients with bilateral cataract and moderate myopia, who had undergone bilateral phacoemulsification and multifocal IOL implantation surgery between January 2016 and July 2016, were evaluated retrospectively. Nineteen of them were male (51%) and 18 of them were female (49%). Their mean age was 57.22±7.68 (43-76) years. Thirty eyes (42%) had cortical, 26 eyes (34%) had posterior subcapsular and 18 eyes (24%) had nuclear cataracts. Patients who had any ocular or systemic diseases which might affect the vision and preoperative corneal astigmatism greater than 1 D (diopter), were excluded from the study.

Axial length measurements were made by using IOL Master Optical Biometer (Zeiss). SRK-T formula was used for IOL power calculation due the presence of mild myopia. Targeted postoperative refraction was within ±0,50 diopters (D). Preoperative

and postoperative refractive measurements including spheric equivalent(SE) and astigmatism, IOP measurements, fundus examination, uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), uncorrected intermediate visual acuity (UIVA),corrected intermediate visual acuity (CIVA), uncorrected near visual acuity(UNVA),corrected near visual acuity(CNVA), distance corrected intermediate visual acuity(DCIVA) and distance corrected near visual acuity(DCNVA) measurements were made. Postoperative measurements were made on 1st day,1st week,1st month, 3rd month, 6th month,1st year and 2nd year. But for statistical analysis 3rd month values were taken.

All of the surgeries were performed by a single surgeon(SC). Under subtenon anesthesia, a 2,8 mm clear corneal incision was made, anterior chamber was filled with cohesive viscoelastic substance because the anterior chambers were shallow due to high hyperopia. After continuous curvilinear capsulorhexis, hydrodissection and hydrodelineation was performed, then a sideport entrance was made. Nucleus was removed by using "stop and chop" technique (Sovereign Compact, AMO). Cortex was aspirated with coaxial irrigation / aspiration. Capsular bag is filled with a cohesive viscoelastic substance. A foldable multifocal IOL (Acriva^{UD} Reviol MF613) was implanted in the capsular bag through an injector system. It was well centralized, this is important for multifocal IOLs. Then viscoelastic substance was aspirated completely. The entrances were closed with stromal hydration and lastly intracameral moxifloxacin was administrated. After surgery patients used topical antibiotics four times a day and topical steroids six times a day for one week, and only topical steroids four times a day following three weeks.

The multifocal IOL used in the operations was Acriva^{UD} Reviol MF613. It has 6,00 mm optic size, 13,00 mm haptic size, its optic design is biconvex, haptic design is modified C. Its premium material is acrylate monomer, its water content is 25%, it has a water resistant hydrophobic surface and UV absorbtion property. Its aspheric structure corrects corneal aberrations. Its diffractive surface minimizes unwanted scattered light and halos and it is not affected by pupil size, its all square 360◦ enhanced edge reduces PCO (posterior capsular opacification). And it has 3,75 diopter (D) addition power.

SPSS version 22 programme was used for statistical analysis. Data were compared by using Chi-square and paired t test. P<0.05 was accepted as significant.

RESULTS

The mean axial length was 26.33±0.61 (25.6-29.2) mm.The mean IOL power was 14.12±2.14 (12.00-17.00) D. The mean preoperative SE was -6.27±2.02 (-4.00_-8.00) D and the mean postoperative SE was -0.43±0.34 (0.50_-1.00) D, (p<0.001). The mean preoperative astigmatism was -0.37±0.26 (0.00_-1.00) D, and the mean postoperative astigmatism was -0.26±0.20 (0.00_-1,00) D (p=0.312). The mean preoperative UCVA was 1.12±0.18 (0.90-1.50) logMAR and the mean postoperative UCVA was 0.03±0.05 (0.00-0.20) logMAR (p<0.001). The mean preoperative BCVA was 0.44±0.13(0.30-0.90) logMAR and the mean postoperative BCVA was 0.01±0.02 (0.00-0.10) logMAR (p<0.001). The mean preoperative UIVA was 1.10±0.17 (1.00-1.50) logMAR and the mean postoperative UIVA was 0.02±0.04 (0.00-0.12) logMAR (p<0.001). The mean preoperative CIVA was 0.47±0.16 (0.30-0.80) logMAR and the mean postoperative CIVA was 0.01±0.02 (0.00-0.12) logMAR (p<0.001). The mean preoperative UNVA was 1.19±0.15(1.1-1.4) logMAR and the mean postoperative UNVA was 0.05±0.07 (0.00-0.21) logMAR (p<0.001). The mean preoperative CNVA was 0.53±0.13 (0.30-0.80) logMAR and the mean postoperative CNVA was 0.01±0.02 (0.00-0.10) logMAR (p<0.001). The mean distance corrected intermediate visual acuity was 0.02±0.05 (0.00-0.20) logMAR and the mean distance corrected near visual acuity was 0.02±0.04 (0.00-0.20) logMAR. Demographic characteristics of the patients are shown in Table 1. And visual acuites are shown in Table 2.

Table-1: Demographic characteristics of the patients

Charasteristic	Value
Age (Year)	57.22±7.68 (SD) (43-76)
Sex (Male / Female)	19(51%) / 18(49%)
Preoperative Astigmatism (Diopter)	-0.37±0.26 (SD) (0.00_-1.00)
Preoperative SE (Spheric Equivalent) (Diopter)	-6.27±2.02 (SD) (-4.00_-8.00)
Axial Length (mm)	26.33±0.61 (SD) (25.6-29.2)
IOL Power (Diopter)	14.12±2.14 (SD) (12.00-17.00)

Table-2: Visual acuities of the patients

Visual Acuities	Preoperative Mean ± SD (Range)	Postoperative Mean ± SD (Range)	P Value
UCVA (logMAR) (Uncorrected Visual Acuity)	1.12±0.18 (SD) (0.90-1.50)	0.03±0.05 (SD) (0.00-0.20)	< 0.001
BCVA (logMAR) (Best corrected Visual Acuity)	0.44±0.13 (SD) (0.30-0.90)	0.01±0.02 (SD) (0.00-0.10)	< 0.001
UIVA (logMAR) (Uncorrected Intermediate Visual Acuity)	1.10±0.17 (SD) (1.00-1.50)	0.02±0.04 (SD) (0.00-0.12)	< 0.001
CIVA (logMAR) (Corrected Intermediate Visual Acuity)	0.47±0.16 (SD) (0.30-0.80)	0.01±0.02 (SD) (0.00-0.12)	< 0.001
UNVA (logMAR) (Uncorrected Near Visual Acuity)	1.19±0.15 (SD) (1.1-1.4)	0.05±0.07 (SD) (0.00-0.21)	< 0.001
CNVA (logMAR) (Corrected Near Visual Acuity)	0.53±0.13 (SD) (0.30-0.80)	0.01±0.02 (SD) (0.00-0.10)	< 0.001
DCIVA (logMAR) (Distance Corrected Intermediate Visual Acuity)	-	0.02±0.05 (SD) (0.00-0.20)	-
DCNVA (logMAR) (Distance Corrected Near Visual Acuity)	-	0.02±0.04 (SD) (0.00-0.20)	-

Postoperatively two patients used spectacles for distance vision, two patients used for near vision and one patient used for both distance and near vision. So, the total postoperative spectacle dependence percentage was 13%. Three patients complained of halos up to postoperative 3rd month (8%) and 4 patients complained of glare up to postoperative 4th month (10%). PCO developed in 2 eyes in postoperative 6th month and 3 eyes at the end of 1 year postoperatively (13%). After YAG laser capsulotomy they had no problem. 87% of the patients were within the targeted refraction (±0,50 D), postoperatively. When the patients are asked 92% of them said that they were satisfied with this operation and recommended this operation to other people.

DİSCUSSİON

The causes of dissatisfaction in case of multifocal IOL implantation are generally blurred vision due to ametropia, photic phenomenon, decreased contrast sensitivity and personality of the patient [12,13]. Lifestyle, occupation and expectations of the patient should be questioned. Perfectionist personalities are usually difficult to be managed. Astigmatism more than 1 diopter may deteriorate postoperative vision. Regular astigmatism may be corrected, but irregular astigmatism may remain as a challenge. Patients should be informed that there might be refractive surprises or residual refractive errors after the operation, and they might require additional surgical procedures like LASIK[14,15]. In case of high astigmatism, toric multifocal IOLs may be a choice to achieve spectacle independence[16].

Pterygium, corneal dystrophies and scars and dry eye should be evaluated before the surgery and if treatable they may not be contraindication for multifocal IOL implantation[17]. Patients who had RK, PRK or LASIK beforehand, are not good candidates for multifocal IOL implantation. Because they have corneal aberrations causing a multifocal cornea, the implantation of a multifocal IOL into such an eye may result in additional loss of contrast sensitivity leading to reduction in visual quality[18].

The size and shape of pupil is also important, patients with a large pupil are more likely to have glare postoperatively. Small pupils need expansion during the surgery, iris sphincter may be damaged due to this expansion procedure, thus iatrogenic mydriasis leading to glare may develope[19].

Zonular weakness may cause decentration or tilt of IOL, this is important for multifocal IOLs, because it may cause decreased contrast sensitivity, decreased visual acuity and low visual quality. In this case CTR (Capsular Tension Ring) can be used for stabilization of the posterior capsule[20,21].

Optic nerve abnormalities and retinal diseases such as macular degeneration, diabetic retinopathy, retinitis pigmentosa and Stargardt disease decrease contrast sensitivity, in the presence of these diseases, implantation of multifocal IOL will duplicate the contrast sensitivity reduction, hence retina should be assesed carefully before deciding the operation[22].

Patients who have strabismus and/or ambliyopia, cannot achieve the summation benefit of simultaneous binocular multifocal vision. In high hyperopic patients, there may be small angle esotropia and amblyopia, that's why, we should make sure that the patient is a monofixator before the operation. Also in amblyopic patients, contrast sensitivity is already decreased and implantation of the multifocal IOLs in these patients will impair contrast sensitivity and visual acuity more

[13]. In this study, the patients had neither esotropia nor amblyopia, they all were monofixators.

In this study, the patients had good results for distance, intermediate and near visions. Spectacle dependence rate after the operation was low, satisfaction rate was high. The worse the vision before the surgery is, the more likely the patient is satisfied with the result. That's why, myopic cataract patients are good candidates for multifocal IOL implantation.

In conclusion, diffractive multifocal acrylic Acriva^{UD} Reviol MF613 IOL provided decreased level of spectacle dependence, high distance, intermediate and near visual acuities and low residual refractive errors. But, the selection of the patients is very important for multifocal IOL implantation.

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