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İki Farklı Marka Torik İntraoküler Lens İmplantasyonun Kıyaslanması

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Özet

Amaç: Kataraktı ve astigmatizması olan hastalarda astigmatizmayı düzeltmek için Tecnis toric İOL ile Acrysof toric İOL'lerinin görsel sonuçlarının kıyaslanması.

Gereç ve Yöntemler: Otuz sekiz hastanın 38 gözüne Tecnis torik İOL, 36 hastanın 36 gözüne Acrysoft torik İOL implante edildi. Hastaların kataraktı ve astigmatizması vardı. Ameliyatlarda 7 çeşit Tecnis torik İOL (: ZCT150, ZCT225, ZCT300, ZCT400, ZCT450, ZCT525, and ZCT600),7 ceşit, Acrysof torik İOL (SN6AT3, SN6AT4, SN6AT5, SN6AT6, SN6AT7, SN6AT8, and SN6AT9) kullanıldı. İOL'lerin astigmatik değerleri 1.50 ile 6.00 D arasındaydı.Hastaların düzeltilmemiş görme keskinliği (DGK) ve en iyi düzeltilmiş görme keskinliği (EDGK), keratometre, refraktif ölçümleri ve İOL'ün aks hizası düzenli aralıklarla kontrol edilmiştir.

Bulgular: Her iki grupta ortalama postoperatif sferik ve silendirik değerler preoperatif değerlerden anlamlı şekilde daha düşüktü ($P<0.05$) ve ortalama postoperatif DGK ve EDGK değerleri preoperatif değerlerden anlamlı olarak daha yüksekti ($p<0.05$). DGK, EDGK, sferik ve silendirik değerler açısından iki grup arasında istatistiksel olarak anlamlı bir fark saptanmadı ($p>0.05$).

Sonuç: Hem Tecnis torik İOL hemde Acrysof torik İOL implantasyonunun , katarakt cerrahisi sırasında var olan korneal astigmatizmayı düzeltmek için etkin olduğu izlenmiştir. İkinci grup (Acrysof toric) hastaların ameliyat sonrası ortalama görme keskinlikleri, birinci grup (Tecnis toric) hastalara göre biraz daha iyi olmasına rağmen istatistiksel olarak anlamlı bir farklılık yoktu.

Anahtar Kelimeler

Katarakt
Fakoemülsifikasyon
Astigmatizma
Tecnis torik IOL
Acrysof torik IOL

Makale Hakkında

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Comparison of Two Different Brands of Toric Intraocular Lens Implantation

Abstract

Purpose To compare the visual outcomes of Tecnis toric IOL and Acrysof toric IOL implantations in patients with cataract and astigmatism retrospectively.
Methods: Tecnis toric IOLs were implanted in 38 eyes of 38 patients, and Acrysof toric IOLs were implanted in 36 eyes of 36 patients. The patients had cataract and astigmatism. During the surgeries we used 7 kinds of Tecnis toric IOL: ZCT150, ZCT225, ZCT300, ZCT400, ZCT450, ZCT525, and ZCT600, cylindrical power was between 1.50 D and 6.00 D and 7 kinds of Acrysof toric IOL: SN6AT3, SN6AT4, SN6AT5, SN6AT6, SN6AT7, SN6AT8, and SN6AT9, cylindrical power was between 1.50 D and 6.00 D. Uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA), keratometric and refractive measurements, and IOL axis were tested in follow-up examinations.

Keywords

Cataract
Phacoemulsification
Astigmatism
Tecnis toric IOL
Acrysof toric IOL

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Results: Postoperative mean spherical and cylindrical values of both groups were significantly lower than those of preoperative values ($p<0.05$), and postoperative mean UCVA and BCVA levels of both groups were significantly higher than preoperative levels ($p<0.05$). When we compared the two groups (Tecnis toric and Acrysof toric), there were no significant differences in respect to UCVA, BCVA, spherical and cylindrical values ($p>0.05$).
Conclusion: Both Tecnis toric and Acrysof toric IOL implantations during cataract extraction operation are effective in reducing astigmatism. Even though postoperative visual acuities of the second group (Acrysof toric) were slightly better than those of the first group (Tecnis toric), the difference was not statistically significant.

1. Introduction

Cataract is opacification of the natural lens and is the most common cause of vision loss. In Turkey every year 400.000 cataract surgeries are performed. According to the latest studies, every year 20 million cataract operations are performed in the world. The most common causes of cataract are heredity, trauma, inflamation, metabolic disorders, nutritional disorders, radiation, and age-related changes1.

If the steepness of the cornea is on the vertical axis, it is called “with the rule astigmatism”; if it is on the horizontal axis, it is called “against the rule astigmatism.” Almost 60% of cataract patients have minimum 0.75 D astigmatism. We can correct the astigmatism during or after the surgery. During the surgery, astigmatism can be corrected with toric IOLs and astigmatic incisions; after surgery it can be corrected with Excimer laser or IOL exchange. Toric IOLs present a more stable and predictable treatment to correct astigmatism. In 1994, Shimizu et al. used toric IOL for the first time to correct astigmatism2-5.

Effective visual outcomes with toric IOLs depend on the position of the toric IOL on the recommended axis and postoperative rotation. If there is any rotations on the axis of IOL, it leads to a negative effect. The maximum acceptable axis shift seems to be less than 30 degrees. For every 1 degree rotation in the axis, there will be a 3.3% cylindirical power loss5,6.

In this study, the visual outcomes of Tecnis toric IOL (Abott Medical Optics Inc., Santa Ana, CA, USA) and Acrysof toric IOL (Alcon, Fort Worth, TX, USA) implantations were compared with each other retrospectively.

2. Methods

The study protocol was approved by the local ethics committee. An informed written consent form was obtained from the patients before the surgery. The study was carried out according to the tenets of the Declaration of Helsinki.

Seventy-four eyes of 74 patients with cataract and astigmatism who had undergone phacoemulsification and toric IOL implantation surgery (Tecnis toric IOL and Acrysof toric IOL) between February 2016 and April 2018 are enrolled in this study. Tecnis toric IOLs were implanted in 38 eyes of 38 patients, and Acrysof toric IOLs were implanted in 36 eyes of 36 patients. The presence of cataract and astigmatism approved by autorefractokeratometric and Sirius topographic - Scheimpflug (Costruzione Strumenti Oftalmici, Florence, Italy) measurements were the inclusive criteria for the study. The patients who had any systemic or ocular diseases which might affect the vision were excluded from the study.

During the surgeries we used 7 kinds of Tecnis toric IOL: ZCT150, ZCT225, ZCT300, ZCT400, ZCT450, ZCT525, and ZCT600, cylindrical power was between 1.50 D and 6.00 D and 7 kinds Acrysof

toric IOL: SN6AT3, SN6AT4, SN6AT5, SN6AT6, SN6AT7, SN6AT8, and SN6AT9, cylindrical power was between 1.50 D and 6.00 D.

The properties of the IOLs are presented in Table 17,8 and information related to IOLs used in the study is presented in Table 2.

Table 1: Properties of Acrysof toric and Tecnis toric IOL

	Tecnis Model Number						
	ZCT150	**ZCT225**	**ZCT300**	**ZCT400**	**ZCT450**	**ZCT525**	**ZCT600**
Recommended astigmatism correction range (D)	1.03	1.54	2.06	2.74	3.08	3.60	4.11
IOL Cylindirical Power (D)	1.50	2.25	3.00	4.00	4.50	5.25	6.00
Optic diameter (mm)	6.0						
Optic Length (mm)	13.0						
	Acrysof Model Number						
	SN6AT3	**SN6AT4**	**SN6AT5**	**SN6AT6**	**SN6AT7**	**SN6AT8**	**SN6AT9**
Recommended astigmatism correction range (D)	0.75 – 1.50	1.50 – 2.00	2.00 – 2.50	2.50 – 3.00	3.00 – 3.50	3.50 – 4.00	4.00 and up
IOL Cylindirical Power (D)	1.50	2.25	3.00	3.75	4.50	5.25	6.00
Optic diameter (mm)	6.0						
Optic Length (mm)	13.0						

Abbreviations: D; diopter, mm; milimeter

Table 2: Information related to IOLs used.

	Tecnis Toric IOL	**Acrysof Toric IOL**	**p Value**
The mean IOL Power (D)	22.91 ± 1.74 (SD) (18.00 – 25.50)	22.25 ± 2.28 (SD) (16.50 – 27.00)	0.90*
The mean IOL Cylindirical Power (D)	2.85 ± 1.26 (SD) (1.50 – 6.00)	3.09 ± 1.39 (SD) (1.50 – 6.00)	0.42*

Abbreviations: D; diopter, SD; standard deviation

*: t test

Before the surgeries, on every patient's cornea, 0 and 180 degrees angles are marked in sitting position. During the surgery,a Mendez Ring was placed accordingly, and the axis was marked. All the surgeries were performed by the same surgeon (F.U.). Under topical anesthesia (proparacaine hydorchloride 0.5%), following 2.4 mm corneal incision on 180 degree axis, CCC and hydrodissection were performed. After nucleus emulsification, irrigation and aspiration were done. IOL was implanted according to the marked axis. After the aspiration of viscoelastic material, the operation was ended. Postoperatively, all the patients used Dexa-sine (Dexamethasone 0.1%, Liba, Turkey) 4x1 for one month, Vigamox (Moxifloxacine 0.5%, Alcon, USA) 4x1 for a week, and Acular LS (Ketorolac tromethamine 0.4%, Allergan, Ireland) 4x1 for one month. The steroid dosage was tapered and stopped at the end of one month.

All the patients were examined on the 1st day, 1st week, 1st month, and 6th month postoperatively. During these examinations, UCVA, BCVA, autorefractive, and keratometric

measurements and IOL position were tested. 6th month values were taken for statistical analysis. Astigmatic evaluations were made in ASSORT programme, calculated according to Alpins Metod9. The toric IOL calculations were made by using Holladay 1 formula. The calculation of IOL rotations were made by using biomicroscopy. The included angle between the lamp arm and the arm of the slit-lamp microscope was adjusted to 0° under the condition of a narrow crack. Then, the fissure rotational knob was rotated and the crack light was adjusted to the toric IOL axis through the pupil center. The degrees were read using the goniometer on the vertical axis of the slit-lamp microscope to determine the current toric IOL axis. The rotational angle of the toric IOL was compared with the target axis.

Statistical analysis was made using SPSS version 22. The comparison of data was made by using chi-square, t-test, and paired t test. $P<0.05$ was accepted as statistically significant.

3. Results

There were no significant differences between two groups in respect with age, sex and axial length ($p>0.05$).The mean postoperative UCVA, BCVA, spherical, and cylindrical values were significantly reduced in comparison with preoperative values in both groups ($p<0.05$). There were no significant differences between two groups in respect with preoperative and postoperative spherical value,cylindrical value ,UCVA and BCVA($p>0.05$). Preoperative and postoperative findings are presented in Table 3.

Table 3: Preoperative and postoperative findings of the patients

	TORIC IOL		
	Group 1 (Tecnis Toric IOL) (n=38)	**Group 2 (Acrysof Toric IOL) (n=36)**	**P Value**
Age (year)	63.68 ± 9.12 (SD) (41 - 82)	64.05 ± 10.73 (SD) (40 - 82)	0.87*
Sex (Male / Female Ratio)	20 / 18 (%53 - %47)	19 / 17 (%52 - %48)	0.26**
Axial Length (mm)	22.95 ± 0.77 (SD) (21.60 – 24.89)	23.10 ± 0.78 (SD) (21.41 – 24.78)	0.39*
Preoperative Spherical Value (D)	-0.88 ± 1.79 (SD) (-5.25 _ 2.75)	-0.52 ± 1.53 (SD) (-4.25 _ 2.00)	0.13*
Postoperative Spherical Value (D)	-0.07 ± 0.27 (SD) (-0.50 _ 0.50)	-0.01 ± 0.31 (SD) (-0.50 _ 0.50)	0.19*
Preoperative Corneal Astigmatism (D)	-2.75 ± 1.03 (SD) (-4.50 _ -1.00)	-2.68 ± 0.92 (SD) (-4.25 _ -1.25)	0.74*
Postoperative Corneal Astigmatism (D)	-0.8 ± 0.30 (SD) (-0.50 _ 0.50)	-0.06 ± 0.31 (SD) (-0.50 _ +0.50)	0.51*
Preoperative UCVA (logMAR)	0.89 ± 0.12 (SD) (0.60 – 1.00)	0.88 ± 0.12 (SD) (0.60 – 1.00)	0.68*
Postoperative UCVA (logMAR)	0.05 ± 0.08 (SD) (-0.10 _ 0.10)	0.02 ± 0.06 (SD) (-0.10 _ 0.10)	0.06*
Preoperative BCVA (logMAR)	0.64 ± 0.18 (SD) (0.30 – 0.90)	0.69 ± 0.13 (SD) (0.40 – 0.90)	0.22*
Postoperative BCVA (logMAR)	0.03 ± 0.07 (SD) (-0.10 _ 0.10)	0.01 ± 0.05 (SD) (-0.10 _ 0.10)	0.10*

Abbreviations: D; diopter, mm; milimeter, logMAR; logarithm of the minimum angle of resolution, SD; standard deviation, UCVA; uncorrected visual acuity, BCVA; best corrected visual acuity

*: t test

**: Chi-square test

In the 6th month follow-up examinations, IOL rotation degrees were tested, and there was no significant difference between the two groups (p>0.05),presented in Table 4. IOL reposition procedure was applied in 2 eyes in Tecnis group and 1 eye in Acrysof group.

Table 4: IOL Rotation Degrees

	Tecnis toric	Acrysof toric	P Value
6. month IOL rotation (degree)	4.60 ± 3.59 (SD) (0-30)	4.00 ± 2.49 (SD) (0-30)	0.44*

Abbreviations: SD; standard deviation

*: t test

4. Discussion

Toric IOLs are used to correct corneal astigmatism during cataract surgery. There are different kinds of toric IOLs. In this study, we used Tecnis toric and Acrysof toric and IOLs to correct corneal astigmatism greater than 1.00 D. We compared these two IOLs. Postoperative astigmatism was significantly lower than preoperative astigmatism in both the Tecnis toric and Acrysof toric groups, and there was no significant difference between the groups.

In a study related to Tecnis toric IOL, 94% of patients' refractions were within ±0.50 D10. Our study was in accordance with this. In a study related to Acrysof toric, 90% of patients' visual acuities were under logMAR 0.211. Our study, again, was in accordance with this.

Mol et al.11 reported that in patients on whom Tecnis toric IOL was used, BCVA was 0.13 ± 0.13 logMAR postoperatively. The preoperative BCVA of these patients were 0.59 ± 0.44 logMAR. Razmjoo et al.12 reported that for Acrysof toric IOL, the mean preoperative visual acuity 0.98 ± 0.52 logMAR decreased to 0.17 ±0.17 logMAR postoperatively.

Rushworm et al.13 found that 91.9% of the toric IOL patients reached 0.5 or better visual acuity postoperatively. Waltz et al.14 stated that Tecnis toric IOL reduced astigmatism prominently and was safe for use in cataract patients. Kim et al.15 reported that in toric IOL, patients' astigmatism dropped from -1.28 ± 0.48 D to 0.28 ± 0.38 D. Bauer et al.16 observed that 74% of toric IOL patients had 0.75 D or lower astigmatism postoperatively. Clark et al.17 reported that postoperative astigmatism was 0.48 D (0.00 – 1.50) in Acrysof group and 0.46 D (0.00 – 1.00) in Tecnis group. Kim et al.15 reported that 73.3% of the patients (Acrysof toric IOL) had 20/25 or better visual acuity postoperatively. Sheppard et al.18 reported that 88% of patients (Tecnis toric) had 20/40 or better visual acuity postoperatively.

UCVA is the most important factor in determining postoperative success. In our study, the mean preoperative UCVA was 0.89 ± 0.12 in Tecnis group and 0.88 ± 0.12 in Acrysof group. The mean postoperative UCVA was 0.05 ± 0.08 in Tecnis group and 0.02 ± 0.06 in Acrysof group. There were no significant differences between the two groups, but the UCVA of the Acrysof group was a little bit better.

For quality of vision, the position of IOL on the axis is very important. The rotation of IOL causes loss of visual quality. These rotations usually occur due to itching and intraocular pressure increase in the early postoperative phase19. The properties of IOL may also affect this rotation20.

Ferreria et al.21 observed that the IOL rotation was 3.15 ± 2.62 degrees, and Lubinski et al.22 observed that IOL rotation was 1.1 ± 2.4 degrees. Wolffsohn et al.23 found that the rotation for Acrysof toric IOL was 2.23 ± 1.84 degrees, and Bauer et al.16 determined that the IOL rotation was 2.5 ± 2.1 degrees. Grohlich et al.24 found that postoperative IOL rotation was 4.92 ± 4.10 degrees in Tecnis group and 4.31 ± 4.59 degrees in Acrysof group. In our study, in the 6th month of follow-up examinations, the

mean IOL rotation was 4.60 ± 3.59 degrees in the Tecnis group. In this group 93.2% of the rotations were below 5 degrees, and 5.2% were over 10 degrees. In the Acrysof group the mean IOL rotation was 4.00 ± 2.49 degrees; in 96% of patients the rotation was below 5 degrees, and in 5.5% the rotation was over 10 degrees. We observed that rotations over 10 degrees were related to insufficient removal of viscoelastic material from the anterior chamber, and repositioning was applied to these eyes. In this study our limitations were the limited size of the subjects and the kinds of toric IOLs.

Conclusion

In conclusion, both Tecnis toric and Acrysof toric IOL implantations are effective to correct astigmatism during cataract surgery. The postoperative visual acuity of the Acrysof toric IOL group was slightly better than that of the Tecnis toric IOL group, however, there was no significant difference between two groups.

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