LIMBAL RELAXING INCISION DURING CATARACT SURGERY

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SUMMARY – Limbal relaxing incisions are one of the more commonly performed procedures with phacoemulsification to correct preexisting astigmatism during cataract surgery. The aim of the study was to evaluate the effect and stability of limbal relaxing incisions in reducing preexisting astigmatism at the time of phacoemulsification. The study included 10 eyes in 12 patients who underwent limbal relaxing incisions during cataract surgery, with preexisting astigmatism of 1-2 diopter (D). Assessments were made preoperatively, and 1 and 3 months postoperatively. Outcome measures included uncorrected distance visual acuity, best corrected distance visual acuity and keratometric astigmatism measures. The mean preoperative and postoperative refractive astigmatism was 1.50 D (±0.75D) and 0.25 D (±0.25 D), respectively. There were no serious postoperative complications. Limbal relaxing incisions provide a viable option for correcting preexisting astigmatism at the time of cataract surgery with mild complications.

Key words: *Limbal relaxing incision; Phacoemulsification*

Introduction

Astigmatism is an optical defect in which vision is blurred due to the inability of the optics of the eye to focus a point object into a sharp focused image on the retina. Astigmatism usually causes vision to be blurred or distorted to some degree at all distances. Symptoms of uncorrected astigmatism are eye strain and headaches, especially after reading or other prolonged visual tasks. Expectations and demands of patients require correction of refractive errors after cataract surgery. In addition to spherical refractive errors, astigmatism should be addressed at the time of surgery to achieve the best postoperative refractive outcomes. Astigmatism can be reduced or eliminated by a variety of surgical techniques, including selective positioning of the phacoemulsification incisions, corneal relaxing incisions (CRIs), limbal relaxing incisions (LRIs), excimer laser keratectomy, and toric intraocular lens (IOL) implantation. All these methods have limitations such as the degree of astigmatism to be treated or the long-term mechanical instability, and postoperative outcomes are subject to many variables such as age, magnitude, incision number, depth and length[1]. Some 15%-29% of cataract surgery candidates have corneal astigmatism of more than 1.50 diopters (D)[2,3], while 22% of patients have corneal astigmatism of less than 1.25 D[4]. The use of LRIs to correct lower degrees of corneal astigmatism has become popular in the past years[5,6]. Incisions at the limbus are made across the steep meridian according to a nomogram. Today, there are several nomograms like Koch, Nichamin, Gills, Fenzel and Gayton. The length and number of incisions were determined using some of them[7]. LRIs are one of the most commonly performed adjunctive procedures with phacoemulsification to correct preexisting astigmatism, primarily because of the cost effectiveness and the predictable surgical profile[1,8,9].

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Patients and Methods

Ten eyes of twelve patients with preexisting keratometric astigmatism of 1.0-2.0 D, treated at University Department of Ophthalmology, Sestre milosrdnice University Hospital Center, were enrolled in this trial. Preoperative exclusion criteria were astigmatism higher than 2.0 D, irregular astigmatism, corneal pathology, glaucoma, patients wearing IOL and patients with previous eye surgery. Complete general ophthalmic examination was done in all patients including uncorrected distance visual acuity (UCDVA), best corrected distance visual acuity (BCDVA), keratometry and autorefractometer readings, slit lamp and retinal evaluation, and tonometry. All procedures were performed by one surgeon using local anesthesia. Before surgery, orientation marks were identified with a marker dyed with methylene blue, with the patient sitting upright. The LRI nomogram described by Koch and Sanan[10] was used to determine the extent of the incision arc. The steep meridian was identified by aligning a fixation ring (Koch Mendez ring, Mastel Precision, Rapid City, USA). A diamond blade with an empirical blade setting of 600 μm was used (Mastel Precision, Rapid City, USA). LRIs were made at the most peripheral extent of the clear cornea, just inside the true surgical limbus. Phacoemulsification was then performed through a scleral incision to prevent surgically induced astigmatism. A foldable IOL (AcrySof SA60AC, Alcon Laboratories, Inc., Fort Worth, USA) was implanted in the capsular bag. Postoperative corticosteroid eye drops (dexamethasone, Alcon Laboratories, Inc., Fort Worth, USA) were continued for 4 weeks. The main outcome measures at the last follow-up included UCDVA and BCDVA and autorefractometer readings.

Results

The analysis included ten eyes of twelve patients operated by the same surgeon at University Department of Ophthalmology, Sestre milosrdnice University Hospital, Zagreb, between April and July 2011. The mean age of study patients was 65 (range 58-72) years. Preoperative visual acuity was 0.0125-0.6. All postoperative binocular visual acuity (VA) values were obtained 90 days postoperatively. The 1-week postoperative UCDVA was 0.7-1.0 and BCDVA 0.9-1-0. At 8 and 12 weeks after surgery, UCDVA and BCDVA were identical. Visual acuity is presented in Table 1. The mean preoperative astigmatism was 1.50 D (±0.75), while the mean postoperative astigmatism was 0.75 D (±0.50) at 1 week and 0.25 D (±0.25) at 12 weeks. The mean preoperative and postoperative astigmatism is presented in Table 2. The number of eyes with astigmatism on the last visit is shown in Table 3. Postoperative astigmatism of 0.50 D was recorded in five patients, 0.25 D in four patients, and 0.75 D in only one patient. Postoperative complications such as itching or mild pain were reported by three patients and foreign body sensation by two patients for one week postoperatively.

Table 1. Visual acuity

	Preoperative	Postoperative 1 week	Postoperative 8 weeks	Postoperative 12 weeks
UCDVA	0.075-0.5	0.7-1.0	0.9-1.0	0.9-1.0
BCDVA	0.15-0.6	0.9-1.0	0.9-1.0	0.9-1.0

UCDVA = uncorrected distance visual acuity; BCDVA = best corrected distance visual acuity

Table 2. Preoperative and postoperative astigmatism

Preoperative astigmatism	1.50 (±0.75)
1 week postoperatively	0.75 (±0.50)
8 weeks postoperatively	0.25 (±0.25)
12 weeks postoperatively	0.25 (±0.25)

Discussion

Limbal relaxing incisions provide a viable option for correcting preexisting astigmatism at the time of cataract surgery[6,11-13]. In general, patients with astigmatism greater than 1.50-2.0 D are candidates for

Table 3. Number of eyes with astigmatism

Astigmatism	Number of eyes
0.25	4
0.50	5
0.75	1

some form of astigmatic correction[14-16]. The advantage of LRIs is that they are placed at the limbus and preserve optical qualities of the cornea. In addition, they are associated with less risk of inducing postoperative glare, less discomfort, and more rapid postoperative recovery of vision. In our study, the use of LRIs during phacoemulsification significantly reduced preoperative astigmatism. The astigmatic correction with LRIs stabilized early and remained stable for 3 months with no regression noted. Other authors report similar results with 6-month follow-up[5,6,17]. Budak *et al*. report that regression in astigmatic correction mostly occurs in the eyes with astigmatism greater than 3.50 D and between one and three months postoperatively[18]. Despite their efficacy, the LRIs resulted in undercorrection in the study performed by Bayramlar and Borazon[5]. The undercorrection can be treated by extending the LRI or by making additional CRIs. The possible postoperative complications like foreign body sensation, itching, pain and wound leakage were mild and clinically nonsignificant in all studies[5,6,10-13,15,17,18]. In our study, three patients reported itching and mild pain, while two patients had a foreign body sensation at one week postoperatively. Although preexisting astigmatism greater than 2.50 D in cataract patients is rare, correcting high astigmatism has always presented a challenge. Although safer and more predictable than CRIs, LRIs cannot completely correct high astigmatism. CRIs are more effective; however, the number and size of CRIs required to correct high astigmatism can lead to corneal distortion or irregularity. They are also less predictable, which may result in overcorrection[19]. The availability of toric IOLs provides an opportunity to correct some of the high astigmatism[20]. The techniques of relaxing incisions and toric IOL implantation can be combined to correct larger amounts of astigmatism, or just implantation of toric IOLs to correct high amounts of astigmatism[21].

In conclusion, LRIs are a simple, safe and effective method of correcting primary astigmatism at the time of cataract surgery

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Sažetak

LIMBALNA RELAKSIRAJUĆA INCIZIJA TIJEKOM OPERACIJE KATARAKTE

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Limbalna relaksirajuća incizija je jedna od čestih metoda koja se primjenjuje za korekciju astigmatizma za vrijeme operacije katarakte metodom fakoemulzifikacije. Svrha ovoga rada bila je analizirati učinak i stabilnost limbalne relaksirajuće incizije u smanjenju prijeoperacijskog astigmatizma. Analiza je obuhvatila deset očiju u dvanaest bolesnika kod kojih je učinjena limbalna relaksirajuća incizija za vrijeme operacije katarakte s prijeoperacijskim astigmatizmom od 1-2 dioptrije (D). Analizirani su prije operacije te l-2 mjeseca poslijeoperacijski uključujući nekorigiranu i najbolje korigiranu vidnu oštrinu na daljinu te keratometrijske vrijednosti. Srednji prijeoperacijski i poslijeoperacijski astigmatizam bio je 1,50 D (±0,75) odnosno 0,25 D (±0,25). Ozbiljne poslijeoperacijske komplikacije nisu nađene. Limbalna relaksirajuća incizija omogućuje održiv izbor za korekciju prijeoperacijskog astigmatizma za vrijeme operacije katarakte s blagim komplikacijama.

Ključne riječi: *Limbalna relaksirajuća incizija; Fakoemulzifikacija*