ANALYSIS OF POSTOPERATIVE CORNEAL ASTIGMATISM AFTER PHACOEMULSIFICATION THROUGH A CLEAR CORNEAL INCISION

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SUMMARY – The aim of the study was to analyze postoperative corneal astigmatism after phacoemulsification with intraocular lens implantation through a clear corneal incision. This prospective study included 22 eyes (10 right and 12 left eyes) having had phacoemulsification with implantation of a foldable intraocular lens through a clear corneal incision. A supertemporal incision was used in all right eyes, and superonasal incision in all left eyes. Astigmatism was measured by autorefractometer-keratometer preoperatively, and at 1 week, 1 month and 2 months postoperatively. The mean surgically induced corneal astigmatism was 0.23 D (diopter). The vertical component of astigmatism was statistically significantly lower postoperatively than preoperatively (p=0.0404). There was no significant difference in the horizontal component of astigmatism preoperatively and postoperatively (p>0.05). There was no statistically significant difference in surgically induced astigmatism between supertemporal incisions in the right eyes and superonasal incisions in the left eyes either (p>0.05). Oblique localization of clear corneal incision, supertemporal in the right eyes and superonasal in the left eyes, may ease manipulations during phacoemulsification for right-handed surgeon without significant difference in the surgically induced astigmatism.

Key words: cataract surgery, clear corneal incision, surgically induced astigmatism

Introduction

The aims of modern cataract surgery are rapid visual rehabilitation, the best possible uncorrected visual acuity, and minimal postoperative astigmatism. Surgically induced astigmatism (SIA) is still a common obstacle for achieving excellent uncorrected visual acuity. SIA is related to the incision length, incision location, incision architecture, and suture closure technique. Smaller incisions are associated with less surgically induced change in corneal contour. Peripheral incisions at sclera and limbus result in a less surgically induced change in corneal contour than those that involve cornea. Multiplanar incisions give the wound greater stability enabling self-sealing of the wound and thereby avoiding the need of sutures. Suturing the incision may result in either steepening or flattening of one or more parts of the cornea.

In this study, we analyzed postoperative corneal astigmatism after phacoemulsification with intraocular lens implantation through a clear corneal incision and evaluated the effect of small supertemporal and superonasal clear corneal incisions on postoperative corneal astigmatism.

Material and Methods

This prospective study included 22 eyes (10 right and 12 left eyes) of 22 patients with senile cataract. The patients included in the study had no history of previous ocular trauma, surgery or disease that could have affected corneal refraction. All operations were performed by the same surgeon. Topical anesthesia was achieved with tetracaine hydrochloride eye drops. In all right eyes the incision was located supertemporally, and in all left eyes superonasally. Three-step clear corneal...
tunnel incision was made with a 3.0-mm blade. The
tunnel length was 1.75-2.0 mm. Phacoemulsification was
performed with Universal II phacoemulsifier (Alcon).
The incision was enlarged to 3.2 mm and a foldable in-
troacular lens was implanted in the capsular bag. All in-
cisions were left sutureless. Patients were given dex-
amethasone-neomycin-polymyxin B eye drops qid and
the ointment once a day, and the regimen was tapered
over two months postoperatively. Corneal astigmatism
was measured by a Speedy autorefractometer-keratome-
ter preoperatively, and at 1 week, 1 month and 2 months
postoperatively.

Results

The mean preoperative astigmatism was 0.72±0.57
D (diopter). One week postoperatively, the mean astig-
matism decreased to 0.49±0.38 D. One month postop-
eratively it increased to 1.06±0.83 D, and two months

postoperatively it stabilized at 0.95±0.77 D. There was
a statistically significant difference between the mean
preoperative astigmatism and the mean postoperative
astigmatism at two months (Friedman test: χ²=8.44;
p=0.038) (Fig. 1). The mean surgically induced corneal
astigmatism was 0.23 D.

Decomposition of vectors showed that the vertical
component of astigmatism was statistically significant-
ly lower postoperatively than preoperatively (repeated
measure ANOVA: F=2.92; p=0.0404) (Fig. 2). There
was no statistically significant difference between the
preoperative and postoperative horizontal component of
astigmatism (p>0.05) (Fig. 3).

Discussion and Conclusion

Clear corneal incisions (CCI) have been widely re-
ported to produce minimal SIA. To avoid an effect
on corneal refraction, the appropriate size of corneal
incision for self-sealing is 3.0-3.5 mm in width and 1.7-2.0
mm in length [6,10]. In our study, all operations were
performed by the same surgeon who is right-handed. The
corel of CCI in width after enlarging for proacular lens
implantation was 3.2 mm. CCI can be placed at superi-
or, oblique (superotemporal and superonasal) or tempo-
ral locations. Different studies confirmed that a small

Fig. 2. Values of the vertical component of astigmatism (diopter)
preoperatively and on postoperative days 7, 30 and 60.

Fig. 3. Values of the horizontal component of astigmatism (diopter)
preoperatively and on postoperative days 7, 30 and 60.
superior CCI induced greater postoperative astigmatism than a small temporal or a small oblique CCI, and that a small oblique CCI induced greater postoperative astigmatism than a small temporal CCI. In our patients, CCI in the right eyes was located superotemporally, and in the left eyes superonasally. We found no statistically significant difference in SIA between the superotemporal and superonasal incisions. It is consistent with the results reported by Rainet et al. and Ermi et al. The vertical component of astigmatism was statistically significantly lower postoperatively than preoperatively, which was probably the result of corneal relaxation due to the operative incision. There was no significant difference in the horizontal component of astigmatism preoperatively and postoperatively. In conclusion, oblique localization of CCI, superotemporal in the right eyes and superonasal in the left eyes, may ease manipulations during phacoemulsification for right-handed surgeon without significant difference in SIA.

References

Sažetak

ANALIZA POSLIJEOPERACIJSKOG KORNEALNOG ASTIGMATIZMA NAKON FAKOEMULZIFIKACIJE KROZ ČISTI KORNEALNI REZ

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Cilj studije bio je analizirati poslijeoperacijski kornealni astigmatizam nakon fakoemulzifikacije i implantacije intraokularne leće kroz čisti kornealni rez. U ovu prospekativnu studiju bila su uključena 22 oka (10 desnih i 12 lijevih očiju) kod kojih je učinjena fakoemulzifikacija i implantacija savitljive intraokularne leće kroz čisti kornealni rez. Operacije desnih očiju rade su kroz superotemporalni rez, a operacije lijevih očiju kroz superonasalni rez. Astigmatizam je mjeren autorefraktometrom-keratometrom prijeoperacijski, te 1 tjedan, 1 mjesec i 2 mjeseca poslijeoperacijski. Srednja vrijednost kirurški induciranog kornealnog astigmatizma iznosila je 0,23 D (dioptrije). Vrijednosti vertikalne komponente astigmatizma bile su statistički značajno niže poslijeoperacijski u odnosu na prijeoperacijske vrijednosti (p=0,0404). Vrijednosti horizontalne komponente astigmatizma nisu se statistički značajno razlikovale prijeoperacijski i poslijeoperacijski (p>0,05). Također nismo našli statistički značajnu razliku između vrijednosti kirurški induciranog astigmatizma nakon superotemporalne incizije u desnim očima i superonasalne incizije u lijevim očima (p>0,05). Zaključeno je kako kosa lokalizacija čistog kornealnog reza, superotemporalno u desnim očima i superonasalno u lijevim očima, može olakšati rad i manipulacije tijekom fakoemulzifikacije kirurgu dešnjaku bez značajne razlike u veličini kirurški induciranog astigmatizma.

Ključne riječi: kirurgija katarakte, čisti kornealni rez, kirurški inducirani astigmatizam