

Frown scleral incision without phacoemulcification (Sutured and unsutured technique)

P. Traianidis, G. Sakkias, S. Avramides

Department of Ophthalmology, Hippokration Thessaloniki General Hospital,
Thessaloniki Greece

Abstract: Objective: To assess prospectively the reduction of post operative astigmatism with the frown incision (chord length 5-5.5 mm) which is mostly located in the astigmatism neutral area. **Study design:** Prospective study of surgical technique and postoperative results concerning induced astigmatism with a minimum follow-up time of 4 months, maximum of 11 months and a mean 5,46 months. **Setting:** Department of Ophthalmology Hippokration Thessaloniki General Hospital, Thessaloniki Greece. **Patients:** 238 patients with relatively soft cataracts were randomly assigned in two groups (155 patients sutured group, 83 patients unsutured group) and underwent extracapsular cataract extraction with the frown incision te-

chnique from March 1994 to September 1994. **Main outcome measures:** Early and late postoperative astigmatism. **Results:** The mean induced astigmatic change in dioptres was: 0.47, 0.35, 0.27, 0.22 (1st day, 10th day, 1st month, 3rd month) in the sutured group, whereas the corresponding figures in the unsutured group were: 0.73 ($p < 0.01$), 0.54 ($p < 0.01$), 0.42 ($p < 0.05$), 0.35 ($p < 0.05$) respectively. **Conclusions:** The small scleral (5-5.5 mm) frown incision is easy to perform, causes a significant reduction of early and late postoperative astigmatism and the sutured technique gives better results than the unsutured one.
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INTRODUCTION

Despite the enormous progress that has been achieved in the field of cataract surgery, control of postoperative astigmatism still remains a problem. Reduction in induced astigmatism has been not only a major goal of current cataract surgery but also one of the "sine qua non" factors for rapid visual rehabilitation. Incision size, location, configuration and closure technique may have a profound effect on induced postoperative astigmatism¹.

Armeniades and co-authors² in their finite element analysis found that of the three incision variables studied, incision length had the greatest effect on compromising the structural integrity of the globe. Gills and Sanders³ came to the conclusion that corneal astigmatism is directly proportional to the cube of the incision length. Phacoemulsification allows the removal of cataracts through a 3 mm incision, but this is not the case with conventional extracapsular cataract ex-

traction (E.C.C.E.). Regarding the incision location and shape, P. Koch⁴ described the incisional funnel where the incisions made should be astigmatism neutral and Singer⁵ developed the frown incision which is completely confined within Koch's⁴ incisional funnel. Closure technique is another important factor implicated in induced astigmatic error and there are many studies on the closure method and sutureless technique⁶⁻¹⁹. After having performed the straight small scleral incision for more than four years, we have decided to begin performing Singer's⁵ frown incision without phacoemulsification, since this type of incision is confined within an area which is considered to be astigmatism neutral. We report on this technique and on the results of our cases.

PATIENTS – METHODS

Our series included 238 cataract operations performed at the Department of Ophthalmology, Hippokration Thessaloniki General Hospital from March 1994 to September

1994. The age of the patients ranged from 57-73 years (mean: 68.13 years) and there were 107 males and 131 females. The follow-up time ranged from 4 to 11 months (mean: 5.47 months).

Preoperative examination included: visual acuity measurement, biomicroscopy, intraocular pressure measurement (applanation tonometry), keratometry (Haag-Streit, Javal-Schiotz keratometer), ophthalmoscopy, biometry (Tomey A/B Scan Al-510, SRK/T). Cataract type was grouped as nuclear, posterior subcapsular or as a combination of both types. Patients with mature hard cataract with presumed hard large nucleus were excluded from the study and so were those in whom major intraoperative complications, such as complete posterior capsule absence with vitreous loss, made a normal posterior chamber I.O.L. implantation impossible.

The surgical technique was a slight modification of Blumenthal's²⁰ technique using the Singer's⁵ frown incision. A fornix based conjunctival flap was prepared and minimal cautery was performed for hemostasis. After having marked with caliper a 5-5.5 mm chord length, a half thickness curved scleral incision was performed with an Alcon 15 degree ophthalmic knife (Alcon 806592150). The ends of the incision were at a distance of 3 mm from the anterior vascular arcades and its most anterior point was 1.5-2 mm from the aforementioned arcades. This initial incision was mainly placed within Koch's⁴ incisional funnel (Fig. 1 depicts the frown incision). A lamellar scleral dissection was performed with an Alcon bevel-up crescent knife (Alcon 8065940002) and was carried forward until the knife tip could be seen into clear cornea (1-1.5 mm). At this point two small side-port corneal incisions were made with the Alcon 15 degree ophthalmic knife, one at 8 or 4 o'clock position depending on the right or left eye, which was used for the anterior chamber maintainer insertion, and a second incision at approximately 10 o'clock position regardless of the right or left eye, which was used for different intraoperative manipulations (viscoelastic filling and removal, cortex aspiration, I.O.L. adjustment). The anterior chamber was entered with an Alcon Ophthalmic 3.2 mm angled knife (Alcon 8065923261) which was angled dra-

matically downward, thus creating an incision almost parallel to the iris. Following anterior capsulotomy (circular of canopener), nucleus hydrodissection and hydrodelination, the nucleus extraction was made with an irrigating vectis through the scleral tunnel. After residual cortex removal an one piece biconvex 5.5-6 mm optic diameter posterior chamber polymethylmethacrylate (PMMA) I.O.L. (Domilens Centra 55B, Alcon LX90BD, Dr. Schmidt MF 2125) was into the capsular bag implanted with a Kellman-McPherson forceps. Viscoelastics were used during anterior capsulotomy and I.O.L. implantation.

Regarding wound closure patients were randomly assigned in two groups. In the first group (155 eyes), the incision was closed with an X-shaped suture (Alcon polypropylene 10-0, blue monofilament 306401) and the knot was buried within the incision. In the second group (83 eyes) the incision was left without sutures, after a careful testing for watertightness with a microsponge (Alcon microsponge NDC 8065-1000-02) and with the anterior chamber maintainer open. No attempt was made to alter the preoperative astigmatism. Keratometry readings were taken preoperatively and postoperatively at one day, ten days, and at one and three months. The simple subtraction method without regard to axis was used for calculating cylinder change. Additionally, intraocular pressure was measured one day prior to and one day after surgery to determine changes in intraocular pressure as indications of wound leakage.

A prior series of 122 eyes that had a straight 6-6.5 mm scleral incision with an X-shaped suture was retrospectively reviewed and compared with the sutured frown incision group.

RESULTS

Table 1 shows the mean induced astigmatic change (dioptres), the standard deviation and p-values for both groups with the simple subtraction method (without regard to axis). The sutured group had statistically significantly less induced astigmatism the first postoperative day and after ten days ($p < 0.01$). A smaller difference was present at one and three months ($p < 0.05$).

Table 2 shows the mean induced astigmatic

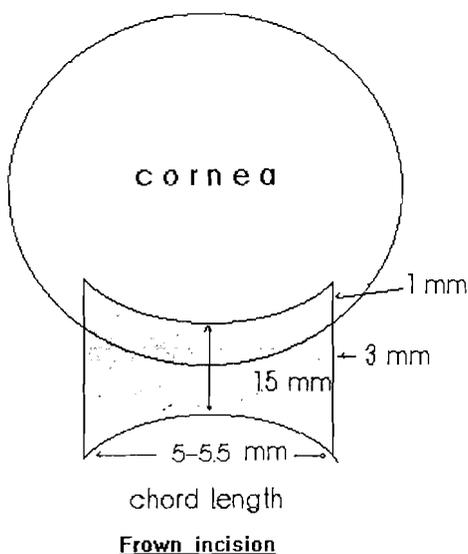


Figure 1

Table 1. Mean induced astigmatism change for 5-5.5 mm frown incision (sutured and unsutured group). Simple subtraction method

Interval	Sutured group (155 patients)	Unsutured group (83 patients)	p
1 day	0.47 ± 0.46	0.73 ± 0.62	<0.01
10 days	0.35 ± 0.39	0.54 ± 0.51	<0.01
1 month	0.27 ± 0.35	0.42 ± 0.47	<0.05
3 months	0.22 ± 0.32	0.35 ± 0.44	<0.05

Results expressed as mean ± standard deviation in dioptres.

Table 2. Mean induced astigmatism for frown incision and for straight incision. Simple subtraction method

Interval	Frown incision (155 patients)	Straight incision (122 patients)	P
1 day	0.47 ± 0.46	1.33 ± 0.97	<0.001
10 days	0.35 ± 0.39	0.88 ± 0.71	<0.001
1 month	0.27 ± 0.35	0.72 ± 0.61	<0.001
3 months	0.22 ± 0.32	0.58 ± 0.52	<0.001

Results expressed as mean ± standard deviation in dioptres.

change (dioptres) the standard deviation and p-values with the simple subtraction method (without regard to axis) for our sutured frown incision group and for a prior group of ours of 122 eyes that had a straight 6-6.5 mm scleral incision with an X-shaped suture. The frown incision sutured group had statistically significantly less induced astigmatism during all follow-up time ($p < 0,001$).

Table 3 and figure 2 show the shift toward against the rule astigmatism in the sutured group.

Table 4 show the same shift in the self-sealing group. This shift mainly occurred in the sutured group.

A small reduction in IOP was recorded on the first postoperative day. There were no cases with shallow anterior chamber, wound leakage or hypotony observed. No cases developed filtration blebs, hyphema or postoperative endophthalmitis. The cataract type was classified as combination of nuclear and posterior subcapsular in 126 eyes (52,94%), only nuclear in 41 eyes (17,22%) and only posterior subcapsular in 91 eyes (29,83%). While preparing the scleral tunnel

the surgeon inadvertently entered the anterior chamber in 7 eyes (2,94%). This happened because of a deep dissection and excessive force exerted by the bevel-up crescent knife. All these eyes were sutured. Anterior capsulotomy was circular in 187 eyes (78,57%) and can-opener in 51 eyes (21,42%).

DISCUSSION

Wound construction in cataract surgery may vary in incision size, location, configuration and closure technique. We still perform conventional extracapsular cataract extraction (E.C.C.E.) at our Department given the lack of phacoemulsification unit and that of appropriate experience. P. Koch's⁴ description of the astigmatism neutral incisional funnel and Singer's⁵ frown incision within that funnel urged us to begin performing conventional E.C.C.E. with a 5-5.5 mm frown incision.

The incisional funnel is an imaginary pair of curved lines which diverge outwards from the limbus and incisions made within it will be astigmatism neutral. Singer⁵ resembled the frown incision with a suspension bridge where the incision's broad surface area is available for healing and its relationship to the incisional funnel may provide long term refractive stability.

Some difficulties may arise during nucleus extraction due to the relative short length of the incision. The nucleus is practically entrapped within the scleral tunnel where the hydrostatic pressure from the anterior chamber maintainer plus the mechanical pressure exerted by the irrigating vectis pull it out. This manipulation may result to soft nucleus fracturing within the tunnel

Table 3. Astigmatism shift in the sutured group

Interval	Group I (155 sutured cases)			
	With -the- rule	Against the rule	Oblique	No astigmatism
1st day	84 (54,19%)	25 (16,13%)	17 (10,97%)	29 (18,71%)
10th day	32 (20,64%)	78 (50,33%)	14 (9,03%)	31 (20%)
1st month	28 (18,07%)	82 (52,9%)	14 (9,03%)	31 (20%)
3rd month	23 (14,84%)	88 (56,78%)	10 (6,45%)	34 (21,93%)

Number of cases and percentage.

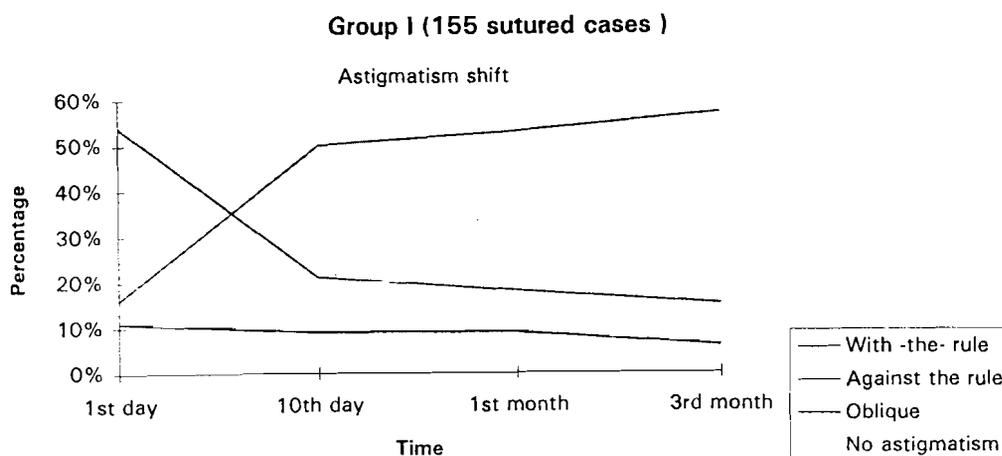


Figure 2

Table 4. Astigmatism shift in the unsutured group

Group II (83 sutured cases)				
Interval	Astigmatism shift			
	With -the- rule	Against the rule	Oblique	No astigmatism
1st day	15 (18,07%)	47 (56,63%)	10 (12,05%)	11 (13,25%)
10th day	12 (14,46%)	50 (60,24%)	8 (9,64%)	13 (15,66%)
1st month	9 (10,84%)	52 (62,65%)	7 (8,43%)	15 (18,08%)
3rd month	6 (7,23%)	52 (62,65%)	7 (8,43%)	18 (21,69%)

Number of cases and percentage.

and the smaller preces of the nucleus as well as those of the remaining epinucleus may easily come out from the anterior chamber. The elasticity of the sclera allows the 5,5-6 mm PMMA IOL to be inserted through a 5-5.5 mm entry²¹.

Our results concerning induced postoperative astigmatism were satisfactory enough and undoubtedly better than those obtained with the straight scleral incision which had a 6-6.5 mm length and was mostly located out of the incisional funnel. The sutured group had statistically significantly less induced astigmatism than the sutureless group at one day and ten days after surgery ($p < 0.01$). This difference was lessened at one and three months after surgery ($p < 0.05$). A statistically significant difference was observed between our sutured frown incision group and a prior series of ours with straight small scleral incision ($p < 0.001$). Unfortunately we have used the simple subtraction method which disregards axis change, is the least precise and gives the

least amount of astigmatic change. By the 10th postoperative day, there was an early against-the-rule astigmatism shift which is in agreement with other studies^{6,16,19,22}. The self sealing group had a high initial against-the-rule astigmatism rate, which is attributed to an inherent wound gaping which leads to flattening in the meridian perpendicular to the incision, resulting in against-the-rule astigmatism rate, which is attributed to an inherent wound gaping which leads to flattening in the meridian perpendicular to the incision, resulting in against-the-rule astigmatism^{24,25}.

Intraocular pressure virtually remained unchanged on the first postoperative day compared with that on the day before surgery. Nucleus extraction of posterior subcapsular cataracts was easier than that of nuclear cataracts. Anterior capsulotomy type had no remarkable effect on the final outcome.

Radial sutures generally induce an initial

with-the-rule astigmatism²³⁻²⁵. Shepherd's¹⁸ horizontal mattress suture, Fine's¹⁹ infinity suture and Masket's⁹ horizontal anchor suture have further reduced the initial with-the-rule astigmatism for incisions ranging from 4-7 mm in length.

Self-sealing incisions have been reported on by many authors^{1,3,8,10,17,26-30}. Advantages attributable to sutureless incision may include: rapid visual rehabilitation, return to preoperative astigmatism⁸, surgical time saving, reduction of corneal tissue distortion¹¹, no postoperative hyphemas^{12,13}, no irritation or discomfort from exposed sutures¹⁴. Buzard and Shearing¹⁷ found no statistical difference between horizontal suture groups and no-suture groups regarding induced astigmatism, although they did not expect any induced astigmatism with the no-suture technique. Masket²⁶ reported that the astigmatic behavior of sutured and unsutured 4.0 mm corneoscleral tunnel incisions were quite similar, based on his results at one year after surgery. Sinkey and Stoppel³¹ performed a 6 mm no-stitch frown incision with phacoemulsification and reported mean induced keratometric cylinder of 0.32 dioptres (D) at one day, 0.37 D at one week, 0.16 D at one month and 0.15 D at three months. These results are close to ours of the sutured group, but better than ours of the self-sealing group.

In conclusion we might say that a small 5-5.5 mm frown incision is easy to perform, is suitable only for relatively soft cataracts, results to less induced astigmatism than the scleral straight incision and may be left unsutured after a careful watertightness testing without any serious complications. If any suspicion of wound leakage arises, then the incision must be sutured.

ΠΕΡΙΛΗΨΗ

Τραϊνίδης Π, Σάκκας Γ, Αβραμίδης Σ. Η καμπύλη τομή χωρίς φακοθρυψία (Τεχνική με ράμματα και χωρίς ράμματα). *Hippokratia* 1997, 1: 200-205.

Σκοπός της εργασίας μας είναι να εκτιμήσουμε προοπτικά την ελάττωση του μετεγχειρητικού αστιγματισμού με την καμπύλη τομή (μήκος χορδής 5-5.5 χιλ.) η οποία βρίσκεται κυρίως στην ελεύθερη από αστιγματισμό περιοχή. Διακόσιοι τριάντα οκτώ ασθενείς με σχετικά μαλακούς καταράκτες κατανομήθηκαν τυχαία σε δύο ομάδες (115 ασθενείς στην ομάδα με ράμματα και 83

ασθενείς στην ομάδα χωρίς ράμματα) και χειρουργήθηκαν με την εξωπεριφακική μέθοδο και την καμπύλη τομή. Η μέση αστιγματική αλλοίωση σε διοπτρίες ήταν 0,47, 0,35, 0,27, 0,22 (πρώτη μέρα, δεκάτη μέρα, πρώτος μήνας, τρίτος μήνας) στην ομάδα με ράμματα, ενώ τα αντίστοιχα ευρήματα στην ομάδα χωρίς ράμματα ήταν 0,73, 0,54, 0,42, 0,35 αντίστοιχα. (Η διαφορά ήταν στατιστικά σημαντική σε όλες τις περιπτώσεις). Η μικρή σκληρική καμπύλη τομή (5-5,5 χιλ.) διενεργείται εύκολα προκαλεί μεγάλη ελάττωση τόσο του πρώιμου όσο και του όψιμου αστιγματισμού και η τεχνική με συρραφή δίνει καλύτερα αποτελέσματα από εκείνη χωρίς συρραφή.

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