VIDEOKERATOGRAPHY: A COMPARISON BETWEEN 6 MM SUTURED AND UNSUTURED INCISIONS FOR PHACOEMULSIFICATION

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SUMMARY

One of the main aims of small incisions in cataract surgery is to reduce surgically induced astigmatism to a minimum. A prospective study was set up to compare sutured with unsutured 6 mm scleral pocket frown incision wounds for phacoemulsification. Videokeratography was used to study the topographical changes induced by surgery. Two groups of 15 patients were allocated to have either sutured or unsutured 6 mm frown incisions for their phacoemulsification. Videokeratography was performed 1 day pre-operatively, and repeated 6 weeks post-operatively. Statistical analysis of the resultant data is discussed. The results show a modest flattening in the vertical meridian in both groups of patients which was slightly larger in the unsutured group. The astigmatic change did not differ significantly between the two groups. The 6 mm scleral pocket incisions induce a small amount of astigmatism whether sutured or unsutured. However, we felt it was perhaps safer to suture an incision of that size. Videokeratography is an invaluable tool for collection of outcome audit data, and allows for accurate graphical assessment of the effect of differing surgical approaches.

Advances in surgical technique to minimise surgically induced astigmatism following cataract surgery require information on changes of the entire corneal shape. Computerised videokeratography (CVK) has recently provided valuable data on the changes to the whole of the corneal surface following cataract surgery.

In this study we used CVK to evaluate the corneal topographic changes induced by sutured and unsutured 6 mm scleral pocket incisions for cataract extraction by phacoemulsification and posterior chamber intraocular lens implantation.

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SUBJECTS AND METHODS

A total of 30 patients undergoing cataract extraction by phacoemulsification and posterior chamber intraocular lens implantation were included in this study. There were 18 women and 12 men with a mean age of 67 years (range 49–74 years). Patients with anterior segment pathology, such as glaucoma, pre-operative uveitis, previous intraocular surgery or any corneal abnormalities, were excluded from the study.

Patients were randomly allocated to two groups of 15. Age and sex distribution in the two groups did not differ significantly. A 6 mm scleral pocket frown incision was used on all patients. The scleral pocket incisions were left unsutured in patients of group 1 and sutured with a single horizontal 10–0 nylon suture in group 2.

A uniform procedure was used in all patients and they were all operated on by one surgeon (H.T.K.). A fornix-based conjunctival flap was fashioned and light bipolar cautery was applied to the proposed wound area. A 6 mm scleral pocket frown incision was fashioned, the apex of which was 2 mm from the limbus (Fig. 1). The centre of the incision was always at the 90° axis (12 o'clock). Access to the anterior chamber was gained by a 3.2 mm keratome. After completion of a continuous curvilinear capsulorhexis and hydrodissection, posterior chamber phacoemulsification was performed. Irrigation/aspiration of cortical lens matter followed. The wound was then enlarged to the externally measured size of 6 mm. A 6 mm posterior chamber PMMA implant was inserted in the capsular bag. In eyes receiving a suture, a 10–0 nylon horizontal mattress suture was inserted. All patients received 4 mg betamethasone and 20 mg gentamicin injections subconjunctivally in the lower fornix at the conclusion of surgery. The patients were instructed to use betamethasone–neomycin 0.5% drops four times daily for a period of 4 weeks.

Videokeratography using the EyeSys corneal

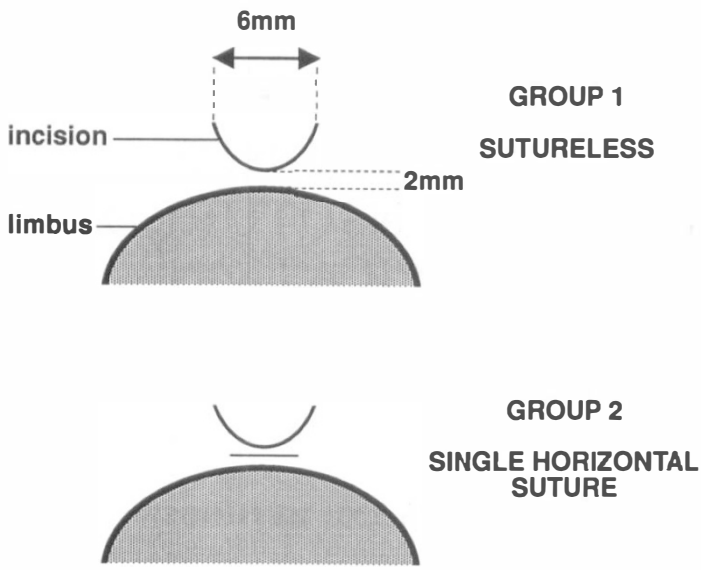

Fig. 1. *Schematic representation of the surgical incisions used in each of the study groups.*

analysis system was performed on all patients 1 day pre-operatively. This was repeated 6 weeks post-operatively.

Analysis of the data was done along the 0, 90, 180 and 270 degree semimeridia. The 90 degree semimeridian was taken to be at the centre of the incision. The corneal powers (in dioptres) at four points at a radial distance of 0.75, 1.5, 2.5 and 3.5 mm from the centre of the cornea along each of the four semimeridia were noted and the mean corneal power for each semimeridian was calculated (Fig. 2). The data obtained were used in three ways:

(1) Data were converted into a standard astigmatism format using the following formula (where K = astigmatism):

$$K = \frac{|(\text{Power at } 90)+(\text{Power at } 270)}{2} - \frac{(\text{Power at } 0)+(\text{Power at } 180)|}{2}$$

The change in astigmatism was calculated as follows:

$$\text{delta } K = (K \text{ post-op}) - (K \text{ pre-op})$$

This method was used to obtain the overall surgically induced astigmatism which would correlate to spectacle correction. Negative (−) values indicate flattening while positive (+) values indicate steepening in the vertical meridian.

(2) The means, standard deviations and medians of the change in corneal power at each of the four semimeridia from pre- to post-operative were also calculated and the results of the two groups compared using the Mann–Whitney non-parametric test. This step of data analysis compares the local astigmatic changes of the two groups of patients in each of the four semimeridia. More details are therefore obtained on the topographical changes in each corneal quadrant as opposed to the entire meridian.

(3) The changes in mean corneal power at the 90 degree semimeridian, from pre- to post-operative, within each of the two groups were analysed for statistical significance using a paired t-test.

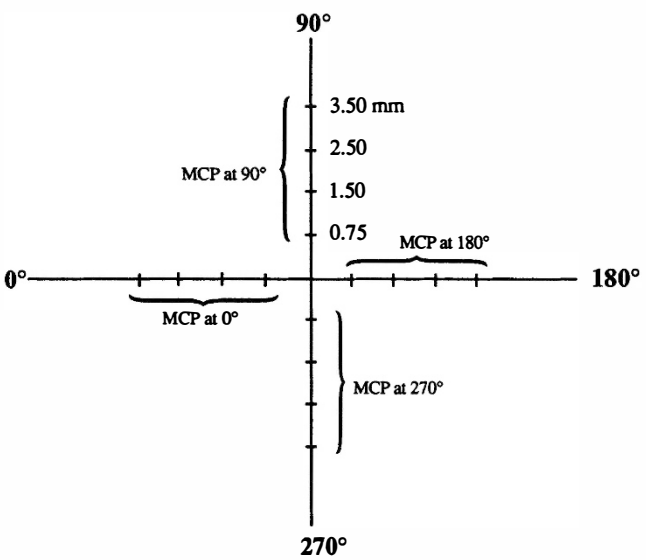

Fig. 2. *Schematic representation of data analysis points. MCP, mean corneal power = mathematical mean of the corneal power in dioptres at the four points illustrated. The 90 degree semimeridian is taken to be at the centre of the incision.*

Table I. Keratometric equivalent of post-operative astigmatic changes (dioptres) as measured with computerised videokeratography[a]

	Mean	SD	Median
Group 1: unsutured	−0.722	0.29	−0.635
Group 2: sutured	−0.428	0.409	−0.615

[a]Values were derived by subtracting pre-operative from post-operative K values where K = (mean corneal power in the vertical meridian − mean corneal power in the horizonal meridian). Negative values indicate net flattening along the vertical meridian.

RESULTS

The 6 mm incision used allowed safe surgery and lens implantation. No significant post-operative complications were noted in any of the patients. There was no demonstrable wound leakage in any of the patients, although one patient with an unsutured wound developed a diffuse bleb that had no adverse consequences.

Table II. Surgically induced change in corneal power (dioptres) at 6 weeks post-operative[a]

	Mean changes (SD)	
Semimeridian (degrees)	Group 1: Unsutured (n = 15)	Group 2: Sutured (n = 15)
90	−0.505 (0.991)	−0.01 (1.030)
270	−0.017 (0.824)	0.258 (0.870)
0	0.232 (0.854)	0.622 (0.641)
180	0.689 (0.874)	0.486 (0.682)

[a]Values were derived by averaging the corneal powers at four points along each of the semimeridia. Negative values indicate flattening.

Analysis of the topographical data showed the following:

(1) The keratometric equivalents of the astigmatic change 6 weeks post-operatively showed a mild flattening in the vertical meridian, i.e. against-the-rule (ATR) astigmatism in both groups of patients, more pronounced in the unsutured group (Table I). Statistical analysis using the Mann–Whitney test showed no significant difference between the two groups ($p = 0.2626$).

(2) The amount of astigmatic change in each of the semimeridia is shown in Table II. There was a mild flattening along the 90 degree semimeridian in the unsutured group (mean −0.5 D, median −0.86 D) while the sutured group did not show much change (mean −0.01 D, median −0.3 D). The difference was not statistically significant ($p = 0.2619$). Along the 270 degree semimeridian there was no change in group 1 (median 0.00) and a negligible steepening in group 2 (median 0.32). The difference was also not statistically significant. This indicates that the induced flattening in the vertical meridian was mostly expressed by changes in the 90 degree semimeridian nearest the wound with very little change in the 270 degree semimeridian.

(3) There was no statistically significant change in mean corneal power at the 90 degree semimeridian from pre- to post-operative in the sutured group ($p = 0.98$). The change was more significant in the unsutured group ($p = 0.068$).

DISCUSSION

It has been shown both clinically and experimentally that a smaller incision approaching 3 mm in width induces the least astigmatism.[1–3] However, many cataract surgeons using phacoemulsification prefer rigid PMMA intraocular lens implants (IOL) to foldable IOLs. This necessitates the use of 5–6 mm incisions to introduce 5 × 6 mm or round 6 mm rigid IOLs. Masket[4] reported ATR astigmatism of 0. 7 D 6 weeks post-operatively with a 6 mm incision. Our results showed a comparable, although smaller ATR astigmatism of 0.4 D for the sutured group of patients. Masket used a horizontal anchor suture of a different configuration to the one we used. We also used a frown incision, which is thought to induce less astigmatism than a linear incision.[5]

Koch and co-authors[6] noted remarkably little astigmatic change in both sutured and unsutured 4 mm scleral pocket incisions. Our study suggests that 6 mm incisions induce ATR astigmatism of a small value. The sutured group had less astigmatism on average, although the difference did not reach statistical significance. Despite a lack of complications from the unsutured incisions, we felt that a sutured wound is probably safer in a wound 6 mm or more in width.

Computerised videokeratography proved an invaluable tool for assessing and auditing the astigmatic changes induced by cataract surgery. Such insight is necessary in advancing our surgical techniques to achieve optimal results for our patients.

Key words: Astigmatism, Cataract, Corneal topography, Phacoemulsification, Posterior chamber intraocular lens implants, Scleral pocket incision.

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