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A COMPARATIVE STUDY ON THE SUPERIOR, SUPEROTEMPORAL, AND TEMPORAL INCISION IN MANUAL PHACOEMULSIFICATION FOR POST-OPERATIVE ASTIGMATISM

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ABSTRACT

Aim: To compare the amount of astigmatism in superior, superotemporal, and temporal incisions in manual phacoemulsification.

Methods: Three hundred patients were studied. The patients were randomly assigned to any of the three groups. The three groups had 100 patients each. The patients in group A underwent manual phaco with a superior incision, the patients in group B underwent manual phaco with a supero-temporal incision and the patients in group C underwent manual phaco with a temporal incision. The patients were examined on postoperative days 1,7,21 and 45. The uncorrected and the best-corrected visual acuity was recorded and a slit-lamp examination and auto-refractometer and keratometry examinations were also done.

Results: The mean SIA in group A was found to be 1.572 ± 0.651, in group B, it was 0.532 ± 0.317and in group C, it was 0.435 ± 0.338. The F score which was applied was found to be 186.44. This value was more than the standard value. The p-value accordingly was < 0.001, which was highly significant.

Conclusion: Manual phaco which is done with a temporal and a supero-temporal approach provides a better quality of vision due to a significantly less SIA than the superior approach.

KEYWORDS :

INTRODUCTION

The cataract is defined as opacity in the lens capsule or its substance. The mainstay of the management of cataract is surgery. The main aim of cataract surgery is to provide a good vision quantitatively as well as qualitatively and early visual rehabilitation. Miller Stephen J defined astigmatism as a condition of refraction in which a point of light cannot be made to produce a punctate image upon the retina by a correcting spherical lens [1]. These scars cause corneal flattening along the meridian of the incision and steepening in the meridian 90% away [2]. This Surgically Induced Astigmatism (SIA) is one of the causes of the poor quality of vision post-operatively because of the blurring of images. SIA in turn depends on the type, length, and position of the incision and also on the method of the wound closure [3]. Reddy et al., (2007) studied the comparison of astigmatism which was induced by superior and temporal sections in SICS in the Indian population, but their study had a smaller group of 64 patients only [4]. Gokhale et al., (2005) compared astigmatism which was induced by superior, supero-temporal, and temporal incisions in manual SICS [5].

MATERIALS AND METHODS

This was a prospective, hospital-based, randomized, controlled clinical study that was conducted between January 2018 – November 2021 with permission from the ethical committee of the institute. All the surgeries were conducted at the Department of Ophthalmology, Government General Hospital, Kadapa. A total of 300 patients were selected. The patients were randomly assigned to any of the three groups. The three groups had 100 patients each. The patients in group A underwent manual SICS with superior tunnel incisions. The patients in group B underwent manual SICS with supero-temporal tunnel incisions. The patients in group C underwent manual SICS with temporal tunnel incisions.

Inclusion Criteria

The patients with nuclear cataracts from grade 2 to grade 3 and cortical cataracts. Above 45 years age group patients were included.

Exclusion Criteria

The patients with associated glaucoma, traumatic cataract, complicated cataract, lenticular subluxation, poorly dilating pupils, previous intraocular or corneal surgeries or glaucoma surgeries, doubtful zonular integrity due to pseudoexfoliation, corneal scarring or degeneration, macular degeneration, and retinal pathology.

METHODS

All the patients were pre-operatively assessed with visual acuity recording, slit-lamp bio-microscopy, tonometry, and fundus examination by using a distant direct ophthalmoscopy and slit lamp biomicroscopy using 90 D lens. Astigmatism was measured by using an auto refractometer keratometer. The IOL power was calculated by contact A-scan biometry by using the SRK II formula. Pre-operative investigations like a complete haemogram, random blood sugar. Topical ciprofloxacin 0.3 % eye drops were instilled four times a day, three days before the surgery. A pre-operative informed consent was taken from the patients. Topical tropicamide 0.8% with phenylephrine 5% and flurbiprofen (non-steroidal anti-inflammatory) eye drops were instilled every 15 minutes, 1 hour before the surgery. The patients were operated under peribulbar anesthesia with 5 cc of a 3:2 mixture of injection Xylocaine 2% and Injection bupivacaine 0.5 % with 150 I.U. of hyaluronidase.

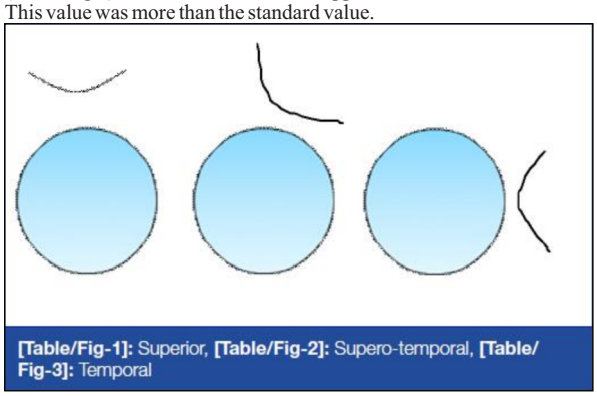
A conjunctival flap was made. A 6 mm frown-shaped scleral incision which was 1.5 mm posterior to the limbus was made. In group A, the incision was made superiorly (Table/Fig 1), in group B it was made supero-temporaly (Table/Fig 2) and in group C, it was made temporally (Table/Fig 3). A three-plane sclero-corneal tunnel was created with a 15 No. blade and a crescent blade. Through a side port, the anterior chamber was filled with Trypan blue. After 30 seconds, the anterior chamber was washed and filled with a viscoelastic solution . Capsulorrhexis was performed by using a 26 gauge needle. An entry into the anterior chamber was made with a sharp 3.2 mm keratome to create a self-sealing corneal valve and the internal opening was extended . Hydro-dissection and delineation were performed. The upper pole of the nucleus was prolapsed out of the capsular bag. Through the scleral tunnel, the nucleus was delivered by sandwich technique. The cortical matter was aspirated with Simcoe two-way irrigation and aspiration cannula. In the presence of a viscoelastic solution, a rigid posterior chamber 6—12.5 mm PMMA intraocular lens was implanted in the capsular bag.

The viscoelastic solution was removed from the anterior chamber by irrigation with balanced salt solution by using a Simcoe cannula. Corneal stromal hydration was performed at the wound edges. A subconjunctival injection, Gentamicin 20 mg mixed with Dexamethasone 2mg was injected in the lower fornix. The eye was bandaged for 24 hours. Post-operatively, oral antibiotics (Tab.Ciprofloxacin 500 mg twice daily) and analgesics were given. The patients were examined on postoperative days 1,7, 21, and 45. The uncorrected and the best-corrected visual acuity were recorded; slit-lamp examination, fundus examination, and auto refractometer and keratometry examinations were done. The patients were asked to come for regular follow-ups. All the calculations were performed by using the surgically induced astigmatism (SIA) calculator version 2.1, a free software program[6]. The Surgically Induced Astigmatism was calculated from the pre and the postoperative keratometric values, as

was described by Holladay et al.,[7]. The comparison between the groups was done by using InStat (a statistical software program) in steps like comparing the means and performing the ordinary ANOVA test and the assuming values were sampled from the Gaussian distribution.

RESULTS

A total of 300 eyes were operated on. There were 100 eyes in each group. The mean SIA in group A was found to be 1.572 ± 0.651, in group B, it was 0.532± 0.317 and in group C, it was 0.435±0.338 (Table/Fig 4). The F score which was applied was found to be 186.44. This value was more than the standard value.



[Table/Fig-1]: Superior, **[Table/Fig-2]:** Supero-temporal, **[Table/Fig-3]:** Temporal

Table/Figure 4: Surgically Induced Astigmatism

INCISION LOCATION	NUMBER OF PATIENTS	SURGICALLY INDUCED ASTIGMATISM
Superior	100	1.572+/- 0.651
Supero-temporal	100	0.532+/-0.317
Temporal	100	0.435+/-0.338

Table/Figure 5: Comparison Between The Groups

COMPARISON	MEAN DIFFERENCE	Q	P
Group A vs. Group B	1.040	22.52	P<0.001
Group A vs. Group C	1.138	24.63	P<0.001
Group B vs. Group C	0.0975	2.112	NS p>0.05

One-way Analysis of Variance (ANOVA) with post-tests showed a p-value of < 0.0001, which was highly significant. The mean of the variation among the groups was significantly greater than that which was expected by chance (Table/Fig 5). The Bartlett's statistics was 67.490 and so, p was < 0.0001. This suggested that the difference between the standard deviations was extremely significant.

DISCUSSION

The sutureless manual SICS is a good alternative to Phacoemulsification and it gives visual results which are equivalent to Phacoemulsification, at lower expenses. But the rates of astigmatism are higher due to the larger sizes of the incisions. To achieve an excellent visual acuity, the effect of astigmatism on the postoperative vision has to minimize. Burgansky et al have reported an increase in astigmatism with an increase in the incision size [8]. Pre-existing astigmatism can be neutralized by changing the site of the incision. When the incision is located superiorly, both the gravity and the blinking of the eyelid tend to create a drag on the incision. These forces are neutralized better with temporally placed incisions because in such cases, the incision is parallel to the vector of the forces [9]. But a superior incision is easy to learn and the upper eyelid covers the incision and so the wound is protected and the foreign body sensation is less. The temporal location is the farthest from the visual axis and any flattening which is caused by the wound is less likely to affect the corneal curvature at the visual axis. A temporal incision is advantageous because it can be made easily in deep sockets and small eyes. Also, the superior site is still there if a trabeculectomy surgery has to be done for glaucoma in the future. But it is difficult to learn and the upper lid does not cover the incision and so the foreign body sensation due to the exposure is more and it is exposed to infection.

The supero-temporal location has the advantages of both locations. The supero-temporal incision is free from the effect of gravity and eyelid pressure and it tends to induce less astigmatism. Astigmatism which was induced in manual SICS which was done with superior, supero-temporal, and temporal scleral tunnel incisions was compared. This study found that the induced astigmatism was lower in the temporal and supero-temporal groups as compared to that in the superior group. Astigmatism in the supero-temporal and temporal groups was comparable. In the study of Gokhale et al., (2005), the SIA in the superior group was 1.28D, it was 0.2D in the superotemporal group and it was 0.37D in the temporal group [5]. Our study also showed similar results, with the superior group having an SIA of 1.57D, an SIA of 0.53D in the supero-temporal group, and that of 0.435D in the temporal group.

CONCLUSION

SICS with the superior-temporal and the temporal approaches provides a better quality of vision due to the significantly less SIA than the superior approach. But the supero- temporal incision has the advantages of both locations and so it is better than the temporal incision.

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