

Change in Pre Existing Corneal Astigmatism after Phacoemulsification through Clear Corneal Incision

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ABSTRACT

OBJECTIVE: To compare the change in pre existing corneal astigmatism after closing superonasal incisions by single 10/0 suture and by simple hydration at the time of cataract surgery with phacoemulsification through clear corneal incision.

DESIGN: Prospective, comparative and interventional.

SETTING: Department of Ophthalmology, Liaquat University of Medical and Health Sciences Jamshoro, during the period from Jan 2011 to Sept 2011.

METHODS: This prospective study included 244 left eyes. All eyes went phacoemulsification through a clear corneal incision (3.0 mm) superonasally. First 122 eyes were closed with single 10/0 sutures and remaining 122 with simple hydration. Magnitude of astigmatism was measured by keratometer at 1 week, 4 and 8 weeks postoperatively. Vector analysis method was used to calculate the surgical induced astigmatism. SPSS version 11.0 was used to analyze the data. P value 0.05 was considered significant.

RESULT: Out of 244 patients 59.42% were males and 40.57% were female. The mean pre operative astigmatism was >1.0 D. In early days there no significant change in post operative astigmatism (0.50 ± 0.45 D / 0.75 ± 0.50 D, p value < 0.001) was found, but statistically significant change in magnitude of astigmatism (0.84 ± 0.69 D / 2.25 ± 0.70 D, p value 0.05) and Surgically Induced Astigmatism (0.81 ± 0.62 D / 1.12 ± 0.94 D) was found in first and second group respectively at the end of follow-up.

CONCLUSION: Closing of clear corneal incision superonasally with our technique in the left eyes is easy during phacoemulsification for right-handed surgeon without fear of increase in pre existing astigmatism.

KEY WORDS: cataract surgery, clear corneal incision, surgically induced astigmatism, Pre existing astigmatism.

INTRODUCTION

The most popular technique for cataract is phacoemulsification that rehabilitate the vision rapidly,^{1,2} but some time it does not meet the expectation of patients; because of either surgical induced astigmatism (SIA) or pre existing astigmatism (PEA). Recently the cataract surgery has been changed without doubt into a refractive surgery. Therefore aim is to achieve excellent uncorrected visual acuity (UCVA) after surgery. It is important to know how to deal not only with spherical ametropia but also with pre existing and surgical induced astigmatism at the time of surgery³. By modifying various parameters of the incision like length, distance from the corneal center, and the corneal meridian; the mild to moderate corneal astigmatism can be improved^{4,5}. Less than 1 D of corneal astigmatism can be treated by placing the incision on the steep meridian⁶ and single or paired peripheral corneal-relaxing incisions are being used to correct the astigmatism of 1 to 3 D⁶. Toric IOLs are being im-

planted in eyes with 1–4 D of corneal astigmatism⁷. Most of the surgeons don't want to change the position of the microscope and phacoemulsification machine, when attempting an oblique incision. Right handed surgeons are more comfortable to perform oblique incision superotemporally in right eye and superonasally in left eye². With advancing age the corneal astigmatism changes from with-the-rule (WTR) to against-the rule (ATR) astigmatism that also affect the post operative vision⁸⁻¹¹. As we know that the placing of clear corneal incision may cause flattening at the meridian of incision with a corresponding steepening 90° away from the incision meridian⁴, it means the surgery at superotemporal meridian of right eye with clear corneal incisions may decrease against-the rule (ATR) astigmatism but worsen with-the-rule (WTR) astigmatism⁴. But this situation becomes reversed when the surgery is performed through superonasal site of left eye.

The rational of this study is to share our experience to

deal with astigmatism while performing phacoemulsification at superonasal site because most of the right hand surgeons are not familiar to perform surgery at superotemporal meridian of left eye and to other options of treatment to decrease SIA and PEA at the time of surgery.

Objective

To compare the change in pre existing corneal astigmatism after closing superonasal incisions; by single 10/0 suture and by simple hydration at the time of cataract surgery with phacoemulsification through clear corneal incision.

MATERIAL & METHOD

This prospective, comparative study was carried out in the Eye Hospital Hyderabad of Liaquat University of Medical and Health Sciences Jamshoro, Sindh – Pakistan, during the period from Jan 2011 to Sept 2011.

After taking a written consent 244 left eyes with immature cataract and flatten meridian superonasally, having no history of previous ocular trauma, ocular surgery or disease that could have affect corneal refraction were included in the study.

Preoperative comprehensive ophthalmic examination including: Clinical data, refractive status of the eye, uncorrected and best corrected distance visual acuities, slit-lamp examination, intraocular pressure measurement (IOP), indirect binocular ophthalmoscopy for fundus was carried out. Astigmatism was measured by keratometer (readings with steep meridians between 46 degrees and 134 degrees were considered WTR astigmatism and those with steep meridians less than 46 degrees and greater than 134 degrees were considered ATR astigmatism) pre-operatively, and at 1 week, 4 weeks and 8 weeks post-operatively. At the end of follow up SIA was calculated by vector analysis method described by Holladay et al¹².

Surgical Procedure

All surgeries were performed by single surgeon. Mydriasis was made through 1 % tropicamide eye drops. Topical anesthesia was achieved with 0.5% proparacaine hydrochloride eye drops. The phacoemulsification was performed through a two-step superonasal clear corneal incision of 3.0 mm size and foldable IOL was implanted by increasing the size of incision up to 3.5 mm. Incisions of first group of 122 eyes were closed with 10 / 0 nylon sutures and second group of 122 eyes closed with simple hydration for self sealing.

Statistical Analysis

Results were compiled on SPSS version 11 by using the t test to compare the pre and post-operative data and the Mann-Whitney U test for comparison between groups. P value of 0.05 was considered statistically significant.

RESULTS

Demographic data and clinical data of study patients is shown in **Table I**, Out of 244 patients 145 (59.42%) were male and 99 (40.57%) were female. The mean age of patients in first group (incision closed by 10/0 suture) was 71.69±8.91 and in second group (incision closed with hydration) was 67.91±80.0. The mean pre operative astigmatism in eyes of both group was >1.0 D, in first group it was 1.50 ± 0.51 D and second group it was 1.60 ± 0.55 D. Phacoemulsification was performed on left eyes with flatten meridian (ATR Astigmatism) in all patients. In early days there was no significant change found in post operative astigmatism (0.50 ± 0.45 D / 0.75 ± 0.50 D, p value < 0.001) in both groups, but statistically significant change in magnitude of astigmatism (0.84 ± 0.69 D / 2.25 ± 0.70 D, p value 0.05) was found postoperatively in both groups at the end of follow-up (**Table II**). The mean SIA 0.81 ± 0.62D / 1.12 ± 0.94D was found in first and second group respectively at the end of follow up. Figure I show that nasally placed incisions does not compensate the pre existing astigmatism. But the single 10/0 nylon suture when placed radially to close the nasal incision can control the increase in post operative astigmatism as compared to incision closed with hydration.

TABLE I: DEMOGRAPHIC AND CLINICAL DATA

Study Variables	Incision closed (10/0 suture)	Incision closed (hydration)
Number of Eyes (n, %)	122, 50%	122, 50%
Gender (n, %)		
Male	70, 57.37%	75, 61.47%
Female	52, 42.62%	47, 38.52%
Age (year)		
Mean(± SD)	71.69±8.91	67.91±80.01
Range	55-89	51-80
Pre Operative Astigmatism (±SD)	1.50 ± 0.51 D	1.60 ± 0.55 D

TABLE II: CHANGE IN ASTIGMATISM (n=122)

Study Period	Incision closed (10/0 suture) (mean ± SD)	Incision closed (hydration) (mean ± SD)	P Value
Preoperative	1.50±0.51 D	1.60±0.55 D	0.091
1 week Post OP	0.50±0.45 D	0.75±0.50 D	<0.001
1 Month Post Op	0.85±0.70 D	1.30±0.80 D	<0.001
2 Months Post Op	0.84±0.69 D	2.25±0.70 D	0.05

FIGURE I: CHANGE IN ASTIGMATISM

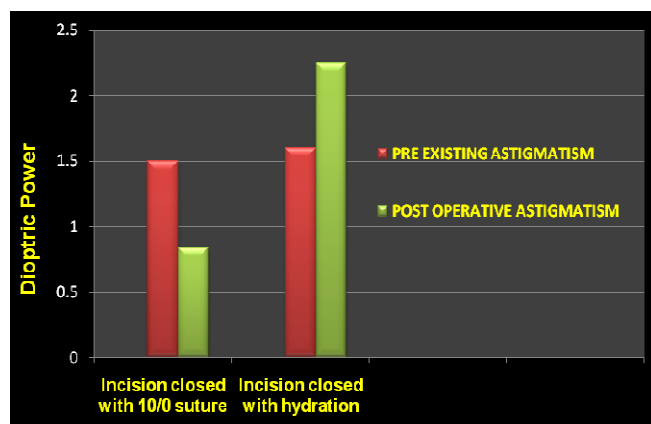
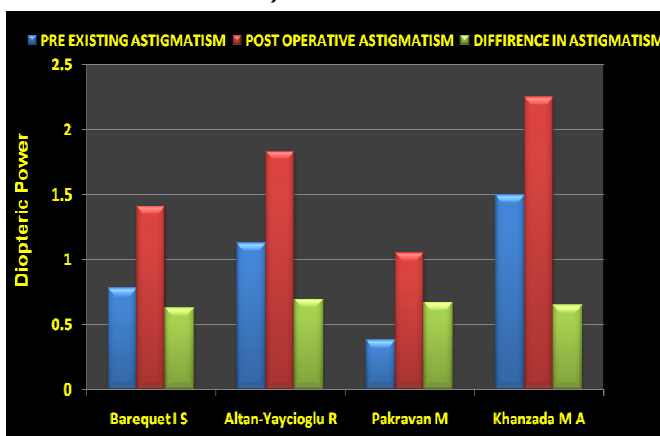


FIGURE II: DIFFERENCE IN ASTIGMATISM IN NASALLY PLACED INCISION (Comparison with international studies)



DISCUSSION

The 20th century evolution in refractive cataract surgery with refractive IOL has optimized the final visual outcome and decreased the spectacles dependence by minimizing the post operative astigmatism. But still there are two main obstacles to excellent uncorrected final visual acuity after cataract surgery, one is the PEA which is intrinsic to the cataract patients and second one is the SIA which is related to surgical proce-

cedure that depends on the size, site and configuration of the incision and also the laterality of the eye¹³⁻¹⁶. Surgery on the steep meridian with a 3.0 to 3.2-mm clear corneal incision is an ideal approach in patients with less than 1 D of pre-existing corneal astigmatism¹⁷. In our study we also used 3.0 mm size incision for phacoemulsification but our subjects were of left eye with ATR astigmatism >1 D.

The magnitude of astigmatism induced by surgeon usually runs between 0.50 and 1.00 D depending on technique and other factors¹³⁻¹⁶. Altan-Yaycioglu R et al¹⁵ found increase in preoperative astigmatism from 1.13 D to 1.83 D 6 months after surgery at nasal side. We also found a significant increased in preoperative astigmatism from 1.60 ± 0.55 D to 2.25 ± 0.70 D after performing surgery superonasally in left eyes which was not corrected by any means. In same group of patients the mean SIA was 1.12 ± 0.94 D. This is comparable with results of previous studies of phacoemulsification^{13,14} in which the SIA ranged from 0.30 to 1.55 D without taking any method to correct it. Barequet I S et al² stated that the side of the incision significantly affected SIA he found higher value of SIA in nasally placed incision as compared to temporal and it persisted throughout study period. Pakravan M et al¹⁸ also observed higher SIA (0.92 D) six months after surgery for nasal incisions which is comparable to Barequet I S et al² and current study. Comparative graph (Fig: 2) shows some disparity in the results of current study due to slight change in site of incision; we placed incision obliquely and they placed horizontally on nasal meridian. They all admitted that the nasally placed self sealing incisions do not compensate the pre existing astigmatism^{2,14,18}. In early post operative follow up Ozkurt Y et al¹⁹ found significantly less SIA in patients with superotemporal incision than in the superonasal incision. Dooley I et al²⁰ in study of 120 eyes reported a statistical significance trend toward a greater mean SIA and its variance in left eyes as compare to right eyes after phacoemulsification on clear corneal incision. Previously Kohnen et al²¹ also reported that nasal incision is not an appropriate for astigmatism neutral surgery. Because they found nasal incision to induce more post operative astigmatic changes than temporal incision after cataract surgery. The statement of both studies seems to be agreeing with our results. So to get the astigmatism neutral eyes the pre operative planning and intraoperative management should be taken to minimize the SIA and PEA.

Most popular and time tested techniques regarding the management of mild to moderate astigmatism during cataract surgery are positioning or enlarging the main incision and performing astigmatic keratotomy²²⁻²⁴, on-axis incisions⁴, creating opposite clear corneal

incisions and implanting a toric IOL and also using laser ablative procedures postoperatively²⁵⁻²⁷. But most of these are exercised on steep temporal meridian and we did not found any comprehensive data to correct the SIA on nasal meridian. In this study we applied a single 10/0 nylon radial suture to close the nasally placed incisions and found less SIA ($0.81 \pm 0.62D$) and also decreased in PEA as compared to incision closed with hydration. This technique is a best option for correcting astigmatism more than one diopter at the time of phacoemulsification surgery and will be very help full to phaco surgeons who are working in rural health centers and not familiar to these modern techniques to minimize the post operative astigmatism.

CONCLUSION

Single 10/0 suture is effective in reducing post operative astigmatism and should be applied to patients when phacoemulsification is performed at superonasally to meet the expectation of patients not to wear the glasses after cataract surgery.

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