Research Paper

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A Retrospective Study To Compare Surgically Induced Corneal Astigmatism(Sia) After Temporal,Superotemporal And Superior Incisions in Cataract Surgry.

MEDICAL SCIENCE

KEYWORDS :Friction Stir Welding, Yield Strength, Aluminium Alloy, Parameter Optimization, Weightage Allocation.

DR.ANKU H RAJA — Raja provision store,rajnagar-3,sarusection road, jamnagar.

DR.ASHISH C BHAROLIYA — B-601,earth heights, utran road, surat.

ABSTRACT

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. In this comparative retrospective study, 150 patients that were underwent phacoemulsification with implantation of foldable posterior chamber intraocular lens(PCIOL) in eye department of our institute which were divided into 3 groups of 50 patients including temporal(Group A), superotemporal(Group B) and superior (Group C) clear corneal incisions. These patients were evaluated on day 1, 1st week,3rd week and at the end of 6th week. In present study shows a mean surgically induced astigmatism (SIA) at the end of 6 weeks after cataract surgery following temporal incisions was 0.68D, that following supero-temporal incisions was 0.96D & following superior incisions was 1.5D. This implies that temporal (Group A) and supero-temporal (Group B) incisions cause less surgically induced astigmatism as compared to superior (Group C) incisions.

There was no statistically significant difference in SIA between temporal(Group A) and supero-temporal (Group B) incisions.

INTRODUCTION:

The aims of modern cataract surgery are rapid visual rehabilitation, the best possible uncorrected visual acuity and minimal postoperative astigmatism.[1] Surgically induced astigmatism (SIA) is still a common obstacle for achieving excellent uncorrected visual acuity.[2]

As per NPCB survey[3] (2001-02) cataract is by far the major cause of blindness in India accounting up to 62.6% cases of blindness.

Cataract surgery has undergone significant changes beginning with the abandonment of intra capsular surgery, and continuing with the advent of IOL, and continuing variations in extra capsular lens removal. Conventional extra capsular cataract extraction employing 10mm limbal incision and requiring wound closure with sutures is considered is easier to perform but has its limitations. Phaco-emulsification is used by most surgeons in developed countries and enables the most elegant surgery but at high cost.

Femtosecond (FS) laser assisted cataract surgery has been commercially available since 2011 and has changed the way cataract surgery is performed across the world. There has been substantial progress in software development and surgical experience since introduction of Femtosecond lasers with emerging evidence of reduced phaco time, better wound architecture, greater precision and accuracy of the anterior capsulotomy, and more stable and predictable positioning of intraocular lens (IOL). Current Femtosecond laser (FS) systems deliver ultra short pulses of energy at near infrared wavelength (1053nm). [4]

It has been observed that farther the cataract incision from the visual axis, less is the effect on corneal curvature at visual axis. It has been reported that a lateral or a superolateral incisions can decrease and quickly stabilize surgically induced astigmatism(SIA).[5]These two locations are farther from visual axis and flattening of the cornea by the wound is less likely to affect the corneal curvature at visual axis, thus less astigmatism. [6]

Paul Koch [7] introduced the " **Incisional Funnel"**. Koch described the incisional funnel as an imaginary area of safety in which external incisions can be placed with minimal induced astigmatism. He indicated that self sealing incision with respect to length and configuration, imparted not only scalability but also astigmatism neutrality to incisions.

AIMS AND OBJECTIVES:

To analyze and compare surgically induced corneal astigmatism (SIA) caused by temporal, supero-temporal and superior incisions after phaco-emulsification with PCIOL implantation.

To compare magnitude of post-operative astigmatism after temporal, supero-temporal and superior incisions in cataract surgery.

MATERIALS AND METHODS:

In this randomized retrospective comparative study, data were collected of 150 patients who were underwent uncomplicated cataract surgery with IOL implantation by phacoemulsification technique in our Department of ophthalmology during one year period between June 2013 to may 2014 with the approval by ethical committee.

INCLUSION CRITERIA:

- Patients of uncomplicated senile cataract including nuclear sclerosis, cortical cataract or posterior sub capsular cataract (PSC) as well as mature cataract.
- Patients who have completed all the postoperative visits during the 2 months of follow up period.

EXCLUSION CRITERIA:

- Patients with infective pathology such as blephritis, conjunctivitis, active keratitis, dacryo cystitis etc.
- Corneal dystrophies and opacities
- Patients with previous history of ocular trauma.
- Patients with complicated cataract.

The patients were randomly divided into 3 groups each with 50 patients, group A having temporal corneal incisions; group B having supero-temporal corneal incisions and group C having superior corneal incision. For analysis all the astigmatic changes were studied in horizontal, vertical axis and oblique axis**.**

A thorough pre-operative evaluation was done including
- History and general examination
- Visual acuity assessment and refraction
- Anterior segment examination including nuclear sclerosis grading on

slit-lamp bio-microscopy using Lens opacities classification system

II & III (LOCS II and LOCS III).[8,9]

- Fundus examination
- A-scan biometry
- Auto refractometry
- Keratometry using standard Bausch and Lomb keratometer
- Indentation tonometry

Operative procedure

- Painting and draping of the eye by standard technique was done.
- Peribulbar block was given.
- Painting and draping of the eye again was done.
- Lid speculum was applied.
- Antibiotic and povidone iodine (5%) wash was given.
- Biplaner clear corneal entry was made with kearome in phaco emulsification.
- Two Side port entry was done at with 20 G MVR blade.
- Air followed by trypan blue dye 0.06%w/v was injected intracamerally to stain capsule of the lens.
- Continuous curvilinear capsulorrhexis (CCC) was done.
- Hydro dissection and hydro delineation of nucleus was done.
- Free roatation of nucleus was noted with sinsky & was emulsified by phaco probe.
- Thorough lens matter wash done with Bimanual irrigation aspiration cannula.
- Foldable Posterior chamber intraocular lens (PCIOL) was inserted and dialled in the capsular bag.
- Air was injected if required.
- Antibiotic wash done.
- Stromal hydration of side port entry was done.
- Lid speculum was removed.
- Patch and bandage was done.

Post operative Evaluation:

Slit lamp examination of the operated eye was done in each post operative visit to assess the wound approximation, depth of anterior chamber, clarity of anterior chamber and status of the fundus. Pin hole visual acuity was tested.

Keratometry was repeated for all patients on 1st postoperative day, 1 week, 3 week and 6 week post operative visits and the surgically induced astigmatism was assessed and compared with pre operative astigmatism.

Patients were prescribed antibiotic-steroid eye drops every 2 hourly in tapering doses and advised to come for the further follow-up examinations.

Analysis of astigmatic cylinder restricted to corneal keratometry readings only because this is an objective measure of corneal curvature not influenced pre operatively by cataract which may affect the refractive status.

Surgically induced astigmatism (SIA) was calculated by using Holladay method of vector analysis using trigonometric functions. We have used a "SIA Calculator 2.1" version developed by Saurabh Sawhney[10] for calculating SIA for a given set of pre- and post-operative keratometric data.

OBSERVATIONS:

In this comparative retrospective study, 150 patients that were underwent phacoemulsification with implantation of foldable posterior chamber intraocular lens(PCIOL) in eye department of our institute which were divided into 3 groups of 50 patients including temporal(Group A), superotemporal(Group B) and superior (Group C) clear corneal incisions. These patients were evaluated on day 1, 1st week,3rd week and at the end of 6th week.

Following were the observations of the study.

TABLE 1:

PRE OPERATIVE ASTIGMATISM (GROUP A)		
TYPE OF ASTIGMATISM	**NO.OF PATIENT**	**PERCENTAGE(%)**
ATR	34	68%
WTR	10	20%
NEUTRAL	4	8%
OBLIQUE	2	4%
TOTAL	**50**	**100%**

TABLE 2:

PRE OPERATIVE ASTIGMATISM (GROUP B)		
TYPE OF ASTIGMATISM	**NO.OF PATIENT**	**PERCENTAGE(%)**
ATR	17	34%
WTR	28	56%
NEUTRAL	3	6%
OBLIQUE	2	4%
TOTAL	**50**	**100%**

TABLE 3:

PRE OPERATIVE ASTIGMATISM (GROUP C)		
TYPE OF ASTIGMATISM	**NO.OF PATIENT**	**PERCENTAGE(%)**
ATR	15	30%
WTR	32	64%
NEUTRAL	3	6%
OBLIQUE	0	0%
TOTAL	**50**	**100%**

TABLE 4:

POST OPERATIVE ASTIGMATISM PROFILE (AT THE END OF **1 WEEK**) (TOTAL NO.OF PATIENTS=150)						
TYPE OF ASTIGMATISM	**GROUP A (TEMPORAL)**		**GROUP B (SUPEROTEMPORAL)**		**GROUP C (SUPERIOR)**	
	NO. OF PATIENT	**PERCENTAGE (%)**	**NO.OF PATIENT**	**PERCENTAGE (%)**	**NO.OF PATIENT**	**PERCENTAGE (%)**
ATR	10	20%	33	66%	44	88%
WTR	29	58%	12	24%	5	10%
NEUTRAL	10	20%	4	8%	0	0%
OBLIQUE	1	2%	1	2%	1	2%
TOTAL	**50**	**100%**	**50**	**100%**	**50**	**100%**

TABLE 5:

POST OPERATIVE ASTIGMATISM PROFILE (AT THE END OF **6th WEEK**) (TOTAL NO.OF PATIENTS=150)						
TYPE OF ASTIGMATISM	**GROUP A (TEMPORAL)**		**GROUP B (SUPEROTEMPORAL)**		**GROUP C (SUPERIOR)**	
	NO. OF PATIENT	**PERCENTAGE (%)**	**NO.OF PATIENT**	**PERCENTAGE (%)**	**NO.OF PATIENT**	**PERCENTAGE (%)**
ATR	12	24%	24	48%	40	80%
WTR	24	48%	15	30%	7	14%
NEUTRAL	13	26%	10	20%	2	4%
OBLIQUE	1	2%	1	2%	1	2%
TOTAL	**50**	**100%**	**50**	**100%**	**50**	**100%**

TABLE 6:

MEAN SURGICALLY INDUCED ASTIGMATISM (TOTAL NO. OF PATIENT-150)				
TYPE OF INCISION	**MEAN VALUE OF SIA (D)**			
	Day 1	Week 1	Week 3	Week 6
GROUP A(TEMPORAL)	0.94	0.84	0.76	0.68
GROUP B(SUPEROTEMPORAL)	1.33	1.22	1.06	0.96
GROUP C(SUPERIOR)	1.88	1.72	1.6	1.5

In present study shows a mean surgically induced astigmatism (SIA) at the end of 6 weeks after cataract surgery following temporal incisions was 0.68D, that following supero-temporal incisions was 0.96D & following superior incisions was 1.5D. This implies that temporal (Group A) and supero-temporal (Group B) incisions cause less surgically induced astigmatism as compared to superior (Group C) incisions.

There was no statistically significant difference in SIA between

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temporal(Group A) and supero-temporal (Group B) incisions.

DISCUSSION:

In our study, main aim was to compare surgically induced astigmatism after temporal, superotemporal and superior clear corneal incisions following cataract surgery. 150 patients that were underwent phacoemulsification with implantation of posterior chamber intraocular lens in eye department of our institute which were subdivided into 3 groups of 50 patients including temporal(Group A), superotemporal (Group B) and superior (Group C) incisions. These patients were evaluated on day 1, 1st week, 3rd week and at the end of 6th week.

Preoperative astigmatism profile:

In Group A, among 50 temporal incisions, 68% of patients had against the rule(ATR) type astigmatism, 20% had with the rule(WTR) type followed by neutral in 8% and oblique in 4% of patients.

Postoperatively, there was astigmatic shift towards with-the-rule(WTR) type (48%) than against-the-rule(ATR) type (24%) at the end of 6 weeks. And 26% of patients had neutral astigmatism. This could be due to flattening of the horizontal meridian with steepening of vertical meridian because of coupling effect after temporal wound. This is beneficial because particularly most of the patients in elderly group had against-the-rule (ATR) astigmatism.

In Group C, there was with-the-rule (WTR) type in 64% of patients followed by against the rule (ATR) type in 30% of patients and neutral in 6% patients pre-operatively.

Postoperatively, there was astigmatic shift towards ATR type with 80% had against-the-rule (ATR), 14% had with-the-rule (WTR) and only 4% had neutral type. This could be due to incision along vertical meridian with resultant flattening of the vertical meridian and steepening of the horizontal meridian.

This result implies that **temporal incision** is better approach for patients with pre-operative ATR astigmatism with **early visual rehabilitation** post-operatively.

In our study found that, in the superotemporal group, there was constant decline in the gross astigmatism from day 1 to 6th post-operative week (0.85D). While in the superior incision group, the decay was slower (0.38D) between day 1 and 6th post-operative week.

SUMMERY:

One year retrospective study including 150 patients (150 eyes) was undertaken. The aim of our study was to compare surgically induced astigmatism after temporal, superotemporal and superior incisions in cataract surgery. The mean surgically induced astigmatism (SIA) was 0.68D in temporal incisions, 0.96D in superotemporal group and 1.5D in superior incision at the end of 6 weeks of cataract surgery.

The superotemporal incision is also free from effect of gravity and eyelid blink with added advantage of performing more easily in deep set eyes. The superotemporal incision also avoids 12 o'clock limbus and thus allows any filtering surgeries if required later at superior limbus site. When the incision is located superiorly, both gravity and eyelid blink tend to create a drag on the incision. These factors are neutralized well with temporally placed incisions because the incision is parallel to vector of forces.

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