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# To compare post-operative astigmatism in temporal clear corneal incision phacoemulsification and temporal manual small incision cataract surgery

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## Abstract

**Aim**: This study is designed to evaluate post-operative astigmatism induced by 3.2 mm temporal clear corneal incision phacoemulsification and compare it with astigmatism induced by temporal manual small incision cataract surgery (SICS).

**Materials and Methods:** This retrospective study was conducted at a medical college and hospital, Gurgaon during academic session 2015 – 2016. The patients were divided into two groups. The patients allotted in group A were operated by temporal manual SICS technique to remove their cataract, whereas group B had temporal clear corneal phacoemulsification to remove their cataract. Best corrected vision and keratometeric values were recorded in Preoperative and postoperative period. Post-operative astigmatism was analysed by using SIA software (SIA calculator version 2.1 by Dr Saurabh Sawhney and Dr Ashima Aggarwal).

**Results:** Mean post-operative astigmatism in group A was 1.08 (±0.55) D and in group B was 0.78 (±0.52) D after 1 month of surgery. At 1 month of follow up, post-operative astigmatism was comparable between the groups.

**Conclusion:** Clinical outcomes of both surgeries were similar, as there was no significant statistical difference in the SIA at one month of follow up.

**Keywords:** Post-operative Astigmatism, Temporal manual small incision cataract surgery, Temporal clear corneal incision, Phacoemulsification.

## Introduction

The cataract is defined as opacity of the human crystalline lens capsule or its substance. It is the leading cause of visual disability in the world. Modern cataract surgeries like SICS and Phacoemulsification with IOL are considered safest, successful and frequently performed surgery. Manual SICS is inexpensive, and requires minimal infrastructure in comparison to phacoemulsification, therefore it is a preferred option in low cost settings such as developing countries. Postoperative astigmatism has remained the only obstacle to the achievement of good uncorrected visual acuity after successful cataract surgery. Post-operative astigmatism may lead to decreased visual acuity, glare, monocular diplopia, asthenopia and distortion of image after a good cataract surgery. Good Postoperative vision preferably without spectacles is considered as the bench mark of modern cataract surgery.

As the age increases the horizontal axis becomes steeper than the vertical axis (against the rule astigmatism; ATR) even in the absence of anterior segment surgery.[(1)] After cataract surgery, depending upon various factors, astigmatism is common and variable. Post-operative astigmatism is the outcome of two important factors namely length of incision used &location of incision in relation to the surgical limbus. Astigmatism is directly related to incision chord length smaller incision mean less post-operative astigmatism &vice versa. Also cataract incisions placed 1-2mm posterior to surgical limbus induce less astigmatism in comparison to anteriorly placed corneal incision. It is worth noting that maximum flattening of the cornea occurs at the axis of cataract incisions, therefore, placing the incision on the steep meridian of pre-existing astigmatism can reduce post-operative astigmatism. Studies have demonstrated that the temporal incisions in SICS has resulted in lesser SIA when compared to superior incisions.[(2)] However studies comparing the results of SICS and Phacoemulsification are scarce.[(3)]

## Materials and Methods

The present study was designed as a retrospective, nonrandomised, comparative study to evaluate post-operative astigmatism induced by temporal manual SICS and temporal clear corneal Phacoemulsification.

Sample size: 80 surgical cases that were diagnosed to have cataract were included in the study; 40 eyes had manual temporal small incision cataract surgery, whereas other 40 had temporal clear corneal Phacoemulsification to remove their cataract. All cases in this study were operated by single surgeon.

**Inclusion criteria:**

1. Patients with clinically significant cataract.
2. Patients with clear cornea on slit lamp examination.
3. Age group selected was between 30-80 years.
4. Patients having steep horizontal axis's.

**Exclusion criteria:**

1. Patients with hazy cornea, corneal degeneration/ dystrophies.
2. Patients with scleral thinning.
3. Patients with connective tissue disorders.
4. Traumatic and paediatric cataracts.

All the patients were assessed thoroughly before surgery. Pre-operative examination included visual

acuity recording, slit-lamp bio- microscopy, tonometry and fundus examination by using direct and indirect ophthalmoscope and 90D. Keratometry readings were recorded by using an auto-keratorefractometer (Topcon autokeratorefractometer KR8800). All the patients had ATR astigmatism. Axis between 60 and 120 degree were taken as vertical axis and between 30 and 150 degree considered as horizontal axis. The IOL power was calculated by contact A-scan biometry using the SRK 2 formula. Pre-operative investigations like random blood sugar, ECG and BP were done. A pre-operative informed consent was taken from the patients. Topical tropicamide 0.8% with phenylephrine 5%, antibiotic and non-steroidal anti-inflammatory eye drops were instilled every 15 minutes, 1 hour before the surgery. Peribulbar anaesthesia with 5 cc of a 3:2 mixture of injection Xylocaine 2% and injection bupivacaine 0.5% with 150 I.U. of Hyaluronidase was used to achieve anaesthesia & akinesia in all patients.

Group A patients were taken up for manual SICS. A conjunctival flap was made on the temporal part of the eye. 6-6.5 mm straight incision approximately 50% of scleral thickness was made on temporal side using No.15 blade. 2.8 mm bevel up crescent blade was used to fashion sclera-corneal tunnel extending 1.0 mm into clear cornea. Internal incision was completed using 2.8 mm keratome. Anterior chamber was formed using viscoelastic device. 26-gauge needle was used to create anterior capsulorhexis. Nucleus was prolapsed in the anterior chamber. Irrigating Vectis technique was used to remove nucleus from anterior chamber. Epinucleus was aspirated using 23 gauge simcoe cannula. A rigid P.M.M.A posterior chamber IOL was placed in bag. Viscoelastic device was removed from anterior chamber using 23 gauge Simcoe cannula. Anterior chamber was reformed using ringer lactate solution and conjunctival flap was repositioned. Sub-conjunctival antibiotic and steroid solution was injected before pad and bandage of eye.

Group B underwent phacoemulsification using peribulbar block. Three port phacoemulsification was done. Temporal 2.8 mm clear corneal incision was made using a keratome. After creating anterior capsulorhexis hydro dissection and hydro delineation of nucleus was completed using 26-gauge cannula to ensure free rotation of nucleus in the capsular bag. Nucleus was emulsified by using direct horizontal chop technique. Epinucleus was aspirated using bi-manual irrigation aspiration cannula. Foldable single piece acrylic posterior chamber IOL implanted in the bag. Viscoelastic removed from the anterior chamber and anterior chamber was reformed using ringer lactate. After Subconjunctival antibiotic and steroid injection eye was padded and bandaged.

In post-operative period, oral antibiotic along with analgesic were prescribed for 5 days. Topical antibiotic and steroid combination eye-drop 6 times per day for first 7 days was started. Antibiotic-steroid combination was tapered over one month period. The patients were examined on the 1st post-operative day, subsequently on 7th 21st 30th day of surgery. The uncorrected and best corrected visual acuity were recorded. Keratometric data was recorded using an auto-keratorefractometer.

The surgically induced astigmatism was calculated from the pre-and postoperative keratometric values. All the calculations were performed by using SIA calculator (SIA calculator version 2.1 by Dr Saurabh Sawhney and Dr Ashima Aggarwal).

Data were expressed as mean (95% confidence interval) for normally distributed data.

Two groups were compared using the Student's t-test (parametric data). The probability level of <0.05 was set for statistical significance. Statistical analysis was carried out using SPSS 16.0 (SPSS Inc., Chicago, Illinois, USA).

## Results

80 eyes were included in the study and divided in two groups. Both groups were comparable on all parameters except type of cataract surgery. Mean SIA in group A was 1.08 (±0.55) D and in group B was 0.78 (±0.52) D after 1 month of surgery. At one month, there was no statistical difference in SIA in both the groups.

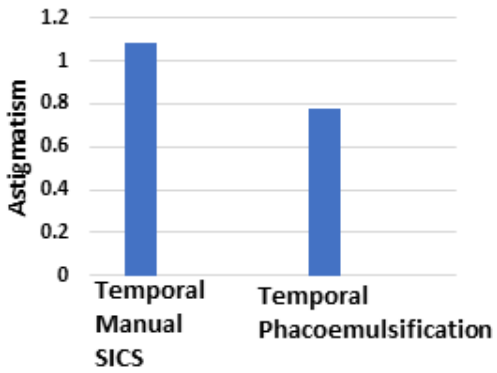


**Fig. 1 Post-operative Astigmatism after one month**

## Discussion

Phacoemulsification with foldable I.O.L implantation is the global bench mark for treatment of cataract with excellent postoperative results. However, it is not always feasible in developing countries like India due to high cost of phacoemulsification machine, and infrastructure. Manual SICS is a good alternative, but there is a concern that visual results may not be comparable to Phacoemulsification. We have demonstrated in our study that the clinical outcome (SIA) of cataract surgery by both the techniques was comparable.

With increasing age, there is a gradual shift towards ATR astigmatism even in the absence of anterior segment surgery. We had selected patients with ATR astigmatism for this study, therefore temporal incision was preferred. Temporal incision is parallel to the vector of forces and is less likely to affect the corneal curvature

at the visual axis. Moreover, when the incision is located superiorly, the eyelid blink and gravity creates a drag on the incision, the effect which is not seen in temporal incision. Several studies have demonstrated that in manual SICS, temporal incision gives a better result in terms of lesser SIA and better visual acuity when compared to superior incision.[(4)] In a recent study, clear corneal temporal incision in Phacoemulsification was better in minimizing SIA when compared to superior incision. [(5)]

We have demonstrated that the magnitude of SIA was similar in manual SICS and Phacoemulsification when temporal incisions were used during cataract surgery. Mean post-operative astigmatism in group undergoing temporal manual SICS was1.08 (±0.55) D and in other group undergoing temporal clear corneal Phacoemulsification was 0.78 (±0.52) D after 1 month of surgery. It is generally perceived that smaller incision used during phacoemulsification induces less astigmatism in comparison to a larger incision used during manual small incision cataract surgery. This contrasts with our finding in which we got comparable results in two groups; our better results could be due to temporal incision in manual SICS.

## Conclusion

The present study was a retrospective, nonrandomised, comparative study of astigmatism induced by temporal manual SICS and temporal clear corneal Phacoemulsification. Clinical outcome of both surgeries was similar. There was no significant difference in the post-operative astigmatism between the two groups included in the present study. Thus, in a resource constrained settings, where infrastructure and expensive machines like Phacoemulsification are not readily available in most hospitals; cheaper and widely available options like manual SICS can give be a worthy alternative. Authors concede that phacoemulsification with foldable I.O.L implantation sets the bar for cataract surgery and is considered to be the yard stick to assess the outcome of different techniques of cataract surgery. Through this study authors emphasis that manual SICS could be considered in difficult cases like supra hard cataract, non -dilating pupil, hazy cornea and most important in resource constrained situation prevalent in the developing world including our country.

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