

A Clinicoepidemiological Study for Incidence of Astigmatism in Postoperative Patients who Underwent Manual Small Incision Cataract Surgery in a Tertiary Care Centre: Cross - Sectional Study

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Abstract: *Cataract is the commonest cause of treatable blindness worldwide. The best and early possible visual rehabilitation is hallmark of a good cataract surgery, but the incidence of surgically induced astigmatism is a roadblock to this goal.*

Keywords: Surgically Induced Astigmatism, Cataract, Astigmatism, SIA

1. Introduction

Astigmatism is one of the causes for reduction in visual acuity postoperatively. A benchmark for a successful cataract surgery is to produce least postoperative astigmatism. The goal of cataract surgery recently has been to achieve an emmetropic state. This study is done to find the effective method of cataract surgery which induces the least or no astigmatism post surgically.

With the advent of phacoemulsification, cataract surgery has been reduced to a day care surgery. But due to economic reasons, phacoemulsification is limited to big cities & institutions only. Non - phaco or manual small incision cataract surgery (SICS) by virtue of its self - sealing suture - less incision appears as a ray of hope for tackling the cataract burden in developing countries. Lower cost of instrumentation and disposables in manual SICS is an added advantage. It is also better suited for advanced and mature cataracts seen in developing countries³

Small incision cataract surgery (SICS) is a self - sealing suture - less surgery, that enables reduction of surgically induced astigmatism

Post - operative astigmatism has remained as an obstacle in attaining good uncorrected visual acuity following cataract surgery. SICS through a sclero - corneal tunnel has demonstrated that smaller incision and valvular construction of wound induce minimal astigmatism.

The size, shape and location of incisions used in Small Incision Cataract Surgery (SICS) determine surgically induced astigmatism (SIA). Small incisions (6 mm) induced the smallest SIA when compared with medium (6.5 mm) and large (7 mm) incisions, with reference to the location of the incision, placing the incision on the steeper corneal meridian based on the preoperative keratometry reading has been recommended.

2. Materials and Methodology

This study was a cross sectional study conducted at the Department of Ophthalmology Government medical college, Akola. 327 patients having senile cataract, who opted for SICS and who fulfilled the inclusion criteria. Patients were followed up to a period of 6 months.

Type of study – Hospital based cross sectional observational study

Sample size: 327 eyes of 327 patients who had cataract surgery done by a single surgeon

The study period was from 1ST JANUARY 2021 – 30TH JULY 2022. All the procedures performed in this study were in accordance with the ethical standards. This study's purpose and procedure were explained to all the potential participants and informed consent was taken from all of them. Institutional ethical committee clearance was obtained. Patients with any other concurrent eye disease and keratometric astigmatism >1.5 D were not included in the study. The standard clinical examination was carried out including visual acuity testing with Snellen chart, lacrimal sac syringing, applanation tonometry, slit lamp examination and fundoscopy. Automated Keratometry (unique rk) was performed before surgery and at 7th day, 21st day, 45th day after surgery. Intraocular lens (IOL) power was calculated using SRK II formula with the A scan.

Inclusion Criteria:

- 1) Patients with age related cataract

Exclusion Criteria:

- 1) In children, congenital cataract
- 2) Traumatic cataract
- 3) Any previous surgery on the same eye
- 4) Pre - existing corneal scars
- 5) Glaucoma
- 6) Collagen vascular diseases.
- 7) Posterior segment pathologies affecting the visual outcome
- 8) Any intraoperative complication

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3. Observation

Age Distribution

In the study population 40.7% were between the age group of 61 - 70years, 22.9% were in the age group of 51 - 60 years, 21.1% in 70 - 80 years.

Mean age in the study was 64.63 years.

Gender Distribution

56.9 % of the study population were females while another 43.1% of the population were males.

Types of Cataracts

In the study population 74.9% belongs to Immature senile cataract patients, 25.1% belong to mature cataract

Preoperative and postoperative visual acuity comparison

The preoperative visual acuity in the study population was below 6/60 in 86.9% of patients and 13.1% had vision above 6/60

At the end of 45 days the 100 % of the patients had vision between 6/6 - 6/18 which is the desired outcome

Frequency and Type of Astigmatism on Preoperative Visit

Preoperatively out of 327 patients 75.8% had with the rule astigmatism, 16.8% had against the rule astigmatism and 7.3% patients had no astigmatism

Frequency and Type of Astigmatism on Postoperative Day 7 Visit

On Postoperative day 7, 45.6% had with the rule astigmatism, 41.3% had against the rule astigmatism and 13.1% patient had no astigmatism

Frequency and Type of Astigmatism on Postoperative Day 21 Visit

On Postoperative day 21, 29.1% had with the rule astigmatism, 49.8% had against the rule astigmatism and 21.1% patient had no astigmatism

Frequency and Type of Astigmatism on Postoperative Day 45 Visit

On Postoperative day 45, 29.1% had with the rule astigmatism, 61.2% had against the rule astigmatism and 9.8% patient had no astigmatism

Comparison of Frequency of Astigmatism between the Types of Astigmatism at different times

The mean astigmatism in patients having **Against the Rule Astigmatism** (steeper axis at 90°) and **With the Rule Astigmatism** (steeper axis at 180°) preoperatively was **0.44 ± 0.20** and

1.17 ± 0.41 respectively and the **Astigmatism at Day 45** noted was **0.61 ± 0.38** and **0.47 ± 0.34** Respectively

4. Discussion

This study is a tertiary care centre based cross sectional study performed to determine the incidence of surgically induced astigmatism in postoperative patients of manual small

incision cataract surgery. This study carries significance as surgically induced astigmatism is the cause of poor postoperative vision even after uneventful cataract surgery. Corrective steps can be taken in account which might not only reduce astigmatism but will also improve the visual outcome in post operative patient of manual small incision cataract surgery if we know about the present incidence of surgically induced astigmatism.

Age Distribution

In the study population 22.9 % belong to 51 years to 60 years, 40.76 % belong to 61 - 70 years and 21.1% belong to 71 - 80 years Most of the patients belonged to the age group of 61 - 70 years. Comparison to a study done by Sekhar Reddy MR et al.⁴⁸ where most of the patients (53%) belonged to the age group 51 - 60 years The mean age group of the study population was 64.63 years. No statistically significance between the age groups was noted.

Gender Distribution

Gender distribution in the study population who underwent surgery, 56.9 % were females and 43.1 % were males. The male female ratio was 0.75: 1. Age and sex have no bearing in performing the surgery

Types of Cataract

Wound construction is an important criterion to the final surgical success of any cataract surgery, even more so in MSICS. it has been seen that in MSICS, wound construction varies, depending upon the type of technique used, the **hardness of the nucleus**, pre - existing astigmatism, and the condition of the patient's sclera and cornea. In our study out of 327 patients in the study 74.9 % of the study population belongs to Immature senile cataract patients, 25.1 % belong to mature cataract.

Preoperative Visual Acuity

It is reported from previous studies that patients undergoing Manual SICS have an early visual rehabilitation. The quick visual restoration is attributed to little inflammation and less SIA. Patients also have fewer complaints regarding ocular discomfort in terms of pain, foreign body sensation and redness. In our study, Visual acuity was tested using Snellen's chart. Pre operatively 86.9 % had BCVA of 6/60 or less & 13.1 % had greater than 6/60. There is no statistical significance of the preoperative visual acuity. At the end of 6 week the 100 % of the patients had vision between 6/6 - 6/18 which is the desired outcome.

In Zavar S V, et al the post - operative BCVA was >6/18 in 93.4% at 6weeks⁵⁶.

Siddique M, et al⁵⁷ study reported good (>6/18) BCVA in 92.2% of cases at six weeks follow - up

Comparison between Preoperative and Post Operative Astigmatism

In our study, preoperatively out of 327 patients 75.8% had **with the rule** astigmatism (steeper axis at 180°), 16.8% had **against the rule** astigmatism (steeper axis at 90°) and 7.3% patient had no astigmatism.

The mean astigmatism in patients having **Against the Rule Astigmatism** (steeper axis at 90°) and **With the Rule**

Astigmatism (steeper axis at 180°) **preoperatively** was **0.44 ± 0.20** and **1.17 ± 0.41**

On **Postoperative day 7**, 45.6% had “with the rule” (steeper axis at 180°) astigmatism, 41.3% had “against the rule” (steeper axis at 90°) astigmatism and 13.1% patient had no astigmatism

On **Postoperative day 21**, 29.1% had “with the rule” (steeper axis at 180°) astigmatism, 49.8% had “against the rule” (steeper axis at 90°) astigmatism and 21.1% patient had no astigmatism

On **Postoperative day 45**, 29.1% had “with the rule” (steeper axis at 180°) astigmatism, 61.2% had “against the rule” (steeper axis at 90°) astigmatism and 9.8% patient had no astigmatism

The mean astigmatism in patients having **Against the Rule Astigmatism** (steeper axis at 90°) and **With the Rule Astigmatism** (steeper axis at 180°) on post operative day 45 was **0.61 ± 0.38** and **0.47 ± 0.34** respectively

In our study, the mean surgically induced astigmatism after superior frown incision was found to be **1.20 ± 0.53 D**

Kimura *et al*⁵⁵ have shown by vector analysis that surgically induced astigmatism with a superior incision in their study was (1.41 ± 0.72 D).

Burgansky *et al*² have shown an increase in astigmatism with an increase in incision size. In their study by vector analysis, the mean induced astigmatism was 0.6 ± 0.3 D for 6 mm incision, 0.75 ± 0.67 D for a 6.5 mm incision and 1.36 ± 0.77 D for a 7 mm incision.

Randeri *et al*⁶¹ have reported astigmatism of 1.25 - 2 D with central frown incision

The results of the study were comparable with other similar published studies