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Manual Sutureless (MSICS) Cataract Surgery and Corneal Astigmatism

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Abstract:- The most frequent preventable cause of blindness worldwide is cataracts. Manual Small Incision Cataract Surgery (MSICS) is still very much in use, even though cataract surgery is always changing. The resurgence of MSICS can be attributed to its low cost and safety, as it primarily uses easily sterilizable equipments and does not require sophisticated technology. This study aims to assess corneal astigmatism and manual sutureless (MSICS) cataract surgery after a month of follow-up. Forty individuals with cataract diagnoses were enrolled in this prospective study. During the procedure, a posterior chamber intraocular lens (IOL) implantation was done in addition to a superior manual minor incision under local anesthesia. The findings indicated that 15% or so of the patients experienced astigmatism following surgery. Also the findings revealed that sphere and cylinder refraction was significantly influenced by surgery. The means of sphere refraction before and after surgery were 3.93±6.37 and 0.93±0.98 D, while the corresponding means for cylinder refraction were 1.37±1.08 and 1.94±1.18 D. The results showed that means preoperative and postoperative Keratometry of cornea (K1) were 43.09±1.21 and 43.37±1.42 mm, while the corresponding means of Keratometry (K2) were 43.97±1.35 and 44.49±1.59 mm. The study concluded that the length of the superior incision (6.0 mm) may have contributed to the higher mean SIA than reported in other studies. However, more research is required to determine the impact of incision size on surgically produced astigmatism.

Keywords:- *Manual Small Incision Cataract Surgery (MSICS), Posterior Chamber Lens (PCL), Surgically Induced Astigmatism (SIA).*

I. INTRODUCTION

Recent years have seen advancements and modifications in cataract surgery to achieve improved anatomical and functional outcomes. The World Health Organization (WHO) states that cataracts are the most common cause of blindness worldwide[1]. With its many variations, phacoemulsification has emerged as the gold standard for cataract extraction. Additionally, cataract surgery using the manual and sutureless minor incision technique Manual Small Incision Cataract Surgery (MSICS) is becoming more common in Libya [2].

More so in Manual Small Incision Cataract Surgery (MSICS), wound construction plays a significant role in determining the overall surgical success of any cataract surgery [3]. It has been observed over time that the wound construction in (MSICS) differs based on the technique employed, the nucleus's hardness, the patient's pre-existing astigmatism, and the state of their cornea and sclera. Improved knowledge of incision closure and wound architecture has increased MSICS's popularity, fewer problems, and improved visual acuity following surgery[4].

As more and more patients anticipate being able to live without glasses following cataract surgery, proper wound construction modulation in Manual Small Incision Cataract Surgery (MSICS) can also aid in correcting some pre-existing astigmatism and enhancing postoperative visual quality[5].

The first surgeon to make the incision from the cornea to the sclera posteriorly was Kratz[6]. He thought that doing so would improve wound healing and lessen surgically induced astigmatism (SIA) by increasing the appositional surfaces. To prevent iris, prolapse, Girard et al. [7] stressed the significance of entering the anterior chamber through the cornea and forming a corneal shelf[8]. The corneal shelf functioned as a one-way valve in these kinds of incisions, making the cornea self-sealing and opening the door for suture-free cataract surgery, as noted by McFarland [9].

At six weeks, the published ranges for mean astigmatism are 0.8 D [10], 1.2 D [11] and 1.0 D [12]. Furthermore, because cataract surgery is now a refractive procedure, the goal of the procedure is now to modify pre-existing astigmatism rather than only prevent surgically induced astigmatism (SIA). More careful surgical planning is needed for refractive cataract surgery, considering the shape, size, and position of the sclerocorneal incision[13]. The objectives of this research are to assess corneal astigmatism after manual sutureless (MSICS) cataract surgery by determine sphere and cylinder refraction and Keratometry of cornea.

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II. MATERIAL AND METHODS

This descriptive cross-sectional study involved 40 individuals diagnosed with cataracts at the Tobruk Medical Clinic over a three-month period. Participants ranged in age from 35 to 75 years. Surgeons created a 4 mm scleral frown incision approximately 2.5 mm from the limbus using a diamond keratome inserted into the anterior chamber 1.5 mm from the clear cornea on either side. The internal incision was widened by 6 mm on one side to accommodate a foldable posterior chamber lens (PCL). The side port was hydrated, and the conjunctiva was cauterized. All surgeries were performed under retrobulbar anesthesia.

One surgeon performed all the local 2% lidocaine injections. Before their operations, every patient had an astigmatism evaluation. Additionally, all patients received a month-long follow-up and auto RK monitoring for the emergence of astigmatism.

III. RESULTS & DISCUSSION

In this investigation, we employed superior sutureless MSICS, measuring roughly 6 mm in length, along with PCL insertion. Additionally, we observed the subjects for a month following the procedure and discovered a noteworthy 15% changed in post-operative astigmatism.

There were 40 individuals (40 eyes) with cataracts; the female-to-male ratio was 3:2 with 24 (60%) being female and 16 (40%) being male. The patients' ages ranged from 35 to 75 years old, with a mean age of 59.35±7.04 years. The age range of 55–64 years old was the most represented (Figure 2).

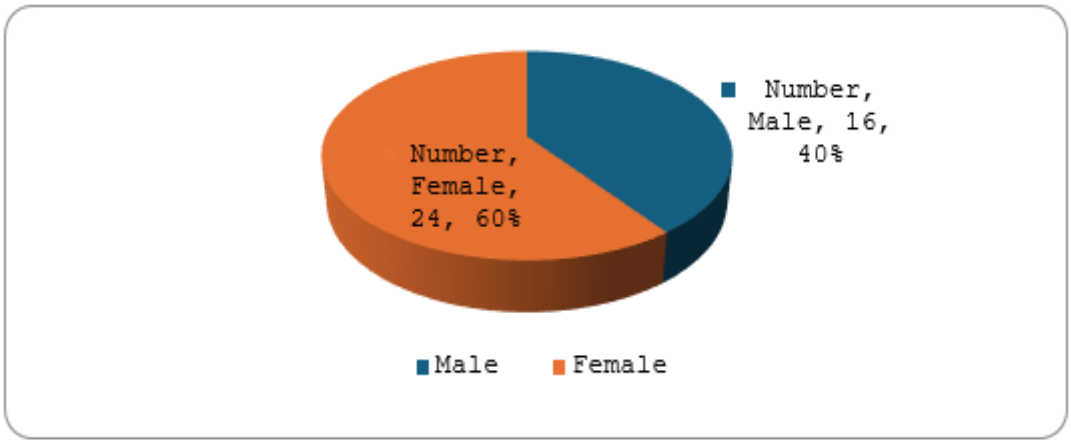

Fig. 1. Distribution of Patients According to Gender

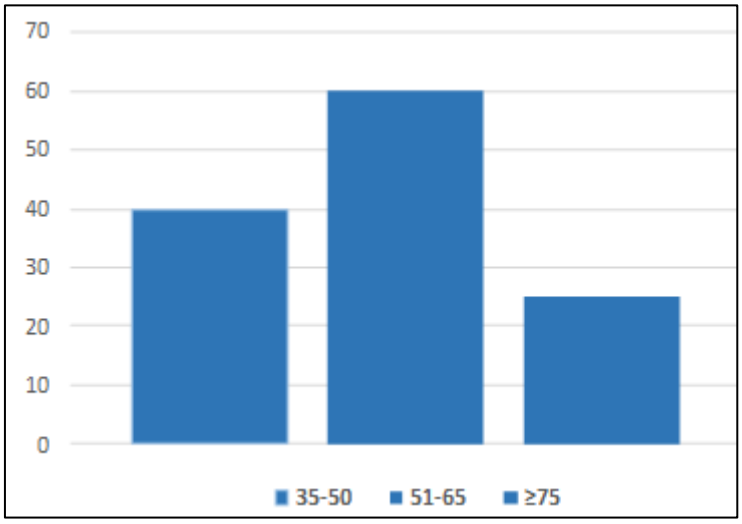

Fig 2. Distribution of Patients According to Age

Table 1 indicates a statistically significant correlation between preoperative and postoperative sphere and cylinder refraction. The results revealed that sphere refraction was significantly ($P<0.05$) decreased after surgery operation. The average sphere refraction before surgery was 3.93±6.37 D, with a range of 0.00 to -24.00 D, and after surgery, the average was decreases to 0.93 ±0.98 D, with a range of -0.00 to -3.50 D. Moreover, the statistical analysis showed that cylinder refraction was significantly ($P<0.01$) affected by surgery operation. The average cylinder refraction before surgery was 1.37±1.08 D, with a range of 0.00 to -4.5 D, and after surgery, the average was significantly increased to 1.94±1.18 D, with a range of -0.50 to 5.0 D. Burgansky et al. [16] state that as the incision lengthens, the percentage of SIA rises. Also they indicated that the mean SIA for incisions of 6 mm,

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6.5 mm, and 7 mm was 0.60±0.3 D, 0.75±0.67 D, and 1.36±0.77 D, respectively and concluded that the incision was longer; the value of SIA was higher[16]. Sekharreddy et al. [14] reported in their study that the mean SIA for supratemporal incisions was 0.8032±0.322 D, while the mean SIA for temporal incisions was 0.3826±0.142 D. On the other hand; according to Malik et al. [15], patients with cataracts who underwent temporal approach MSICS had an average SIA value of 0.75±0.4067 D. before surgery, all those individuals had astigmatism.

Table 1. The Study Participants' Preoperative and Postoperative Refraction.

Period	Sphere refraction		Cylinder refraction	
	Mean±SD	Range	Mean±SD	Range
Preoperative	3.93± 6.37	0.00 to -24.00	1.37±1.08	0.00 to -4.5
Postoperative	0.93± 0.98	0.00 to - 3.500	1.94±1.18	-0.50 to -5.0

Overall, 90% of patients had astigmatism after surgery that was greater than 0.50 D, compared to 75% of patients who had astigmatism before surgery (Fig. 3).

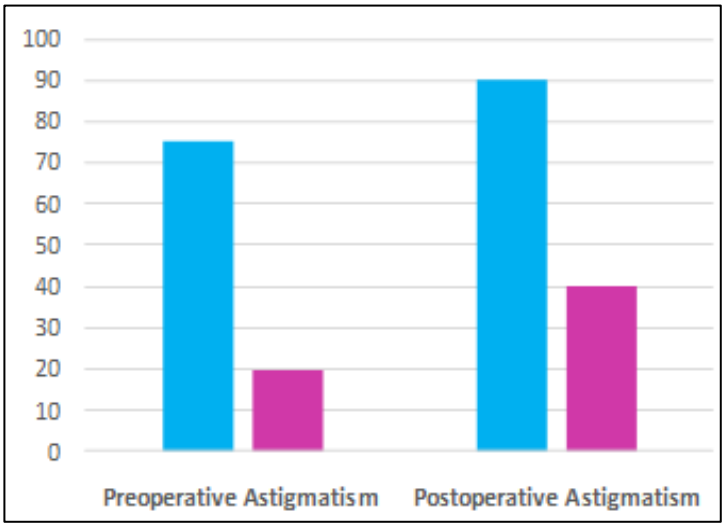

Fig. 3. The Individuals' Pre- and Post-Operative Improvements in Astigmatism.

Table 2. shows the study participants' preoperative and postoperative keratometry results. The results revealed that preoperative Keratometry of cornea (K1) mean was 43.09±1.21 mm, with a range of 40.80 to 45.80 mm, while the preoperative Keratometry of cornea (K2) mean was 43.97±1.35 mm, with a range of 41.11 to 46.30 mm. On the other hand; the postoperative Keratometry of cornea (K1) mean was 43.37±1.42 mm, with a range of 40.50 to 46.00 mm, while Keratometry of cornea (K2) mean was 44.49±1.59 mm, with a range of 41.08 to 47.60 mm. Additionally, there is a noteworthy and significantly ($P<0.01$) increase of Keratometry of cornea from the preoperative to postoperative.

Table 2. The study participants' preoperative and postoperative keratometry results.

Item	Preoperative		Postoperative	
	Mean±SD	Range	Mean±SD	Range
Keratometry of cornea -K1(mm)	43.09 ± 1.21	40.80 to 45.80	43.37 ± 1.42	40.50 to 46.00
Keratometry of cornea -K2(mm)	43.97 ± 1.35	41.11 to 46.30	44.49 ± 1.59	41.08 to 47.60

The location, dimensions, and form of incisions made during MSICS have an impact on postoperative astigmatism. Considering this, our findings support the hypothesis that a temporal method yields a lower mean SIA than a superior strategy, namely Manual Small Incision Cataract Surgery (MSICS).

IV. CONCLUSSION

Similar benefits to phacoemulsification are provided by MSICS, which is more common in developing and impoverished nations due to its shorter surgical times, lower costs, fewer problems, and greater application. Even though it is frequently discredited, postoperative astigmatism can be significantly decreased, improving patients' uncorrected visual

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acuity after cataract surgery. Minor adjustments like a smaller frown or chevron incisions placed either temporally or on the steeper axis away from the limbus can also help induce astigmatism. About 15% of the cases showed a notable rise in post-operative astigmatism. The length of the superior incision (6.0 mm) may have contributed to the higher mean SIA than reported in another research. However, more research is required to determine the impact of incision size on surgically produced astigmatism. The needed research should be use the same technique (superior sutureless MSICS), but a smaller incision (5–5.5 mm) with large number of patients.

DECLARATIONS

- *Ethical Approval and Consent to Participate*

The study adhered to ethical standards. Informed consent was secured from each participant, who voluntarily agreed to partake in the research after receiving a comprehensive explanation of the study's methodology. We guaranteed confidentiality of their information and emphasized their right to withdraw or refuse participation at any time, without any adverse consequences.

- *Competing Interests*

There were no conflicts of interest disclosed by the authors.

- *Consent for Publication*

Not applicable

- *Funding*

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- *Availability of Data and Materials*

The datasets used during the current study are available from the corresponding author upon reasonable request.

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