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Comparison of Preoperative and Postoperative Corneal Astigmatism after Phacoemulsification Through A 2.75mm Clear Corneal Temporal Incision

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ABSTRACT

Objective: To compare Corneal Astigmatism pre and post-operatively after Phacoemulsification through a 2.75mm Clear Corneal Temporal Incision.
Study Design: Comparative Cross sectional Study.
Place and Duration of Study: Combined Military Hospital, Kharian, Pakistan from Jan to May 2023.
Methodology: The data of 46 patients of age more than 55 years of either gender with cataract was collected after taking consent. Those patients were excluded from the study with past ocular history of conditions affecting Corneal Astigmatism. Intra-ocular lens (IOL) with previously determined power was placed following Phacoemulsification through 2.75mm temporal incision. Corneal Astigmatism was noted pre-operatively, and at 7th and 28th day after surgery and the differences if any were recorded subsequently.
Results: Out of 46 patients, 27(58.7%) were females while 19(41.3%) were males aged 61.19+10.66 years on average. Overall variation in astigmatism in the operated patients from pre-op value of 7 and 28 days post op value of 0.08+0.42D (p=0.529) and 0.14+0.48D (p=0.351). 95% of patients had a variation of <1.00 D in Corneal Astigmatism after surgery while >1.00 D variation was found in only 5%.
Conclusion: Surgically induced astigmatism is much reduced in patients post-operatively who have undergone Phacoemulsification using a temporal clear corneal incision with a 2.75mm keratome.

Keywords: Astigmatism, Cataract, Intraocular Lens, Phacoemulsification

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INTRODUCTION

Cataract is an opacity in the lens that prevents light from entering the eye and reaching the retina, causing visual impairment.[1] The most common cause of cataract is the natural process of aging. Cataract especially in elderly is a leading cause of blindness. As per statistics, in 2010 it caused 33.4% of all blindness in the world, this roughly means that cataract was the cause in about one in three people who suffered from blindness.[2]

Phacoemulsification that is considered as a standard surgical modality for treatment of cataract, has undergone various advances in terms of technique and equipment that has led to improvement in the post-operative outcomes drastically.[3,4] It is a superior procedure as compare to manual small incision cataract surgery.[5] Perioperative complications like surgically induced astigmatism, hyphema and posterior capsular rupture are much reduced with better visual outcomes in patients undergoing Phacoemulsification.[6]

Astigmatism is a common refractive error in which parallel rays of light do not converge or focus on a single point on the retina.[7] Patients with astigmatism experience haloes, increased glare and decreased visual acuity.[8] Astigmatism increases the spectacle dependency of patients and reduces their quality of life. While some amount of astigmatism occurs naturally, problem usually arises when surgically induced astigmatism (SIA) occurs as a complication and enhances the refractive error of the eye. This results in poor visual outcomes in the long term for the patients.

Cataract surgery using Phacoemulsification through Clear Corneal Incision (CCI) with a foldable Intraocular lens (IOL) yields the best results.[9] Surgically induced astigmatism (SIA) which generally adds to the overall morbidity of the elderly population undergoing cataract surgery, is minimal. Using the suture less clear corneal incision, there is lesser post-

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op pain, inflammation, SIA and better visual rehabilitation.[10]

In our part of the world, data focusing on the new advances in Phacoemulsification is scarce. So this study aimed to find out accuracy of a blooming surgical technique of Phacoemulsification, by giving a temporal clear corneal incision. Using a 2.75mm keratome, in such patients, our aim was to compare the pre and post-op astigmatism in our subset of patients.

METHODOLOGY

This is a quasi-experimental study set up in the department of Ophthalmology, Combined Military Hospital, Kharian from January to May 2023. After approval of Ethical Committee of the Institute (No. 1103/Administration Dated: 7th July, 2023), the study commenced. Informed consent was taken from all the participants of the study.

Inclusion criteria: A sample size of 46 patients of age 55 years or more, of either gender, diagnosed with cataract, were included in our study using WHO sample size calculator, keeping confidence interval of 95%.

Exclusion criteria: Those patients with previous history of any ocular condition or surgery, affecting corneal refraction, for example corneal ulceration leading to a scar, pterygium or corneal degenerations, were excluded from the study.

Patient's demographics were recorded. All eyes were examined using auto kerato refractometer (KR 8900.) Tropicamide 1% ophthalmic solution was used for pupillary dilatation pre-operatively. 2.75 mm keratome was used for the 2.75 mm anterior chamber clear corneal incision (CCI) temporally. Phacoemulsification was done to remove the senile cataract followed by placement of intra-ocular lens (IOL) whose power was predetermined. Post-operatively, these patients were treated with 1% solution of prednisolone acetate 2 hourly and moxifloxacin 2 hourly for 1 week.

Corneal Astigmatism was recorded pre-operatively, 1 week and 4 weeks post operatively and the differences if any were recorded subsequently. Data confidentiality was maintained. After data collection, it was analyzed on SPSS-22 and Microsoft Xcel. Descriptive stats were applied to measure mean +/- standard deviation, (SD) frequency and percentages. Appropriate test of significance was applied by considering *P* value<0.05 as significant.

RESULTS

Total number of patients included in our study was 46 out of which 19(41.3%) were males while 27(58.7%) were females. Mean age of our study population was 61.19+10.66 years.

Mean astigmatism in patients pre-operatively was -1.12+0.57 diopters (D). Mean astigmatism post-operatively after 1 week was -1.20+0.64D while that after 4 weeks was -1.26+0.63D. Mean change in astigmatism in the operated patients from pre-op value to 1 and 4 weeks post op was 0.08+0.42D (p=0.529) and 0.14+0.48D (p=0.351). Table-I shows the mean change in astigmatism in the operated eyes of patients at Week 01 and 04 post operatively.

Table-I. Mean Change in Astigmatism (N=46)

Operated Eye Side (n=46)	Pre-op Mean Astigmatism	Difference in Astigmatism (Post-op 1W)	Difference in Astigmatism (Post-op 4W)
Right(n=29)	-1.10+0.54	0.03+.30D	0.10+0.39D
Left (n=17)	-1.15+0.66	0.18+0.57D	0.21+0.61D

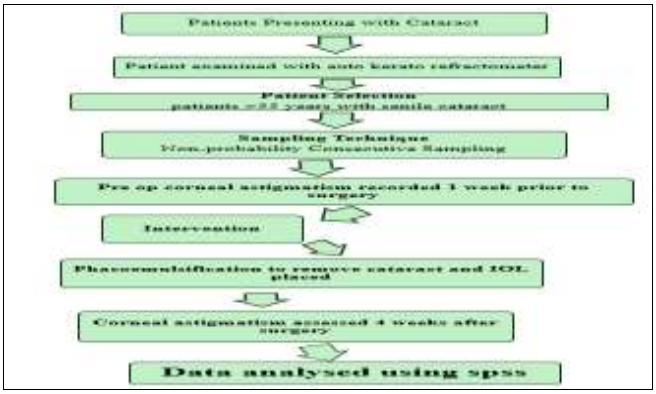

Figure: Study Methodology

DISCUSSION

The study was designed in such a way that the same group of surgeons performed Phacoemulsification during the study period for the sake of reliability of our results. The mean astigmatism in our study pre-op was -1.12+0.57D while it increased slightly to -1.20+0.64D at 1 week while to -1.26+0.63D at 4 weeks post-operatively . 95% of our study population had a keratomertic difference of <1.00D in astigmatism post operatively after following them for 4 weeks while just up to 5% had difference of >1.00D. There was no statistically significant change recorded in astigmatism at 1 and 4 weeks post-operatively. This means that Phacoemulsification using a 2.75mm keratome and a temporal CCI is a reliable surgical technique that can produce stable visual outcomes in patients.

A similar study conducted in Kerman, Iran followed up the patients for about 75 days and found a mean keratometric astigmatism of 0.90±0.54 (D) preoperatively and 0.93±0.45 D postoperatively. These findings of difference in astigmatism are similar to our findings.[11] Another study which compares the changes in astigmatism using a temporal CCI and a superior scleral tunnel incision concluded that the group where CCI was used had a change of 1.04+0.76D post surgically. The total change was about approximately 1D, thus reinforcing our study findings of temporal CCI being a reliable surgical technique in cataract surgery.[12] A similar study, organized in India concluded that SIA in a temporal CCI was much less and therefore it is a superior surgical technique.[13] It is extensively researched in literature throughout the world that among all the surgical techniques used and developed for cataract surgery, Phacoemulsification using a temporal CCI yields better visual results in the long-term with less incidence of SIA. [14-16]

A meta-analysis also revealed the global burden of cataract according to age, and states that geriatric population aged more than 60 years of age suffer predominantly from visual impairment and blindness due to cataract.[17] This was also the mean age of our study population. With much of the elderly people getting cataract surgeries, there is a need of new advances in this very field, providing better results, safety profiles and improving quality of life of such patients.[18]

Factors affecting SIA as experienced by our surgeons were similar to those found by researchers in New Delhi, like incision site, size and shape alongside the severity of cataract encountered pre-operatively.[19] Surgically induced astigmatism remains a challenge for eye surgeons all around the world, and the greater success of a surgeon remains in reducing its frequency or severity post-operatively, while doing Phacoemulsification especially using CCI. One limitation of our study was that patients were followed up post-operatively for 4 weeks only. There is a need to conduct prospective studies of longer duration to get more comprehensive results.

LIMITATION OF STUDY

There were a few limitations of our study. It included patients from our hospital only. We did not include patients from other setups, as it may lead to loss of follow up. Another limitation of our study was that patients were followed up post-operatively for 4 weeks only. There is a need to conduct prospective studies of longer duration to get more comprehensive results. A meta-analysis also revealed the global burden of cataract according to age, and states that geriatric population aged more than 60 years of age suffer predominantly from visual impairment and blindness due to cataract.[17] This was also the mean age of our study population. With much of the elderly people getting cataract surgeries, there is a need of new advances in this very field, providing better results, safety profiles and improving quality of life of such patients.[18]

CONCLUSION

In conclusion, surgically induced astigmatism is much reduced in patients post-operatively who have undergone Phacoemulsification using a temporal clear corneal incision with a 2.75mm keratome. It is a reliable surgical technique. It yields good visual and safety outcomes with minimal side effects.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

KT & MSB: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

NB & MAK: Data acquisition, data analysis, approval of the final version to be published.

ZUB: Critical review, concept, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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