



## ORIGINAL RESEARCH PAPER

### A COMPARATIVE ANALYSIS OF POST OPERATIVE ASTIGMATISM IN PATIENTS UNDERGOING CATARACT SURGERY BY PHACOEMULSIFICATION AND MANUAL SMALL INCISION CATARACT SURGERY

## Ophthalmology

**KEY WORDS:** astigmatism, phacoemulsification, MSICS (manual small incision cataract surgery), visual acuity

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## ABSTRACT

Incision size reduction in cataract surgery has lead the development from intracapsular cataract extraction to phacoemulsification machine, lasers and surgical tools. MSICS is an approach to cataract surgery with easier access to nuclear fragments, smaller size of instruments, flexibility of two incisions and prevention of unexpected complications during newer technique of phacoemulsification like capsulorrhexis extension, Incomplete or difficult hydrodissection, iris prolapse. However the development of Bimanual Phaco cataract surgery with incision size less than 1.8mm and thereby the least possible Post-operative astigmatism. With incisions being smaller, wound integrity is a concern. Depending upon the surgery used for cataract extraction, appropriate modulation of wound construction can help to rectify the pre-existing astigmatism, Improving the quality of vision. The present study will compare the surgically induced astigmatism in both MSICS and phacoemulsification.

## INTRODUCTION :

The advances in cataract surgery have come a long way to refined small incision sutureless surgery performed under microscope. A driving force in the evolution of cataract extraction is the attempt to arrive at the least possible postoperative astigmatism, excessive postoperative corneal astigmatism remains a problem limiting visual outcome as conventional cataract surgery had disadvantages like large incision, multiple sutures and induced astigmatism, newer techniques like phacoemulsification cataract surgery came into vogue. A small cataract incision has been correlated with minimal postoperative astigmatism. Operative factors such as the location and type of cataract incision, the type of suture material, and the technique of wound closure influence the amount of postoperative astigmatism. In phacoemulsification, the slow learning curve and its inapplicability to hard cataracts are its major drawbacks. Surgically induced astigmatism is still the main reason behind poor uncorrected visual acuity in both phaco as well as MSICS. This present study will calculate the surgically induced astigmatism in both phacoemulsification and MSICS.

## AIMS AND OBJECTIVES:

To compare surgically induced astigmatism following Manual small incision cataract surgery (MSICS) with Rigid PMMA Posterior Chamber Intraocular lens & Phacoemulsification with Foldable Posterior Chamber Intraocular lens.

To compare best corrected visual acuity following Manual small incision cataract surgery (MSICS) with Rigid PMMA Posterior Chamber Intraocular lens & Phacoemulsification with Foldable Posterior Chamber Intraocular lens.

## METHODOLOGY:

The present study was conducted on patients having senile cataract underwent surgical management in the form of sutureless small incision cataract surgery and phacoemulsification. In this study 100 cases of senile cataract were selected.

**Inclusion Criteria:** Having WTR astigmatism preoperatively

## Exclusion Criteria:

Uncontrolled diabetes mellitus and hypertension; History of previous intraocular surgery

Any retinal or optic nerve disease; History of POAG/PACG.

Patients in **Group-A** were operated using MSICS technique.

Patients in **Group-B** were operated using phacoemulsification technique.

Pre-operative evaluation: Ophthalmic examination: Visual acuity of the patient, IOP with applanation tonometer, Slit lamp biomicroscopy, Fundus examination, Specular microscopy, Keratometry with automated keratometer and refractive power of the Cornea in the meridian of the greatest and curvature was recorded.

Preoperative preparation: lashes of both the lids of the eye to be operated were trimmed.

Following preoperative medications were administered: Topical antibiotic drops were instilled, Phenylephrine hydrochloride 5% and tropicamide 0.8% eye drop were used for mydriasis.

Anaesthesia: All the patients were operated under local anaesthesia: Peribulbar injection of lignocaine 2% with hyaluronidase, bupivacaine 0.5% was given in equal ratio.

Operative technique: Operating site was cleaned with povidone iodine I.P. 5% solution, One drop of betadine solution was put in the conjunctival sac. Head of the patient was draped. A bridge suture was passed through Superior rectus muscle.

**Group-A:** In group-A cases, conjunctival peritomy done. Bleeding points cauterized. Incision of 5.5mm frown incision was made with its Center 1mm posterior to the limbus. A side port entry was made at 8 o'clock position with 15-degree blade. Anterior chamber was formed by injecting viscoelastic substance. Continuous curvilinear capsulorhexis performed using cystitome. Entry into the anterior chamber through sclerocorneal tunnel was made using 3.2mm. Hydrodissection performed by passing 27 gauge cannula in a syringe filled with BSS separating the cortex with epi and endonucleus from the anterior lens capsule. Nucleus prolapse performed with the help of Sinskey hook. The nucleus delivered using irrigating wire vectis. The residual lens matter was aspirated by Simcoe cannula. Implantation of Posterior Chamber IOL done. Conjunctival flap was cauterised. **Group-B:** Side port incision made on either side 2-3 clock hours from main corneal incision, followed by clear corneal incision of 3.2mm; sclero corneal tunnel incision made. Continuous curvilinear capsulorhexis performed. Hydrodissection done, nucleus cracking and emulsification performed in posterior chamber, crater created with 2<sup>1/2</sup> -3

phacotip,in form of plus sign.finally cortex aspirated using I/A probe.

Postoperative evaluation including visual acuity,keratometry at day-1,1<sup>st</sup> week, 3<sup>rd</sup> week, 6<sup>th</sup> week.The induced astigmatism and its axis was calculated by a computerized spreadsheet based on principle described by Holladay et al.To calculate induced astigmatism, preoperative x and y values are subtracted from the respective postoperative values, and then reconverted to astigmatic values (amount and axis) using mathematical operatives.

RESULTS :  
 Table-1:Distribution Of Age & Sex Of All Groups

AGE GROUP	GROUP-A(MSICS)		GROUP-B(PHACO)	
	MALE	FEMALE	MALE	FEMALE
50-59	7	10	17	20
60-69	11	9	13	19
70-79	4	7	15	10
>80	-	2	2	4
TOTAL	22	28	47	53
RANGE OF AGE	50-81		50-88	
MEAN±SD OF AGE	62.86±8.2		63.28±9.77	

In Group-A,22(44%) patients were male and 28(56%) patients were female.

In Group-B,24(48%) were male and 25(50%) were female.

Pre-operative Astigmatism:  
 Table-2:Amount Of Pre-operative Astigmatism

AMOUNT OF ASTIGMATISM	Group- A (MSICS)		Group- B (PHACO)	
	No.	%AGE	No.	%AGE
<0.5	8	16	10	20
0.6-1.0	13	26	8	16
1.1-1.5	8	16	9	18
1.6-2.0	8	16	13	26
2.1-2.5	5	10	5	10
2.6-3.0	8	16	5	10
TOTAL	50	100	50	100
MEAN±SD	1.46±0.85		1.5±0.83	
p'VALUE	>0.05			
SIGNIFICANCE	NOT SIGNIFICANT			

Number of cases with pre-operative astigmatism of <1D or 1D was twenty one(42%) in Group-A and eighteen(36%) in Group-B.

Mean value of pre-operative astigmatism in Group-A cases was 1.46D.

Mean value of pre-operative astigmatism in Group-B cases was 1.5D.

Pre-operative Visual Acuity:  
 Table-3:pre Operative Visual Acuity

VISUAL ACUITY	Group-A (MSICS)		Group-B (PHACO)	
	No.	%AGE	No.	%AGE
6/6-6/9	-	-	-	-
6/12-6/18	1	2	2	4
6/24-6/60	25	50	22	44
<6/60	24	48	26	52
TOTAL	50	100	50	100

Maximum number of patients had pre operative visual acuity of less than 6/60.

in Group A, twenty four cases (48%) and in Group B twenty six (52%) cases had Visual acuity less than 6/60. None of the cases had visual acuity better than 6/12.

**Power Of Posterior Chamber IOL :**  
 25 cases(50%) in Group A (MSICS) and 23 cases(46%) in Group B(phaco) required IOL power between 21-23diopters.

Postoperative Observations :  
 Postoperative observations on day one

Amount Of Astigmatism	Group-A (MSICS)				Group-B (PHACO)			
	Day 1	1 Week	3 Weeks	6 Weeks	Day 1	1 Week	3 Weeks	6 Weeks
<0.5	11	15	15	14	18	18	19	19
0.6 - 1.0	15	12	15	16	19	16	14	15
1.1 - 1.5	12	15	15	15	6	10	8	9
1.6 - 2.0	9	5	3	2	5	4	5	3
2.1 - 2.5	3	3	1	2	1	1	4	4
2.6 - 3.0	0	0	0	1	1	1	0	0
TOTAL	50	50	50	50	50	50	50	50
RANGE	0-2.35	0-2.27	0-2.6	0-2.65	0-2.75	0-2.69	0-2.5	0-2.5
MEAN±SD	1.12±0.63	0.98±0.64	0.92±0.61	0.91±1.22	0.94±0.61	0.9±0.67	0.87±0.67	0.85±1.06
'p' Value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
SIGNIFICANCE	NOT SIGNIFICANT							

The average amount of post operative astigmatism:  
 The average amount of post operative astigmatism on day-1 in Group-A was 1.12D and in Group-B was 0.94D.

Average post operative astigmatism after 1-week,3-weeks & 6-weeks in Group-A are 0.98D,0.92D & 0.91D respectively.

Average post operative astigmatism after 1-week,3-weeks & 6-weeks in Group-B are 0.90D,0.87D & 0.85D respectively.

Post Operative Best Corrected Visual Acuity:  
 Table-5: Post Operative Best Corrected Visual Acuity

Best Corrected Visual Acuity	GROUP-A(MSICS)				GROUP-B(PHACO)			
	DAY 1	1 WEEK	3 WEEKS	6 WEEKS	DAY 1	1 WEEK	3 WEEKS	6 WEEKS
6/6-6/9	12	24	26	33	14	27	26	34
6/12-6/18	28	22	24	17	26	22	23	16
6/24-6/60	10	2	2	0	10	1	1	0
<6/60	0	0	0	0	0	0	0	0
TOTAL	50	50	50	50	50	50	50	50

Maximum no.of cases in Group-A,i.e28(56%) & 26(52%) in Group-B had best corrected visual acuity between 6/12 and 6/24 in post operative day-1.

Maximum no.of cases in Group-A,after 1-week,3-weeks and 6-weeks are 24(48%),26(52%) and 33(66%) in Group-A and 27(54%),26(52%) and 34(68%) in Group-B,respectively had post operative best corrected visual acuity of 6/9 or better than 6/9.

None of the cases had best corrected visual acuity worse than 6/60.

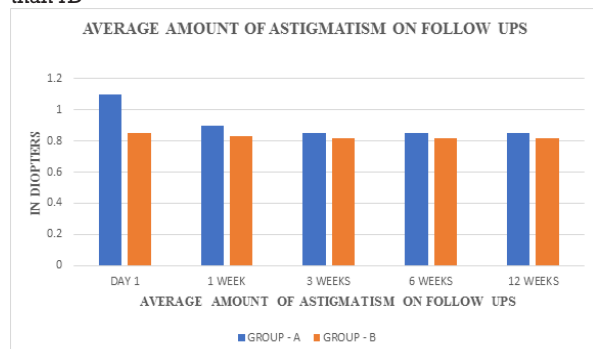
Surgically Induced Astigmatism:  
 Table-6: Surgically Induced Astigmatism

Amount Of Astigmatism	Group A (MSICS)		Group B (PHACO)	
	No.	% AGE	No.	% AGE
<0.5	14	28	18	36

0.6 – 1.0	16	32	16	32
1.1 – 1.5	15	30	10	20
1.6 – 2.0	2	4	3	6
2.1 – 2.5	2	4	3	6
2.6 – 3.0	1	2	-	-
TOTAL	50	100	50	100
RANGE	0 – 2.65		0 – 2.5	
MEAN ± SD	0.92 ± 0.63		0.85 ± 0.66	
'p' VALUE	>0.05			
SIGNIFICANCE	NOT SIGNIFICANT			

In Group-A 30(60%) had surgically induced astigmatism less than 1D

In Group-B 34(68%) had surgically induced astigmatism less than 1D



**Chart-1:** Average Amount Of Astigmatism On Follow UPS

## DISCUSSION :

The present prospective study was undertaken on 100 patients with uncomplicated age related cataract . The study was designed to compare the postoperative astigmatism and best corrected visual acuity of the two Groups: Group-A MSICS technique and Group-B phacoemulsification technique. All the patients were followed up for a period of 6-weeks.

## Preoperative Astigmatism

The mean pre operative astigmatism was 1.46D in Group-A and 1.5D in Group-B. This difference after statistical analysis was found to be insignificant.The amount of pre existing astigmatism in all of the cases was in the range of 0.2-3 D in both the Groups.

## Preoperative Visual Acuity

Maximum number of patients had pre operative visual acuity of less than 6/60 in Group-A(48%) and in Group-B (52%).

## Post Operative Astigmatism

In Group-A the average amount post operative astigmatism on day one was 1.12D.

The minimum and maximum amount of astigmatism was 0.0D and 2.35D respectively. In Group-A after one week,the average amount of post operative astigmatism was 0.98D. After three weeks, the average amount of post operative astigmatism was reduced to 0.92D .after six weeks,the average amount of post operative astigmatism was further reduced to 0.91D.The minimum and maximum amount of astigmatism at end of study was 0.0D and 2.65D respectively. Thus the was progressive decrease in amount of astigmatism postoperatively over six period all cases.

In Group-B the average amount of post operative astigmatism on day one 0.94D.The minimum and maximum amount of astigmatism was 0.0D and 2.75D respectively. After one weeks, the average amount of post operative astigmatism 0.90D. After three weeks, the average amount of post operative astigmatism was 0.87D. after six weeks, the average amount of post operative astigmatism was reduced to

0.85D.Thus there was progressive Group also. The different between these two Groups was statistically significant and thus in this series. the amount of postoperative astigmatism in phacoemulsification is less than postoperative astigmatism induced by MSICS.

This was observed in our study also. In the present study phacoemulsification was found to induce less postoperative astigmatism than sutureless small incision ECCE.

## Post Operative Best Corrected Visual Acuity

In the present study,the difference of the best corrected visual acuity between MSICS and phacoemulsification techniques was non significant.Minimum number of cases in both the Groups (66% in Group-A and 68% in Group-B) had best corrected visual acuity 6/9 or better than 6/9, none of the cases in Group-A and Group-B had post operative best corrected visual acuity worse than 6/24.

## Surgically Induced Astigmatism

In Group-A the mean surgically induced astigmatism was 0.92+0.63 D.In Group-B the mean surgically induced astigmatism was 0.85+0.66D.Maximum number of cases i.e.30(60%) in Group-A had surgically induced astigmatism less than 1D. Maximum number of cases i.e.34(68%) in Group-B had surgically induced astigmatism less than 1D.The difference in mean surgically induced astigmatism between the two Groups was statistically significant.

## CONCLUSION :

100-cases of senile cataract without any other ocular pathology operated were included in the present study.In this Study postoperative astigmatism and best corrected visual acuity after manual small incision cataract surgery with rigid posterior chamber intraocular lens was compared with phacoemulsification with foldable posterior chamber intra ocular lens implantation.

This study highlights the fact that,phacoemulsification is a better surgical technique in reduction of post operative astigmatism when compared to Manual Small Incisional cataract surgery eventhough there is no statistical significance.

MSICS and phacoemulsification had similar visual outcomes postoperatively.the difference was statically non significant. This study conducted at a tertiary hospital proves that a good visual outcome can be achieved following both the techniques MSICS and Phacoemulsification.However there was no statistical difference in the rate of complications between the two groups.

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