To Study the Outcome of Different Modalities for the Treatment of Astigmatism During Phacoemulcification

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Cataract affects approximately 20 million people world wide and this figure is expected to reach 50 million by the year 2020.

It is currently among the most performed planned surgical procedures world wide positively impacting over patients qualify of life.

Aproach to the surgical correction of astigmatism at the time of cataract surgery

One way to plan surgical correction of astigmatism is to initially assess the refraction and the keratometry simultaneously. If good correlation exists as to the amount of cylinder and axis, the surgical planning for astigmatism correction during cataract surgery is fairly straightforward. If, however, there is poor correlation (even though keratometry should be more reliable), surgical correction can be less predictable, even with corneal topography. This is where the "art" of astigmatism correction applies. The surgeon needs to also judge the relative reliability of the astigmatic information. If, after careful consideration, there is doubt as to a reasonable surgical plan, the astigmatism correction should be postponed until after cataract surgery and an adequate time for incision healing rather than astigmatism "correction" or "treatment" is an important subtlety. The terms In some instances, a patient's astigmatism will be worse after surgery than it was before, but hopefully the unavoidable increase will be minimized or paired peripheral corneal relaxing incisions (PCRIs), and toricIOL implantation. For less than 1 D of corneal astigmatism, the phacoemulsification incision is placed in the steep axis. For 1 D can be utilized. We prefer LRI for astigmatism from 1 D to 1.5 D and toriclOLs for astigmatism above 1.5 D. ToriclOLs and LRI are used . The need for LRI is amarket and the availability of toric corrections in accommodating and multifocal lOLs.

Stepladder Approach to Management of Astigmatism at Time of

Cataract Surgery

Comeal Astigmatism	*Treatment Approach*
<1 D	incision on steep axis
1 D to 1.5 D	LRI incisions
1.5 D to 2.5 D or more	Toric intraocular lens

Limbal relaxing incision

Limbal relaxing incisions (LRIs) can flatten astigmatism as an adjunct to cataract surgery. LRI's have been demonstrated to predictably alter the corneal curvature by flattening the cornea in the meridian in which they are placed and allowing for a commensurate amount of steepening 90 degrees away

A number of nomograms are available to determine the arc length and number of incisions for a certain amount and axis of astigmatism, such as the Donnenfeldnomogram

Nichamin Nomogram

When performing LRIs alone, the number and length of incisions are determined according to the using nomogram.

This nomogram, which titrates surgery by length and number of LRIs, should be considered a starting point. The goal is to reduce cylinder power and absolutely avoid overcorrecting with-the-rule cases because we want to minimize against-the-rule astigmatism. In cases with 0.5 D or less of cylinder, only an astigmatically neutral cataract incision is used.

TABLE 1

Nichamin Nomogram for Limbal Relaxing Incisions to Correct Astigmatism With Phacoemulsification

	Degrees of Arc to be Incised—Against-the-Rule Astigmatism						
	Age (y)						
Cylinder (D)	30 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	>90
0.75 to 1.25	55	50	45	40	35		
1.50 to 2.00	70	65	60	55	45	40	35
2.25 to 2.75	90	80	70	60	50	45	40
3.00 to 3.75	90*	90*	85	70	60	50	45
	Degrees of Arc to be Incised—With-the-Rule Astigmatism						
	Age (y)						
Cylinder (D)	30 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	>90
1.00 to 1.50	50	45	40	35	30		
1.75 to 2.25	60	55	50	45	40	35	30
2.50 to 3.00	70	65	60	55	50	45	40
3.25 to 3.75	80	75	70	65	60	55	45

*Optic zone to 8 mm.

Toric intraocular lens

The first toric intraocular lens model was approved by the FDA in 1998. Widespread use of toric IOLs would not come until later, however, with approval of a foldable toric IOL in September 2005. Toric IOLs have the advantage of being able to correct large amounts of astigmatism. Alcon has published a web site for their toric IOL calculation which is very useful and takes into account induced astigmatism from the wound

(http://www.acrysoftoric-calculator.com)

There are 3 important prerequisites to success with toricIOLs. First, the surgeon must be able to perform astigmatically neutral surgery or be able to accurately estimate his or her surgeon-induced astigmatism so that the lOL's cylindrical power and axis can be selected based on the preoperative keratometry measurements. Second, the axis of the toricIOL must be properly aligned during surgery. Finally, the lens must not rotate out of alignment postoperatively.

Aim And Objectives

1. To assess astigmatism prior to cataract surgery.
2. To study the results of different modalities used during phacoemulsification for astigmatism treatment.
3. To assess final visual outcome.

Materials And Methods

This prospective, parallel, cohort, non-randomized study was performed at the Upgraded Department of Ophthalmology, LLRM Medical College, Meerut.

Total 60 patients were selected from OPD and undergone a complete ophthalmic examination that included uncorrected visual acuity (UCVA), refraction under cycloplegia, slit lamp biomicroscopy, tonometry, indirect ophthalmoscopy, automated keratometry and Ultrasonic biometry was used to calculate IOL power using the SRK-T formula in all study groups. The study was conducted from 2018 to 2019.

Inclusion Criteria :

All patients with age related cataract with preexisting astigmatism of less than 4 D where included in the study.

Exclusion Criteria :

1. Patients having irregular astigmatism.
2. Astigmatism due to pterygium.
3. Previous history of any surgery in the same eye.
4. The same Eye having Corneal Opacity 5.Those having traumatic or complicate cataract

6. Sever dry eye.
7. Macular degeneration or Retinopathy.

Three groups were formed on the basis of astigmatic error

Group 1-Patients were selected with astigmatism of < 1D

Group 2- Patients were selected with astigmatism of 1.00D to <2.00D

Group 3- Patients were selected with astigmatism of 2-4D.

Surgical Management in Three Groups-

GROUP 1- Patients were underwent clear corneal incision at steep axis during phacoemulsification.

GROUP 2- Patients were underwent for limbal relaxing incision using Nichamin nomogram during phacoemulsification.

Group 3- Patients were underwent for implantation of ToricIOL by phacoemulsification.Toric IOL axis and power were calculated by online acrysof Toric IOL calculator.

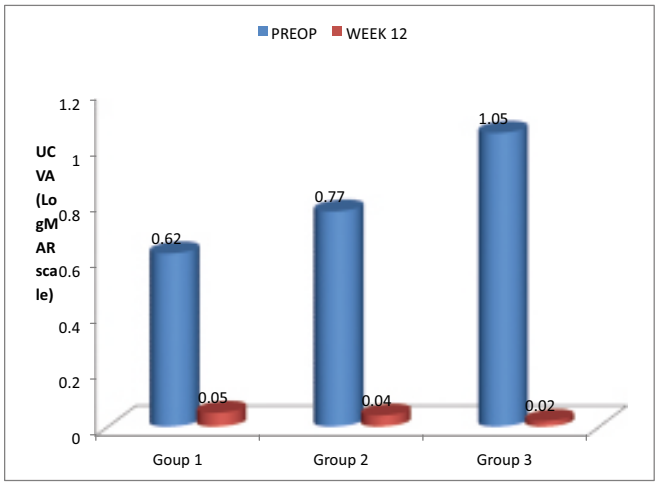
Observations And Results-

TABLE 1-Preoperative UCVA and postoperative UCVA at week 12-

UCVA(logMAR) mean±SD	Goup 1	Group 2	Group 3
PREOP	0.62±0.30	0.77±0.36	1.05±0.25
WEEK 12	0.05±0.03	0.04±0.02	0.02±0.02
P value	0.003	0.003	0.001

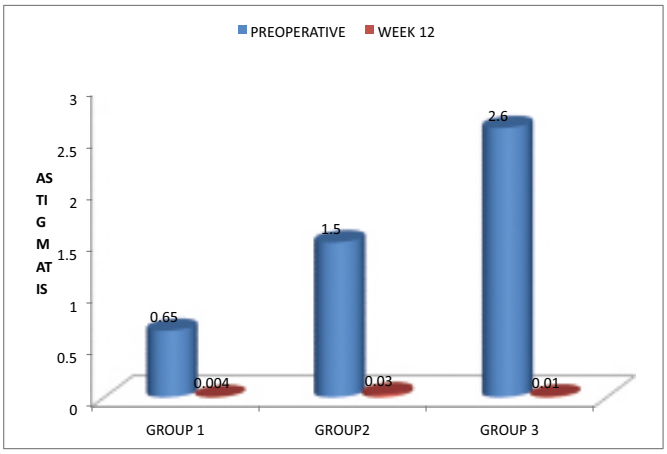
On applying non parametric WILCOXON SIGNED RANKS TEST based on positive ranks the average difference in UCVA (log MAR) AT week 12 postoperatively from preoperatively were all

Statistically significant ,taking p value <0.05 as statistically significant. P value in all the three groups were significant.



ASTIGMATISM (MEAN±SD)	GROUP 1	GROUP 2	GROUP 3
PREOPERATIVE	0.65±0.19	1.5±0.30	2.6±0.57
WEEK 12	0.04±0.08	0.03±0.13	0.01±0.02
P VALUE	0.001	0.001	0.002

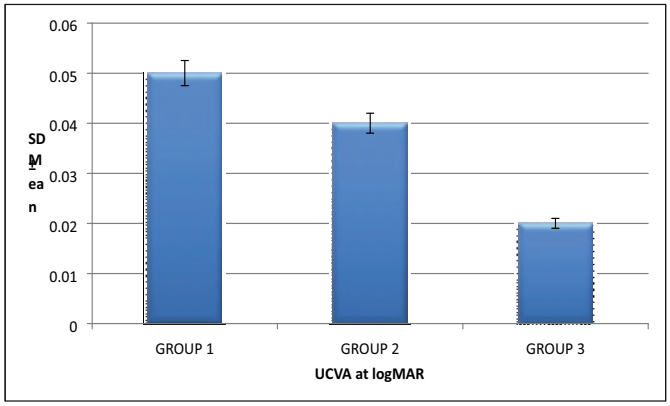
On applying non parametric WILCOXON SIGNED RANK TEST based on positive ranks the difference in Astigmatism at week 12 postoperatively were all statistically significant ,taking p value<0.05, as statistically significant



Comparison between three groups for improvement in UCVA at week 12

UCVA(MEAN ±SD)at logMAR	GROUP 1	GROUP 2	GROUP 3
AT WEEK 12	0.050±0.03	00.04±0.02	0.03±0.02

THE UCVA (logMAR) in postoperative group was analysed after applying KRUSKALL WALLIS NON PARAMETRIC TEST and taking p value <0.05 as statistically significant .H statistic is 7.719. -P value is 0.02. and this was considered to be statistically significant.

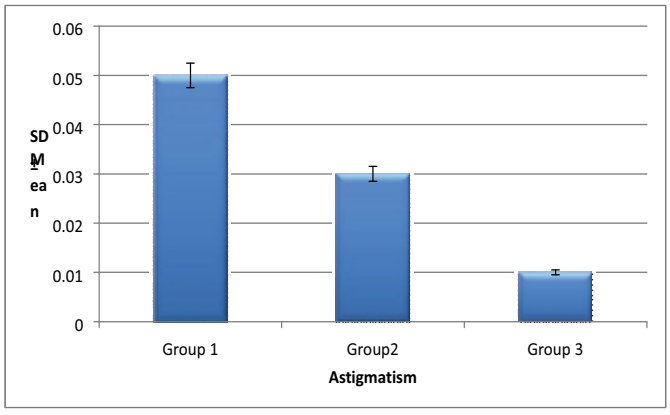


Comparison between three groups for the improvement in astigmatism between three groups at week 12

Astigmatism (mean ±SD)	Group 1	Group2	Group 3
at week 12	0.05 ±0.13	0.03 ±0.15	0.01 ±0.12

The Asmatigmatism in postoperative patients was analysed after applying Kruskall Wallis non parametric test and taking p value <0.05 as statistically significant

The p value is 0.012 and this was considered to be statistically significant.



Discussion

This study represents 60 patients visiting to our OPD confirmed inclusion criteria as laid down with corneal astigmatism of more than 0.50(D) to 4(D)

A study done by Hossein mohammad –Rabei and his colleagues in 2016 The results of this study showed that UCVA 20/40 at week 24 was achieved in 97% of eyes in thee EOAI group, 82.4% of eyes in the LRI group, and 76.2% of eyes in the tIOL group.

In a similar study done by carvalho et al who found LRI as a safe approach to correct astigmatism during phacoemulsification reported a postoperative UCVA of 6/12 in 75% of cases. my result is better than this result in LRI group.[10]

The result of our study showed that UCVA 6/9 at week 12 was achieved in 90% of eyes in clear corneal incision group 1,85% of eyes in group 2,and 95% of eyes in group 3.

Change in astigmatism at day 1 in all the three groups were significant.but there were a large change in astigmatism at day 1,0.14 ±0.22 in clear corneal incision group as compared to two other groups. Manpreet Kuar at al.in a study done on patients undergoing cataract surgery and toric IOL implantation with pre-existing high astigmatism.and concluded that toric IOL demonstrate good visual outcome with UCVA better than than 6/12 in 97% to 100% Of patients. and residual astigmatism lower than 0.50D in 38-78% of patients.our results are approximately same.[12]

Similarily in our study in toric IOL group 90% Patients improved to UCVA of ≥ 6/9 and residual astigmatism lower than 0.50 D in 15% patients.[12]

Dr K. Ravikumar at al done a study on efficacy of limbal relaxing incisions in correcting corneal astigmatism along with clear corneal phacoemulsification .in his study done on 50 eyes of 37 patients the preoperative UCVA was 1.0 with a standered deviation of 0.4.The post operative UCVA at 4 weeks 0.0 with standered deviation of 0.15 in logMAR units. In our study in mean UCVA in limbal

relaxing group at 4 week was 0.07 with standered deviation of 0.14.

A study done by Nick Mamalis in may 2019 concluded that there were statistically significant difference when looking at the mean residual astigmatism with toric IOL resulting in less cylinder than CCI.But in our study all the three modalities are equaly effective when comparing there preoperative and postoperative at week 24

The results of the present study should be interpreted in the context of its limitations. The study was not randomized which explains why preoperative astigmatism was significantly higher in the tIOL group.

All the three methods used in our study are effective , safe and predictable method.

However drawbacks of clear corneal incision is that it can't correct high astigmatism, while limbal relaxing incision and toric IOL implantation can correct moderate to high astigmatism .

Conclusion

Limbal relaxing incision is cost effective alternative to toric IOL and can be used in conjunction with cataract surgery to reduce moderate astigmatism .

Implantation of acrysof toric IOL is apredictive and safe method to `correct high astigmatism ,the stability of the lens in the capsular bag has been excellent .These lenses also appears to slow if not prevent the development of dense posterior subcapsular opacification

Outcome after toric IOL implantation are influenced by numerous factors ,right from the preoperative case selection and investigations to accurate intraoperative alignment and post operative care.

With the limitation of our study that is study was not randomized can't conclude that which study is better or which is best ,all the three methods to correct astigmatism during phacoemulsification give good results.

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Ophthalmology News:

Dry Eye? New Nasal Spray May Increase Tear Production

Varenicline (Tyrvaya, Oyster Point Pharma) is a cholinergic agonist that demonstrated an effect on tear production within five minutes of dosing in clinical trials. The nasal spray can restore the tear film homeostasis early on and, hopefully, prevent a lot of patients from having a chronic hyperosmolarity state that leads to more chronic inflammatory issues. The clinical trial results that led to FDA approval of varenicline last month. The study, with more than 1,000 participants, showed statistically significant increases in tear production after four weeks of twice-daily dosing with the nasal spray. The most common adverse reaction was mild sneezing, in 82% of participants. Other adverse events, also mild, were cough, throat irritation, and instillation-site (nasal) irritation, in 5% to 16%

Treat Presbyopia With an Eye Drop

The big news in this area came, when the FDA approved VUITY, a new eye drop medication developed by Allergan, an AbbVie company -- the first medication ever approved for the treatment of presbyopia.This drug has a rapid onset of almost 15 minutes and an exceptional duration, so this is a durable drug out to 6 hours relative to controls that improved distance-corrected near visual acuity almost three lines without affecting distance vision