Comparison of Post-Operative Astigmatism in Conventional Extracapsular Cataract Extraction and Converted Extracapsular Cataract Extraction

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Abstract
Introduction: *High quality, high volume cataract surgery is needed to effectively manage the large backlog of cataract blindness with less postoperative complications. The present study has been conducted in order to find out and compare the degree of post-operative astigmatism following cataract surgery by conventional ECCE and converted ECCE.*
Materials And Methods: *This study was conducted in Department of Ophthalmology, Regional Institute of Medical Sciences, lmphal from October 2011 to September 2013 for duration of 2 years. Patients with age-related cataract attending the Department of Ophthalmology, Regional Institute of Medical Sciences Hospital, lmphal during the 2 years data collection period were included in this study. Study tools included Snellen's visual acuity chart, Bausch and Lomb Keratometer, Retinoscope, Trial case with lenses and trial frames. The degree of the surgical induced astigmatism was calculated and the results analyzed by appropriate descriptive statistical method such as mean, median, proportion and chi-square.*
Results: *The postoperative astigmatism was significantly higher in the converted ECCE group compared to conventional ECCE group in all the follow-up, showing that conventional ECCE is a better technique to control postoperative astigmatism. Reasonably good vision is restored in all the cases of converted ECCE.*
Conclusion: *In a developing country like India, where phacoemulsification may be unaffordable to the majority of population requiring cataract surgery, converted or conventional ECCE is safe and efficacious alternative.*
Keywords: *Astigmatism, converted ECCE, conventional ECCE.*

I. Introduction

The lens is a transparent, biconvex, elliptical, semisolid, avascular body of crystalline appearance located between iris and vitreous, suspended by zonules which are inserted in the anterior equatorial and posterior lens capsules attached to the ciliary body.[1] Any opacity in the lens or its capsule, whether developmental or acquired, is called a cataract**.** Any factor, physical or chemical, which disturbs the critical intra and extracellular equilibrium of water and electrolytes or deranges the colloid system within the fibres tend to bring about opacification.[2]

The fundamental aim of cataract surgery is the removal of the opacified natural lens to improve vision. There are a variety of cataract extraction methods, which includes[3] -

a) Intra capsular cataract extraction (ICCE) method
b) Extra capsular cataract extraction (ECCE) by conventional method
c) Manual Small incision cataract surgery method and
d) Phacoemulfication.

One of the unwelcomed consequences of cataract surgery is an alteration in corneal curvature leading to astigmatism. Astigmatism[4] is that condition of refraction wherein a point focus of light cannot be formed upon the retina. It is a refractive error mainly due to an anatomic abnormality of the cornea or occasionally of the crystalline lens. Astigmatism results when the cornea is not a perfect sphere because the radii of curvature in different meridians of the cornea are not equal. In the astigmatic cornea, one meridian is flattened compared with the other, resulting in the formation of two perpendicular images, one image for each meridian. Also, instead of a single far point, there are two far lines.

High quality, high volume cataract surgery is needed to effectively manage the large backlog of cataract blindness with less postoperative complications. The present study has been conducted in order to find out and compare the degree of post-operative astigmatism following cataract surgery by conventional ECCE and converted ECCE. It is well known that small incision cataract surgery is producing less amount of astigmatism than conventional ECCE, but it requires more learning curve. On the other hand, we have to avoid serious

complication like Posterior capsule rupture, vitreous prolapse and corneal decompensation while forcibly attempting SICS. In such situation, converted ECCE is to be performed, if the amount of astigmatism produced by converted ECCE is not more than planned ECCE, it is definitely better to perform converted ECCE than planned ECCE for the beginners. Moreover, no study exactly similar to this proposed study had been reported in standard journals in Ophthalmology.

II.   Aims and Objects

1.   To find out the degree of astigmatism following conventional extracapsular cataract extraction (ECCE).
2.   To find out degree of astigmatism following converted extracapsular cataract extraction (ECCE).
3.   To compare the post-operative astigmatism of conventional ECCE & converted ECCE.

III.   Materials And Methods

Study Design: Quasi experimental study.
Setting: Department of Ophthalmology, Regional Institute of Medical Sciences, lmphal.
Study duration: From October 2011 to September 2013 for duration of 2 years.
Study Population: Patients with age-related cataract attending the Department of Ophthalmology, Regional Institute of Medical Sciences Hospital, lmphal during the 2 years data collection period.
Exclusion criteria: Patients who developed aphakic /post-operative complication, patients who underwent phacoemulsification and SICS, previous repaired corneal surgery like keratoplasty, corneal perforation, Lasik and patients having corneal pathology like keratoconus and corneal dystrophy etc.
Sample size and sampling: All patients undergoing conventional Extracapsular Cataract   Extraction (ECCE) and converted Extracapsular Cataract Extraction (ECCE) during the study period fulfilling the inclusion criteria and consenting for the study were selected.
A complete medical history and informed consent were taken from each patient. The baseline visual acuity, refraction & keratometry were done during the time of admission.
Outcome measures: At each follow-up the following were
recorded**.**:Visual acuity, Refraction and Keratometry.
Study variables: Age, sex, religion, address, occupation.
Follow up: Patients included in this study were followed up at second, fourth, sixth and eighth weeks postoperatively and checked for the amount of   astigmatism.
Study tools: Snellen's visual acuity chart, Bausch and Lomb Keratometer, Electric/reflecting
Retinoscope, trial case with lenses and trial frames.
Statistical analysis: The degree of surgical induced astigmatism was calculated and the results analyzed by appropriate descriptive statistical method such as mean, median, proportion and chi-square. A probability value of less than 0.05 would be considered significant.
Ethical issues: Informed Consent was taken from all the patients. Approval of the Institutional Ethical Committee, RIMS was obtained before the study was conducted.

IV.   Results

The present study was conducted on a total of 80 eyes that underwent a cataract surgery at RIMS Hospital from October 2011 to September 2013. Out of which 50 were operated with conventional ECCE (GroupA) and 30 eyes with converted ECCE (GroupB).
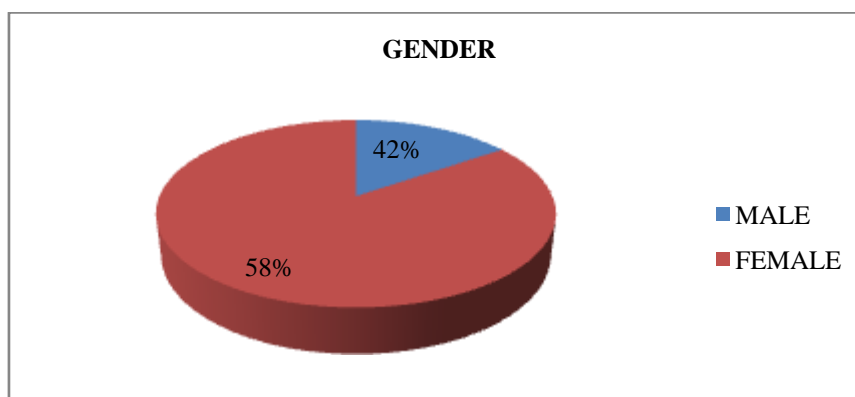

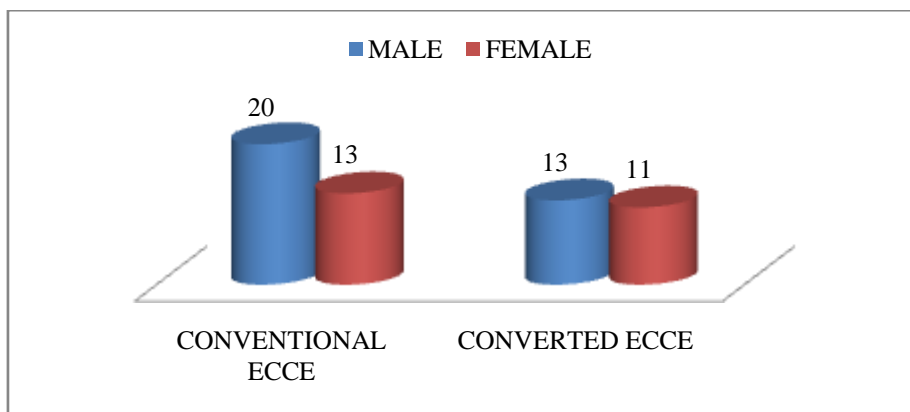**Fig1:** Distribution of patients by gender.

Fig 2: Distibution of patients by gender and group.
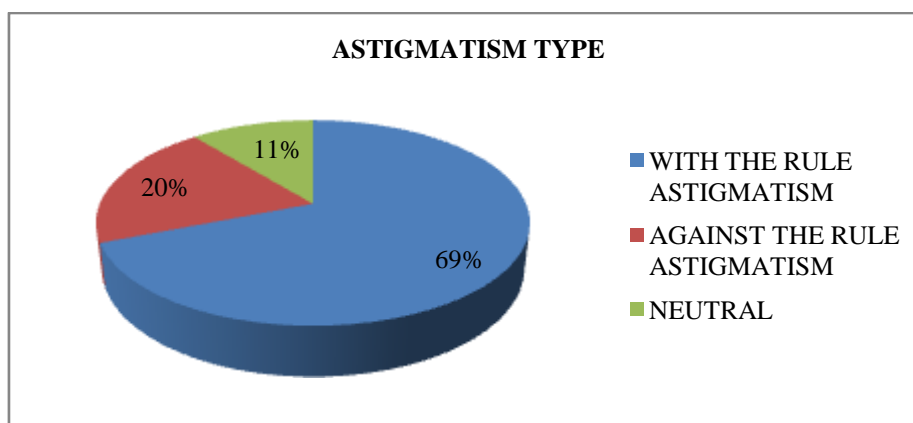
Fig 3: Distribution of pre-operative astigmatism.

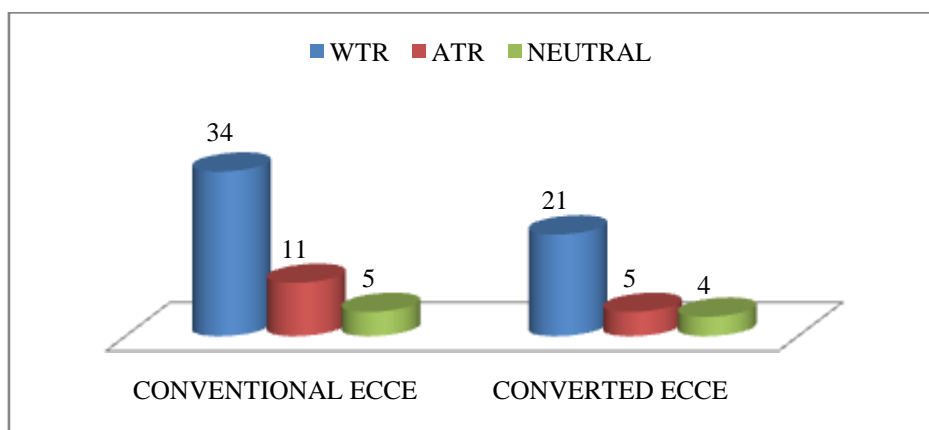**Fig 4:** Distribution of pre-operative astigmatism type.

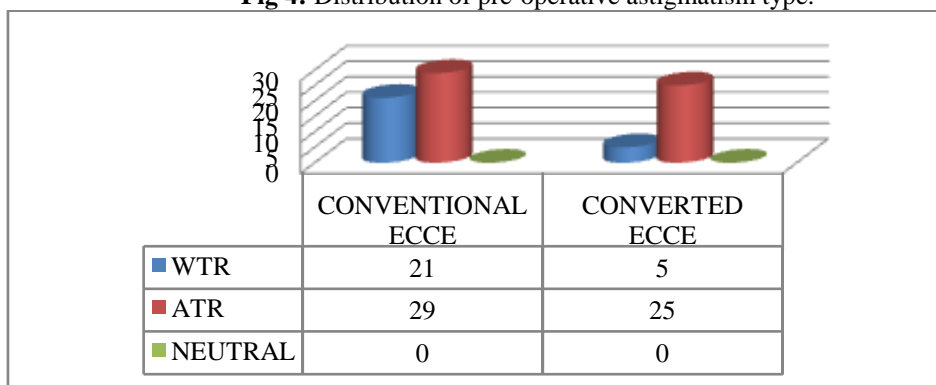|	CONVENTIONAL ECCE	CONVERTED ECCE
WTR	21	5
ATR	29	25
NEUTRAL	0	0

Fig 5: Distribution of post-operative astigmatism type at first follow-up.
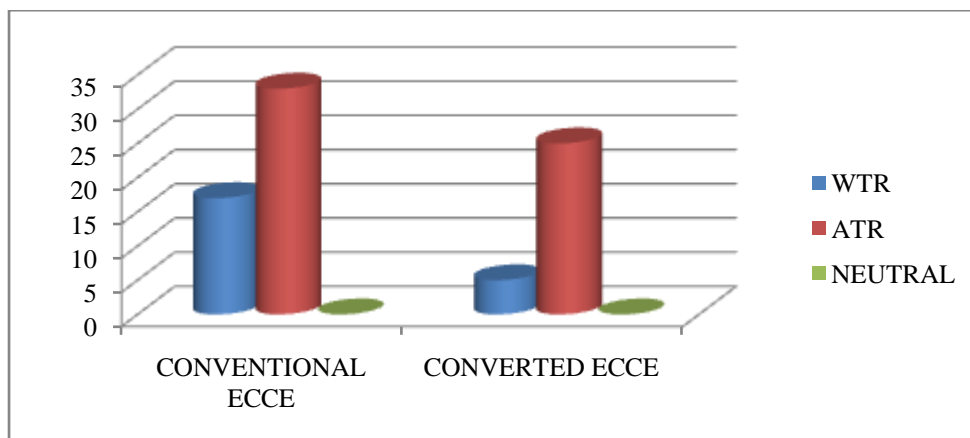
Fig 6: Distribution of post-operative astigmatism type at fourth follow up.

Table 1: Showing ranges and degree of astigmatism at follow-up.

Follow up	Ranges of astigmatism	Mean astigmatism
1st (2nd week)	0.50-10.25D	3.47±2.2D
2nd (4th week)	0.25-7.50D	2.82±1.6D
3rd (6th week)	0.00-6.25D	2.39±1.4D
4th (8th week)	0.50-5.25D	1.99±1.2D

Table 2: Showing Vision at the time of admission by group

Vision	Conventional ECCE number (%)	Converted ECCE number (%)	Total number (%)
PL+	5(10%)	3(10%)	8(10%)
HM+	17(34%)	13(44%)	30(37%)
FC-CF	12(24%)	7(24%)	19(24%)
1/60	7(14%)	3(10%)	10(13%)
2/60	3(6%)	1(3%)	4(5%)
3/60	-	1(3%)	1(1%)
4/60	3(6%)	1(3%)	4(5%)
5/60	2(4%)	1(3%)	3(4%)
6/60	1(2%)	-	1(1%)
TOTAL	50(100%)	30(100%)	80(100%)

Table 3: Distribution of vision at First follow-up.

Vision	Conventional ECCE		Converted ECCE	
	UCVA	BCVA	UCVA	BCVA
6/12	-	13(26%)	-	-
6/18	1(2%)	15(30%)	-	2(7%)
6/24	6(12%)	10(20%)	-	7(23%)
6/36	16(32%)	7(14%)	1(3%)	12(40%)
6/60	21(42%)	5(10%)	11(37%)	9(30%)
5/60	3(6%)	-	8(27%)	-
4/60	1(2%)	-	6(20%)	-
3/60	2(4%)	-	3(10%)	-
2/60	-	-	1(3%)	-
Total	50(100%)	50(100%)	30(100%)	30(100%)

Table 4: Distribution of vision at Second follow-up.

Vision	Conventional ECCE		Converted ECCE	
	UCVA	BCVA	UCVA	BCVA
6/9	-	10(20%)	-	-
6/12	1(2%)	15(30%)	-	5(16%)
6/18	3(6%)	12(24%)	1(3%)	8(27%)
6/24	17(34%)	10(20%)	-	9(30%)
6/36	15(30%)	2(4%)	9(30%)	8(27%)
6/60	12(24%)	1(2%)	16(54%)	-
5/60	2(4%)	-	3(10%)	-
4/60	-	-	1(3%)	-
Total	50(100%)	50(100%)	30(100%)	30(100%)

Table 5: Distribution of Vision at Third follow-up.

Vision	Conventional ECCE		Converted ECCE	
	UCVA	BCVA	UCVA	BCVA
6/6	-	3(6%)	-	-
6/9	1(2%)	18(36%)	-	5(16%)
6/12	5(10%)	18(36%)	-	17(58%)
6/18	14(28%)	6(12%)	3(10%)	5(16%)
6/24	15(30%)	5(10%)	10(33%)	3(10%)
6/36	14(28%)	-	14(47%)	-
6/60	1(2%)	-	3(10%)	-
Total	50(100%)	50(100%)	30(100%)	30(100%)

Table 6: Distribution of Vision at Fourth Follow-Up

Vision	Conventional ECCE		Converted ECCE	
	UCVA	BCVA	UCVA	BCVA
6/6	-	19(38%)	-	-
6/9	-	20(40%)	-	9(30%)
6/12	15(30%)	11(22%)	3(10%)	16(54%)
6/18	20(40%)	-	10(33%)	5(16%)
6/24	13(26%)	-	12(40%)	-
6/36	1(4%)	-	5(17%)	-
Total	50(100%)	50(100%)	30(100%)	30(100%)

Table 7: Comparison of post-operative astigmatism at First follow-up between the two groups.

Procedure	Mean(SD) Astigmatism	Mean Difference	t-Test	p-Value
Conventional ECCE	2.39±1.5	-2.882	-7.19	0.001
Converted ECCE	5.27±2.0			

Table 8: Comparison of post-operative astigmatism at Second follow-up.

Procedure	Mean (SD) Astigmatism	Mean Difference	t-Test	p-Value
Conventional ECCE	2.02±1.1	-2.135	-7.57	0.001
Converted ECCE	4.15±1.4			

Table 9: Comparison of post-operative astigmatism at Third follow-up.

Procedure	Mean (SD) Astigmatism	Mean Difference	t-Test	p-Value
Conventional ECCE	1.68±0.9	-1.883	-7.69	0.001
Converted ECCE	3.56±1.2			

Table 10: Comparison of post-operative astigmatism At Fourth Follow-Up

Procedure	Mean(SD) Astigmatism	Mean Difference	t-Test	p-Value
Conventional ECCE	1.35±0.6	-1.721	-8.70	0.001
Converted ECCE	3.07±1.1			

Table 11: Comparison of post-operative astigmatism developed at first and last follow-up among patients undergoing conventional ECCE.

Conventional ECCE	Mean(SD) Astigmatism	Paired Difference Mean (SD)	t-Test	p-Value
1st Follow-up	2.39±1.5	1.040±1.3	5.85	0.001
Last Follow -up	1.35±0.6			

Table 12: Comparison of post-operative astigmatism developed at first and last follow-up among patients undergoing converted ECCE.

Converted ECCE	Mean (SD) Astigmatism	Paired Difference Mean (SD)	t-Test	p-Value
1st Follow-Up	5.27±2.0	2.200±1.6	7.36	0.001
Last Follow-Up	3.07±1.1			

Table 13: Comparison of pre and post-operative astigmatism among patients undergoing conventional ECCE.

Astigmatism	Mean (Sd) Astigmatism	Paired Difference Mean(Sd)	T-Test	P-Value
Pre-Operative	0.760±0.534	0.585±0.757	-5.465	0.001
Last Follow-Up	1.345±0.645			

Table 14: Comparison of pre and post-operative astigmatism among patients undergoing converted ECCE.

Astigmatism	Mean(SD) Astigmatism	Paired Difference	t-Test	p-Value
Pre-Operative	0.767±0.609			
Last Follow-Up	3.067±1.128	-2.300±1.3	-9.761	0.001

Table 15: Comparison of pre and post –operative astigmatism among all patients undergoing both the procedures

Astigmatism	Mean (SD) Astigmatism	Paired Difference Mean(SD)	t-Test	p-Value
Pre-Operative	0.763±0.559	-1.228±1.3	-8.513	0.001
Post-Operative	1.991±1.195			

V.   Conclusion

The present study was a comparative study on astigmatism following cataract surgery by conventional extracapsular cataract surgery and converted extracapsular cataract extraction surgery. It was concluded from this study that**:**

1. The postoperative astigmatism was significantly higher than preoperative astigmatism showing that astigmatism is an unwanted side effect of cataract surgery.
2. The postoperative astigmatism was significantly higher in the converted ECCE group compared to conventional ECCE group in all the follow-up, showing that conventional ECCE is a better technique to control postoperative astigmatism.
3. Reasonably good vision is restored in all the cases of converted ECCE.
4. Timely conversion of ECCE prevents from more disastrous complication like bullous keratopathy, vitreous loss and posterior dislocation of lens nucleus.
5. In a developing country like India, where phacoemulsification may be unaffordable to the majority of population requiring cataract surgery, converted or conventional ECCE is safe and efficacious alternative.

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