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Comparative Study of Complications in Routine Phacoemulsification Procedure and Bimanual Phacoemulsification (Micro-phaco)

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Abstract
Phacoemulsification surgery for cataract is the most preferred technique as on today. Smaller the incision, less are the complications. On this dictum discovery of Micro-phaco is a revolutionary leap in cataract management - it allows cataract surgery via 2.2 mm incision only.In the present comparative prospective study intra and postoperative complications were compared in routine Phacoemulsification technique and bimanual phaco (Micro-Phaco). 60 eyes were studied. There was no statistically significant difference in complications by either method.. There was difference in surgically induced astigmatism (SIA) but it was not statistically significant.

Keywords: *Phacoemulsification, complications, woodcutter's nucleus cracking technique, Micro-phaco, Bimanual Phaco, MICS, PCR, CME, woundburn, endothelial cell loss, surgically induced astigmatism – SIA,*

Introduction

Cataract surgery has evolved over the past few decades with progressive decrease in the size of the incision. It was Dr. Kelman[1] who is known as the pioneer of phacoemulsification. Interestingly he was on a visit to his dentist when the idea of phacoemulsification was born. His teeth were being cleaned by an ultrasonic device. Using a similar vibrating ultrasonic tip to break up the cataract he developed phacoemulsification technique. The procedure was introduced in 1967.MICS – micro incision cataract surgery, popularly known as Micro-Phaco is a further revolutionary leap in cataract management - it allows cataract surgery via a 1.8 to 2.2 mm incision only. The procedure is supposed to have a quicker recovery and less possibility of postoperative requirement of prescription glasses[2,3]. In this prospective comparative study, 60 matched patients of different grades of senile

cataract underwent cataract surgery. Group A consisted 30 patients who were operated by Routine Phacoemulsification using Woodcutter's nucleus cracking technique of Dr. Vikas Mahatme[4]. Group B also had 30 patients who underwent cataract surgery by Micro Phaco. All the cases were operated by a single surgeon. Intraoperative and postoperative complications were compared in two groups.

Materials and methods:

The study was performed at Mahatme Eye Bank Eye Hospital, Nagpur, India between July 2006 to April 2007 after approval of ethics committee. 60 cases of various grades of senile cataract were operated by a single surgeon. The patients were equally divided in two groups – A and B. In Group A 30 patients were operated by routine phacoemulsification technique. Group B also consisted 30 patients who underwent Microphacoemulsification surgery.

Patient selection criteria:

1. Cases of cataract with visual acuity ranging from perception of light and maximum visual acuity up to 6/12 were included
2. Age group 40 to 80 years

Patient exclusion criteria:

1. Congenital, traumatic or complicated cataract
2. Glaucoma with cataract
3. Lens induced glaucoma
4. Corneal decompensation
5. Active iridocyclitis
6. High myopia with degenerative changes
7. Diabetic patients with ophthalmic manifestation
8. Hypertensive patients with ophthalmic manifestation
9. Macular pathology
10. Retinal detachment

Preoperative evaluation:

1. Blood sugar fasting and postprandial
2. Blood pressure in sitting and supine position
3. Intraocular pressure
4. Lacrimal duct patency
5. Detailed eye examination including fundus examination under mydriasis
6. Visual acuity, unaided and corrected with pin hole
7. Corneal curvature and preoperative astigmatism
8. IOL power and axial length determination

Postoperative follow up:

1. Within 24 – 48 hours
2. After ten days
3. At the end of three months

Operative procedure:

1. Routine phacoemulsification performed in 30 cases belonging to group A. The main incision was made using 3.2mm keratome. The incision was such that the inner width of the incision was 2.8mm, outer width about 3.2mm and breadth about 1.5mm. using a clear corneal incision, site of the

incision was chosen at the deeper meridian so as to reduce postoperative astigmatism. Phacoemulsification was performed using Woodcutter's nucleus cracking technique. No sutures were taken in any of these cases.

2. Microphacoemulsification technique was used for 30 cases of group B. the main difference in routine and micro phaco was the size of incision. Here the main incision was made using 1.6mm MVR blade. After doing phaco, Main incision was extended to 2mm and hydrophilic rollable lens[3] was implanted in bag.

Calculation of surgically induced astigmatism by law of Cosines

$K2^2 = K1^2+K3^2 – 2K1K3\cos K2$

Law of cosines applied to triangle in which K1, K2, K3 represent the three sides of a triangle. Angles opposite their respective side are represented by K1, K2 and K3.

K1 = preoperative astigmatism

K2 = surgically induced astigmatism

K3 = postoperative astigmatism

Observations:

We studied two groups of patients. A series of 60 patients, who willingly underwent phacoemulsification for the treatment of cataract, was divided in group A and B. each group consisted 30 patients. Table 1 shows age distribution.

Table 1: Age distribution of patients

Age (Years)	Group A	Percentage	Group B	Percentage
41-50	4	13.33	7	23.33
51-60	7	23.33	9	30
61-70	13	43.33	7	23.33
71-80	6	20	7	23.33

Maximum patients in both groups belonged to age group 51-70.

Table 2 shows types of cataract.

Table 2: Distribution of types of cataract in the two groups

Cataract Type	Group A	Percentage	Group B	Percentage	Total
NS-I	4	13.33	3	10	7
NS-II	6	20	5	16.66	11
NS-III	4	13.33	5	16.66	9
NS-IV	3	10	4	13.33	7
PSC	8	26.66	5	16.66	13
PPC	1	0.33	3	10	4
MSC	4	13.33	5	16.66	9

Posterior subcapsular cataract was the most common type in the present study. Nuclear sclerosis of grade II was next common type. There were only 4 cases of posterior polar cataract.

Table 3 shows the complications that occurred intraoperative and postoperative.

Table 3: Complications observed in the two groups

Complications	Group A	Group B	Total
Intraoperative PC rent	0	0	0
POSTOPERATIVE			
Striate Keratitis	2	1	3
Corneal Edema	1	0	1
Wound Leak	0	0	0
CME	1	0	1
Endophthalmitis	0	0	0
Uveitis	0	0	0

In both the groups together, 60 patients were operated uneventfully. Intraoperatively there was no posterior capsular rent. We had 3 patients of Striate keratitis. No patients had CME (Cystoid Macular Edema)

Table 4 depicts surgically induced astigmatism on vector analysis.

Table 5: Surgically induced astigmatism (SIA) on Vector Analysis

Postoperative SIA	Group A	Percentage	Group B	Percentage
0	0	0	0	0
>0 to 0.5	8	26.66	7	23.33
>0.5 to 1	22	73.33	16	53.33
>1 to 1.5	0	0	4	13.33
>1.5 to 2	0	0	2	6.66
> 2	0	0	1	0.33

There was difference in surgically induced astigmatism (SIA) ; average SIA in microphaco was 0.5972 as against 0.8328 in routine Phacoemulsification. Vector analysis showed no statistically significant difference between two groups. Statistical analysis by Fisher – two paired test in table no. 6 also showed no statistically significant difference (P=1) in two groups.

Table 6: Statistical Analysis – Surgically Induced Astigmatism – Fisher test

Fisher's Exact Test	
P Value	1
P value summary	Not Significant
One or Two sided	Two sided
Statistically significant? (alpha < 0.05)	No

Discussion

There have been a number of recent advances in ophthalmology that are leading to improved care and enhanced outcomes for patients undergoing cataract removal with IOL implantation. Reducing the incision size has value of achieving the goal of astigmatic-neutral surgery.The greatest advantage of microcoaxialphaco is that the soft sleeved phaco tip does not significantly stretch the incision well-constructed two or three step near

clear corneal incision are 100% watertight even without stromal hydration. The present study involved 60 patients – 30 each in two groups A and B. All the 60 cases were of operable senile cataract of all grades, posterior subcapsular cataract being the commonest and 61 to 70 yrs being the commonest age group. With the advancement in surgical technique, closed chamber surgery and clean cortical clean up, complications rate following phacoemulsification has reduced drastically. We had no patients of posterior capsular rent or wound leak. Only 1 patient in group had CME (Cystoid Macular Edema). It is possible that we could have missed a few cases of subclinical cystoid macular edema as we had not performed fundus fluorescein angiography.

Ursellet al[5] reported a 19% incidence of angiographic CME, even though clinical CME was not seen in any of these cases postoperatively. Striate Keratitis was observed in 1 patient in group A and in 2 patients in group B. one patient in group B had corneal edema. We did not come across any complications of postoperative uveitis, glaucoma, woundburn, retinal detachment or endophthalmitis. The reason may be the exclusion of patients having the predisposing ocular morbid conditions. Social et al have evaluated wound burn in 2 studies on cadaver eyes and found that wound burn is not generated when the phaco needle is naked (sleeveless) and the irrigating chopper is used and at worst only mild temperature elevation occurred at the tuneel. Wound burn occurred only when the fluid inflow was completely cut off at nearly 80% power.

Donnenfeldet al[6] evaluated wound temperature using a micropulse system and showed only a minimal temperature elevation and comparable endothelial cell loss at 3 months with conventional coaxial phaco.

At the department of Ophthalmology, Shanghai, Wang W et al 2007[7] evaluated the complications in 2250 patients. It showed 187 cases of complications. The incidence was 3.1% for posterior capsular rent, 0.1% for nuclear drop, 1.2% temporary intraocular hypertension, 0.4% retinal detachment, 1.1% cystoid macular edema and 0.4% IOL displacement.

Yap E et al[8], evaluated the visual outcome and complication after posterior capsular rent and zonulolysis in 44 eyes that further underwent vitreous loss and anterior vitrectomy at the time of surgery. Dr. Cyrus Mehta et al performed bimanual micro-phaco in 100 cases and found that the average variation between preoperative and postoperative endothelial loss was 3.2%

All cases had surgically induced astigmatism of less than or equal to + or – 0.25D in four to six weeks after rollable IOL and + or – 0.5 D to 0.75 D after acrylic IOL implantation. Surgically induced astigmatism (SIA) though differed in two groups, showed no statistically significant difference between two groups. John Merriam C[9] et al in their study found that there is significant change in corneal curvature when incision is taken on temporal clear cornea. R. P. Gupta et al[10] studied surgically induced astigmatism in three groups. Group A comprised of 100 patients with clear corneal incision. Group B comprised of 50 cases with limbal tunnel incision, Group C had 50

patients with scleral tunnel incision. They found that surgically induced astigmatism was < 0.75 in majority of cases. Corneal incision resulted in more astigmatism in the immediate postoperative period which stabilized earlier than other incisions. Higher against the rule astigmatism in the immediate postoperative period in scleral tunnel incision was due to use of cautery on episcleral tissue.

Mattila J[11] studied bimanual micro incision 1.4 mm incision (20eyes) and routine phacoemulsification 3.0 mm incision (20 eyes). He found that there were small differences in surgically induced astigmatism.

Conclusion

There was no statistically significant difference in intra or postoperative complications in routine phacoemulsification and Micro-phaco. Apparently, there was difference in SIA in both techniques 0.5972 in microphaco as against o.8328 in routine phaco. However this difference was not significant statistically.

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