



## ORIGINAL RESEARCH PAPER

## Ophthalmology

### COMPARISON OF INCIDENCE OF POSTERIOR CAPSULE RUPTURE USING CONVENTIONAL AND CALIBRATED PHACOTIPS DURING COAXIAL MICROINCISIONAL CATARACT SURGERY

**KEY WORDS:** posterior capsule rupture, senile cataract, Lens Opacity Classification System III (LOCS)

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#### ABSTRACT

**Purpose:** To compare the incidence of posterior capsule rupture using conventional and calibrated phacotips  
**Patients and methods:** 60 patients with senile cataract with grade 4.0 to 6.9 (LOCS III), fulfilling the inclusion and exclusion criteria were included in the study group after written informed consent. They were divided into two groups A and B, 30 patients each randomly using envelope method and were operated using conventional and calibrated phacotips respectively. The incidence of posterior capsule rupture was noted in the two groups.  
**Results:** In group A, there was one incidence of PC rent while the incidence in group B was nil  
**Conclusion:** The observation shows that the incidence of posterior capsule rupture with a calibrated phacotip was less as compared to a conventional phacotip. This is largely because the surgeon already knows preoperatively as to what depth the phacotip needs to be penetrated into the nucleus to perform the chop depending upon the grade of the cataract.

#### INTRODUCTION

Most surgeons agree that there is a definite learning curve<sup>(1,2,3,4)</sup> while making the transition from manual extracapsular cataract extraction and intraocular lens implantation to phacoemulsification. This eventually stems from the fact that phaco is a surgical procedure requiring eye-hand-foot coordination and is a bimanual surgical procedure. In addition to the above mentioned factors, a third factor makes phaco a surgical procedure that is significantly different from extracapsular cataract extraction. This pertains to the fact that several physical and mechanical factor principles govern phaco. These components constitute the heart of all phaco systems which are irrigation, aspiration and ultrasound. The nuclear dis-assembly requires various nuclear fragmentation techniques and the configuration of the phacotips affects the efficacy and execution of these nuclear chopping techniques.

Phacotips come in many different angles and configurations. Selection of appropriate one depends on the type of lens removal technique

Till now there was no objectivity to suggest as to how much phacodepth has to be achieved to obtain a safe and effective vertical chop. Though Lisa brothers, Moore RL and Mahatme (in wood cutter's chop) had advised to expose the tip from 1.5mm to 2.0mm, they didn't give any scientific basis for this.<sup>(5)</sup>

Inadequate penetration of phacotip may result in partial thickness nuclear cleavage with residual posterior plane and over enthusiastic penetration may result in posterior capsule rupture. This may be avoided if some estimate can be made pre operatively of the depth of penetration required to achieve full thickness crack.

Malik P and Dewan T<sup>(6)</sup> gave objectivity to this by doing preoperative assessment of the required phacodepth mathematically and then based on the actual phacodepth required during surgery, they suggested the following nomogram.

**TABLE 1 : Normogram for phacodepth**

LOCS III GRADE	DEPTH REQUIRED
Grade 0.1 to 3.9	2.4mm

Grade 4.0 to 5.5	2.6mm
Grade 5.5 to 6.9	2.8mm

They calibrated the phacotip with 4 etched bands of 0.2mm width and 0.2mm apart, the first point starting 2mm from the point of phacotip for safe and effective vertical chop.

With a conventional phacotip, the depth upto which it is embedded in the nucleus can not be predetermined. It is based on trial and error which comes with experience of the surgeon and the surgeon may or may not achieve the required depth.

This may lead to longer nuclear cleavage time, more endothelial damage and increased chances of posterior capsule rupture.<sup>(7)</sup> This dilemma is averted with a calibrated phacotip. With the help of the nomogram already provided, the surgeon shall know the exact depth the phacotip needs to be embedded and hence less chances of posterior capsule rupture.

#### MATERIAL AND METHODS

The study was conducted at Department of Ophthalmology, Post Graduate Institute of Medical Education and Research (PGIMER), Dr Ram Manohar Lohia Hospital (RML), New Delhi

**Sample size :** 60 CASES

**Inclusion Criteria:** Recruitment was done from the list of patients of either sex awaiting cataract surgery in eye OPD who were diagnosed as grade 4.0 to grade 6.9 (LOCS III)<sup>(8)</sup> of age related cataract after they signed a written informed consent form.

#### Exclusion Criteria :

Patients with any of the following criteria :-

1. Subluxated or dislocated lens.
2. Central leucomatous corneal opacity/scar/dystrophy preventing visualization of cataractous lens for grading and surgery.
3. Posterior synechia

**Method of Data Collection :** Previously diagnosed patients of cataract reporting to eye OPD were approached to participate in the study. Written informed consent was taken

from all the patients. Preoperative assessment including detailed history taking, systemic workup and careful anterior and posterior segment examination using slit lamp biomicroscopy was done in all cases. Consecutive sampling of study subjects with age related cataract was done with LOCS III. grade 4.0 to 6.9. After accounting for exclusion criteria, a minimum of 30 patients of either sex in each group were analysed

The surgeries were performed by a single surgeon within one month of recruitment of patient at PGIMER Dr. RML Hospital, New Delhi. All surgeries were performed using phacoemulsification machine (APPASAMY INTERFACE: MODEL NO -0080110). The ultrasound power was fixed at 40% at linear mode with vaccum at 300-350mm of Hg.

The incidence of posterior capsule rupture in the two groups was noted

POST OPERATIVE EVALUATION

Standard post-operative care was provided to all patients. Post-operatively all patients were given:  
 Tab Ciprofloxacin-----500 mg BD for five days  
 Tab Ranitidine-----150 mg BD for 5 days  
 Topically Moxifloxacin 0.5% + Prednisolone Acetate 1% Six times per day with gradual tapering was used for 4 weeks.

STATISTICAL ANALYSIS:

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used. Statistical tests were applied as follows-

- 1. Quantitative variables were compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
- 2. Qualitative variables were correlated using Chi-Square test /Fisher's exact test.

A p value of <0.05 was considered statistically significant.

The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS :

60 patients with senile cataract with grade 4.0 to 6.9 (LOCS III), fulfilling the inclusion and exclusion criteria were included in the study group after written informed consent. They were divided into two groups A (conventional phacotip) and B (calibrated phacotip), 30 patients each randomly.

Table 2: Distribution of sample in two groups

PHACO TIP	NON CALIBRATED	CALIBRATED
GROUP	A	B
PATIENTS	30	30

The age of patients ranged from 43-88 years. Mean ages of patients included in the two groups A and B were 66.67 ± 10.01 years and 66.3 ± 9.87 years. Both groups were comparable in terms of age (p=0.887)

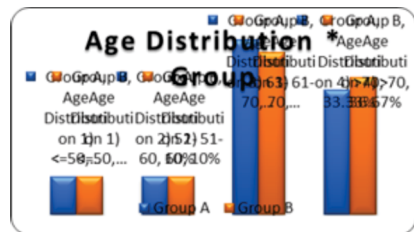


Figure 1 : Shows age distribution in study subjects

A total of 60 eyes of 60 patients, 30 in each group, having age related cataract with grade 4.0 to 6.9 as per LOCS III were included in this study. The two groups were comparable (p value=0.995)

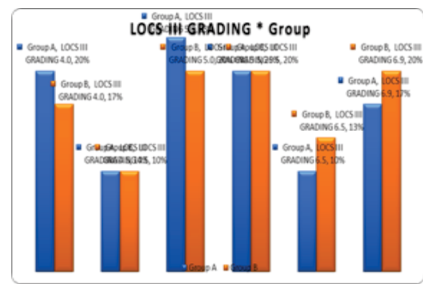


Figure 2 : Shows the distribution of grades of cataract in study population as per LOCS III

There were 28 females and 32 males in the study. There were 16 (53.33%) females and 14 (46.67%) males in group A and 12(40.00%) females and 18(60.00%) males in group B. Both groups were comparable in terms of sex distribution (p=0.301)

Table 3 : SexWise Distribution Of Study Subjects

	Group A	Group B	Total
Sex - F	16 (53.33%)	12 (40.00%)	28 (46.67%)
Sex - M	14 (46.67%)	18 (60.00%)	32 (53.33%)
Total	30 (50.00%)	30 (50.00%)	60 (50.00%)

Table 4 : Incidence of posterior capsule rupture in two groups

	Group A	Group B	Total	P value
PC RENT NIL	29 (96.67%)	30 (100.00%)	59 (98.33%)	
PC RENT YES	1 (3.33%)	0 (0.00%)	1 (1.67%)	1.000
Total	30 (100.00%)	30 (100.00%)	60 (100.00%)	

In group A, there was one incidence of PC rent while the incidence in group B was nil. This was statistically insignificant

DISCUSSION

A prospective randomized study to compare the incidence of posterior capsule rupture using a calibrated and conventional phacotips during coaxial microincisional cataract surgery, was conducted at the Department of Ophthalmology, PGIMER Dr Ram Manohar Lohia Hospital, New Delhi.

Patients awaiting cataract surgery for age related cataracts of grade 4.0 to 6.9 according to Lens Opacities Classification System III (LOCS III) reporting to eye OPD at Dr.RML Hospital, were approached to participate in the study. Written informed consent was taken from all the patients. Preoperative assessment including detailed history taking, systemic workup and careful slit lamp biomicroscopy was done.

A total number of 60 subjects fulfilling the inclusion and exclusion criteria were randomised to one of the study group after written informed consent. Those allocated to group A underwent phacoemulsification using a non calibrated phacotip and those allocated to group B underwent phacoemulsification using a calibrated phacotip. The results obtained were studied in the light of available literature.

TABLE 1 shows the nomogram for the phacodepth required for successful phaco chop for various grades of cataract

TABLE 2 shows the division of the study population into two groups

As shown in TABLE 3, there were 28 females and 32 males in

the study. There were 16 (53.33%) females and 14 (46.67%) males in group A and 12(40.00%) females and 18(60.00%) males in group B. Both groups were comparable in terms of sex distribution ( $p=0.301$ ).

As shown in **TABLE 4**, the incidence of PC rupture was one in group A while it was nil in group B. This was statistically not significant and requires a larger sample size to draw a conclusion

Corey R. P, Olson R.J (1998) and Henning A, Schroeder B, Kumar J, (2004) stated that the rate of PC tear among trainee surgeons was 5.8% to 15% which was significantly low with experienced surgeons. The Swedish Study ( phase 3 and 4) also stated that with experience, the rate of PC rupture goes down<sup>(1)</sup>

As shown in **FIGURE 1**, The age of patients ranged from 43-88 years. Mean ages of patients included in the two groups A and B were  $66.67 \pm 10.01$  years and  $66.3 \pm 9.87$  years respectively. Both groups were comparable in terms of age ( $p=0.887$ )

As shown in **FIGURE 2**, 60 eyes of 60 patients with age related cataract were included in the study and graded between 4.0 to 6.9 as per LOCS III grading. 30 patients in each group were graded. Both the groups were comparable in terms of grading of cataract as per LOCS III ( $p=0.995$ ).

With the use of a calibrated phacotip, the surgeon already know to what depth he has to penetrate the tip into the center of nucleus depending upon the grade of cataract which results in safe and effective chop with least chances of a posterior capsule rent where as in the conventional phacotip, it was more of a blind process. Hence the calibrated phacotip has taken the guess work out of question.

Mahatme V, in wood cutter chop technique had advised to expose the tip from 1.5mm to 2.0mm but he failed to give any scientific basis for it.

Malik P and Dewan T designed the calibrated phacotip in which the first groove is made at 1mm beyond the terminal point of phaco tip. There are two bands of 0.2mm width first at 2.2mm to 2.4mm away from the point of tip and the second 2.6mm to 2.8mm from the point of tip.

The learning curve for phacoemulsification is generally accepted to be quite steep. This calibrated phacotip can be a boon for the trainees.

## CONCLUSION

Our study also shows the incidence of PC rent being present in one patient in group A while it was nil in Group B, however further studies with a larger study sample is required to conclude that by using a calibrated phacotip, the incidence of PC tear goes down which in turn can prevent a lot of post operative complications. However no such study has been done in the past. Hence further work needs to be done on this subject.

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