



ORIGINAL RESEARCH PAPER

Ophthalmology

COMPARISON OF NUCLEAR CLEAVAGE TIME USING CONVENTIONAL AND CALIBRATED PHACOTIPS DURING COAXIAL MICROINCISIONAL CATARACT SURGERY

KEY WORDS: Complete nuclear chop, senile cataract, Lens Opacity Classification System III (LOCS)

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ABSTRACT

Purpose: To compare the time taken to chop the nucleus completely 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 and the time required to achieve complete nuclear chop was noted.
Results: The mean nuclear cleavage time using conventional phacotip was 22.2±5.05 seconds while in the other group where calibrated phacotip was used, the mean nuclear cleavage time was 15.47±5.84 seconds. (p < 0.0005) which was statistically significant.
Conclusion: The observations shows that the average time taken to cleave the nucleus safely and effectively into two equal halves is less with a calibrated phacotip 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

Phacoemulsification is a state of art technique for cataract surgery with a definite learning curve.^(1,2,3) The nuclear disassembly requires various nuclear fragmentation techniques and the configuration of the phacotip affects the efficacy and execution of these nuclear chopping techniques. Phacotip act like chisel and straws that carve and aspirate lens material and selection of an appropriate one depends on the type of lens removal technique. The vertical chopping techniques offer much better result, though difficult, have a higher learning curve and need a high degree of expertise.

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.⁽⁴⁾ Inadequate penetration of phacotip may result in partial thickness nuclear cleavage with residual posterior plate 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⁽⁵⁾ 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.⁽⁶⁾ 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 which is embedded depending on the grade of cataract and subsequently the cleavage shall be immediate and clean, thus reducing the cleavage time and complications.

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)⁽⁷⁾ 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 vacuum at 300-350mm of Hg.

The time taken to cleave the nucleus completely in the two groups were 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)

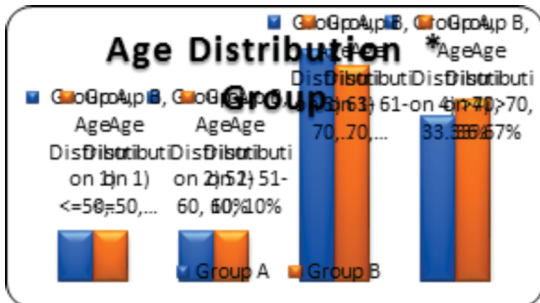


Figure 1 : Shows age distribution in study subjects

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)

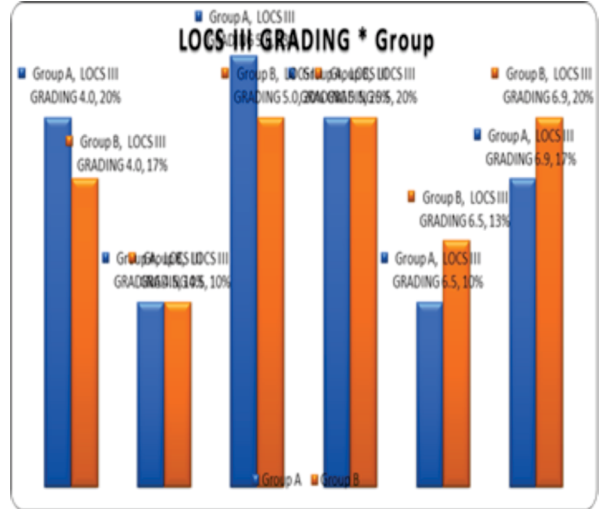


Figure 2 : Shows the distribution of grades of cataract in study population as per LOCS III

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 : Sex Wise Distribution Of Study Subjects

	Group		Total	
	A	B		
Sex	F	53.33%	40.00%	46.67%
	M	46.67%	60.00%	53.33%
Total	100.00%	100.00%	100.00%	

The mean nuclear cleavage in group A was 22.2±5.05 seconds while in group B it was 15.47±5.84 seconds. This was statistically highly significant (p value<0.0005)

Table 4 : Mean± Sd Of Nuclear Cleavage Time In Study Groups

GROUP	A	B
NUCLEAR CLEAVAGE TIME	22.2±5.05 seconds	15.47±5.84 seconds

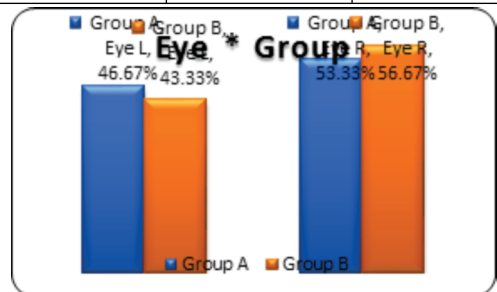


Figure 3: eye wise distribution in study subjects

DISCUSSION

A prospective randomized study to compare the number of attempts for complete nuclear chop 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 mean nuclear cleavage in group A was 22.2 ± 5.05 seconds while in group B it was 15.47 ± 5.84 seconds. This was statistically highly significant (p value < 0.0005).

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 ± 10.01 years and 66.3 ± 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 ($p=0.995$).

As shown in **FIGURE 3**, there were 60 eyes in total out of which there were 27 left eyes and 33 right eyes. Of these 14 left and 16 right eyes were included in the Group A and 13 left and 17 right eyes were present in the Group B. Both groups were comparable in terms of eyes

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 in minimum attempts 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.⁽⁹⁾

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 0.2mmwidth 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

From our study, we found out that the time taken to completely cleave the nucleus into two halves was less with a calibrated phacotip than with the conventional phacotips. This lead to a significant reduction in the total surgical time which can be beneficial for the patient in terms of less endothelial cell loss

and less intraop complications. However no such study has been done to compare the time taken with various types of phacotips, hence further work needs to be done on this subject.

This was largely because the surgeon knew as to what depth he has to penetrate the phacotip in the center of nucleus depending on the grade of the cataract.

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