

# Phacoemulsification Learning Curve : Our Experience

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## ABSTRACT

**Background :** To assess resident's performance of phacoemulsification surgery and determine which steps of the procedure are most difficult to learn and to measure rate of intraoperative complications.

**Materials and methods :** A prospective study was carried out at Bangladesh Eye Hospital between January 2016 to December 2017. The total 50 (Fifty) eyes of fifty patients diagnosed cataract patient were selected randomly.

**Results :** Corrected visual outcome after 3 weeks of operation were 6/6 in 18 patients (36%) 6/9 in 17 pts (34%) 6/12 in 7 pts (14%) 6/18 in 4 pts (8%) 6/24 in 3 (6%) and 6/36 in one pt (2%). Overall intraoperative complications occurred in 14 cases (28%) including with cases experiencing more than one complication. There is corneal wound burn 2 cases (4%) Iris catch by phaco probe 3 cases (6%) Anterior capsular edges tear 3 cases (6%) Posterior capsular rupture 4 cases (8%) with vitreous loss 2 cases (4%) retained lens fragments 2 cases (4%). Post operative complications include wound gap, shallow anterior chamber, corneal stromal oedema and bullous keratopathy .

**Conclusion :** The study indicates that a trainee can be taught phacoemulsification with acceptable complication rates and visual results. The results compare favourably with reports of senior surgeons converting to phacoemulsification, trainee surgeons learning extracapsular surgery, and recently reported phacoemulsification series.

**Key words :** Cataract; Learning curve; Phacoemulsification; Visual Acuity (VA).

## Introduction

Phacosurgery, the nick name of phacoemulsification is introduced by Dr Charles Kalman, is the popular and advanced technique of cataract extraction. It is the standard method of cataract extraction in developed countries<sup>1</sup>. Phacoemulsification is an extracapsular technique that differs from conventional Small Incision Cataract Surgery with nuclear expression by the size of the incision required and the method of nucleus removal. This technique use an ultrasonically driven tip (The phaco tip) to fragment the lens nucleus of the cataract and aspirate the lens<sup>2</sup>.

A smaller tunnel incision may be done on either cornea or sclera where a lower incidence of wound related complications, healing rate is faster and early recovery of the patient. This is a technique of self sealing

incision provides a relatively closed system during phacoemulsification and aspiration and thereby anterior chamber depth is well maintained all time, act as safe guard against positive vitreous pressure and choroidal haemorrhage, usually do not need any suture, post operative astigmatism is less and good vision even without correction, usually more rapid visual rehabilitation than the procedures that require larger incision.

Phacoemulsification surgery is one of the essential surgical requirements of residency training in ophthalmology. Developing microsurgical skills require time and dedication. Teaching cataract surgery remains an ongoing challenge considering both attaining a high level of training and maintaining patient safety<sup>3</sup>. To assess resident's performance of phacoemulsification surgery and determine which steps of the procedure are most difficult to learn and to measure rate of intraoperative complications<sup>4,5</sup>.

## Materials and methods

This prospective study was carried out at Bangladesh eye hospital between January 2016 to December 2017. The total 50 (Fifty) eyes of fifty cataract patients were selected randomly. Before doing live surgery a good number of wet lab practice were done in different settings.

Phacoemulsification was performed with relatively uniform technique in all cases. Phaco surgeries were done by phaco emulsification machines that is Alcon Laboratories Infinity. Phacoemulsification usually done with

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devide and conquer technique All the cases were performed under peribalbar and surface anaesthesia. 30 (Thirty) limbal and 20 (Twenty) clear corneal incision were given. A continuous curvilinear capsularrhaxis was performed and then hydrodissection, nucleus sculpting, nucleus dissembly, nucleus removal, removal of cortical matter, Intra ocular lens (PMM and Foldable) insertion, removal of viscoelastic substance and wound integrity were done.

Data recorded for each case included details of per-operative & postoperative complications, visual acuity with pin hole & best corrected, slit lamp examination, fundus examination were done on first post operative day and 3 (Three) weeks after operation.

### Results

The study shown 1st post operative visual acuity with Pin Hole (PH) were 6/9 in 3 patients (6%) 6/12 in 9 patients (18%) 6/18 in 8 patients (16%) 6/24 in 7 patients (14%) 6/36 in 9 patients (18%) 6/60 in 7 patients (14%) <6/60 in 7 patients (14%).

Uncorrected visual outcome after 3 (Three) weeks of operation were 6/6 in 6 pts (12%) 6/9 in 14 pts (28%) 6/12 in 7 pts (14%) 6/18 in 4 pts (8%) 6/24 in 3 pts (6%) 6/36 in 8 pts (16%) 6/60 in 8 pts (16%).

Corrected visual outcome after 3 weeks of operation were 6/6 in 18 patients (36%) 6/9 in 17 pts (34%) 6/12 in 7 pts (14%) 6/18 in 4 pts (8%) 6/24 in 3 (6%) and 6/36 in one pts (2%).

Overall intraoperative complications occurred in 14 cases (28%) including cases experiencing more than one complication. There is corneal wound burn 2 cases (4%) Iris catch by phaco probe 3 cases (6%) Anterior capsular edges tear 3 cases (6%) Posterior capsular rupture 4 cases (8%) with vitrous loss 2 cases (4%) retained lens fragments 2 cases (4%).

Post operative complications include wound gap, shallow anterior chamber, corneal stromal oedema and bullous keratopathy.

**Table I** Visual outcome on 1st postoperative day (n = 50)

V.A	No of patient	Percentage
6/9	3	6%
6/12	9	18%
6/18	8	16%
6/24	7	14%
6/36	9	18%
6/60	7	14%
<6/60	7	14%

**Table II** Uncorrected visual outcome after 3 weeks of operation (n=50)

V.A	No of patient	Percentage
6/6	6	12%
6/9	14	28%
6/12	7	14%
6/18	4	8%
6/24	3	6%
6/36	8	16%
6/60	8	16%

**Table III** Corrected visual outcome after 3 weeks of operation (n=50)

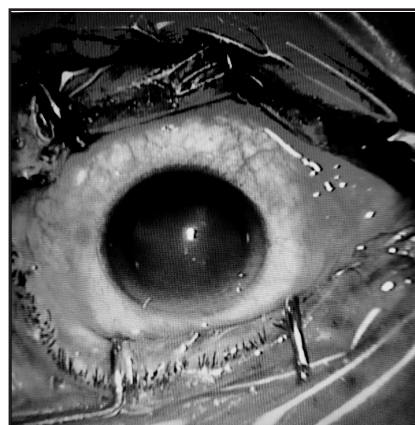
V.A	No of patient	Percentage
6/6	18	36%
6/9	17	34%
6/12	7	14%
6/18	4	8%
6/24	3	6%
6/36	1	2%
6/60	0	0%

**Table IV** Per operative complication

Complication	No of patient	Percentage
Wound Burn	2	4%
Iris catch by phaco probe	3	6%
Anterior capsular edge tear	3	6%
Posterior capsular rupture	4	8%
Retained lens fragments	2	4%

**Table V** Post operative complication

Complication	No of patient	Percentage
Wound gap	2	4%
Shallow anterior chamber	3	6%
Corneal stromal oedema	8	16%
Bullaous keratopathy	1	2%



**Figure 1** Before Phacoemulsification of a cataract patient

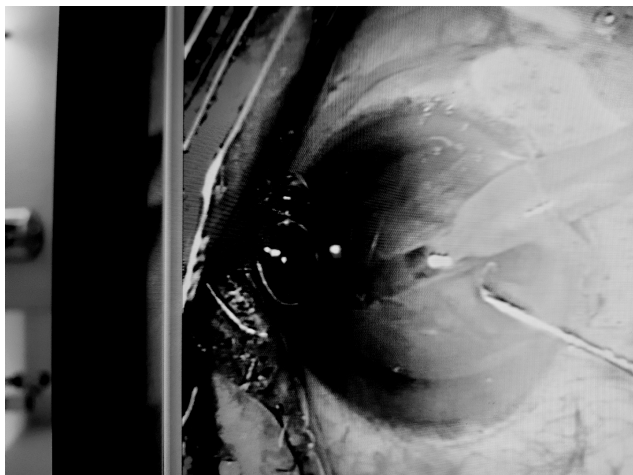


Figure 2 During Phacoemulsification

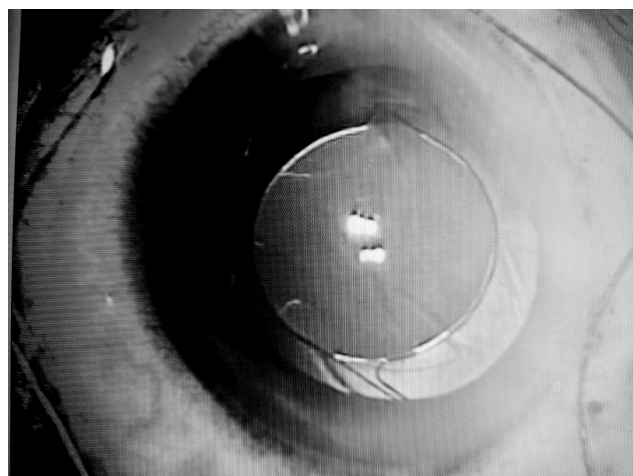


Figure 3 After Phacoemulsification with PC IOL Implantation

### Discussion

Phacoemulsification remains one of the most important skills to master during phaco learning. Although each surgeon will likely to develop these skills at an individualized pace and although some trainees may face great challenges in acquiring surgical skills, to be a phaco surgeon must master this art to be a perfect surgeon<sup>6-9</sup>. There were various difficulties during my learning of phaco-development training programme when they were orientation about phaco machine, fluid dynamics, difficulty in making good capsulorrhexis, danger of posterior capsular tear with vitrous loss, dropping of nucleus in the vitrous, scalping and fracture of hard nucleus, removal of cortical matter, chance of iris capture, iris injury and long phacoemulsification curve<sup>10-12</sup>. Our experience about phaco-machine, it is costly but affordable and Alcon phaco-development program make the phaco-training make easy for all ophthalmologists.

In this study uncorrected visual acuity after 3 weeks 6/6 is 12%, 6/9 is 28%. In J Bradlly et al 6/6 in 12.4% ,6/9 in 31%<sup>13</sup>. Al Jidan M et al it is 6/6 in 13.00% , 6/9 in 30%<sup>3,2</sup>. Corrected visual acuity 6/6 is 36% and 6/9 is 34%. In J Bradlly et al 6/6 in 39%, 6/9 in 36%.%, Al Jidan M et al it is 6/6 in 37%, 6/9 in 35%<sup>13,3</sup>.

Overall intraoperative complications seen in 14 patients that is 28%. In J Bradlly et al it is 31%<sup>13</sup>. In Al Jidan M et al it is 27.4%<sup>3</sup>. Post operative complication occurred 14 patients that is 28%. In J Bradlly et al is 25%<sup>13</sup>. In Al Jidan M et al it is 25.7%<sup>3</sup>. In later part of the training there were significantly decrease of complications.

### Conclusion

The study indicates that a trainee can be taught phacoemulsification with acceptable complication rates and quality visual outcomes. The visual threshold for cataract surgery fell dramatically with increasing experience of phacoemulsification. As the instrument is costly, so it should be available in cheaper rate and phaco-training center must be increased in number in our country. Phaco training programme should have specific training guidelines and the trainee must perform a realistic number of minimum surgical cases to be a good phaco-surgeon.

### Disclosure

Both the authors declared no competing interest.

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