

Comparison of safety and effectiveness between phacoemulsification and suture less small incision procedures in cataract surgery

Asma Aftab^a, Muhammad Imran Janjua^b, Yaseen Lodhi^c, Marrium Shafi^d, Saad Rauf Khan^e

^aAssistant Professor, Department of Ophthalmology, Wah Medical college (Affiliated with NUMS) POF Wah Cantt.

^bAssistant Professor, Department of Ophthalmology, Shifa College of Medicine, Islamabad.

^cAssociate Professor, Department of Ophthalmology, Wah Medical college (Affiliated with NUMS) POF Wah Cantt.

^dAssistant Professor, Department of Ophthalmology, Wah Medical college (Affiliated with NUMS) POF Wah Cantt.

^eJunior Registrar, Department of Ophthalmology, Quaid E-Azam International Hospital, Rawalpindi.

Correspondence: * asmaaftab32@yahoo.com

ABSTRACT

BACKGROUND & OBJECTIVE: Cataract is major cause of preventable blindness, worldwide. Phacoemulsification and manual small incision are most common surgical methods of cataract. The objective of our study was to compare surgical outcomes and complications in phacoemulsification (Phaco) and manual small incision cataract surgery (MSICS) patients

METHODOLOGY: A Prospective Observational study was conducted at Ophthalmology department of POF Hospital Wah Cantt, Pakistan. Study duration was 6 months (January 2020-June 2020). We calculated sample size of 30 cataract patients. Selection of cataract patients in OPD was done through non probability consecutive sampling technique. Afterwards, they were divided randomly into two different groups using lottery method; Group A patients cataract extraction was done with Phacoemulsification while in group B patients cataract extraction was done with small incision cataract surgery. Patients were followed for 5 weeks. Fisher-exact test and independent and paired T-test was applied to get statistically significant results. p value ≤ 0.05 was considered significant.

RESULTS: Total 30 patients were included in study. There were 19(64.5%) male and 11(35.5%) female. Mean age of patients was 48.3 ± 7.5 SD. There was a significant change in pre and post operative visual acuity in both groups (Group A $p \leq 0.000$ and Group B $p \leq 0.000$). MSICS showed high surgery duration as compared to phacoemulsification (29.6 ± 1.5 vs 22.2 ± 2.1 , $p \leq 0.000$).

CONCLUSION: Phacoemulsification and Manual small incision cataract surgery are safe and clinically effective surgical techniques that did not show any difference in surgical outcomes. However, Phacoemulsification is associated with less post-operative complications as compared to MSICS.

KEYWORDS: Effectiveness, Manual small incision cataract surgery, Phacoemulsification, Safety.

INTRODUCTION

Cataract is a major cause of preventable blindness worldwide^[1]. An estimated 17.7 million individuals are Blind due to untreated cataract^[2]. One of common type of cataract is age related cataract^[3]. In Pakistan, an estimated 570,000 individuals are facing blindness due to cataract while 3560,000 eyes are diagnosed with visual acuity less than 1.0 Log Mar^[4].

Cataract is defined as opacity of crystalline lens in eye. Significant change in refractive index and transparency of lens leads to several visual impairment's levels. This visual

impairment leads to quality-of-life reduction and increases risk of falls and accidents. Age related cataract is classified according to area affected including nuclear, sclerotic, cortical and posterior sub capsular cataract^[5].

Annually 15 million surgeries are performed globally. Any eye care program is evaluated on the basis of i) prevalence of visual disabling (un-operated cataract), ii) cataract surgical coverage, iii) cataract surgical rate. Phacoemulsification and manual small incision cataract surgery (MSICS) are most common surgical methods of cataract. Phacoemulsification becomes the mainstream management of cataract due to

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evolving technologies. Some studies reported that MSICS is equally effective; however, it is also economical and convenient as compared to phacoemulsification [6].

MSICS is associated with several complications including capsular opening creation, nuclear delivery technique and wound construction issues [7]. It also leads to postoperative corneal edema and iritis due to poor sclera-corneal tunnel construction and extensive intracameral maneuvers [8].

In last few decades, with improvement of operating skills Phaco has become most popular and commonly used surgical procedure. However, MSICS is suggested as an effective procedure with minimal complications in elderly population [9]. Comparison of Phaco and MSICS was conducted to clarify the difference in effectiveness of two procedures. It will contribute knowledge in understanding better treatment option. This study will be effective in understanding complications associated with both procedures. Therefore, present study was planned to compare surgical outcomes and complications in phacoemulsification and manual small incision cataract surgery patients.

METHODOLOGY

Prospective observational study was conducted at ophthalmology unit, Pakistan Ordinance Factories (POF) Hospital, Pakistan. Study duration was 6 months (January 2020-June 2020). WHO calculator was used for calculation of 30 cataract patients (15 patients in each group) $\mu 1$ mean time for PHACO=12.2 min, $\mu 2$ mean time for MSICS= 8.8, SD=3.4, power of study=80, level of significance=5% and 95% confidence interval [10]. Internal review board approval was taken from respective hospital ethical committee (ERC#POFH/ERC/10/19). All participating patients signed written consent before surgery. Inclusion criteria was age >18, both genders, diagnosed with senile cataract, best corrected visual acuity before surgery 1.0 Log Mar.

Exclusion criteria was diagnosed with glaucoma, congenital cataract, traumatic cataract and metabolic cataracts, diagnosed with corneal dystrophies, retinal and vitreous lesions were excluded from study. Patients were undergone through initial examination including detailed history, visual acuity (uncorrected and best corrected in Log Mar), evaluation of anterior segment. IOP measurement, slit lamp examination, evaluation of posterior segment (after dilation) and B scan ultrasonography. After initial examination, they were divided randomly into two different groups using lottery method; Group A patients cataract extraction was done with Phacoemulsification while in group B patients cataract extraction was done with small incision cataract surgery. Patients were followed for 5 weeks after surgery.

MSICS was performed by using techniques as described by Venkatesh et al. Briefly, the process based upon superior fornix based conjunctival flap formulation and sclera incision (partial thickness) 6-6.5mm behind limbus (2mm). Then we extended sclera tunnel 1mm into clear cornea. At 10 o'clock position additional paracentesis was made. We filled anterior chamber with air bubble (0.1ml of 0.06%

trypan blue injected under bubble). We use keratome to enter anterior chamber. We used 26G bent needle mounted on syringe to make small nick in anterior capsule and aspiration of liquid cortex. Patients was undergone through capsular bag Inflation by using viscoelastic and Continuous curvilinear capsulorhexis(CCC). With the help of Sinskey hook, nucleus pole from one side was hook out and it was rotated out towards anterior chamber (AC). Irrigating Vectis was used for extracting nucleus out of eye. After complete cortex aspiration, polymethyl methacrylate (PMMA) IOL of posterior chamber (PC) of 6mm was implanted into capsular bag. Aspiration of viscoelastic material was done. Paracentesis and wounds both were hydrated with Balanced Salt Solution (BSS). In the end forceps were used to oppose Conjunctival flap.

In this case we treat patients post-operatively with antibiotics and steroids and analgesics if required, however, intra and post-operative complication were recorded using Oxford Cataract Treatment and Evaluation Team Classification (OCTET). After 5 weeks patients underwent independent ophthalmic examination by expert ophthalmologist.

Phacoemulsification is a mechanically assisted extracapsular technique of cataract extraction. Phacoemulsification involves removal of lens fibers and leave epithelial of posterior capsule in patients. New IOL was kept in place by capsule and helps in keeping vitreous humor away from AC. After process of phacoemulsification, patients were treated with oral and topical antibiotics, steroids and oral analgesics (if required). Patients were followed after 5 weeks for measuring surgical outcomes.

We analyzed data in our research using SPSS (version 24). Mean \pm Standard deviation, frequency and percentage calculation for descriptive statistics was done while inferential statistics involved fisher's exact and independent and paired t-test calculation. p-value ≤ 0.05 was considered significant.

RESULTS

There were 30 patients in our study. There were 19(64.5%) male and 11(35.5%) female. Mean age of patients was 48.3 ± 7.5 SD. There were 4(13.3%) patients in age group 18-40 years age group and 26(86.7%) were in age group 41-70 years. There were 10(33.3%) hypertensive patients while 20(66.7%) non hypertensive patients. In our data, 9(30%) patients were diagnosed with diabetes mellitus.

There is significant increase in visual acuity after surgery in both group's pre and post operatively (Group A 0.900 ± 0.13 vs 0.0133 ± 0.03 $p \leq 0.000$ and Group B 0.8267 ± 0.13 vs 0.020 ± 0.04 $p = 0.000$). However, there is no significant change in intra ocular pressure (IOP) pre and post operatively in both groups (Group A 15.6 ± 1.4 vs 16.2 ± 0.7 $p = 0.07$ and Group B 16.3 ± 1.6 vs 16.5 ± 1.3 $p = 0.550$). MSICS showed long surgery duration as compared to phacoemulsification (29.6 ± 1.5 vs 22.2 ± 2.1 , $p \leq 0.000$) as shown in table-I.

There is no significant difference in complication of phaco and MSICS group (Corneal edema $p = 0.500$ and Iritis $p = 0.500$) as shown in table-III.

Table-I: Comparison of surgical outcomes in phacoemulsification and manual small incision cataract surgery group.

Surgical outcomes	Groups	n	Pre operative mean ±SD	Post operative Mean ± SD	p-value
Best corrected visual acuity (Log Mar)	Group A (Phaco)	15	0.900±0.13	0.0133±0.03	≤0.000
	Group B (MSICS)	15	0.8267±0.13	0.020±0.04	≤0.000
Intraocular pressure (IOP) mmHg	Group A (Phaco)	15	15.6±1.4	16.2±0.7	0.070
	Group B (MSICS)	15	16.3±1.6	16.5±1.3	0.550
Post-operative ECC (cells/mm2)	Group A (Phaco)	15		2633.3±17.5	0.794
	Group B (MSICS)	15		2634.4±12.5	
Surgery duration	Group A (Phaco)	15		22.2±2.1	≤0.000
	Group B (MSICS)	15		29.6±1.5	

Table-II: Oxford cataract treatment and evaluation team classification grading in phacoemulsificon and manual small incision cataract surgery group.

OCTET Grading (Grade 1)	Interventional Groups		Total	p-value
	Group A (Phaco)	Group B (MSICS)		
Corneal edema with descemets fold				
No	15(50%)	12(40%)	27(90%)	0.224
1-10 or higher	0(0%)	3(10%)	3(10%)	
Iritis				
No	15(50%)	13(43.3%)	28(93.3%)	0.483
Mild to severe	0(0%)	2(6.7%)	2(6.7%)	
Complications				
No	14(46.7%)	11(36.7%)	25(83.3%)	0.330
Yes	1(3.3%)	4(13.3%)	5(16.7%)	
Total	15(50%)	15(50%)	30(100%)	

Table-III: Comparison of complications in both groups.

Complications	Interventional Groups		Total	p-value
	Group A (Phaco)	Group B (MSICS)		
Corneal edema				
Absent	15(50%)	14(46.7%)	29(96.7%)	1.00
Present	0(0%)	1(3.3%)	1(3.3%)	
Iritis				
Absent	15(50%)	14(46.7%)	29(96.7%)	1.00
Present	0(0%)	1(3.3%)	1(3.3%)	
Total	15(50%)	15(50%)	30(100%)	

In group A, no patients present with corneal edema while in group B 3(10%) patients present with cornea edema with descemet's folds 1-10 or higher (p=0.224). In group A, no patient present with iritis while in group B 2(6.7%) patients present with iritis mild to severe (p=0.483). In group A 1(3.3%) patients present with complication while in group B 4(13.3%) present with complications (p=0.330) as shown in table-III.



Figure-A: Phacoemulsification for cataract removal

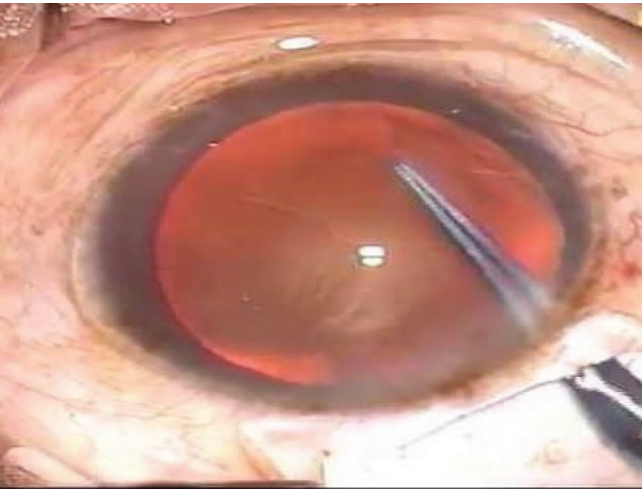


Figure-B: Manual small incision cataract surgery

DISCUSSION

Phacoemulsification is a mainstream treatment option for cataract with improvement in operating skill and development of operating technology [11]. On contrary

manual small incision cataract surgery was used less after phacoemulsification advancement [12]. However, some literature suggested that MSICS and Phaco had similar efficacy while MSICS had showed less complications and cost-effective modality [13]. Literature reported that MSICS

include eye brow shaped tunnel incision similar to phaco, confirming both ends separation from limbus with good suspension.

The process resulted in preventing sagging of upper lip and incision was maintained and good closure of incision was ensured. Generally, incision flap was self closing (with eye pressure) ensuring quick visual acuity recovery and preventing corneal endothelium damage ^[14].

In present study, there was no significant different in surgical outcomes between two groups except pre and post operative visual acuity and surgery duration. A similar study reported that poor outcomes were reported in 1/185 patients in phacoemulsification, however, no complication was reported in MSICS group. Moreover, astigmatism mode was 0.5D in phacoemulsification group and 1.5D in MSICS group ^[15]. Similarly an Indian study reported that phaco patients showed more complications than MSICS (4.8% vs 1.46%) ^[16]. Another local study reported that phaco patients showed less complications as compared to MSICS (7.1% vs 15.1%) ^[17].

Phaco surgery and small incision both are effective surgical technique and show high visual improvement. Phaco surgery is associated with better visual outcomes in high frequency of patients in approximately six weeks ^[18]. Another similar study reported that no significant difference was found uncorrected visual acuity, corneal edema, posterior capsular rupture between MSICS and PHACO group ^[19]. Similar clinical effects were found in MSICS and PHACO among patients with senile cataract ^[20]. Wang et al. reported that cataract surgery with PHACO and MSICS was dependent upon personal affordability, social economics, skill limitation and number of surgeons ^[21].

Present study did not found any significant difference in post operative side effects of PHACO and MSICS. Evidence exists in a similar study that there is no significant difference in safety of PHACO and MSICS. However, MSICS is simple, required less equipments, low operation cost, short learning curve and effective in less resourced areas ^[22]. A similar study reported that phacoemulsification is associated with less induction of astigmatism post operatively as compared to MSICS, however, there is no difference in post operative endothelial cell count of both procedures ^[23].

Our study suggests that clinically both procedures are effective for patients however, phacoemulsification is associated with less complications and better patient care as compared to MSICS. We need to conduct large randomized controlled trials to evaluate cost of these procedures and provide robust evidence.

LIMITATION: Small sample size limits generalizability of study.

CONCLUSION

Phacoemulsification and MSICS are safe and clinically effective surgical techniques that did not show any difference in surgical outcomes. However, Phacoemulsification is

associated with less post-operative complication as compared to MSICS. We recommend that surgeon's skills also had important contribution in determining surgical outcomes of cataract surgery. So, we need larger trials to investigate social factors association with cataract surgery.

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- Asma Aftab:** Substantial contributions to the conception and design of the work.
- Muhammad Imran Janjua:** Drafting the work for important intellectual content.
- Yaseen Lodhi:** Reviewing the manuscript for important intellectual content.
- Marrium Shafi:** Analysis, and interpretation of data for the work.
- Saad Rauf Khan:** Final approval of the version to be published.

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