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# Phacoemulsification versus Manual Small Incision Cataract Surgery in Hard Nuclear Cataracts

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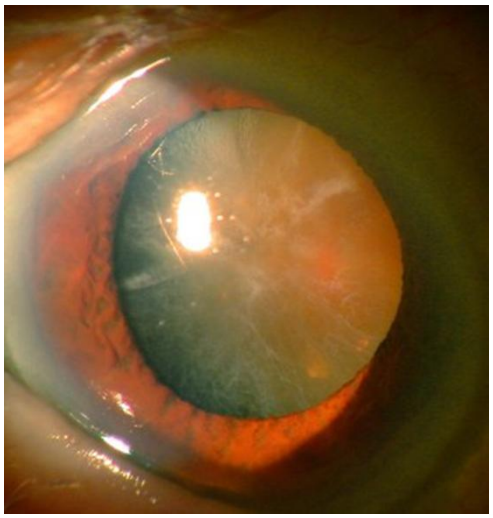
**Abstract:** ***Aim: To compare the clinical outcomes of phacoemulsification with that of manual small incision cataract surgery (MSICS) in cases of hard nuclear cataract. Material and methods: 60 patients with senile nuclear cataract grade 4 or higher according to Lens Opacities Classification System III (brown cataract), were studied. These eyes were divided randomly into two groups: group A included 30 eyes treated by phacoemulsification and group B included 30 eyes treated by MSICS. Results: On day 1postoperatively, the corrected distance visual acuity was 6/12 in 16 patients in the MSICS group and in 7 patients in the phacoemulsification group. The difference was statistically significant (P=0.01). Also, 9 cases in the MSICS group and 12 cases in the phacoemulsification group developed postoperative iritis. Conclusion: Both phacoemulsification and MSICS achieved comparable and excellent visual outcomes, with lower complications rates and earlier postoperative visual rehabilitation in MSICS.***

## 1. Introduction

The main objective in modern cataract surgery is to achieve a better unaided visual acuity with a rapid postsurgical recovery and reduced intraoperative and postoperative complications.[1]Advances in surgical techniques, instrumentation, and pharmacological agents have contributed to a revolution in this field, making cataract surgery almost risk free.[2] Extracapsular techniques of cataract extraction surgery originally involved manual nuclear expression. Phacoemulsification is a mechanically assisted extracapsular technique of cataract surgery.[3]It has become the routine procedure for cataract extraction, where rehabilitation of the patient is very fast & associated with good visual outcomes.

The evolution of cataract surgical techniques over the past several decades has been associated with a progressive decrease in the size of the cataract incision. Wound size has progressively decreased from 12.0 mm in intracapsular cataract surgery to about 10.5 mm in early extracapsular surgery and to 5.5-7.0 mm with the advent of phacoemulsification. The widespread use of foldable intraocular lens (IOL) has allowed the cataract wound to decrease to 3.0 mm or smaller[4]. A smaller incision gives distinct advantages to the patient and surgeon, in the form of early rehabilitation, better intraocular pressure control, and lowpostoperative astigmatism.[5]In the intraoperative management, reduced wound size has several advantages. The smaller the incision, the more stable the anterior chamber with improved control during capsulorhexis and hydrodissection.[6]

In phacoemulsification, the duration of surgery, phaco power used, and even the incidence of intraocular complications vary with the nucleus density however, in MSICS, the time spent on nucleus delivery does not vary from patient to patient.[7] During phacoemulsification chances of conversion to ECCE in case of hard brown cataracts are higher because of the damage to intraocular tissues produced by surgical trauma during emulsification of hard and large nuclei .[8]MSICS is characterized by early wound stability, less postoperative inflammation, no suture-related complications, few postoperative visits, and less damaging effect on the corneal endothelium. Moreover, MSICS can be performed in almost all types of cataract in contrast to phacoemulsification, where case selection is extremely important.



**Pre OP slit-lamp image showing brown catarct**

### Aim

The aim of this study was to compare the clinical outcomes of phacoemulsification with that of MSICS in cases with hard nuclear cataracts.

## 2. Methodology

This is a prospective interventional study in which 60 eyes of 60 patients with cataract who came to Ophthalmology OPD at our tertiary care hospital were selected for 95% confidence level by simple random sampling.

### Inclusion Criteria

- Patients above 50 years of age diagnosed as senile nuclear cataract grade 4 or higher according to Lens Opacities Classification System III (brown cataract).
- Patients willing to participate in the study.
- Patients who are able to read and understand Marathi/Hindi.
- Patients ready to give written informed consent.

### Exclusion Criteria

Patients with-

- Dislocated and subluxated lens.
- Corneal diseases (degeneration, dystrophies, peripheral thinning.)

- Chronic open angle glaucoma.
- Poorly dilated pupils.
- Ocular inflammations. (scleritis, uveitis)
- Previous intrao-ocular surgeries.

## 3. Materials and Methods

60 patients above 50 yrs of age were selected which had gradual painless diminution of vision, diagnosed as senile nuclear cataract grade 4 or higher according to Lens Opacities Classification System III (brown cataract) [10]. The eyes were randomly divided into two groups: group A included 30 eyes treated by phacoemulsification and group B included 30 eyes treated by MSICS.

**Pre-OP Examination**

A careful examination was performed for each case in the form of measurement of visual acuity and slit-lamp examination. Assessment of the cornea, AC depth, regularity of the pupil & nuclear hardness was confirmed. Measurement of IOP was done using a Goldmann applanation tonometer, and keratometric readings taken.

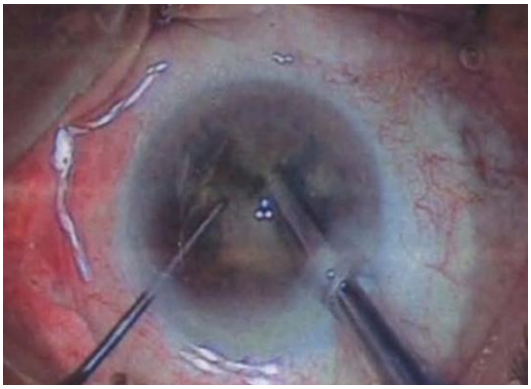
A dilated fundus examinatiom was performed using a +20 D lens for indirect ophthalmoscopy and a +90 D lens for slit-lamp fundus biomicroscopy if possible to exclude any retinal pathology. B-scan ultrasonography was performed to evaluate the posterior segment ifit was not visualized properly because of the dense cataract.

A-scan to measure the axial length and keratometry to measure the corneal refractive power were performed for IOL power calculation using the SRK II formula.

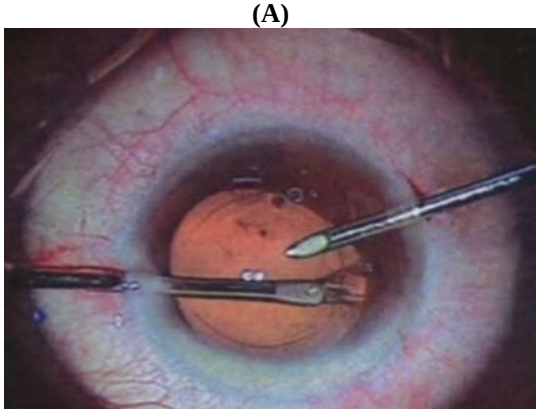
**Surgical Technique**

Group A underwent phacoemulsification while group B underwent MSICS. Both procedures were performed under local anesthesia; peribulbar block was given. (2% lignocaine hydrochloride & 2% bupivacaine).

In phacoemulsification, after initial entry with sideports, adequate amounts of dispersive type of visco-elastic device(OVD) was injected to fill the anterior chamber and to flatten the anterior capsule of the lens for proper subsequent capsulorhexis procedure. After achieving hydrodissection, standard tips with 15° bevel fitted on phaco hand piece were used in all patients. Vertical chopping technique was applied to perform nucleus disassembly under certain parameters. Irrigation and aspiration (I/A) of the cortical matter was then performed using bimanual I/A and foldable posterior chamber IOL was implanted into the bag. The IOLs used in all patients were acrylic foldable lens, single piece, 6.0 mm with overall length of 12.5 mm. Closure of the wound was performed by stromal hydration.



**(A)**



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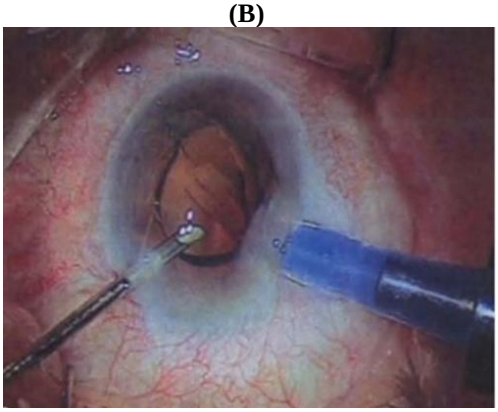
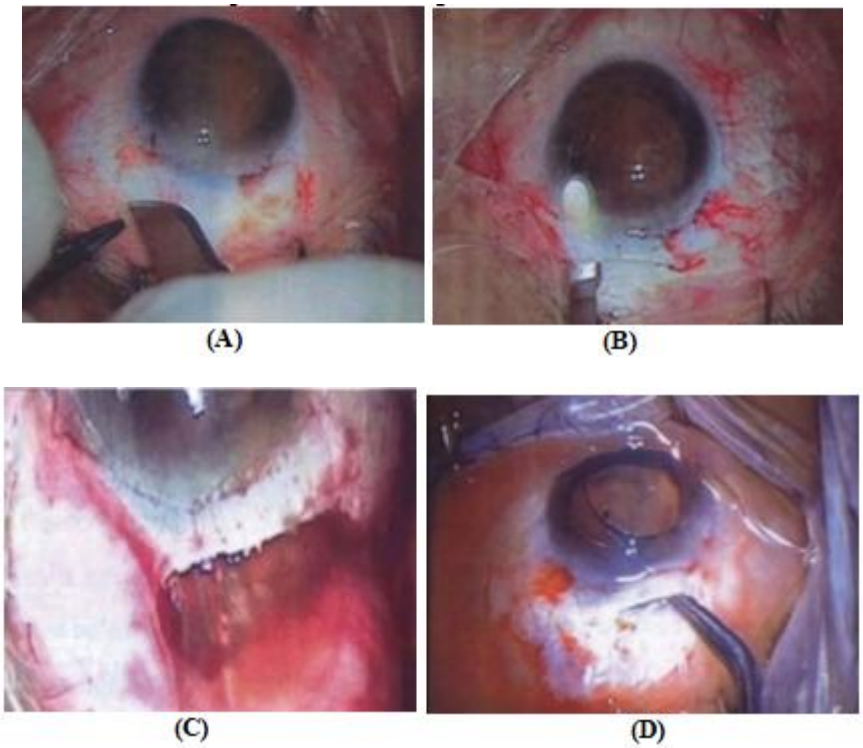


**(c)**

**Phaco Technique Showing- (A) Chopping (B) Bimanual I/A. (C) Iol Implantation**.

In MSICS, after initial peritomy, frown incision was made with the tip of a crescent blade at about 1.5-2 mm distance from the limbus. The external width of the incision was about 6-6.5 mm according to the expected size of the nucleus. Side-port was made, dispersive OVD was injected to fill the anterior chamber and CCC was done. Then, the anterior chamber was entered with a 3.2-mm keratome at the depth of this scleral flap, giving a self-sealing internal flap. Complete hydrodissection was done and nucleus was delivered with the help of visco-expression technique. I/A of the cortex was carried out by Simcoe double-way cannula through the main wound or through the side port for the subincisional cortex. Posterior chamber 6.5 mm PMMA IOL was implanted into the bag.



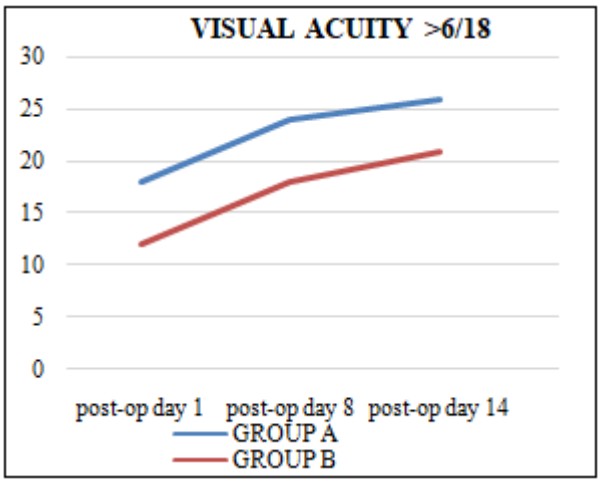

Msics Technique Showing- (A) Scleral Incision. (B) Tunnel Pocketing. (C) Lens Delivery. (D) Iol Implantation.

## 4. Follow-Up

Patients were examined on the first postoperative day, and after 1, 2, 4, and 6 weeks.

## 5. Results

- Intraoperative complications in both groups were recorded.
- On day 1 post-operatively, the corrected distance visual acuity was 6/18 and above in 12 (40%) patients in the phacoemulsification group & 19 (63.3%) patients in the MSICS group; the difference was statistically significant (P=0.01).




- Corneal edema was compared in 2 groups by slit-lamp and specular microscopy on day 1 and day 8 post-operatively. On day 1 difference was found significant (p=0.01) 36% in group A & 18% in group B; whereas it was found insignificant on post-operative day 8(p=0.369) 7.4% in group A and 3.6% in group B.

| | Corneal edema grading. | | | | P value |
|---|---|---|---|---|---|
| | None | mild | moderate | severe | |
| Group A(day 1) | 0 | 6 | 14 | 10 | P=0.01(significant) |
| Group B(day 1) | 0 | 15 | 11 | 4 | |
| Group A(day 8) | 13 | 9 | 7 | 1 | P=0.0369(insignificant) |
| Group B(day 8) | 19 | 7 | 4 | 0 | |

- The difference between both groups in failed CCC (4 cases (15%) in group A and 3 cases (13%) in group B) was insignificant (P=0.08), whereas in conversion to ECCE (group A=8 cases (26%)& group B=0%) was significant (P=0.001).
- In group A, PC rupture occurred in 6 (20%) cases and 3 (12%) in group B (p=0.021) which is significant difference between the two groups.
- Postoperative iritis was observed on the first postoperative day in 7 (23.3%) cases in the MSICS group and 8 (26.6%) cases in the phacoemulsification group, a statistically insignificant difference (P=0.258).

**Intra-Operative Complications**

| Complications. | Phaco (n,%) | MSICS (n,%) | P value |
|---|---|---|---|
| Failed CCC | 4(15%) | 3(13%) | 0.08 (not significant) |
| PCR & VL | 6(20%) | 3(12%) | 0.021(significant) |
| Premature entry | | 2(6.6%) | |
| Button hole | | 3(12%) | |
| Conversion to ECCE | 8(26%) | 0 | 0.001(significant) |
| Iris shaffing. | 7(23%) | 6(20%) | 0.08(not significant. |

## 6. Discussion

MSICS is recommended as an alternative to phacoemulsification wherever the required equipment and experience are not available. A hard brown cataract is a well-known risk factor for intraoperative complications like PCR, vitreous loss, failed CCC, zonular dialysis & lost nucleus in case of phacoemulsification. Venkatesh et al.[11] reported that both surgical techniques achieved good visual outcomes and both groups had a comparable corrected distance visual acuity of at least 6/18 two months postoperatively (92.5 vs. 85%, P=0.36). In the present study, uncorrected distance visual acuity of at least 6/18 2 months postoperatively was achieved in 85 and 90% of the patients, respectively. In the present study, conversion to ECCE was recorded in 20% of phacoemulsification cases. The reason for this higher rate of conversion to ECCE was the nature of this hard brown cataract, which makes the nucleus management more difficult and risky. In the present study, MSICS yielded better successful visual results than phacoemulsification (i.e. ≥6.18) in a larger proportion of patients day 1 postoperatively. The success rate correlated with the absence of severe corneal edema. Previous studies reported no significant difference in endothelial cell loss among MSICS, and phacoemulsification groups.

Phacoemulsification technique has the advantage of early visual rehabilitation after cataract surgery and this is mainly attributed to the small incision size used. However, phacoemulsification is an expensive technique. MSICS is less dependent on technology. Hence, it is less expensive and more appropriate for the treatment of advanced cataracts prevalent in the developing countries.

One of the limitations of this study was that only one technique of phocoemulsification and MSICS were compared. Also only one type of OVD was used, Other techniques may yield different results.Another major limitation of the present study was the short-term follow-up around 6 weeks.

## 7. Conclusion

- Both MSICS and phacoemulsification yielded excellent results, both anatomical and refractive.
- However, MSICS appears to be more advantageous than phacoemulsification in terms of speed, cost, and independence from technology, and appears to more suitable for dense cataracts and mass surgery.

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