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Research Article

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

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## ABSTRACT

**Objective:** The aim of this study was to compare the clinical outcomes of phacoemulsification with that of manual small incision cataract surgery (MSICS) in cases of hard nuclear cataract. **Methods:** 160 of 160 patients with gradual painless diminution of vision, diagnosed as 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 80 eyes treated by phacoemulsification by the vertical chopping technique and group B included 80 eyes treated by MSICS by the viscoexpression technique. **Results:** One day postoperatively, the corrected distance visual acuity was at least 6/18 in 42 (52.5%) patients in the SICS group and in 18 (22.5%) patients in the phacoemulsification group. The difference was statistically significant (P=0.01). A postoperative increase in intraocular pressure was recorded in 2 (2.5%) case in the phacoemulsification group. On the first postoperative day, 22 (27.5%) cases in the SICS group and 26 (32.5%) cases in the phacoemulsification group developed postoperative iritis, with no statistically significant difference between both the groups. **Conclusion:** Both phacoemulsification and SICS achieved comparable and excellent visual outcomes for treatment of hard brown cataract, with lower complications rates and earlier postoperative visual rehabilitation in small incision cataract surgery.

***Keywords:*** cataract, manual small incision cataract surgery, phacoemulsification.

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## 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] Hard brown cataract is a risk factor for intraoperative complications during phacoemulsification in the

hands of surgeons who deal with such cataract occasionally. It is still a challenge for experienced surgeons. The chances of conversion into extracapsular cataract extraction (ECCE) are higher than soft and medium-hard nuclei because of the damage to intraocular tissues produced by surgical trauma during emulsification of hard and large nuclei. [2] Phacoemulsification has become the routine procedure for cataract extraction in the developed countries, where rehabilitation of the patient is fast, associated with good visual outcomes. It offers the advantages of faster and more predictable wound healing, reduced discomfort to patients, fewer wound complications, and less changes of postoperative astigmatism than conventional ECCE. [3] Modern ECCE surgery involves removal of the lens fibers, which form the nucleus and cortex of the cataract, leaving the posterior epithelial capsule to hold the new artificial intraocular lens (IOL) and keep the vitreous humor away from the anterior chamber. Extracapsular techniques of cataract extraction surgery originally involved manual nuclear expression. Phacoemulsification is a mechanically assisted extracapsular technique of cataract extraction surgery. [4] Small incision cataract surgery (SICS) 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, SICS can be performed in almost all types of cataract in contrast to phacoemulsification, where case selection is extremely important for junior surgeons. [5] Studies on normal population to assess the response of the endothelium to cataract surgery have shown a decrease in the endothelial density over a 3-month period postoperatively with an increase in the coefficient of variation and decrease in the percentage of hexagonal cells. [6] In developing countries such as India, where there is a cataract backlog, SICS with IOL implantation promises to be a viable cost-effective alternative to phacoemulsification. [7] In Egypt, SICS is less dependent on technology; hence, it is less expensive and more appropriate for the treatment of advanced cataracts. [8] The aim of present study was to compare the clinical outcomes of phacoemulsification with that of SICS in cases with hard nuclear cataracts.

## METHODOLOGY

Eighty eyes of 160 patients were chosen from the outpatient clinic of the Department of Ophthalmology Era University,

Lucknow. These patients had gradual painless diminution of vision, diagnosed as senile nuclear cataract grade 4 or higher according to Lens Opacities Classification System III (brown cataract). [9] The eyes were divided randomly into two groups: group A included 80 eyes treated by phacoemulsification by the vertical chopping technique and group B included 80 eyes treated by MSICS by the viscoexpression technique. **Exclusion criteria**: Patients younger than 50 years, with dislocated and subluxated lenses, corneal diseases (congenital anomalies, degeneration, dystrophies, peripheral thinning, and conditions with a low endothelial count), ocular inflammations such as scleritis, patients with chronic open-angle glaucoma, poorly dilated pupils, a history of previous intraocular surgeries. **Preoperative examination:** The history obtained from the patients included name, age, sex, history of any medical disease, especially diabetes and hypertension, and a history of any previous operation (ocular or systemic). A careful ophthalmologic examination was performed for each case in the form of measurement of distance visual acuity, slit-lamp examination for assessment of the cornea, anterior chamber depth, regularity of the pupil, nuclear hardness, measurement of intraocular pressure using a Schiotz tonometer, and measurement of keratometric readings. After pupillary dilatation, nuclear grading was performed according to Lens Opacities Classification System III. 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 [P=A1−BL−CK, where P is the implant power for emmetropia, L is the axial length (mm), K is the average keratometry, and A, B, and C are constants] and B-scan ultrasonography was performed to evaluate the posterior segment if it was could not be visualized properly because of the dense cataract. Pupillary dilatation was performed by topical administration of phenylephrine hydrochloride 2.5% eye drops and cyclopentolate hydrochloride 1% eye drops. Both operative procedures were performed under local anesthesia by the ophthalmologist. Surface anesthetic, lignocaine 2% eye drops and sensocain 0.7%, was administered once just before the operation. **Surgical techniques:** Group A included 80 eyes treated by phacoemulsification by the vertical chopping technique. Group B included 80 eyes treated by MSICS by the viscoexpression technique. The conjunctiva was closed by cauterization at the end of surgery. **Follow up:** Patients were examined on the first postoperative day, and after 1, 2, 4, and 8 weeks. **Statistical analysis**: SPSS 23.0 was used. The independent-samples t-test and $\chi 2$ were used. The test was considered significant if P is less than 0.05, highly significant if P is less than 0.01, and not significant if P is more than 0.05.

## RESULTS

160 patients undergoing cataract surgery were included in this study. Patients were divided into two groups: group A
included those patients who underwent phacoemulsification and group B included those patients who underwent MICS
(Table 1). Intraoperative complications in both groups were recorded. There was no intraoperative complication between both groups.

**Table 1 Patients' data**

| **Parameters** | **Groups** | | **t-test** | **P** |
|---|---|---|---|---|
| | **PHACO** | **SICS** | | |
| **Mean age (years)** | 63.1 | 65 | 0.885 | 0.634 (NS) |
| **Sex (%)** | | | | |
| **Male** | 70 | 65 | $\chi^2$=0.741 | 0.258 (NS) |
| **Female** | 30 | 35 | | |
| **Preoperative IOP (mmHg)** | 14.6±2.1 | 14.8±1.9 | 0.5 | 0.620 (NS) |
| **Preoperative CDVA (%)** | | | | |
| **6/60–3/60** | 67.5 | 62.5 | $\chi^2$=0.741 | 0.258 (NS) |
| **3/60–HM** | 32.5 | 37.5 | | |

A postoperative increase in the intraocular pressure was recorded in one (2.5%) case in the phacoemulsification group. Postoperative iritis was observed on the first postoperative day in 22 (27.5%) cases in the SICS group and 26 (32.5%) cases in the phacoemulsification group, a statistically insignificant difference (P=0.258).

One day postoperatively, the corrected distance visual acuity was at least 6/18 in 42 (52.5%) patients in the SICS group and 18 (22.5%) patients in the phacoemulsification group; the difference was statistically significant (P=0.01, Table 2). Both groups had a comparable corrected distance visual

acuity of at least 6/18 2 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 75% of the patients, respectively.

**Table 2 Corrected distance visual acuity at the first day, first week, eighth week, and uncorrected distance visual acuity at eighth week postoperatively in both groups**

| **Visual acuity** | **n (%)** | |
|---|---|---|
| | **SICS** | **PHACO** |
| **CDVA first day** | | |
| ≥6/18 | 9 (22.5) | 21 (52.5) |
| <6/18 | 31 (77.5) | 19 (47.5) |
| $\chi 2$ | | 6.27 |
| P value | | 0.001 (significant) |
| **CDVA first week** | | |
| ≥6/18 | 24 (60) | 32 (80) |
| <6/18 | 16 (40) | 8 (20) |
| $\chi 2$ | | 3.81 |
| P value | | 0.05 (significant) |
| **CDVA eighth week** | | |
| ≥6/18 | 34 (85) | 37 (92.5) |
| <6/18 | 6 (15) | 3 (7.5) |
| $\chi^2$ | 0.541 | |
| P value | 0.36 (significant) | |
| **UDVA eighth week** | | |
| ≥6/18 | 30 (75) | 34 (85) |
| <6/18 | 10 (25) | 6 (15) |
| $\chi^2$ | 0.541 | |
| P value | 0.39 (significant) | |

CDVA, corrected distance visual acuity;
MSICS, manual small incision cataract surgery;
PHACO, phacoemulsification;
UDVA, uncorrected distance visual acuity.

## DISCUSSION

SICS is comparable to phacoemulsification for the rehabilitation of the patient with cataract. In the present study, there was no intraoperative complications in both groups. Muhtaseb et al.[10] assessed the risk factors for intraoperative 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 during phacoemulsification. In the present study, conversion to ECCE was recorded in 20% of phacoemulsification cases. Ali et al.[11] reported a conversion rate in phacoemulsification cases of 1.67%, whereas Dada et al.[2] reported a

conversion rate in phacoemulsification cases of 3.7%. 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 riskier.

In the present study, SICS yielded better successful visual results than phacoemulsification (i.e., ≥6.18) in a larger proportion of patients 1 day postoperatively (52.5 vs. 22.5%, respectively). The success rate correlated with the absence of severe corneal edema (5% vs. 25%, respectively). Venkatesh et al.[12] showed that the SICS group had less corneal edema than the phacoemulsification group on the first postoperative day in cases with white cataract. Previous studies reported no significant difference in endothelial cell loss among conventional ECCE, SICS, and phacoemulsification groups.[13] Gogate et al.[14] reported that both phacoemulsification and small incision techniques were safe and effective for visual rehabilitation of cataract patients, although phacoemulsification yields better uncorrected visual acuity in a larger population of patients at 6 weeks. El-Sayed et al.[8] reported both phacoemulsification and MSICS achieved excellent visual outcomes with low complication rates. SICS is less dependent on technology. Hence, it is less expensive and more appropriate for the treatment of advanced cataracts prevalent in the developing countries. Both SICS and phacoemulsification yielded excellent results in term of anatomical and refractive. However, SICS 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. [15]

## CONCLUSION

Phacoemulsification and MSICS achieve comparable and excellent visual outcomes in dealing with hard brown cataract, with lower complication rates and earlier postoperative visual rehabilitation in SICS.

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## REFERENCES

1. Mitchel PW. Update on bimanual micro-incisional cataract surgery. Curr Opin Ophthalmol 2006; 17:62–67.
2. Dada T, Sharma N, Vajpayee RB, Dada VK. Conversion from phacoemulsification to extracapsular cataract extraction; incidence, risk factors and visual outcome. J Cataract Refract Surg 1998; 24:1521–1524.
3. Gonglore B, Smith R. Extra-capsular cataract extraction to phaco- emulsification: why and how? Eye 1998; 12:976–982.
4. Bobrow JC, Blecher MH, Glasser DB, Mitchell KB, Rosenberg LF, Reich J, et al. Surgery for cataract. In: Skuta GL, Cantor LB, Weiss JS, editors. Basic and clinical science course: lens and cataract. 1st ed. San Francisco, CA: American Academy of Ophthalmology; 2011. pp. 91–160.
5. Ravindran RD, Haripriya A, Minu M. Relevance and clinical significance of SICS (Manual Phaco) in modern cataract surgery. In: Ashok G, Luther L, Geoffery T, editors. Clinical practice in small incision cataract surgery (Manual Phaco). 1st ed. New Delhi, India: Jaypee Brothers Medical Publishers; 2005. pp. 238–240.

6. Ventura AC, Walti R, Bohnke M. Corneal thickness and endothelial density before and after cataract surgery. Br J Ophthalmol 2001; 85: 18–20.

7. Muralikrishnan R, Venkatesh R, Prajina NV, Frick KD. Economic cost of cataract surgery procedures in an established eye care centre in Southern India. Ophthalmic Epidemiol 2004; 11:369–380.

8. El-Sayed SH, El-Sobky HM, Badawy NM, El-Shafy EA. Phacoemulsification versus manual small incision cataract surgery for treatment of cataract. Menoufia Med J 2015; 28:191–196.

9. Chylack LT, Wolfe JK, Singer DM, Leske MC, Bullimore MA, Bailey IL, et al. The Lens Opacities Classification System III. The Longitudinal Study of Cataract Study Group. Arch Ophthalmol 1993; 111: 831–836.

10. Muhtaseb M, Kalhoro A, Lonides A. A system for preoperative stratification of cataract patients according to risk of intraoperative complications: a prospective analysis of 1441 cases. Br J Ophthalmol 2004; 88: 1242–1246.

11. Ali A, Ahmed T, Ahmed T. Phacoemulsification: complications in first 300 cases. Pak J Ophthalmol 2007; 23:64–68.

12. Venkatesh R, Tan CS, Sengupta S, Ravindran RD, Krishnan KT, Chang DF. Phacoemulsification versus manual small incision cataract surgery in eyes with white cataracts. J Cataract Refract Surg 2010; 36: 1849–1854.

13. Gogate PM, Kulkarni SR, Krishnaiah S, Deshpande RD, Joshi SA, Palimkar A, et al. Safety and efficacy of phacoemulsification compared with manual small-incision cataract surgery by a randomized controlled trial: six-week results. Ophthalmology 2005; 112:869–874.

14. George R, Rupauliha P, Scipiya AV, Rajesh PS, Vahan PV, Praveen S. Comparison of endothelial cell loss and surgically induced astigmatism, following conventional extracapsular cataract surgery, manual small- incision surgery and phacoemulsification. Ophthalmic Epidemiol 2005; 12:293–297.

15. Ammous I, Bouayed E, Mabrouk S, Boukari M, Erraies K, Zhioua R. Phacoemulsification versus manual small incision cataract surgery: anatomic and functional results. J Fr Ophtalmol 2017; 40:460–466.