



Research Article

To compare postoperative astigmatism and visual outcome following phacoemulsification versus Manual Small Incision Cataract Surgery (MSICS) seen at tertiary care center

Priyanka^{1*}, Khalid Khan¹, Mansi Kishnani¹ and Mihika Dube²

¹Assistant Professor, Chirayu medical college and hospital, Bhopal, India

²Assistant professor, RKDF medical college and hospital, Bhopal, India

Received: 27 December, 2021

Accepted: 06 January, 2022

Published: 07 January, 2022

***Corresponding author:** Dr. Priyanka, Assistant Professor, Chirayu medical college and hospital, Bhopal, India, Tel: 9555571355;

E-mail: priyankapmch@rediffmail.com; priyankapmch1@gmail.com

Keywords: Manual small incision cataract surgery; Phacoemulsification; Astigmatism; Visual acuity

Copyright License: © 2022 Priyanka, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

<https://www.peertechzpublications.com>



Abstract

Purpose: To compare postoperative astigmatism and visual outcome following phacoemulsification versus Manual Small Incision Cataract Surgery (MSICS) seen at a tertiary care center.

Method: A total of 100 patients were enrolled in this retrospective study. Group A included 50 patients undergoing phacoemulsification surgery and group B included 50 patients undergoing MSICS. The outcome was evaluated in both techniques in terms of astigmatic profile and visual outcome at post-operative day 1 and 3 months.

Results: The mean age was 60 ± 1.84 years in the phacoemulsification group and 61 ± 1.25 years in the MSICS group. In the phacoemulsification group, 60% were male patients as compared with 40% female patients while MSICS group included 62% female patients and 38% male patients. The initial visual recovery on the first postoperative day was better in the patients who underwent phacoemulsification, with the uncorrected visual acuity better than or equal to 6/18 in 94% of the patients, whereas the percentage was 72% in the MSICS group. At three months, 80% of the patients in the MSICS group had uncorrected visual acuity better than or equal to 6/18 versus 88% of the patients in the phacoemulsification group. The mean astigmatism was $0.808 \pm 0.39D$ in the phaco group and $1.565 \pm 0.51D$ in the MSICS group, p-value significant (0.0001).

Conclusion: Both phacoemulsification and MSICS achieved comparable and excellent visual outcomes. However, MSICS appears to be more advantageous than phacoemulsification in terms of speed, cost and independence from technology and appears to be more suitable for mass surgery especially in developing countries.

Introduction

Cataract is the main cause of avoidable blindness worldwide, with the developing country accounting for more than 60% of patients. In more affluent areas of the world, phacoemulsification has become the primary method for cataract extraction. Significant efforts are being undertaken

to increase the output of cataract surgery in many developing countries and to make it affordable to all people irrespective of their economic status [1]. The main objective in modern cataract surgery is to achieve a better unaided visual acuity with faster rehabilitation and reduced complications rate [2]. Phacoemulsification offers the advantages of faster wound healing, fewer wound complications, and fewer changes of



postoperative astigmatism than conventional Extracapsular Cataract Extraction (ECCE) [3]. Manual Small Incision Cataract Surgery (MSICS) is characterized by early wound stability, less damaging effect on the corneal endothelium while negating the need for expensive equipment [4,5]. However, MSICS can be performed in almost all types of cataracts in contrast to phacoemulsification, where case selection becomes extremely important for junior surgeons [6]. In developing countries such as India, where there is a cataract backlog and in rural areas where access to advanced healthcare is limited, more advanced cataracts are encountered, MSICS with IOL implantation is a better cost-effective, safe technique with good visual outcome alternative to phacoemulsification [7,8]. Being economically viable, easier to master and safe even in the hands of less experienced surgeons, MSICS helps reach many more people, especially in lower economic regions [9,10]. The disadvantage of phacoemulsification however is the higher cost, steeper learning curve, and difficulty in handling harder, complicated cataracts [11]. The purpose of the current study was to compare visual outcome and astigmatic profile in patients with phacoemulsification and MSICS. To the best of our knowledge, it is the first comparative study to evaluate visual outcome and astigmatic profiles from north India.

Materials and methods

This retrospective study was conducted between October 2016 and September 2018 at the tertiary care center of north India after approval from the ethical committee. 100 patients with uncomplicated cataracts were included. The eyes were divided randomly into two groups: group A included 50 eyes treated by phacoemulsification by the divide and conquer technique and group B included 50 eyes treated by MSICS by the viscoexpression technique. Data including age, gender, ocular and medical history, preoperative Uncorrected Visual Acuity (UCVA) and postoperative UCVA on Postoperative Day (POD) 1 and at 3 months were retrieved from patient record. Informed consent was taken from every patient. All patients had Uncorrected Visual Acuity (UCVA) and Best Corrected Visual Acuity (BCVA), color vision testing, pupillary light reflex testing, slit-lamp biomicroscopy, Goldmann applanation tonometry and dilated funduscopy and keratometry. To measure the axial length A-scan and to measure the corneal refractive power keratometry were done for IOL power calculation using the SRK II formula. B-scan ultrasonography was performed to evaluate the posterior segment whenever required. Patient with a deep socket, hypermature cataracts, small pupil (pseudoexfoliation etc.), pre-existing ocular comorbidities such as corneal pathologies, retinal disease, glaucoma and others (non-glaucomatous optic nerve pathologies and uveitis), complicated cataract, traumatic cataract, subluxated lens, nuclear cataract grade IV & V (brunescent & black), macular disorders or optic atrophy, pathological myopia, history of previous intraocular surgeries, uncontrolled hypertension or diabetics were excluded from the study. In this study, visual outcomes and, astigmatic profiles, were noted.

Statistical analyses were performed with R version 4.0.5. Data were recorded as the mean \pm Standard Deviation (SD).

An independent *t*-test was used to compare variables between patients with phaco and MSICS. A value of $p < 0.05$ was considered to be statistically significant for all analyses.

Results

100 patients undergoing cataract surgery were included for analysis in this retrospective study. Patients were divided into two groups: group A (50 patients) included those patients who underwent phacoemulsification and group B (50 patients) included those patients who underwent MSICS. The mean age was 60 ± 1.84 years in the phacoemulsification group and 61 ± 1.25 years in the MSICS group. There were more male patients [30 (60%)] as compared with female patients [20 (40%)] in the phacoemulsification group and more female patients [31 (62%)] as compared with male patients [19 (38%)] in the MSICS group (Table 1). However, gender did not have any effect on the result. In our study, 66% of the patients operated had pre-operative BCVA of $< 6/60$, while a significant number (34%) had that of $6/24 - 6/60$ due to varying degrees of cataract. The percentage of patients with visual acuity (with pinhole) of $6/6$ at the first post-operative day in the phaco group was 44% as compared to 36% in MSICS. Those who had VA of $6/9$ in phaco group were 32% and 24% in MSICS group. Those who had VA of $6/36$ and worse were 2% in phaco group as compared to 16% in MSICS group (Table 2). This showed that Phacoemulsification has early post-operative rehabilitation as compared to MSICS. The difference in the visual acuity of the groups was statistically significant (p -value = 0.0298). At the end of 3 month, differences in the visual acuity of both group was statistically better in phaco group (Table 3). However, overall phacoemulsification gave better results in terms of final visual acuity, but this was statistically insignificant (p -value = 0.6969). In our study, most of the patients in both the phaco and MSICS group had post-operative with the rule astigmatism (Table 4). The mean astigmatism was $0.808 \pm 0.39D$ in phaco group and $1.565 \pm 0.51D$ in the MSICS group, p -value extremely significant (0.0001). In our study, the phaco group showed a

Table 1: Showing patient demographic profile.

Parameters	Group A	Group B
Mean age (years)	60 ± 1.84	61 ± 1.25
Sex		
Male	30	19
Female	20	31
Preop BCVA		
$6/24-6/60$	16	18
$6/60-3/60$	19	22
$3/60-HM$	15	10

Table 2: Showing visual acuity on first post-operative day.

Visual acuity Using pin-hole	Phaco group		MSICS group	
	NO.	%	NO.	%
6/6	22	44	18	36
6/9	12	24	12	24
6/12	10	20	6	12
6/18	3	6	4	8
6/24	2	4	2	4
6/36	1	2	5	10
6/60	0	0	3	6

**Table 3:** Showing best corrected visual acuity at 3 month.

Visual acuity Using snellen's chart	Phaco group		MSICS group	
	NO.	%	NO.	%
6/6	32	64	24	48
6/9	8	16	10	20
6/12	3	6	3	6
6/18	1	2	3	6
6/24	2	4	2	4
6/36	2	4	3	6
6/60	2	4	5	10

Table 4: Showing type of astigmatism at 3 month.

AstigmaTISM Type	Phaco Group		MSICS group	
	NO.	%	NO.	%
With The Rule (WTR)	27	54	35	70
Against The Rule (ATR)	18	36	11	22
Neutral	5	10	4	8

maximum of -1.25 D and a minimum of -0.25 D of astigmatism while MSICS group had a maximum -2.50 D and minimum of -0.75 D of astigmatism.

Discussion

In this study, the two techniques of cataract surgery were compared with respect to their effect on astigmatism and postoperative visual acuity. All over the world, Phacoemulsification is now the preferred technique among most of the eye surgeons. Another alternative MSICS was shown to get popularity because of its comparable surgical and postoperative outcomes, economically viable, safe similar to phacoemulsification and suitable for mass surgery [12]. Hence, it can be used in overcrowded poor communities in which a large number of cataract surgeries are required to be performed to overcome the increasing incidence of blindness in those communities. The mean age of patients was nearly similar in both groups. This was important while comparing the astigmatic effect between the two groups, as the relaxing effect of an incision varies with the age of the patient. Ruit, *et al.* [13] compared the efficacy and visual outcome of phacoemulsification versus MSICS and found excellent surgical outcomes with low complication rates with both the surgical techniques.

With comparing the preoperative visual acuity, it was almost similar in both groups in our study. The visual outcome achieved on the first postoperative day was better in group A in which the patients underwent phacoemulsification where the percentage of patients who achieved UCVA of 6/18 or better was 94%, whereas it was 72% in group B. Both groups achieved good visual results after 3 months, however, the difference in UCVA and BCVA between both groups was statistically insignificant. With respect to mean astigmatism in our study, group A had 0.808 ± 0.39 D at 3 months, whereas in group B it was 1.565 ± 0.51 D. There was a significant statistical difference between both groups regarding mean astigmatism. Gogate, *et al.* [14] compared phacoemulsification and MSICS with respect to postoperative astigmatism and found less astigmatism in phaco. Khan, *et al.* [15] studied the visual outcome, Surgical Induced Astigmatism (SIA) and proved that the course of time

has no significant effect on the final amount of postoperative astigmatism in eyes operated by MSICS. A study from Mumbai, India showed temporal and superotemporal tunnel to induce less astigmatism compared with superior tunnel for MSICS [16]. A study comparing endothelial cell loss and surgically induced astigmatism between MSICS and phaco showed induced astigmatism occurred slightly more in MSICS than phaco. There was no significant difference in the endothelial cell loss between the these techniques [17] Venkatesh, *et al.* [18] reported good visual outcomes with both surgical techniques. Our findings are also consistent with those of previous studies.

Limitations of this study was its retrospective nature and the short follow up period. Only one technique of phacoemulsification and MSICS were compared. Other techniques may yield different results.

Conclusion

Due to the small incision size, phacoemulsification technique has the advantage of early visual rehabilitation after cataract surgery. However, it is not an affordable technique in developing countries with low socioeconomic due to its higher cost. In this study, we found that both techniques can give excellent visual results but, for developing countries where cost and training are the rate limiting factors and patients tend to present late with harder and complicated cataracts, MSICS is the procedure of choice that fulfills the need with low cost, high volume cataract surgery for all.

References

- Limburg H, Vasavada A, Muzumdar G, Khan MY, Vaidyanathan K, *et al.* (1999) Rapid assessment of cataract blindness in urban district of Gujarat. *Indian J Ophthalmol* 47: 135-141. [Link: https://bit.ly/3EXk11P](https://bit.ly/3EXk11P)
- Mitchel PW (2006) Update on bimanual microincisional cataract surgery. *Curr Opin Ophthalmol* 17: 62-67. [Link: https://bit.ly/3zMr1XL](https://bit.ly/3zMr1XL)
- Gonglore B, Smith R (1998) Extra-capsular cataract extraction to phacoemulsification: why and how? *Eye* 12: 976-982. [Link: https://go.nature.com/3qRZXsF](https://go.nature.com/3qRZXsF)
- Enany HA (2018) Phacoemulsification versus manual small incision cataract surgery in hard nuclear cataracts. *Delta J Ophthalmol* 19: 92-98. [Link: https://bit.ly/3qYGFva](https://bit.ly/3qYGFva)
- Jaggernath J, Gogate P, Moodley V, Naidoo KS (2014) Comparison of cataract surgery techniques: safety, efficacy, and cost-effectiveness. *Eur J Ophthalmol* 24: 520-526. [Link: https://bit.ly/3HEy3ac](https://bit.ly/3HEy3ac)
- Ravindran RD, Haripriya A, Minu M (2005) 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 238-240. [Link: https://bit.ly/3f1EmZ4](https://bit.ly/3f1EmZ4)
- Singh S, Pardhan S, Kulothungan V, Swaminathan G, Ravichandran JS, *et al.* (2019) The prevalence and risk factors for cataract in rural and urban India. *Indian J Ophthalmol* 67: 477-483. [Link: https://bit.ly/3HMrP8r](https://bit.ly/3HMrP8r)
- Muralikrishnan R, Venkatesh R, Prajna NV, Frick KD (2004) Economic cost of cataract surgery procedures in an established eye care centre in Southern India. *Ophthalmic Epidemiol* 11: 369-380. [Link: https://bit.ly/3G3S6P3](https://bit.ly/3G3S6P3)
- Tabin G, Chen M, Espandar L (2008) Cataract surgery for the developing world. *Curr Opin Ophthalmol* 19: 55-59. [Link: https://bit.ly/3t59AqH](https://bit.ly/3t59AqH)



10. Singh K, Misbah A, Saluja P, Singh AK (2017) Review of manual small-incision cataract surgery. *Indian J Ophthalmol* 65: 1281-1288. [Link: https://bit.ly/3qVGqHF](https://bit.ly/3qVGqHF)
11. Gogate P (2010) Comparison of various techniques for cataract surgery, their efficacy, safety, and cost. *Oman J Ophthalmol* 3: 105-106. [Link: https://bit.ly/31x97lx](https://bit.ly/31x97lx)
12. Ammous I, Bouayed E, Mabrouk S, Boukari M, Erraies K, et al. (2017) Phacoemulsification versus manual small incision cataract surgery: anatomic and functional results. *J Fr Ophtalmol* 40: 460-466. [Link: https://bit.ly/3qXgyep](https://bit.ly/3qXgyep)
13. Ruit S, Tabin G, Chang D, Bajracharya L, Kline DC, et al. (2007) A prospective randomized clinical trial of phacoemulsification vs. manual sutureless small-incision extracapsular cataract surgery in Nepal. *Am J Ophthalmol* 143: 32-38. [Link: https://bit.ly/3r2n18e](https://bit.ly/3r2n18e)
14. Gogate PM, Kulkarni SR, Krishnaiah S, Deshpande RD, Joshi SA, et al. (2005) Safety and efficacy of phacoemulsification compared with manual small-incision cataract surgery by a randomized controlled clinical trial: six week results. *Ophthalmology* 112: 869-874. [Link: https://bit.ly/3JLFE8N](https://bit.ly/3JLFE8N)
15. Khan MT, Jan S, Hussain Z, Karim S, Khalid MK (2010) Visual outcome and complications of manual sutureless small incision cataract surgery. *Pak J Ophthalmol* 26: 32-38. [Link: https://bit.ly/3t0SGcF](https://bit.ly/3t0SGcF)
16. Gokhale NS, Sawhney S (2005) Reduction in astigmatism in manual MSICS through change in astigmatism site. *Indian J Ophthalmol* 53: 201-203. [Link: https://bit.ly/3EWB8AM](https://bit.ly/3EWB8AM)
17. George R, Rapauliha P, Sriprya AV, Rajesh PS, Vahan PV, et al. (2005) Comparison of endothelial cell loss and surgically induced astigmatism following conventional extracapsular cataract surgery, manual small incision surgery and phacoemulsification. *Ophthalm Epidemiol* 12: 293-297. [Link: https://bit.ly/3n4vTZE](https://bit.ly/3n4vTZE)
18. Venkatesh R, Tan CS, Sengupta S, Ravindran RD, Krishnan KT, et al. (2010) Phacoemulsification versus manual small incision cataract surgery in eyes with white cataracts. *J Cataract Refract Surg* 36: 1849-1854. [Link: https://bit.ly/3G64FJs](https://bit.ly/3G64FJs)

Discover a bigger Impact and Visibility of your article publication with Peertechz Publications

Highlights

- ❖ Signatory publisher of ORCID
- ❖ Signatory Publisher of DORA (San Francisco Declaration on Research Assessment)
- ❖ Articles archived in worlds' renowned service providers such as Portico, CNKI, AGRIS, TDNet, Base (Bielefeld University Library), CrossRef, Scilit, J-Gate etc.
- ❖ Journals indexed in ICMJE, SHERPA/ROMEO, Google Scholar etc.
- ❖ OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting)
- ❖ Dedicated Editorial Board for every journal
- ❖ Accurate and rapid peer-review process
- ❖ Increased citations of published articles through promotions
- ❖ Reduced timeline for article publication

Submit your articles and experience a new surge in publication services (<https://www.peertechz.com/submission>).

Peertechz journals wishes everlasting success in your every endeavours.