

# First Post Operative Day Visual Outcome Following 6 mm Manual Small Incision Cataract Surgery (MSICS) Using Intratunnel Phacoemulsification Technique.

Sudhir Singh, MS; Sumit Singh, DOMS

Dr Sudhir Singh  
M.S. Ophthalmology  
Senior Consultant & HOD  
Dept of Ophthalmology  
JW Global Hospital & Research Centre  
Mount Abu  
Rajasthan 307501  
drsudhirsingh@gmail.com

## ABSTRACT

**Object :** to study first post operative day visual outcome following 6 mm manual small incision cataract surgery (MSICS) using intratunnel Phacoemulsification technique

**Design:** Retrospective design.

**Setting:** Tertiary eye care centre.

**Participants:** A total of 216 patients who underwent MSICS performed by a single surgeon at the Global Hospital & Research Centre, Mount Abu, India from April 2012 to March 2013. Cataract patients with any other ocular co morbidity were not included. 136 cataract patients (72 Male / 64 Female) with a mean age of 59.75 years (range 40 - 80 years) were included in the study. All surgeries were performed by 6 MSICS using Intratunnel Phacoemulsification technique by single surgeon.

**Outcome measures:** The first post operative uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA) along with the rates and types of complications were recorded.

**Results:** A total of 136 surgeries were performed by 6 mm manual small incision cataract surgery (MSICS) using intratunnel phacoemulsification. All the surgeries were performed by single experienced surgeon. The mean UCVA and mean BCVA at first post operative day were 0.367 (Snellen equivalent 20/46) and 0.226 (Snellen equivalent 20/33) log MAR units respectively. No serious pre and post operative complication encountered.

**Conclusions:** The 6 mm MSICS is a safe, fast and low cost, cataract extraction technique. It is an effective alternate to costly phacoemulsification

## Introduction

The cataract remains the leading cause of avoidable blindness in the world. According to the latest assessment, cataract is responsible for 51% of world blindness, which represents about 20 million people (2010). Although cataracts can be surgically removed, in many countries barriers exist that prevent patients to access surgery. Manual small incision cataract surgery (MSICS) and phacoemulsification are the most popular methods of cataract extraction today. Manual small incision cataract surgery (MSICS) is significantly

faster, less expensive and less technology-dependent than phacoemulsification. MSICS has been extensively practiced in developing countries like India. The most commonly practiced MSICS techniques are Blumenthal, visco-expression, irrigating wire vectis and fish hook needle. These techniques require a 7 to 9 mm large incision, which leads to more astigmatism. So if nucleus is managed to remove through a sub 6mm incision at appropriate site would result approximately same astigmatism as 3.2 mm phacoemulsification<sup>2-5</sup>. To the best of our knowledge, this is the first study

to study post operative day visual outcome following 6 mm manual small incision cataract surgery (MSICS) using intra-tunnel phacofracture method of nucleus delivery.

## **Material and Methods**

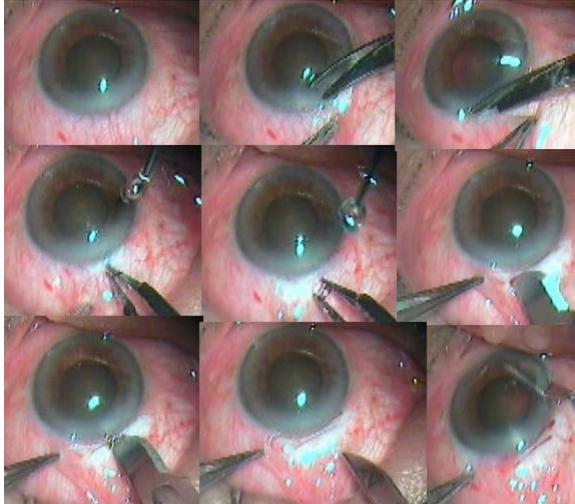
We examined the records of 216 patients who underwent MSICS performed by a single surgeon at the Global Hospital & Research Centre, Mount Abu, India from April 2012 to March 2013. We included all cases with immature senile cataracts (IMSC), mature senile cataracts (MSC), hyper mature senile cataracts (HMSC), posterior subcapsular cataract (PSC), posterior polar cataracts (PPC) and nuclear cataracts. Cataracts patients with any other ocular co morbidity were not included One hundred thirty six cataract patients (72 Male / 64 Female) with a mean age of 59.75 years (range 40 - 80years) were included in the study. Cataracts patients with good fixation and without any other ocular co morbidity were included. A full preoperative ophthalmic examination was done. Preoperative data collection for each eye included the patient age and gender, preoperative visual acuity (uncorrected and best corrected visual acuity; UCVA and BCVA respectively), details of slit lamp examination. The intraocular pressure was recorded by Sctiotz tonometry in all cases. The posterior pole was examined with slit-lamp biomicroscopy and indirect ophthalmoscopy. Axial length

measurements and keratometry recordings were done and SRK-II formula<sup>14</sup> was used to calculate the intraocular lens (IOL) power required.

## **Surgical Technique:**

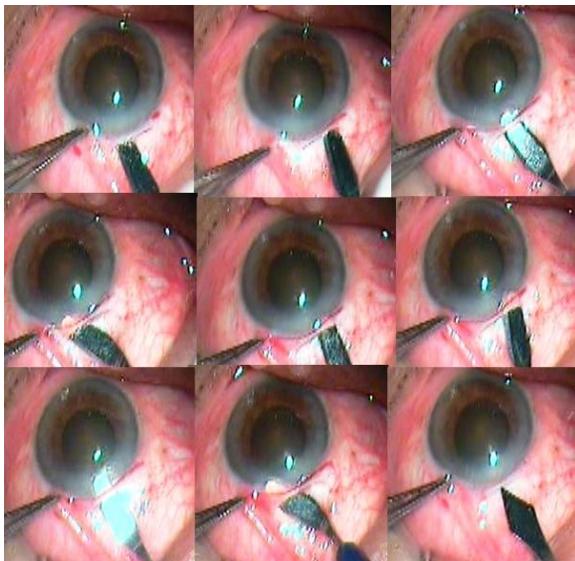
### **6 mm manual SICS with intra tunnel phacofracture technique:**

All surgeries were performed under peribulbar / topical anesthesia by single experienced surgeon (SS). A 4/0 silk bridle suture was placed beneath the tendon of the superior rectus muscle. Superotemporal quadrant for right eye and superonasal quadrant for left eye was chosen if K1 and K2 difference was equal or less than 1.0 D. If K1 and K2 difference more than 1.0 D then incision was on steeper axis. A fornix based conjunctival flap at the limbus with a chord length of approximately 6.5 mm was made. After careful dissection of the Tenon's capsule, light cautery was applied. A 6 mm scleral frown incision, 1.5 mm from the limbus was made with a 15 number Bard Parker blade (Figure1). A funnel shaped sclerocorneal pocket incision was created with a steel crescent knife. One side ports was made 90 degrees apart on either side of the scleral tunnel with a 15 degree knife temporally in right eye and nasally in left eye. With a 2.8 mm keratome, the anterior chamber was entered 1.5 mm into the clear cornea.



**Fig 1**

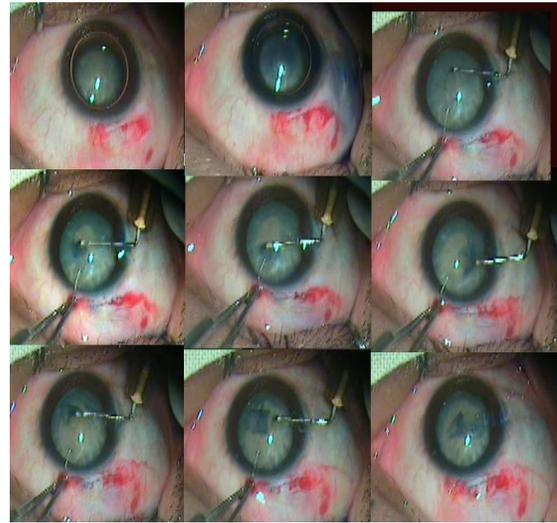
Anterior chamber is entered with 1.5 mm in clear cornea with help of 3.2 mm keratome (Figure2).



**Fig 2**

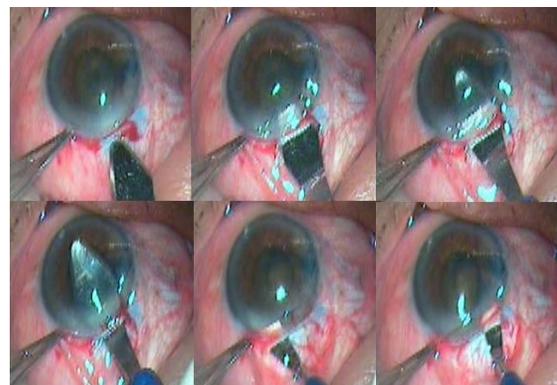
The hydroxyl propyl methyl cellulose 2 % (HPMC) viscoelastic is injected into anterior chamber .The central circular capsulorhexis (CCC) was made with help of 26 gauge needle capsulotome. If glow was poor then capsule was stained with trypan blue dye under the air bubble. Then viscoelastic was injected and CCC done. The size of CCC is depends on the size of the nucleus .It

may vary from 5.5 mm to 7.5 mm (Figure 3).



**Fig 3**

If nucleus size was anticipated large then two relaxing incisions were made at the margins of CCC. The hydrodessection was made with 26 gauge cannula place on 2 CC syringe filled irrigating fluid. The internal incision of the tunnel was enlarged sideways to 7 mm the 5.1 mm keratome (Figure 4).



**Fig 4**

Enough viscoelastic was placed between cornea and superior surface of the nucleus to protect endothelium and between nucleus and iris to keep away iris from nucleus. The nucleus was

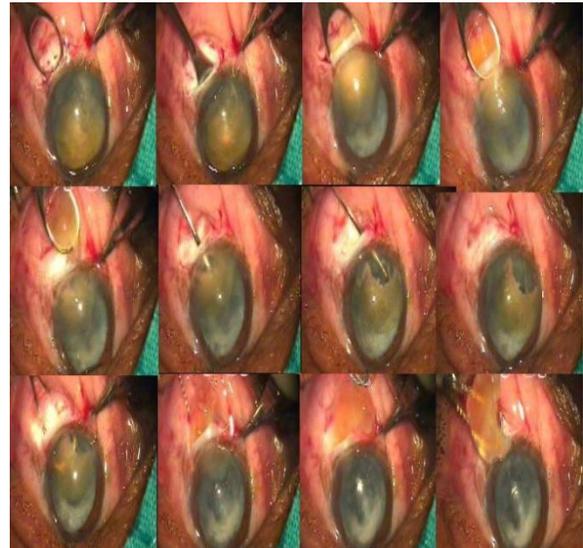
rotated within the capsule using a Sinsky hook. The nucleus was prolapsed into anterior chamber using a Sinsky hook. A Sinsky hook was used to retract the capsulorrhexis to engage the equator and lever out one pole of the nucleus outside the capsular bag and the rest of the nucleus was rotated into the anterior chamber. If the nucleus was too large then two or three relaxing incision were made at the capsulorrhexis margins at equidistance (Figure 5).



**Fig 5**

The globe was stabilized and the small Levis lens loop (AA 1915 from Appasamy Associate, India) was introduced through the tunnel and positioned between the iris and the nucleus. The nucleus was engaged in the lens loop and slowly withdrawn from the anterior chamber while the posterior lip of the tunnel is depressed. Once the nucleus got engaged in the tunnel, then the wire vectis was pulled posteriorly and upwards. This caused breaking and removal of a part of the nucleus and other part remains engaged in the

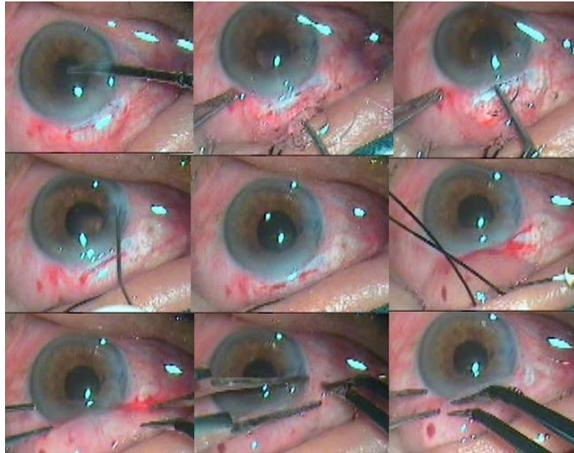
tunnel. By viscoelastic the engaged part of the nucleus was pushed back into AC and rotated so its longitudinal axis was coincided with longitudinal axis of the tunnel. Again viscoelastic was placed between the cornea and superior surface of the nucleus and between the nucleus and iris. The lens loop was introduced through the tunnel and positioned between the iris and the remaining part of the nucleus. The part of the nucleus was engaged in the lens loop and slowly withdrawn from the anterior chamber while the posterior lip of the tunnel was depressed. Most of the times remaining part of the nucleus came out. If it still broke down then remaining part again pushed in the AC with help of viscoelastic and previous steps were repeated till it came out (Figure 6).



**Fig 6**

The remaining cortical matter clean up was done with direct 23 gauge Simcoe irrigating aspirating cannula. The AC was formed with viscoelastics. A single piece PMMA intraocular lens of 6mm optic size and 12.5 mm total size was implanted into the capsular bag. The AC was washed out thoroughly by Simcoe IA cannula using Ringer's lactate

solution .The conjunctival flap is repositioned back and cauterized at the edges. Tunnel and side ports were hydrated. A 0.5 cc subconjunctival gentamycin with dexamethasone injection was given. (Fig 7)



**Fig 7**

Tobramycin 0.3 % with dexamethasone eye drops were administered three times a day in for 30 days. Moxifloxacin 0.3% eye drop were administered three times a day for the first 5 days and then discontinued. The Patients were examined on next day.

The uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), slit lamp examination finding were recorded.

[Video on Youtube](#) (Internet connection required)

### Results

A total of 216 cases 6 mm MSICS with intra tunnel phacofracture of which 136 satisfied the above mentioned Inclusion criteria and were reviewed. The mean age at presentation was 59.75 years with male: female ratio of 1.3:1. Mean age was 59.75 years (range 40-80 years) (Table 1).

Patients	Number (%)	Mean Age (Range)In Years
Male	72(52.94)	59.16(40-80)
Female	64(47.06)	60.5(45-75)
Total	136(100)	59.75(40-80)

Out of the 136 patients, 45 (33.08%) had immature senile cataract (IMSC), 10 (7.35%) had mature senile cataract (MSC), 26(19.11%) had hyper mature senile cataract (HMSC), 7 (5.14 %) had posterior subcapsular cataracts (PSC), 12 (8.82%) had posterior polar cataracts (PPC) and 36 (26.74%) had nuclear cataract (Table 2).

Type of Cataracts	Patient Number (%)
IMSC	45(33.8)
MSC	10(7.35)
HMSC	26(19.11)
PSC	12(8.82)
PPC	07(5.14)
Nuclear Cataract	36(26.47)

First postoperative day uncorrected visual acuity (UCVA) out of the 136 patients, 07 (5.14%) had 6/6, 29(21.32%) had 6/9, 32(23.62%) had 6/12, 48 (35.29 %) had 6/18, 16 (11.76 %) had 6/24 and only 4 (2.94%) had 6/36. Cumilatively 50% presented with 6/12 or better UCVA and 85.29% had 6/18 or better UCVA (Table 3). The mean UCVA was 0.367 Log MAR (Snellen equivalent 20/46).

Visual Acuity	Patient Number (%)	Patient Cumulative Number (%)
6/6	7(5.14)	7(5.14)
6/9	29(21.32)	36(26.47)
6/12	32(23.52)	68(50.00)
6/18	48(35.29)	116(85.29)
6/24	16(11.76)	132(97.05)
6/36	4(2.94)	136(100)

First postoperative day best corrected visual acuity (BCVA) out of the 136 patients, 20 (14.7%) had 6/6, 56(41.17%) had 6/9, 48(35.29 %) had 6/12, 9 (6.61 %) had 6/18, 01 (0.73 %) had 6/24 and only 2 (1.47%) had 6/36. Cumilatively 55.9% presented with 6/9 or better UCVA and 91.17% had 6/12 or better UCVA (Table 4). The mean BCVA was 0.226 (Snellen equivalent 20/33).

Visual Acuity	Patient Number (%)	Patient Cumulative Number (%)
6/6	20(14.70)	20(17.17)
6/9	56(41.17)	76(55.88)
6/12	48(35.29)	124(91.17)
6/18	9(6.61)	133(97.79)
6/24	1(0.73)	134(98.52)
6/36	2(1.47)	136(100)

The most frequent postoperative complication encountered was transient

corneal edema 9 out of 136 patient had mild corneal edema, 4 out of 136 patients had moderate corneal edema and Case was recovered well topical steroids within a week (Table 5).

Cataract Types	UCVA	BCVA	Complication
NS++++	6/24	6/12	Mild corneal edema
MSC	6/18	6/12	Mild corneal edema
IMSC	6/18	6/12	Mild corneal edema
PSC	6/18	6/12	Mild corneal edema
PSC	6/24	6/12	Mild corneal edema
NS++++	6/18	6/12	Mild corneal edema
IMSC	6/18	6/12	Mild corneal edema
HMSC	6/24	6/18	Mild corneal edema
NS+++	6/18	6/12	Mild corneal edema
HMSC	6/24	6/18	Mod corneal edema
HMSC	6/24	6/18	Mod corneal edema
HMSC	6/36	6/36	Mod corneal edema
PPC	6/24	6/18	Mod corneal edema
IMSC	6/36	6/36	Severe corneal edema

## Discussion

The cataract is the leading cause of blindness worldwide behind cataract<sup>1</sup>. It accounts for 50 % of the worlds blind. Manual SICS is already a proven technique for cataract extraction in terms of safety and efficacy. The outcomes following MSICS when compared with phacoemulsification, which is the gold standard, suggests that it is a safe alternative. The advantages of MSICS as a low-cost, equally effective technique make it an attractive alternative for the developing world<sup>6-8</sup>. A prospective trial comparing 3.2-mm incisions with 5.5-mm incisions

in Japan had found the difference in astigmatism of 0.3D.<sup>2</sup> A study from Mumbai, India had found temporal and superotemporal tunnels to induce less astigmatism as compared with superior tunnels for MSICS<sup>3</sup>. A study comparing endothelial cell loss and surgically induced astigmatism among ECCE, MSICS, and phaco had found the induced astigmatism slightly more in MSICS than phaco but much less than ECCE. There was no significant difference in the endothelial cell loss among the three techniques<sup>4</sup>. The average astigmatism was 0.7 diopter (D) in the phaco and 0.88 D in the MSICS ( $P = 0.12$ ) in the Nepal study<sup>5</sup>. In our study, all sizes and hardness nucleus were removed from 6 mm width tunnel using intratunnel phacofracture method. The mean first postoperative day UCVA, BCVA in log MAR were 0.367 (Snellen equivalent 20/46) and 0.23 respectively (Snellen equivalent 20/33). The surgical results obtained in our study compare favorably with those mentioned in the literature for MSICS. However, to the best of our knowledge; there are no prior reports of the first visual outcomes and complications in 6 mm MSICS using intra tunnel phacofracture technique. So a sub 6 mm scleral incision at appropriate site is the key factor to attain visual outcomes comparable to 3.2 mm incision phaco surgery. But large size nucleus remains the hurdle in the MSICS. Various methods of nucleus size reduction are described in the literature. But maneuvers were done inside the AC. In our method phacofracture was done inside the tunnel, so there were less chances of endothelium damage. There were few post operative complications, like mild transient corneal edema at first postoperative day. Only one case had

severe corneal edema. This was subsided in a week. Drawbacks of the study are the retrospective study design. We recommend further studies to document results using 6 mm MSICS using intra tunnel phacofracture technique.

### **Conclusion**

6 mm MSICS using intra tunnel phacofracture technique is a safe, effective, reproducible and economic technique. It is an alternative to expensive phacoemulsification.

## References

1. <http://www.who.int/blindness/causes/priority/en/index1.html>
2. Oshika T, Nagahara K, Yaguchi S, Emi K, Takenaka H, Tsuboi S, *et al* . Three year prospective randomized evaluation of intraocular lens implantation through 3.2 and 5.5 mm incisions. J Cataract Refract Surg 1998;24:509-14
3. Gokhale NS, Sawhney S. Reduction in astigmatism in manual MSICS through change in astigmatism site. Indian J Ophthalmol 2005;53:201-3
4. George R, Rapauliha P, Sripriya AV, Rajesh PS, Vahan PV, Praveen S. Comparision of endothelial cell loss and surgically induced astigmatism following conventional extracapsular cataract surgery, manual small incision surgery and phacoemulsification. Ophthal Epidemiol 2005;12:293-7.
5. 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 clinical trial: Six weeks results. Ophthalmology 2005;112:869-7411.
6. Gogate P, Deshpande M, Nirmalan PK. Why do phacoemulsification? Manual small-incision cataract surgery is almost as effective, but less expensive. Ophthalmology 2007;114:965–8.
7. Gogate PM, Kulkarni SR, Krishnaiah S, *et al*. Safety and efficacy of phacoemulsification compared with manual small-incision cataractsurgery by a randomized controlled clinical trial: six-week results. Ophthalmology 2005;112:869–74.
8. Ruit S, Tabin G, Chang D, *et al*. A prospective randomized clinical trial of phacoemulsification vs manual sutureless small-incision extracapsular cataract surgery in Nepal. Am J Ophthalmol 2007;143:32–8.