

ORIGINAL RESEARCH

Endothelial cells loss post manual small incision cataract surgery (MSICS) vs phacoemulsification

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ABSTRACT

Aim- The aim of this study is to evaluate and compare the endothelial cell density and cells loss following uncomplicated MSICS (Manual Small Incision Cataract Surgery) and phacoemulsification in grade 2-3 nuclear sclerosis. **Methods-** This was a retrospective conducted at tertiary eye care hospital between June 2023 to December 2023. Total 120 consecutive patients were randomly allocated in to two groups based on type of surgery- Group A: manual SICS (n=60) and group B: phacoemulsification (n=60). Complete Ophthalmic examination was done in form of visual acuity, slit lamp examination, IOP, Specular microscopy by non-contact automated specular microscope pre operatively and post operatively at day 1, day 7 and 6 weeks. Patients with preoperative endothelial cell density (ECD) less than 1500 cells/mm², known case of diabetes, a history of previous ocular surgery, any other coexisting ocular disease and intraoperative or postoperative surgical complications were excluded. **Result-** Total 120 patients (60 in each group) were included in the study. Mean age of the patients was 64.25 years ± 9.53 (SD) in SICS group and 62.50 years ± 8.87 (SD) in phacoemulsification group. Endothelial cell density pre operatively was 2509.79 cell/mm² ± 340.90 (SD) and 2496 cells/mm² ± 402.18 (SD) in SICS and phacoemulsification group respectively. Mean cells loss at 6 weeks is 328.46 cell/mm² ± 220.65 (SD) (p=0.011) in SICS group and 342.62 cells/mm² ± 218.48 (SD) (p=0.009) in phacoemulsification group. Both groups have significant cell loss, however no statistically significant difference in endothelial cell loss between the manual SICS group and phacoemulsification group. **Conclusion-** Safety profile of SICS and Phacoemulsification is same in term of endothelial cells loss. SICS can be use as an alternative to phacoemulsification where trained surgeons for undertaking phacoemulsification or facilities for phacoemulsification are lacking.

Key words- Specular Microscopy, Small incision cataract surgery(SICS), Endothelial Cells loss, Phacoemulsification

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INTRODUCTION

Senile cataract forms the main cause of reversible blindness in developing countries. About 20 million individuals suffer from cataract and 80% of them are in developing countries. In last few decades choice of cataract extraction has shifted from ECCE to SICS and Phacoemulsification. The corneal endothelial cell is single layer of hexagonal cells. [1] The mean endothelial cell count is about 2000-2500 cells/mm² in a normal adult life. The normal endothelial cell count at birth is 3000 cells/mm² and decreases with increasing age. The rate of declination of endothelial cell is 0.3-0.6% per year. [2,3] Loss of endothelial cells occurs in both phacoemulsification and in SICS. Phacoemulsification has given better results but SICS is more popular in developing countries than phacoemulsification because of cost effectiveness and

less expertise.[4,5] Loss of endothelial cells is compensated by increase in size of cells i.e. polymegathism. [6,7] In present we will compare the endothelial cells loss following SICS and Phacoemulsification.

METHOD AND MATERIAL

Methods- This was a retrospective conducted at a tertiary eye care hospital between June 2023 to December 2023. Total 120 consecutive patients were randomly allocated to two groups based on type of surgery- Group A: manual SICS n=60) and group B: phacoemulsification (n=60) and were followed serially until 6 months. Patients with nuclear sclerosis grade 2-3 were included in the study. Patients with preoperative endothelial cell density (ECD) less than 1500 cells/mm², known case of diabetes, a history of

previous ocular surgery, any other coexisting ocular disease, and intraoperative or postoperative surgical complications were excluded. Complete Ophthalmic examination was done in form of visual acuity, slit lamp examination, IOP and specular microscopy by non-contact automated specular microscope pre operatively and post operatively. Post operative examination was done at week 1, week 6. Paired t test was used to analyze the data. "p" value of less than 0.05 was considered to be significant.

RESULTS

120 patients were randomly assigned into 2 groups: group A (n=60) had undergone manual SICS and group B (n=60) had phacoemulsification. Mean age of the patients is 64.25 years±9.53 (SD) in SICS group and 62.50 years ± 8.87(SD) in phacoemulsification group. Out of 120 cases 70 (58.33%) patients were female while rest were males.

Table 1 showed the comparison of endothelial cells loss in both groups. Endothelial cells density pre operatively was 2509.79 cell/mm²± 340.90(SD) and 2496 cells/ mm²±402.18 (SD) in SICS and

phacoemulsification group respectively. Mean cells loss at 6 weeks is 328.46 cell/mm² ±220.65 (SD) (p=0.011) in SICS group and 342.62 cells/mm²±218.48(SD)(p=0.009) in phacoemulsification group.

Endothelial cells loss was 6.2% and 11.91% at 1 week and 6 weeks in manual SICS group, whereas 7.60% and 13.66% at 1 week and 6 week in phacoemulsification group. In both groups preoperatively and at 6 week of follow up, p value is significant although there was no statistically significant difference in endothelial cells loss between the manual SICS group and phacoemulsification group.

Table 1- comparison of endothelial cell loss. Mean ECC(cells/mm²) Mean cell loss,n(%) Pre op Post op post op Method 1 week 6 weeks 1 week 6 weeks SICS 2588.99 2412.53 2274.03 176.46(6.8%) 314.96(12.16%) PHACO 2591.52 2391.14 2243.7 200.38(7.73%) 347.82(13.42%) ECC: Endothelial Cell Count P value SICS -1 week :0.104 6 weeks:0.014 Phaco- 1 week:0.057 6 weeks: 0.008

Table -1 Comparison of endothelial cells density and cells loss

Sn	Parameter	SICS	Phacoemulsification
1	Endothelial cells count (Pre Op) cell/mm ²	2509.79	2496
2	Post op Endothelial cells count(1 week) cell/mm ²	2376.33	2303.21
3	Post op Endothelial cells count(6 week) cell/mm ²	2106.18	2097.73
4	Post op Mean cells loss (1 week)(n)	180.64	191.38
5	Post op Mean cells loss (6 week)(n)	328.46 (P=0.011)	342.62 (P=0.009)

DISCUSSION

Cataract forms a major cause of reversible blindness especially in developing countries. In last few decades choice of cataract extraction has shifted from ECCE to SICS and phacoemulsification. SICS is now becoming popular as quick relatively inexpensive and less technology dependent.

Various studies have concluded phacoemulsification to be safe for the corneal endothelium[5,8,10]Ruit et al has shown in their study that postoperative visual acuity and complication rates are the same phacoemulsification and SICS[4] Endothelial alteration has been considered as a parameter for estimating surgical trauma and safety of a surgery. In SICS endothelial loss occurred mainly due to surgical manipulation in the anterior chamber close to corneal endothelium and endothelial trauma during the nucleus delivery from the anterior chamber. Various modifications of SICS (irrigating Vectis, viscoexpression of the nucleus, anterior chamber maintainer, high density viscoelastics) have significantly reduced the endothelial cell loss. In phacoemulsification, the maneuvering is mechanical and performed in the capsular bag, distantly from the endothelium and newer advanced phacoemulsification units with better fluidics may reduce the chances of endothelial damage.

Study conducted by Baltremé et al [10] comparing endothelial cell damage between scleral tunnel incisions and clear corneal tunnel incisions for phacoemulsification concluded that scleral tunnels led to less postoperative endothelial cell damage than clear corneal tunnels. Because SICS was performed through the scleral tunnel incision, it may have caused less endothelial cell loss than phacoemulsification performed through a clear corneal tunnel incision. The higher cell loss in the upper corneal endothelium might be caused by mechanical trauma from the phaco tip or instruments used to insert the IOL, despite the use of viscoelastic material. Scleral tunnel is more posterior and therefore induces less direct (eg, phaco tip, IOL implantation) and indirect (mechanical corneal striae) trauma. There are number of factors which dictate endothelial cell loss during phacoemulsification surgery are turbulence of the irrigation solution[11], bubble and free-radical formation during phacoemulsification[12], mechanical trauma by instruments[13], and the presence of lens fragments[14] and IOLs[14], ultrasound energy[15]. Hyaluronic acid has binding sites on the endothelium and may provide mechanical and chemical protection during surgery[16] In our study, Endothelial loss was 6.2% and 11.91% at 1 week and 6 weeks in manual SICS group, whereas

7.60% and 13.66% at 1 week and 6 week in phacoemulsification group. There is no statistically significant difference in between 2 groups. Manual SICS is as safe for the corneal endothelium as phacoemulsification. The results in the literature on mean cell loss after phacoemulsification are not homogeneous. A study comparing phacoemulsification and conventional ECCE found a 10% reduction in endothelial cells in both groups.

In a study comparing endothelial cell loss after conventional ECCE, manual SICS, and phacoemulsification, the endothelial cells count decreased by 4.72%, 4.21%, and 5.41%, respectively, with no significant differences between the 3 groups.[8] Another studies have been carried out comparing endothelial cell damage after phacoemulsification and planned ECCE with different capsulotomy techniques showed that mean cells loss was 11.8% in the phacoemulsification Group, 12.8% in the ECCE group in which a CCC was used, and 10.1% in the ECCE group in which a letter box capsulotomy was used.[9] In study conducted by Gogate et al [17], mean endothelial cell loss in phacoemulsification group to be 13.2% and 15.5% at 1 and 6 weeks respectively while in SICS it was 11.1% and 15.3% at 1 and 6 weeks. There was no statistically significant difference in endothelial cell loss between the phacoemulsification group and the SICS group. Evaluation of the endothelial population using cell density does not completely describe the endothelial population.[18]

CONCLUSION

Safety profile of SICS and Phacoemulsification is same in term of endothelial cells loss. SICS can be use as an alternative to phacoemulsification where trained surgeons for undertaking phacoemulsification or facilities for phacoemulsification are lacking.

Financial Interest - Nil

Conflicts of Interest – Nil

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