|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||

Available online on http://www.ijmbs.info

International Journal of Medical and Biomedical Studies; 2026; 10(1); 154-157

Original Research

Corneal Endothelial Changes in Patients with Diabetes after Manual Small Incision Cataract Surgery (MSICS)

Lakhan Kumar[1], Anunay Narain[2], Asif Shahnawaz[3]

[1]Senior Resident, Department of Ophthalmology, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India
[2]Senior Resident, Department of Ophthalmology, Darbhanga Medical College & Hospital, Patna, Bihar, India
[3]Professor and HOD, Department of Ophthalmology, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

Received: 11-11-2025 / Revised: 20-12-2025 / Accepted: 26-01-2026
DOI: https://doi.org/10.32553/ijmbs.v10i1.3240
Corresponding author: Lakhan Kumar
Conflict of interest: No conflict of interest

Abstract:

Background: Diabetes mellitus may make patients more vulnerable to endothelial damage during cataract surgery because it is linked to structural and functional alterations in the corneal endothelium. Although manual small incision cataract surgery (MSICS) is still often done in developing nations, little is known about how the endothelium changes in diabetes individuals after MSICS.

Objective: To assess ocular endothelium alterations over a one-year follow-up in diabetic patients receiving MSICS.

Methods: There were 97 diabetic individuals receiving MSICS in this prospective observational trial. Preoperatively, as well as one week, one month, three months, and twelve months after surgery, specular microscopy was carried out. Endothelial cell density (ECD), coefficient of variation (CV), and the proportion of hexagonal cells were among the parameters that were examined. The paired t-test was used for statistical analysis, and a p-value of less than 0.05 was deemed significant.

Results: After surgery, the mean endothelial cell density dropped from 2548 ± 210 cells/mm² to 2215 ± 230 cells/mm² at 12 months ($p < 0.001$). The average loss of endothelial cells was 13.1%. There were notable declines in hexagonality and increases in CV ($p < 0.01$). The early postoperative phase was when the majority of endothelium loss happened.

Conclusion: Over the course of a year, diabetic patients receiving MSICS exhibit a notable loss of endothelial cells. To maintain endothelial health, careful surgical approach and after surveillance are crucial.

Keywords: Endothelial cell density, postoperative, diabetic patients, coefficient of variation, manual small incision cataract surgery (MSICS)

Introduction

One of the main worldwide health issues and a significant risk factor for ocular morbidity is diabetes mellitus. Diabetes also damages the cornea by generating pleomorphism, polymegathism, and endothelial dysfunction in addition to diabetic retinopathy [1]. Diabetic eyes are more susceptible to surgical stress because

of these alterations, which also lower the corneal endothelium functional reserve [2].

Cataract surgery is one of the most common treatments in diabetic patients because cataracts grow faster and proceed more quickly in this population. Because of its affordability and safety, manual small incision cataract surgery (MSICS) is still a commonly utilized procedure in environments with low resources [3]. Maintaining corneal transparency is largely dependent on the corneal endothelium. Surgical trauma can result in ocular edema and irreversible endothelial loss because endothelial cells do not recover. The purpose of this prospective observational study was to assess corneal endothelium alterations in diabetic individuals receiving MSICS during a one-year period [4].

Methods

Study Design
Prospective observational study.

Study Duration
1 year from January 2024 to January 2025

Sample Size
97 diabetic patients undergoing MSICS.

Study Setting
Darbhanga medical college.

Inclusion Criteria

- Patients with diabetes mellitus
- Age >40 years
- Senile cataract requiring surgery
- Clear cornea preoperatively

Exclusion Criteria

- Corneal dystrophy or degeneration
- Previous ocular surgery
- Uveitis
- Glaucoma
- Traumatic cataract

Surgical Technique

All patients underwent Manual Small Incision Cataract Surgery (MSICS) with posterior chamber IOL implantation under peribulbar anesthesia.

Follow-Up

- 1 week
- 1 month
- 3 months
- 12 months

Statistical Analysis

For continuous variables, mean values were presented as mean ± standard deviation (SD). The two methods' parameters were compared using a paired t-test, and a p value less than 0.05 was deemed statistically significant.

Results

Table 1: Demographic Profile

Variable	Value
Total Patients	97
Mean Age	62.4 ± 8.3 years
Male	55 (56.7%)
Female	42 (43.3%)
Duration of Diabetes >5 yrs.	61 (62.8%)

Table 2: Endothelial Cell Density Changes

Time	Mean ECD (cells/mm²)	SD	p-value
Preoperative	2548	±210	
1 Week	2360	±220	<0.001
1 Month	2298	±225	<0.001
3 Months	2245	±230	<0.001
12 Months	2215	±230	<0.001

Mean endothelial loss = 13.1%

Table 3: Morphological Endothelial Changes

Parameter	Pre-op	12 Months	p-value
CV (%)	34.2 ± 5.1	39.6 ± 5.8	0.002
Hexagonality (%)	51.4 ± 6.2	44.1 ± 6.5	0.001

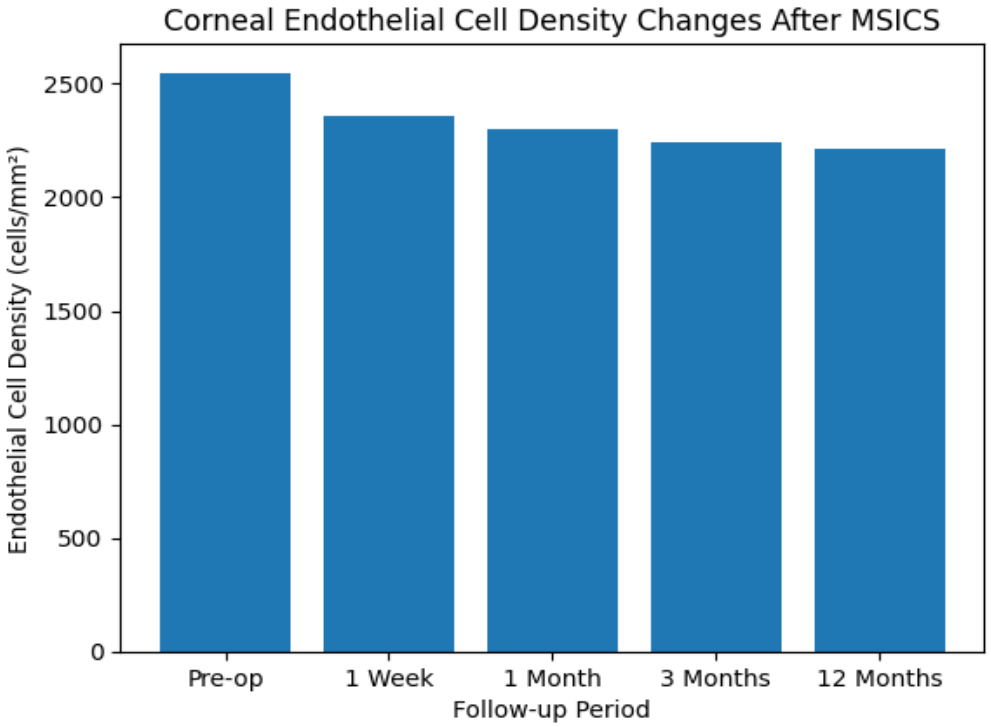

Figure 1: represents Endothelial Cell Density Changes

Discussion

After receiving MSICS for a year, diabetic patients' corneal endothelium alterations were assessed in this prospective study. The findings showed a notable loss of endothelial cells along with morphological alterations.

The study's mean endothelial cell loss of 13.1% is in line with earlier findings on MSICS in diabetic patients, which show endothelial loss ranging from 10 to 18%. Early postoperative time, especially the first week, was when the majority of endothelium damage happened. This study implies that rather than long-term metabolic impacts, surgical stress is the main cause of endothelium loss.

The first postoperative week saw the greatest endothelial cell loss, while the highest endothelial cell density was noted prior to surgery. After that, endothelial cell numbers gradually decreased until stabilizing three to twelve months after surgery.

Endothelial stress and morphological instability are indicated by notable increases in the coefficient of variation and decreases in hexagonality. It is well known that diabetic corneas are more prone to damage due to decreased Na-K ATPase activity and elevated oxidative stress [5].

The findings show that patients with diabetes have a lower endothelium reserve than people without the disease, which raises the possibility of ocular edema following surgery.

No instances of chronic corneal decompensation were noted in spite of detectable endothelium loss, suggesting that MSICS is still a safe technique when carried out appropriately [6].

The single-center design and lack of a non-diabetic control group are among the limitations [7].

Conclusion

Over the course of a year, diabetic patients undergoing manual small incision cataract surgery see notable morphological changes and a loss of corneal endothelial cells. The majority of endothelium damage happens in the initial postoperative phase. Minimizing endothelium damage requires careful surgical technique, adequate preoperative evaluation, and after monitoring. When appropriate care is taken, MSICS is still a safe and successful surgical option for managing cataracts in diabetic individuals.

References

1. Mohan RS, Singasandra SM, Mallaiah D, Venkataswamy SB. A comparative study of endothelial cell loss in small incision cataract surgery versus phacoemulsification cataract surgery by using specular microscope at tertiary care ophthalmic centre in Bengaluru , Karnataka. IP Int J Ocul Oncol Oculoplasty. 2022;7(4):399–405.
2. Kumari P, Bhaskar G. Corneal Endothelial Cell Changes in Patients with Diabetes after Manual Small Incision Cataract Surgery. Int J Pharm Clin Res. 2024;16(5):2720–3.
3. Dhasmana R, Singh IP, Nagpal RC. Corneal Changes in Diabetic Patients after Manual Small Incision Cataract Surgery. Int J Pharm Clin Res. 2014;8(4):3–6.
4. Chávez LAO, Medina LES, Pastrana CP, Suárez WC. Endothelial changes in patients with and without diabetes after manual small-incision cataract surgery. a r c h s o c ESP o f t a l m o l. 2025;100(5):246–53.
5. Ahmed Z, Ahmed SM, Tasneem AF, Jafar FS, Shraavya B. Endothelial cell changes after small incision cataract surgery in diabetic and non-diabetic patients : A cohort study. Int J Med Ophthalmol. 2022;4(1):23–9.
6. N. G. Raut, Ravi Chauhan SS. CORNEAL ENDOTHELIAL CELL LOSS AFTER SMALL INCISION CATARACT SURGERY IN DIABETIC VERSES NON DIABETIC PATIENTS. Dr. Med Res Chron. 2016;3(1):146–55.
7. Gupta P, Singh H, Patel S, Dejwar RK, Singhal A. Corneal Endothelial Changes in Diabetic and Non-Diabetic Patients after Manual Small Incision Cataract Surgery. Eur J Cardiovasc Med. 2025;15(05):11–5.