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TO STUDY THE CHANGE IN CENTRAL CORNEAL THICKNESS AND ENDOTHELIAL CELL DENSITY IN TYPE 2 DIABETICS AFTER PHACOEMULSIFICATION AND SICS USING SPECULAR MICROSCOPY.

Ophthalmology

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ABSTRACT

Background: Diabetics have abnormal corneal morphology along with higher rate of corneal endothelial cell loss and decreased corneal endothelial cell density and early onset of cataract

Aim: To evaluate the corneal endothelial cell density, central corneal thickness and coefficient of variation in patients with type 2 diabetes mellitus before and after phacoemulsification and SICS with intraocular lens implantation and to compare them with the age-matched non-diabetic patients.

Material and method: Fifty eyes of 50 patients with Type 2 diabetes mellitus and 50 eyes of 50 age matched healthy patients underwent MSICS and Phacoemulsification were evaluated. All the patients underwent specular microscopy for the corneal endothelial cell count of cornea and central corneal thickness pre-operatively, first post operative day ,at one week, and six weeks post-operatively. The morphology, variation in the endothelial size and shape and percentage of hexagonal cells were assessed.

Observation and results: The mean pre-operative endothelial count in the control was higher than the diabetic group ($p<0.001$). The post-operative endothelial count loss in all the 4 groups were statistically significant (one-way ANOVA $p<0.001$). On comparing post-operative endothelial loss in non diabetics to diabetic group, the diabetic undergoing phaco had significantly higher endothelial loss (10.52% P value 0.0001) as compared to diabetic undergoing SICS (6.38%). There was also a significant difference in central corneal thickness pre operatively in diabetics as compared to control . On comparing post-operative central corneal thickness in non diabetics to diabetic group, the diabetic undergoing phaco had significantly greater increase in CCT (3.46%) as compared to diabetic undergoing SICS(3.32% P value 0.004).The change in percentage hexagon cells in diabetic group was significantly higher than in non diabetic group. Inter group change in coefficient of variance was not statistically significant

Conclusion: Compared to non-diabetic patients, diabetic patients have more endothelial cells damage after phacoemulsification. Corneal endothelial evaluation of diabetic patients is recommended before any intraocular surgery.

KEYWORDS

Aims- To evaluate the corneal endothelial cell density, central corneal thickness and coefficient of variation in patients with type 2 diabetes mellitus before and after phacoemulsification with intraocular lens implantation and to compare them with the age-matched non-diabetic patients.

To evaluate the corneal endothelial cell density, central corneal thickness and coefficient of variation in patients with type 2 diabetes mellitus before and after small incision cataract surgery with intraocular lens implantation and to compare them with the age-matched non-diabetic patients.

INTRODUCTION - Globally, in 2010 more than 285.3 million people were visually impaired, of whom 39.3 million were blind. Age related cataract remains a major cause of blindness through out the world comprising of 51% of blindness. Other causes such as Age related macular degengeration (AMD), diabetic retinopathy, glaucoma, trachoma etc share together 49% of rest of the blindness[1] .
The corneal endothelium is the innermost layer of the cornea which is essential for maintenance of normal corneal hydration, thickness and transparency.

The human corneal endothelium has little or no ability to divide after birth[2] .

As the prevalence of type 2 diabetes mellitus rises, so does its attendant microvascular complications. Besides diabetic retinopathy, patients with diabetes are prone to develop endothelial damage after cataract surgery.

All surgical procedures that involve entry into the anterior chamber damage a proportion of the endothelial cells as a result of intraoperative corneal manipulations.[3]

Dense cataract has stated to be a risk factor for more corneal endothelial loss in phacoemulsification.

SICS is an alternative technique to phacoemulsification .

MATERIALAND METHODS
The study included 100 patients attending the outpatient Department of Ophthalmology at Subharti Medical College, Meerut.

An informed consent was taken from all the patients in the study and ethical clearance was taken from the ethical committee of SMC. Patients above 40 years were included in the study and age matched randomisation was done in four groups of 25 each.

Group A – Non -Diabetics undergoing manual small incision cataract surgery

Group B – Diabetics undergoing manual small incision cataract surgery

Group C – Non Diabetics undergoing Phacoemulsification

Group D – Diabetics undergoing Phacoemulsification

Inclusion Criteria
Patients with immature and mature senile cataract
Age between 40-70 years

Exclusion Criteria
1. Any other types of cataract other than age-related
2. Pre-operative endothelial count less than 1500 cells/mm
3. Pupillary dilation less than 7 mm;
4. Intraoperative complications.
5. Patients with diabetic retinopathy.

History
A detailed history was elicited from the patient including –
Time since patient noticed a diminution in vision
Progression or variability
History of symptoms like glare, photophobia and coloured halos
History of trauma
Use of glasses or contact lenses
History of previous surgery
Time since diagnosed diabetic
If diabetic whether on Oral Hypoglycemic Agents or Insulin

Examination
Visual Acuity-

Visual acuity in each case without glasses was determined using Snellens chart, E-chart or broken ring chart. In each case retinoscopy under dilatation was done and full correction was prescribed. Appropriate myopic or hypermetropic correction was prescribed to provide maximal visual gain and vision was subsequently recorded using the above mentioned charts.

Head posture and position of palpebral fissures Examination of anterior segment was done on the slit lamp to rule out any corneal or anterior chamber pathology.

Endothelial cell density, central corneal thickness and Coefficient of Variation was recorded using a non contact specular microscope Grading of cataract was done using LOCS III Intra-ocular pressure was recorded using non-contact tonometer (NCT) Examination of posterior segment was done by direct ophthalmoscope and by slit lamp biomicroscopy using +90D Volk lens.

Statistical Evaluation

The data was tabulated using Microsoft Excel 2007 and was analysed by SPSS version 21. The data was expressed as percentages and difference between the proportions in the two independent groups was observed by the Chi Square test.

Observation & Results

The mean age of the patients in the study was more then 45 years.

The total number of diabetic patients in the study were 25 and the total number of non-diabetic were 25.

Forty eyes of 100 patients were enrolled, and a complete 6 weeks follow-up was obtained for all.

Pre and post operative difference in ECD is more in diabetic undergoing phacoemulsification: in our study the extremely statistically significant **P value noted was 0.0001.**

Mean ECD (cells/mm2)					
	Pre Op	Day 1	Week 1	Week 3	Week 6
Group A	1801.3	1754.4	1749.3	1725.3	1702.4
Group B	1801.6	1725.1	1718.5	1710.7	1686.5
Group C	1799.4	1733.6	1727.9	1722.9	1642.4
Group D	1805.4	1699.8	1684.6	1678.3	1615.4

Pre and post operative difference in CCT is more in diabetic undergoing phacoemulsification: in our study the extremely statistically significant **P value noted was 0.2064.**

Mean CT (mm)					
	Pre Op	Day 1	Week 1	Week 3	Week 6
Group A	0.521	0.54	0.538	0.533	0.528
Group B	0.511	0.547	0.538	0.538	0.529
Group C	0.523	0.565	0.553	0.548	0.533
Group D	0.523	0.581	0.557	0.557	0.538

Pre and post operative difference in COV is not clinically significantly.

Comparison of Mean Coefficient of Variation in the 4 Groups

Table 5 Showing comparison of mean Coefficient of Variation

	Pre Op	Day 1	Week 1	Week 3	Week 6	% Change after 6 weeks
Group A	50.64	56.88	55.88	53.44	51.52	1.73%
Group B	52.92	59.36	57.61	57.62	54.08	2.19%
Group C	54.96	59.52	57.58	56.76	55.36	0.73%
Group D	54.08	62.40	60.60	59.44	56.20	3.92%

Statistically significant decrease in ECD and increase in CCT in diabetic patients undergoing phacoemulsification was noted by the end of 6 wk .

DISCUSSION

The present study reports postoperative status of the corneal endothelium in healthy and diabetic subjects after SICS and phacoemulsification and compares the status of the 4 groups.
There was no preoperative difference in endothelial cell density. A significantly greater corneal endothelial cell loss was observed in diabetic subjects compared with nondiabetic subjects 6 weeks after phacoemulsification.

Our results were consistent with the study done by Priya Thomas Mathew et al. Their study included 158 individuals with diabetes and 165 normal individuals. They concluded that there was a steady drop in the ECD in both the groups postoperatively and the diabetic endothelium was found to be under greater metabolic stress and had less functional reserve after SICS than the normal corneal endothelium4.

Similar results has been seen in studies done by Mathew A et al [5] in 1997 , Liesegang TJ et al[6] in 1984 , Ravalico G et al[7] in 1997 ,and Bourne RR[8] in 2004.

CONCLUSION

Despite good glycemic control and no corneal abnormalities before surgery, the endothelium in diabetic subjects is more vulnerable to surgical trauma and has a lower capability in the process of repair. These findings should be considered when planning cataract surgery in patients with diabetes.

However, despite significant higher loss of endothelial cells , functional ocular status seemed unchanged as judged by CCT. Thus, a sufficient reserve capacity to maintain normal corneal functional status in well-controlled patients with diabetes exists during the period of follow-up.

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