A Comparative Study of Endothelial Cell Loss In Small Incision Cataract Surgery and Phacoemulsification

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Abstract

Purpose: Corneal endothelial cell loss following cataract surgery can cause vision threatening complications. SICS which is an economical and time tested technique has largely been superseded by phacoemulsification. Therefore we felt the need to compare the corneal endothelial cell loss in these 2 most commonly used techniques.

Methods: It was a prospective cohort study conducted at Medical College, Kozhikode. 152 eyes of 152 patients with senile cataract were assigned randomly to undergo either SICS or phacoemulsification over a period of 18 months. Endothelial cells were counted using non-contact specular microscope. Endothelial cell count was done a day prior the surgery, then at 2 weeks, 1 month, 3 months and 6 months after the surgery. Statistical analysis was done using the unpaired t-test.

Results: SICS group showed comparable endothelial cell loss with the Phacoemulsification group (p = 0.084). The mean endothelial cell loss in SICS group showed lesser corneal endothelial cell loss than Phacoemulsification in all study intervals. However this was not statistically significant. Diabetics in the combined data (SICS + Phacoemulsification) showed statistically significant corneal endothelial cell loss than the non-diabetic group (t = 2.13, p < 0.05).

Conclusion: Both the groups showed comparable endothelial cell loss in the post-operative period. As SICS is economical and less dependent on technology than phacoemulsification, it may be the appropriate surgical procedure for treatment of cataract in the developing world.

Key Words: Specular Microscopy, Cataract Surgery.

Introduction

Cataract surgery the most commonly performed surgery has always been associated with damage to the corneal endothelium, the layer so vital for keeping the cornea transparent. The response and effect of stress and trauma of cataract surgery on endothelial cell could not have been so well documented if it was not for the advent of specular microscopy. In the present study we compared the endothelial cell loss in SICS and phacoemulsification.

Aim of the study

To study (1) the endothelial cell loss in SICS and Phacoemulsification (2) the ocular and systemic factors contributing to increased cell loss (3) to compare the cell loss between the two surgery.

Materials and methods

The study included 152 eyes of 152 patients undergoing cataract surgery, 77 of them were randomized to SICS and 75 to phacoemulsification. Patients with senile cataract and a normal endothelium were included. Previous H/O of trauma, surgery, uveitis, glaucoma and myopia were excluded. Patients with intra-operative complications like PC rent, dislocated IOL and iridodialysis were excluded. The surgical steps were kept same for all the patients in their respective groups. Single piece PMMA lens were used for all patients, viscoelastic substance used was kept the same, as also the irrigating solution.

Pre-operatively the endothelial cell count was done in the central corneal quadrant using non-contact specular microscope with mean of the 3 readings taken. Minimum 100 cells were counted. The patients were followed up at 2 weeks, 1 month, 3 month and 6 months with endothelial cell count taken in each visit.

Observations and discussion

1. Age distribution

In this study, most of the patients were in the age group of 65-74yrs, i.e. 41.56% of the SICS group and 50.67% of the phacoemulsification group. The mean age of a person undergoing SICS was 67.84 +/- 7.34yrs and those undergoing phacoemulsification was 66.00 +/- 6.51yrs.

2. Sex distribution

Females outnumbered males in this study. 64 were males (42.10%) and 88 were females (57.89%). In SICS group females constituted 54.54% and in phacoemulsification group 61.33%.

3. Distribution of diabetes

Of the total 152 patients included in this study, only 33 of...
them were diabetic and they were equally distributed in both the surgery group. 17 patients (22.08%) in the SICS group and 16 patients (21.33%) in the phacoemulsification group were diabetic.

4. Type of cataract

Majority of the patients had cortical cataract in this study, 40.26% of the SICS group and 48% of the phacoemulsification group. Followed in incidence by nuclear cataract, 35.06% of SICS group and 30.67% of phacoemulsification group.

5. Endothelial cell loss in relation to age of the patient (graph1)

According to this study, the greatest endothelial cell loss was found in the >75 years age group, for SICS it was 20.00% and phacoemulsification it was 22.37%. As against the age group of 55-64yrs, for SICS it was only 11.64% and phacoemulsification it was 13.96%, hence it was found that as the age advances the endothelial cell loss also increases irrespective of the type of surgery (p value=0.003). A clinical study conducted by Srinivas et al1, arrived at a conclusion that there was significant decrease in mean endothelial cell density with increase in age.

6. Endothelial cell loss according to sex distribution (table1)

In the present study, the endothelial cell loss in the SICS group was comparable among females (15.14%) and males (14.12%) p value=0.577. The phacoemulsification group also showed comparable results among females (15.27%) and males (17.80%) p value=0.523.

<table>
<thead>
<tr>
<th>Sex</th>
<th>SICS</th>
<th>Phaco</th>
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<tbody>
<tr>
<td>Male</td>
<td>14.12%</td>
<td>15.14%</td>
</tr>
<tr>
<td>Female</td>
<td>17.80%</td>
<td>15.27%</td>
</tr>
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Table 1: Endothelial cell loss according to sex distribution

7. Endothelial cell loss in diabetics and non-diabetics (graph2)

In the present study it was found that the post-operative endothelial cell loss was higher among patients with diabetes. Diabetic patients undergoing SICS surgery had 18.75% cell loss, as against non-diabetic patients who had 13.52% cell loss (p=0.005). Similarly diabetic patients undergoing phacoemulsification had higher (19.06%) cell loss, when compared to non-diabetic patients who had 15.49% cell loss (p=0.022).

This was in accordance with Morikubo et al2 and Mathew et al3 who have conclusively shown in two separate studies that diabetics who underwent cataract surgery were more prone to corneal endothelial cell loss than the non-diabetics. The diabetic endothelium was found to be under greater metabolic stress and had lesser functional reserve after cataract surgery than the normal non-diabetic corneal endothelium.

8. Endothelial cell loss in various types of cataract

The type and grade of cataract did not influence the final post-operative endothelial cell loss in both the groups. The greatest endothelial cell loss was seen in patients with nuclear sclerosis grade IV in both the groups i.e.16.15% for SICS and 18.45% for phacoemulsification group. As against, for predominant posterior sub-capsular opacity, the endothelial cell loss was 13.04% in SICS group and 14.87% in Phacoemulsification group. But the difference was not statistically significant, SICS group p value=0.098 and phacoemulsification group p value=0.080.

9. Average % cell loss

In this study, majority of the patients (34.8%) had post-operative cell loss of 10-15% at the end of 6 months, in both the groups taken together.
10. Mean cell loss in two consecutive study intervals (graph3)

In the SICS group, the mean post-operative cell loss was 298.64 at 2weeks (298.64 between pre-op and 2wks), 322.48 at 1month (322.48 between 2weeks-1month), 346.93 at 3months (346.93 between 1-3months) and 367.58 at 6 months (367.58 between 3-6 months). In the Phacoemulsification group, the mean post-operative cell loss was 328.12 at 2weeks (328.12 between pre-op and 2wks), 355.44 at 1month (355.44 between 2weeks-1month), 380.65 at 3months (380.65 between 1-3months) and 406.81 at 6 months (406.81 between 3-6 months). Maximum mean cell loss was seen in the immediate post-operative period (0-2weeks), for both SICS and Phacoemulsification. A study conducted by Dick et al had shown that endothelial cell loss was higher in the immediate post-operative period.

Graph 3: Mean cell loss in two consecutive study intervals

11. Total % cell loss at the end of 6 months (graph4)

The mean percentage cell loss among patients in the phacoemulsification group at the end of 6 months was 16.26% ±5.56 which was comparable (p value=0.084) to the SICS group that was 14.68% ±5.57.

Graph 4: % cell loss at the end of 6months

A very recent study by Gogate et al published in February 2010 has conclusively shown that there were no clinically or statistically significant differences in endothelial cell loss between phacoemulsification and SICS. Another study by George et al published in 2005 also concluded that there were no significant differences in endothelial cell loss between phacoemulsification and SICS.

Conclusion

Majority of the patients undergoing cataract surgery were in the age group of 65-74yrs. There was a linear relation between mean post-operative endothelial cell loss and the age of the patient, irrespective of the type of surgery performed. The cell loss was comparable among males and females in both the type of surgery. Diabetics were more prone to corneal endothelial cell loss in the post-operative period than the non-diabetics. The endothelial cell loss was independent of the grade of cataract. Maximum cell loss was seen in the immediate post-operative period. At the end of 6months, the total percentage endothelial cell loss in SICS was 14.68% and in Phacoemulsification it was 16.26% but the difference was not statistically significant. Thus, both the procedures were comparable in terms of endothelial cell loss.

References