Density Changes in Corneal Endothelial Cell after Phacoemulcification Cataract Surgery

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Abstract

A total of 140 eyes of cataract patients were examined for mean corneal endothelial cell density (MCD) before and after cataract surgery. There was no significant difference in MCD among genders and phacoemulcification times. However, significant differences were observed among the age groups before cataract surgery. A trend of increasing MCD in the age group above 73 years old has been observed which is probably due to polymegathism.

Key words: aging, endothelial cell density, gender, phacoemulcification times

Introduction

Corneal endothelial cell is important in maintaining corneal clarity. There are several factors involving corneal endothelial cell density, for example, gender, age, and phacoemulcification techniques. Cataract patients with low endothelial cell density showed slightly lower endothelial cell density than healthy eyes. In this regard, Hoffer (1979) investigated a group of patients after cataract surgery ranging from 2 weeks to 102 months. The author has found that corneal endothelial cell density was decreased after operation. It has been observed that several factors are involved in phacoemulcification. These
include phacoemulcification power\textsuperscript{9–11} and technique\textsuperscript{6,7} in relation to decrease of corneal endothelial cell density. The purpose of this study is to examine density changes in corneal endothelial cell of the patients before and after cataract surgery in relation to gender, age and phacoemulcification times.

**Materials and Methods**

A total of 140 eyes from 140 cataract patients aged 26–90 years old were examined and undergone cataract surgery during January 2006 to December 2008. These patients had no record of diabetes, glaucoma, corneal diseases, retinal diseases, pseudoexfoliation syndrome and history of trauma. Before the cataract surgical operation, all of the patients were examined by the technician for mean corneal endothelial cell density (MCD) using noncontact specular microscopy (TOPCON, SP–2000P) at Department of Ophthalmology, Lerdsin Hospital. The phacoemulcification machine (ALCON, Infiniti Vision System) with power 70%, vacuum 350 mmhg and aspirate 30cc/minute. Phacoemulcification with stop and chop technique was employed. Temporal wound incision was performed by 5.2 mm blade. Balanced Salt Solution (OPTOSOL), Viscoelastic (Ophthalin) and Posterior Chamber Intraocular Lens (OII) 5.0 mm were used for all cases.

There was no complication occurred during the cataract surgical operation. After cataract surgical operation, the patients were examined for corneal endothelial cell density at one week and one month, consecutively. An unpaired t-test was used to compare density of corneal endothelial cell with respect to genders, age groups and phacoemulcification times. The data obtained from these patients were statistically analyzed by using ANOVA and LSD methods. p values less than 0.05 among age groups, genders and phacoemulcification times were considered statistically significant. The 95% confidence of interval (CI) was employed in the descriptive analysis.

**Results**

The population of this study consisted of 140 patients aged 26–90 years old with average age of 64.0±11.1 years. The patients included 55 (39.3%) males (mean age 61.7±11.9) and 85 (60.7%) females (mean age 65.4±10.3). Females showed 3.1%, 1.85% and 0.65% greater mean endothelial cell density than males before surgery and one week and one month after surgery, respectively. Phacoemulcification times were ranging from 0–174 seconds with average of 0.5±0.4 seconds. No significant difference (p > 0.05) in mean endothelial cell density between gender was observed before and after surgical operation (Figure 1).

There was a significant difference (p < 0.05) in mean endothelial cell density between age groups before surgery (Figure 2). However, no

![Figure 1](image1.png)
significant difference in mean endothelial cell density was found between age groups at one week and one month after surgical operation.

No significant difference \((p > 0.05)\) in mean endothelial cell density was found between phacoemulcification times after one week and one month surgical operation (Figure 3). Nevertheless, there were significant differences \((p < 0.05)\) in mean endothelial cell density between age groups 2 and 4 \((p = 0.012)\) and age groups 3 and 4.

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**Figure 2**  Endothelial cell density before surgery, one week and one month postoperation.

**Figure 3**  Endothelial cell density at one week and one month postoperation

**Table 1**  Variation in endothelial cell density among the age groups before surgery.

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Between Group</th>
<th>MCD (cell count/mm(^2))</th>
<th>p-value</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (\leq 56)</td>
<td>1 and 2</td>
<td>3123.9 ± 288.9</td>
<td>0.077</td>
<td>-13.2</td>
<td>256.1</td>
</tr>
<tr>
<td></td>
<td>1 and 3</td>
<td>3125.1 ± 258.8</td>
<td>0.079</td>
<td>-14.3</td>
<td>254.9</td>
</tr>
<tr>
<td></td>
<td>1 and 4</td>
<td>3302.7 ± 302.7</td>
<td>0.423</td>
<td>-198.1</td>
<td>83.6</td>
</tr>
<tr>
<td>2. 57-66</td>
<td>2 and 1</td>
<td>3245.4 ± 305.6</td>
<td>0.077</td>
<td>-256.1</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>2 and 3</td>
<td>3125.1 ± 258.8</td>
<td>0.987</td>
<td>-133.9</td>
<td>131.6</td>
</tr>
<tr>
<td></td>
<td>2 and 4</td>
<td>3302.7 ± 302.7</td>
<td>0.012</td>
<td>-317.7</td>
<td>-39.7</td>
</tr>
<tr>
<td>3. 67-72</td>
<td>3 and 1</td>
<td>3245.4 ± 305.6</td>
<td>0.079</td>
<td>-254.9</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td>3 and 4</td>
<td>3302.7 ± 302.7</td>
<td>0.013</td>
<td>-316.6</td>
<td>38.5</td>
</tr>
<tr>
<td>4. (\geq 73)</td>
<td>4 and 1</td>
<td>3245.4 ± 305.6</td>
<td>0.423</td>
<td>-83.5</td>
<td>198.1</td>
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<td>38.5</td>
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</tr>
</tbody>
</table>
(p = 0.013) before surgery (Table 1).

Discussion

In general, endothelial cell cannot regenerate. Therefore, it is expected that endothelial cell will be decreasing after cataract surgery. In this regard, Thakur et al \((2011)\)\(^{16}\) have recently reported 15.8% of endothelial cell loss after 1 month operation. Their result was in accordance with Wright et al \((1999)\). Corneal endothelial cell normally decreases with aging. However, Joyce \((2003)\)\(^{10}\) has found that endothelial cell has proliferative capacity with aging process.

Phacoemulcification times is one of the factors that causes decreasing MCD because it is prolonged the ultrasound energy. Hence, the result of this study has demonstrated that phacoemulcification times has no significant effect on decreasing MCD.

There are conflicting reports concerning relationships between gender and endothelium characteristics. Some investigators have reported differences of MCD between sexes\(^{10,12}\) while the others have found no statistically significant difference.\(^{1,2}\) The results of this investigation have shown that increasing age of the patients reversely related with decrease in MCD. These findings are in agreement with the previous workers.\(^{1,2,13,14}\) However, regression analysis of data in this study has revealed a reversal trend in the age group above 73 years old although there was a trend toward decreasing MCD (Figure 2, \(p = 0.023\)). This phenomenon may be due to marked increase in polymegathism. A similar observation among the Filipino population has been reported by Padilla et al \((2004)\).\(^{17}\) Such phenomenon may be common in some populations of the Asian people which warrants further investigation. Furthermore, more patients and longer time follow up at 3 and 6 months consecutively should be performed for comparison of corneal endothelial cell density.

References

17. Padilla MDB, Sibayan SAB, Gonzales CSA. Corneal endothelial cell density and morphology in normal Filipino eyes. Cornea 2004; 23:129-35.