Anterior capsule contraction and intraocular lens dislocation in eyes with pseudoexfoliation syndrome

Hideyuki Hayashi, Ken Hayashi, Fuminori Nakao, Fumihiko Hayashi

Abstract

Aims—To examine the extent of anterior capsule contraction as well as intraocular lens (IOL) decentration and tilt following implant surgery in eyes with pseudoexfoliation syndrome (PE).

Methods—53 eyes from 53 patients with PE and 53 control eyes from 53 age matched patients, undergoing phacoemulsification and implant surgery, were recruited. The anterior capsule opening area and the amounts of IOL decentration and tilt after undergoing continuous curvilinear capsulorhexis were measured using the Scheimpflug videophotography system at 1 week and 1, 3, 6, 9, and 12 months postoperatively.

Results—The mean area of the anterior capsule opening in the PE group was significantly smaller than that in the control group at 1 month postoperatively and later. The percentage reductions in the PE group were approximately 25%, while they were less than 10% in the control group. The degree of IOL decentration and tilt after undergoing continuous curvilinear capsulorhexis were measured using the Scheimpflug videophotography system at 1 week and 1, 3, 6, 9, and 12 months postoperatively.

Conclusions—The contraction of the anterior capsule opening was more extensive in the PE eyes than in the control eyes, thus resulting in a high Nd:YAG laser anterior capsulotomy rate. The IOL tilt was also greater in the PE eyes than in the control eyes.

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It has been demonstrated that the anterior capsule opening after continuous curvilinear capsulorhexis gradually constricts to some extent in any eyes. More importantly, the contraction of the anterior capsule opening tend to occur excessively in some kinds of pathological eyes and often impairs the patient’s vision. We have demonstrated diabetes mellitus and retinitis pigmentosa to be larger than those in healthy eyes. In the PE eyes reported by Davison, the IOL also showed a marked displacement due to extensive capsule shrinkage.

The objective of this study was to investigate the contraction of the anterior capsule opening and the extent of IOL decentration and tilt in PE syndrome. We also examined the incidence of the PE eyes which had to undergo an Nd:YAG laser anterior capsulotomy.

Patients and methods

Fifty three eyes from 53 patients with PE as well as 53 control eyes from 53 age matched patients, which were all scheduled to have phacoemulsification and IOL implant surgery between 1 June 1996 and 30 March 1997, were recruited for this study. Of the 53 eyes with PE, 24 eyes had pseudoexfoliative glaucoma, while 29 eyes did not. When we operated on the bilateral eyes, only the first operated eye was included in the analysis. For each eye from the patients with PE, a control eye from a non-PE patient was also selected within the 5 year age group. The preoperative exclusion criteria were (1) cataracts due to aetiologies other than age related changes, (2) a history of prior ocular surgery or inflammation, and (3) ocular pathologies such as diabetes mellitus and retinitis pigmentosa. All eyes had soft acrylic IOLs implanted with a 6.0 mm round optic (MA60BM; Alcon Surgical Inc, Fort Worth, TX, USA). Informed consent was obtained from all patients included in this study.

All surgeries were performed by a single surgeon (KH). The surgical procedures have all been previously described. In brief, an approximately 3.5 mm scleral pocket incision was made for the soft acrylic IOL implantation. After the incision, continuous curvilinear capsulorhexis measuring about 5.5 mm in diameter was accomplished using a bent
Table 2  Mean area of the anterior capsule opening (mm$^2$) and the percentage reduction in the PE and control groups

<table>
<thead>
<tr>
<th>Period</th>
<th>PE group (Area)</th>
<th>Control group (Area)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>25.4 (4.4)</td>
<td>26.5 (3.6)</td>
<td>0.3185*</td>
</tr>
<tr>
<td>1 month</td>
<td>21.1 (6.3)</td>
<td>25.1 (4.7)</td>
<td>0.0124†</td>
</tr>
<tr>
<td>3 months</td>
<td>19.4 (7.0)</td>
<td>23.3 (5.7)</td>
<td>0.0219†</td>
</tr>
<tr>
<td>6 months</td>
<td>20.1 (7.2)</td>
<td>24.2 (5.7)</td>
<td>0.0260†</td>
</tr>
<tr>
<td>9 months</td>
<td>19.9 (7.5)</td>
<td>24.6 (4.7)</td>
<td>0.0143†</td>
</tr>
<tr>
<td>12 months</td>
<td>19.7 (7.8)</td>
<td>24.8 (4.8)</td>
<td>0.0082†</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage reduction (SD)</th>
<th>PE group (Area)</th>
<th>Control group (Area)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month</td>
<td>17.5 (16.4)</td>
<td>5.6 (8.7)</td>
<td>0.0002†</td>
</tr>
<tr>
<td>3 months</td>
<td>24.7 (20.4)</td>
<td>12.7 (13.6)</td>
<td>0.0066†</td>
</tr>
<tr>
<td>6 months</td>
<td>23.9 (20.4)</td>
<td>9.4 (13.4)</td>
<td>0.0006†</td>
</tr>
<tr>
<td>9 months</td>
<td>23.9 (21.8)</td>
<td>7.3 (11.4)</td>
<td>0.0005†</td>
</tr>
<tr>
<td>12 months</td>
<td>22.3 (19.8)</td>
<td>6.7 (11.8)</td>
<td>0.0008†</td>
</tr>
</tbody>
</table>

*Not significant; †statistically significant.

Figure 1  Comparison of the mean area of the anterior capsule opening between the PE and control groups. No statistical difference was observed in the capsulorhexis area at 1 week after surgery between the two groups. However, at 1 month and later, the mean area in the PE group was significantly smaller than that in the control group. *Not statistically significant; †statistically significant.

Figure 2  Comparison of the mean percentage reduction of the area of the anterior capsule opening between the PE and control groups. The percentage reduction in the area in the PE group was significantly greater than that in the control group throughout the follow-up period. †Statistically significant.

Table 1 demonstrates the patient characteristics. The average patient age was 73.6 (SD 6.0) years old, with a range from 60 to 92. No statistically significant differences were found between the PE and control groups regarding age, sex, or the ratio of the left and right eyes. In the first examination after full mydriasis at 1 week after surgery, all IOLs were confirmed to be placed in the capsular bag. Table 2 summarises the mean area of the anterior capsule opening and the percentage reduction in the PE and control groups. The data are also displayed in Figures 1 and 2. The Mann-Whitney U test showed no significant difference in the mean capsulorhexis area at 1 week after surgery. However, at 1 month and later, the area in the PE group was significantly smaller than that in the control group. In addition, the percentage reduction in the PE group was also significantly greater than that in the control group. In the seven eyes (13.2%) with PE, the area markedly decreased to less than 10 mm$^2$, but no eyes in the control group showed such a remarkable reduction. The visual acuity loss of these eyes from the best.

Results

Table 2 summarises the mean area of the anterior capsule opening and the percentage reduction in the PE and control groups. The data are also displayed in Figures 1 and 2. The Mann-Whitney U test showed no significant difference in the mean capsulorhexis area at 1 week after surgery. However, at 1 month and later, the area in the PE group was significantly smaller than that in the control group. In addition, the percentage reduction in the PE group was also significantly greater than that in the control group. In the seven eyes (13.2%) with PE, the area markedly decreased to less than 10 mm$^2$, but no eyes in the control group showed such a remarkable reduction. The visual acuity loss of these eyes from the best.

needle. Following a hydrodissection, phacoemulsification of the nucleus and cortex aspiration were performed. The lens capsule was inflated with 1% sodium hyaluronate, and then the IOL was inserted into the capsular bag. At the end of surgery, the surgeon confirmed whether or not the IOLs were accu-
postoperative acuity on the decimal charts was as follows; (1) two eyes, two lines or more, (2) three eyes, one line, (3) two eyes, no decrease. Table 3 lists the mean IOL decentration length and tilt angle. The data of the tilt angle are also shown in Figure 3. The mean degree of the tilt in the PE group was significantly greater than that in the control group. However, the mean decentration length was almost the same between the two groups.

Table 3  Mean decentration length (mm) and tilt angle (°) of the PE and control groups

<table>
<thead>
<tr>
<th>Decentration (mm) (SD)</th>
<th>PE group</th>
<th>Control group</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>0.304 (0.203)</td>
<td>0.295 (0.236)</td>
<td>0.5782*</td>
</tr>
<tr>
<td>1 month</td>
<td>0.337 (0.192)</td>
<td>0.320 (0.180)</td>
<td>0.7282*</td>
</tr>
<tr>
<td>3 months</td>
<td>0.399 (0.202)</td>
<td>0.312 (0.161)</td>
<td>0.0686*</td>
</tr>
<tr>
<td>6 months</td>
<td>0.277 (0.191)</td>
<td>0.316 (0.135)</td>
<td>0.0796*</td>
</tr>
<tr>
<td>9 months</td>
<td>0.290 (0.146)</td>
<td>0.313 (0.167)</td>
<td>0.0568*</td>
</tr>
<tr>
<td>12 months</td>
<td>0.277 (0.179)</td>
<td>0.298 (0.150)</td>
<td>0.3592*</td>
</tr>
<tr>
<td>Tilt (°) (SD)</td>
<td>3.07 (1.75)</td>
<td>2.11 (1.29)</td>
<td>0.0114†</td>
</tr>
<tr>
<td>1 week</td>
<td>3.44 (2.01)</td>
<td>2.35 (1.29)</td>
<td>0.0046†</td>
</tr>
<tr>
<td>1 month</td>
<td>3.18 (1.87)</td>
<td>2.38 (1.42)</td>
<td>0.0140†</td>
</tr>
<tr>
<td>3 months</td>
<td>3.02 (1.52)</td>
<td>2.41 (1.44)</td>
<td>0.0376†</td>
</tr>
<tr>
<td>6 months</td>
<td>3.60 (1.77)</td>
<td>2.69 (1.74)</td>
<td>0.0063†</td>
</tr>
<tr>
<td>9 months</td>
<td>3.66 (2.12)</td>
<td>2.77 (1.97)</td>
<td>0.0243†</td>
</tr>
</tbody>
</table>

*Not significant; †statistically significant.

In conclusion, the contraction of the anterior capsule opening as well as the IOL decentration and tilt were similar between the eyes with and without glaucoma. These results thus suggest that the capsule shrinkage, which is possibly due to zonular weakness may not be related to the coexistence of glaucoma. Bartholomew also reported that long standing glaucoma plays no part in lens displacement.

In this study, the contraction of the anterior capsule opening and IOL tilt was greater in the PE eyes than in the healthy eyes. Experienced surgeons are surely aware of the intraoperative risk of zonular dialysis when performing implant surgery for PE eyes. However, we must also be careful to find anterior capsule constriction in the early postoperative period. We usually perform an Nd:YAG laser anterior capsulotomy when the patient’s vision is impaired. However, a careful follow up is necessary to confirm the long term safety of an anterior capsulotomy.

The authors have no proprietary interest in any of the materials described in this article.

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