Imaging late capsular bag distension syndrome: an anterior segment optical coherence tomography study

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Background: Anterior segment optical coherence tomography (ASOCT) was used to categorize and provide insights into the etiology of capsular bag distension syndrome (CBDS).

Methods: A prospective review was undertaken of 10 cases who presented with signs of late CBDS 5–11 years after uneventful phacoemulsification with in-the-bag posterior chamber intraocular lens implantation.

Results: All 10 patients presented with a milky collection within the distended capsular bag without raised intraocular pressure or a shallow anterior chamber. ASOCT was used to confirm the diagnosis in all cases, and a hyperintense signal was seen in the space between the posterior chamber intraocular lens and the posteriorly bowed posterior capsule. The continuous curvilinear capsulorhexis was measured to be between 3.18 mm and 4.70 mm. Three cases had uncorrected visual acuity better than 6/12. Uncomplicated Neodymium-doped Yttrium Aluminium Garnet (Nd:YAG) posterior capsulotomy was performed in eight patients, with no resulting change in the intraocular lens position (measured by ASOCT) or subjective refraction.

Conclusion: Our study showed that ASOCT is a useful modality to differentiate this condition clearly from posterior chamber intraocular lens opacification and to investigate its causation. Nd:YAG posterior capsulotomy proved to be a safe and successful treatment for late CBDS with no change in biometric or refractive parameters.

Keywords: anterior segment optical coherence tomography, capsular bag distension syndrome, YAG capsulotomy

Introduction
Capsular bag distension syndrome (CBDS) is a rare complication of phacoemulsification with an anterior continuous curvilinear capsulorhexis and in-the-bag intraocular lens implantation. It may also be associated with a can-opener type capsulorhexis and sulcus-implanted intraocular lens.1,2 In 1990, Davison first described cases of early postoperative CBDS with a shallow anterior chamber, elevated intraocular pressure, and induced myopia from the anterior shift of the intraocular lens.3 Miyake et al reclassified CBDS into intraoperative, early postoperative, and late postoperative CBDS based on the heterogeneity of the clinical features in these cases.4 Late CBDS has also been termed liquefied after-cataract5 or capsulorhexis-related luteocrunenasia.6

We pooled 10 highly similar cases presenting with late CBDS. Uniquely in all our patients, anterior segment optical coherence tomography (ASOCT, Visante, Carl Zeiss Meditec, Dublin, CA) was used to categorize correctly and elucidate the etiology of this subtype of CBDS. Our study adhered to the tenets of the Declaration of Helsinki.
Management of CBDS depends largely on the presenting visual acuity. Three cases had uncorrected visual acuity better than 6/12 and one retained good best-corrected visual acuity of 6/6 beyond one year of follow-up. In our cases, because a hyperintense signal was seen in the space between the intracapsular lens and the posterior capsule.

Table 1 Summary of 10 patients with late capsular bag distension syndrome

<table>
<thead>
<tr>
<th>Case</th>
<th>Gender/age (years)</th>
<th>Size of CCC (mm)</th>
<th>Onset of symptoms (years after surgery)</th>
<th>Presenting UCVA</th>
<th>IOP</th>
<th>Pre-treatment refraction</th>
<th>Nd:YAG Post-treatment</th>
<th>IOL used</th>
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<tbody>
<tr>
<td>1</td>
<td>F/74</td>
<td>4.70</td>
<td>&gt;10</td>
<td>6/45</td>
<td>10</td>
<td>Not done</td>
<td>Yes</td>
<td>6/12</td>
</tr>
<tr>
<td>2</td>
<td>F/68</td>
<td>4.08</td>
<td>11</td>
<td>6/9</td>
<td>15</td>
<td>+0.75/-0.25 x 75</td>
<td>No</td>
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</tr>
<tr>
<td>3</td>
<td>M/52</td>
<td>4.65</td>
<td>6</td>
<td>6/15</td>
<td>17</td>
<td>-1.75/-0.25 x 20</td>
<td>Yes</td>
<td>6/7.5</td>
</tr>
<tr>
<td>4</td>
<td>F/75</td>
<td>-</td>
<td>&gt;10</td>
<td>6/30</td>
<td>15</td>
<td>Not done</td>
<td>Yes</td>
<td>6/9</td>
</tr>
<tr>
<td>5</td>
<td>F/81</td>
<td>3.18</td>
<td>9</td>
<td>6/7.5</td>
<td>11</td>
<td>+1.25/-1.75 x 9</td>
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<td>6/6</td>
</tr>
<tr>
<td>6</td>
<td>F/75</td>
<td>-</td>
<td>6</td>
<td>6/9</td>
<td>12</td>
<td>+0.50/-1.25 x 9</td>
<td>Yes</td>
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<td>3.45</td>
<td>9</td>
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<td>11</td>
<td>6/24</td>
<td>12</td>
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<tr>
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<td>3.20</td>
<td>5</td>
<td>6/12</td>
<td>13</td>
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<td>Yes</td>
<td>6/9</td>
</tr>
<tr>
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<td>F/63</td>
<td>3.53</td>
<td>5</td>
<td>6/45</td>
<td>16</td>
<td>plano/-2.00 x 95</td>
<td>Yes</td>
<td>6/21</td>
</tr>
</tbody>
</table>

Notes: For change in ACD, (+) indicates deepening of the anterior chamber with posterior movement of the IOL whilst (−) indicates anterior movement of the IOL.

Abbreviations: ACD, anterior chamber depth; CCC, continuous curvilinear capsulorhexis; IOP, intraocular pressure; IOL, intraocular lens; NA, not available; Nd:YAG, Neodymium-doped Yttrium Aluminium Garnet; UCVA, uncorrected visual acuity.
of a distended capsular bag trapped with milky fluid, there could be technical difficulty in focusing of the Nd:YAG laser on the posterior capsule, hence leading to failure, which may then require surgical drainage of the trapped fluid.\(^5\) However, this problem was not encountered in our series, and Nd-YAG posterior capsulotomy was safely performed in eight of our patients with no complications, such as an intraocular pressure spike or excessive inflammation. Kollias et al reported a case of Propionibacterium acnes in late CBDS,\(^6\) but in our series, the absence of vitreous inflammation post-YAG posterior capsulotomy indicated that there was no deleterious infective or inflammatory etiology. Of note, there were no cases of retinal detachment seen in our patients after YAG posterior capsulotomy. Whilst YAG posterior capsulotomy remains a relatively simple treatment option, it can still be associated with various risks and complications. Hence, it may be prudent to observe the patient until the onset of visually significant symptoms.

In four patients with pre-YAG and post-YAG capsulotomy refractions performed, there were no refractive changes noted. This finding is similar to that in the series by Pinarci et al.\(^7\) In our series, we were also able to use ASOCT to measure the change in anterior chamber depth pre-YAG and post-YAG capsulotomy, and it similarly showed an insignificant change of less than 0.1 mm in anterior chamber depth measurements, indicating minimal biometric change post-YAG capsulotomy (Table 1).

In most cases of CBDS, be they early or late, the size of continuous curvilinear capsulorhexis tends to be small,\(^7\) and tight adherence to the anterior surface of the intraocular pressure prevents escape of intracapsular fluid. In our series, ASOCT measured the horizontal diameter of the continuous curvilinear capsulorhexis to be in the range of 3.18–4.70 mm, thus corroborating these observations. However, because there are no longitudinal measurements, one cannot confirm whether there had been any capsular contraction.

In conclusion, our study showed that ASOCT is a quick and easy method of imaging the anterior segment to differentiate CBDS clearly from posterior chamber intraocular lens opacification. It can also aid in diagnosis of late CBDS, especially when the milky fluid is not as obvious. Common characteristics seen in our cases were the relatively small continuous curvilinear capsulorhexis in all cases and acrylic intraocular pressures (MA60BM) in seven of 10 cases. YAG posterior capsulotomy was safe and yielded excellent visual results in all cases, with minimal biometric or refractive changes.

### Disclosure

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### References
