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Case Report

Anterior Segment Optical Coherence Tomography Findings in Capsular Block Syndrome with Improvement in Myopia following Neodymium-Yttrium Aluminum Garnet Laser Treatment

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Keywords

Capsular block syndrome · Anterior segment optical coherence tomography · Myopic shift · Neodymium-yttrium aluminum garnet · Case report

Abstract

Introduction: Lacteocrumenasia is a relatively rare postoperative complication of cataract surgery. It is classified as a late-onset type of capsular block syndrome (CBS) and is often accompanied by myopia; however, its mechanism is not clearly understood. ***Case Presentation:*** We report a case of a 62-year-old male patient having CBS with myopia. The patient was treated with neodymium-yttrium aluminum garnet (Nd-YAG) laser posterior capsulotomy. We measured and compared the depth of the intraocular lens using anterior segment optical coherence tomography (AS-OCT) before and after laser treatment. Treatment resulted in refraction improvement of more than 1.0 diopters. The intraocular lens depth before and after Nd-YAG laser irradiation had very mild changes of less than 0.05 mm, which did not explain the refractive changes. ***Conclusion:*** Myopia in the early-onset type of CBS is caused by anterior deviation of the intraocular lens; however, the evaluation of this case using AS-OCT suggested that an abnormal intraocular lens position may not be involved in late-onset CBS.

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Introduction

After cataract surgery and intraocular lens (IOL) insertion, milky white fluid may fill the space between the posterior surface of the IOL and the posterior capsule of the lens. This phenomenon is referred to as "lacteocrumenasia" [1]. Lacteocrumenasia is classified as a late-onset type of "capsular block syndrome" (CBS). It develops, on average, 3.8 years after surgery [2], and the milky white fluid contains high concentrations of α-crystallin and relatively low albumin levels, which are derived from cataract epithelial cells [1]. In many cases, if it is mild, the opacity does not affect vision; however, it can cause blurred vision, if the degree of opacity is severe, and myopia in some cases [3–7]. The precise cause of myopia is not yet fully understood. In the present case, a neodymium-yttrium aluminum garnet (Nd-YAG) laser posterior capsulotomy was performed on a patient with late-onset CBS who complained of myopia. After treatment, the patient showed refraction improvement. We report the evaluation of this case using anterior segment optical coherence tomography (AS-OCT). The CARE Checklist has been completed by the authors for this case report, attached as supplementary material (for all online suppl. material, see https://doi.org/10.1159/000535861).

Case Report

The patient was a 62-year-old man who had undergone combined phacovitrectomy for the epiretinal membrane of the left eye performed by a local ophthalmologist 4 years previously. Postoperative refractive values did not differ between the right and left eyes. The patient was referred to our department after complaining several months prior that the power of his left eyeglasses was out of alignment. Ocular examination revealed an uncorrected distance visual acuity of 20/100 in the right eye and 20/200 in the left eye. The corrected distance visual acuity was 20/20 in both eyes, and the subjective refraction was −4.50 diopters sphere (DS)/−2.00 diopters cylinder (DC) × 90° in the right eye and −7.00 DS/−0.50 DC × 80° in the left eye. No abnormalities were observed in the corneas of either eye; the fundus of the right eye was normal, with only a mild cataract. The left eye was vitrectomized and showed no recurrence of epiretinal membrane; however, a slightly protruding milky white opacity in the shape of a convex lens was observed between the IOL and posterior capsule (shown in Fig. 1a). After the ocular examination, when the Nd-YAG laser treatment was performed, a milky white fluid drained into the vitreous cavity, resulting in the disappearance of the milky white contents (shown in Fig. 1b). The IOL depth in the left eye was measured using a swept-source AS-OCT device (CASIA2; Tomey, Nagoya, Japan). The IOL depth in the left eye was 4.553 mm in horizontal sections and 4.530 mm in vertical sections before, and 4.607 mm and 4.559 mm after, the Nd-YAG laser posterior capsulotomy, respectively (shown in Fig. 2a–d). Objective refraction of the left eye before and after the Nd-YAG laser treatment changed from −7.23 DS/−0.88 DC × 81° to −5.92 DS/−1.18 DC × 71° in normal pupil condition. Two weeks after the Nd-YAG laser treatment was administered, the left corrected distance visual acuity was 25/20 and the subjective refraction was −5.50 DS/−1.00 DC × 70°, indicating that the myopia improved.

Discussion

Miyake et al. [8] classified CBS into three types. In the early-onset type of CBS that occurs within 2 weeks after surgery, the presence of an ophthalmic viscosurgical device or lens fragments remaining in the capsule after surgery causes retention of fluid in the posterior

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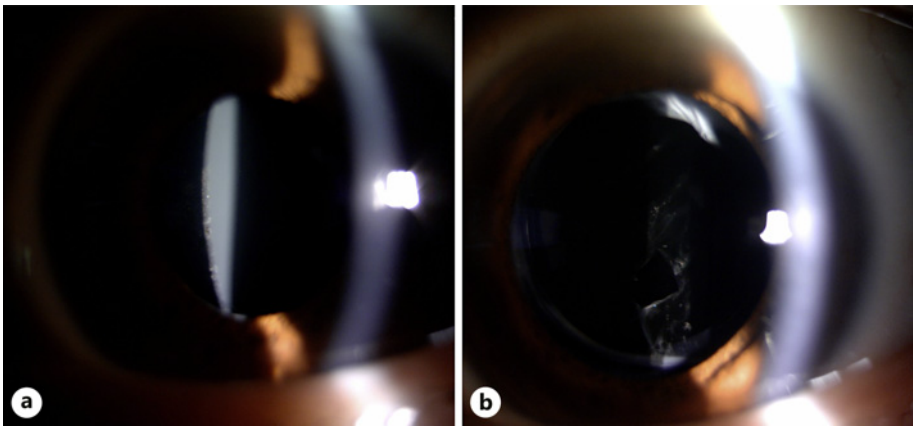

Fig. 1. Slit-lamp examination before and after neodymium-yttrium aluminum garnet (Nd-YAG) laser posterior capsulotomy. **a** Before exposure to the Nd-YAG laser, a slightly protruding milky white opacity in the shape of a convex lens is observed between the posterior surface of the IOL and the posterior lens capsule. **b** Nd-YAG laser treatment causes the fluid to flow out into the vitreous cavity.

space of the capsule due to osmotic pressure, resulting in a shallow anterior chamber with an anterior deviation of the IOL and myopia [5, 9–14]. Late-onset CBS can also cause myopia; however, the mechanism through which myopia develops in the presence of CBS remains unclear (shown in Table 1). Yang et al. [3] reported that the anterior chamber depth of late-onset CBS, measured using ultrasound biomicroscopy, is not significantly different before and after Nd-YAG laser treatment. This particular case of late-onset CBS with myopia was the first in which the depth of the IOL before and after Nd-YAG laser treatment was measured using AS-OCT. Interestingly, despite the improvement in myopia, the IOL depth remained largely unchanged. This finding suggests that the mechanism of myopia development in the present case differs from that of early-onset type of CBS, in which anterior deviation of the IOL occurs.

AS-OCT is a valuable tool for evaluating anatomical structures and qualitative factors in the cornea, anterior chamber, and even the optic media. The usefulness of AS-OCT in differentiating between IOL opacity and late-onset CBS has been highlighted [15]. We assessed the IOL depth before and after Nd-YAG laser treatment and observed a slight deepening of the IOL position, although the shift was less than 0.05 mm. This finding was similar to the 0.04 mm change measured using ultrasound biomicroscopy reported by Yang et al. [3]. For normal eye axis length, a 1.0-mm forward shift of the IOL corresponds to approximately 1.3 diopters of myopia [16]. However, in this case, the observed IOL shift alone cannot fully explain the improvement of more than 1.0 diopter of refraction following the Nd-YAG laser treatment. Additionally, corneal changes or changes in axial length, which can impact refraction, are unlikely to have occurred within such a short timeframe before or after the Nd-YAG laser treatment.

The AS-OCT image obtained before the Nd-YAG laser treatment revealed that the late-onset CBS exhibited a convex lens shape on the posterior surface, with a smaller radius of curvature compared to the posterior surface of the IOL. The late-onset CBS content is a material with an unknown refractive index and a high backward-scattered light intensity. The refractive index is expected to be higher than that of the refractive index of the vitreous space, which is inevitable after vitrectomy. Hence, it can be considered that one of the mechanisms of myopia in this late-onset CBS case was a newly formed refraction created by surfaces between the vitreous cavity and milky white contents that had a different refractive index.

Since late-onset CBS does not cause myopia in all cases and multiple factors may be involved in its development in a complex manner, future studies with a large number of

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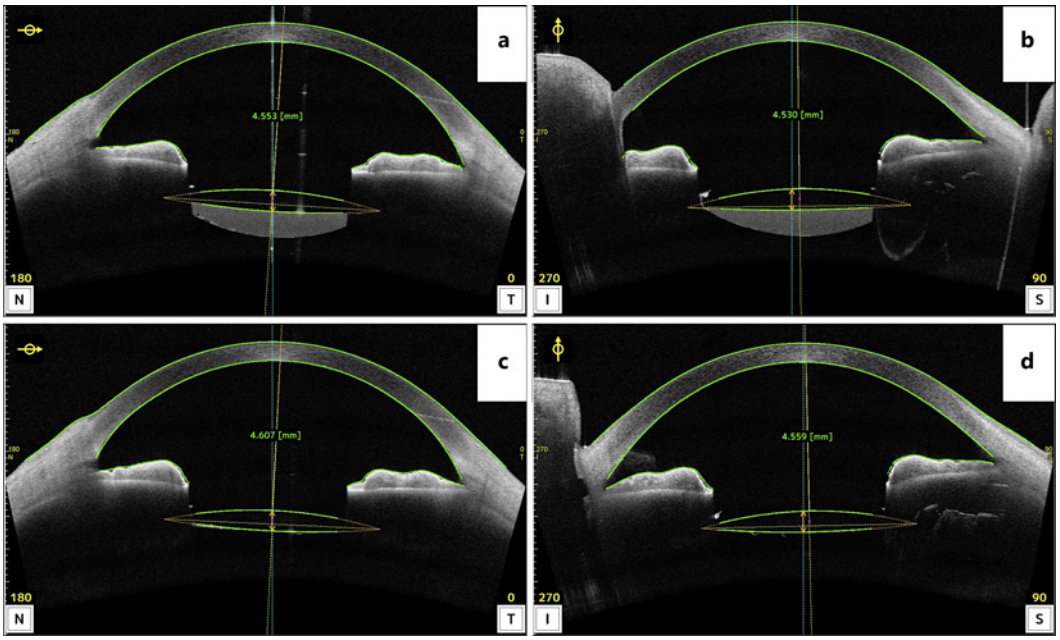

Fig. 2. Swept-source AS-OCT scans before and after neodymium-yttrium aluminum garnet (Nd-YAG) laser posterior capsulotomy. The lacteocrumenasia is convex lens shaped on the rear surface, indicating that its radius of curvature is smaller than that of the IOL rear surface in the AS-OCT image. The distance from the posterior surface of the cornea to the anterior surface of the IOL is 4.553 mm in the horizontal sections (**a**) and 4.530 mm in the vertical sections (**b**) before the Nd-YAG laser treatment. After the Nd-YAG laser treatment, the distance has changed to 4.607 mm in the horizontal sections (**c**) and 4.559 mm in the vertical sections (**d**).

Table 1. Anterior chamber depth and refractive change in three types of CBS

	Intraoperative CBS	Early-postoperative CBS	Late-postoperative CBS (lacteocrumenasia)
Time of onset	Intraoperative	Within 2 weeks postoperatively	Within 3.8 years postoperatively
Cause	Rapid hydrodissection using large amount of BSS	Remaining OVD or inflammatory anterior chamber cellular reaction	LECs proliferation and pseudometaplasia
Accumulated substance	BSS	Residual OVD or trapped lens fragments	Milky-white fluid material
Anterior chamber depth	Shallow (anterior shift of lens nucleus) [8]	Shallow (anterior shift of IOL) [5, 9–14]	Normal [1–5, 8], shallow [7]
Possibility of refractive change	NA	Myopic shift [5, 9–14]	No change [1, 2, 8], myopic shift [3–7]

BSS, balanced salt solution; CBS, capsular block syndrome; IOL, intraocular lens; LECs, lens epithelial cells; NA, not applicable; OVD, ophthalmic viscosurgical device.

patients are warranted. In the present case, we did not observe any IOL positional change that affected refraction; however, we observed an improvement in myopia after the Nd-YAG laser treatment. This finding suggests that anterior deviation of the IOL is not always involved in myopia associated with late-onset CBS.

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Statement of Ethics

This study protocol was exempted from the need for approval by the Institutional Review Board of Kanazawa Medical University Hospital. Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Tsuyoshi Mito conducted the report plan and drafted the manuscript. Hajime Okemoto drafted the manuscript and analyzed data. Takushi Kawamorita critically reviewed the article. Hiroshi Sasaki contributed to study design and manuscript revision. All authors have read and approved the final manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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