



## Pseudo second anterior lens capsule during post-vitrectomy cataract surgery: A case report

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### ARTICLE INFO

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### ABSTRACT

**Purpose:** To report the unexpected finding of a membrane resembling a second anterior lens capsule during cataract surgery after previous pars plana vitrectomy (PPV) with silicone oil tamponade for retinal detachment. **Observations:** A 26-year-old male with a history of two retinal detachment repairs of the right eye over a 5-month period, presented with decreased vision. The first retinal detachment repair was performed with a 23-gauge PPV and the second with a 25-gauge PPV, scleral buckle and placement of silicone oil. Additional ocular history includes bilateral megalocornea, high myopia, and temporal lens coloboma. Upon presentation, slit lamp exam showed migration of silicone oil to the anterior chamber and a nuclear cataract. A decision was made to perform combined silicone oil removal and cataract extraction with intraocular lens (IOL) implant of the right eye. After capsulorrhexis, hydrodissection of the lens was not completed successfully since the presence of a membrane was detected. This membrane was cut, achieving partial completion of the second capsulorrhexis, which was further advanced using a forceps following the contour of the first capsulorrhexis. The cataract was removed without further difficulty and the IOL was placed into the capsular bag with good centration. The membrane was submitted to pathology, and upon microscopic examination was found to represent fibrocellular tissue with some cells expressing PAX8 and cytokeratin AE1/AE3.

**Conclusions and importance:** This case reports the unusual finding of a membrane that behaved as a second anterior lens capsule intraoperatively and that expressed novel pathology markers. These findings may better prepare ophthalmologists for similar pathologies they may encounter during capsulorrhexis.

### 1. Introduction

A common late complication following PPV is cataract formation or progression, with the most frequent types being nuclear sclerotic cataract and posterior subcapsular cataract.<sup>1,2</sup> PPV with silicone oil tamponade can cause anterior lens capsule changes that can complicate capsulorrhexis.<sup>3</sup> In cataract surgery, continuous curvilinear capsulorrhexis is the standard technique and is a crucial step to achieve a successful phacoemulsification necessary for good IOL centration and stability.<sup>4</sup>

This case report describes the finding of a membrane that required a second capsulorrhexis during cataract surgery after prior PPV for retinal detachment 8 months earlier. We present this case to raise awareness that this finding can occur intraoperatively and should warrant pathology examination.

### 2. Case report

The patient was a 26-year-old male that presented with decreased vision. He had a past ocular history of two retinal detachment repairs of the right eye, the first with a 23-gauge PPV and the second with a 25-gauge PPV, scleral buckle and placement of silicone oil, over a 5-month time frame. Also, he had been diagnosed with bilateral megalocornea and myopia at 8 years old and bilateral temporal lens coloboma, worse in the right eye, at 16 years old. Myopia progressed to high myopia at 11 years old.

Upon presentation, his visual acuity in the right eye was counting fingers (CF) at 1 ft and intraocular pressure (IOP) was 16 mmHg. Slit lamp exam of the right eye showed migration of silicone oil to the anterior chamber, a temporal lens coloboma, and a visually significant nuclear cataract. The retina was attached. A decision was made to perform combined silicone oil removal and cataract extraction with IOL

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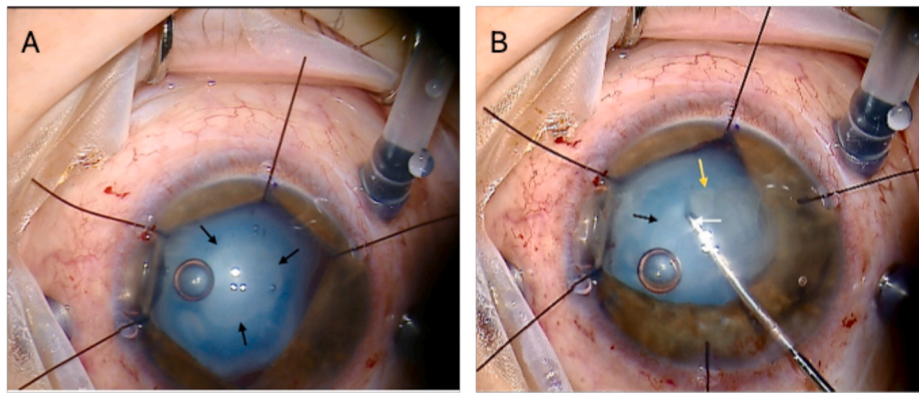
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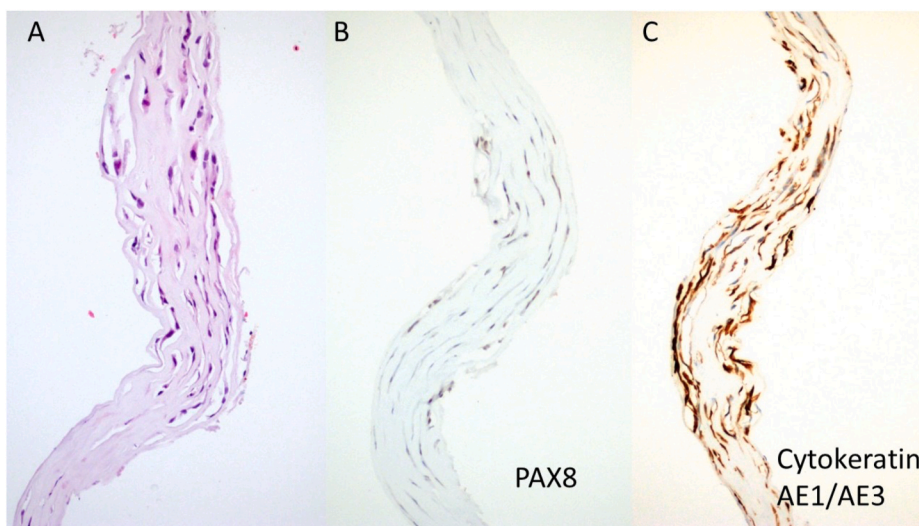
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**Fig. 1. First and second capsulorrhexis.** A, First capsulorrhexis (black arrows). B, Second capsulorrhexis (yellow arrow), tip of Alio's capsulorrhexis forceps (white arrow), first capsulorrhexis (black arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)



**Fig. 2. Pathology of the second anterior lens capsule.** A, Benign fibrocellular tissue (stain, hematoxylin-eosin). B, Some cells were positive in the nucleus for PAX8 (stain, PAX8). C, Cells strongly expressed cytokeratin (stain, AE1/AE3). All images: original magnification, x200.

implant of the right eye.

During surgery, a 23-gauge valved cannula on a trocar was placed posterior to the limbus infero-temporally and additional cannulas were placed in the supero-nasal and supero-temporal quadrants. After draining the silicone oil via the supero-temporal cannula, the paracentesis was performed. A Sinsky hook (Katena, Denville, NJ) was used to detach posterior synechiae of the iris at pupillary area to the anterior capsule. Five iris retractors were implanted through the cornea to help visualize the cataract. Trypan blue was dropped in the anterior capsule under air to stain it. A circular continuous capsulorrhexis of approximately 5 mm was performed using an Alio's capsulorrhexis forceps (Katena, Denville, NJ). After completion of capsulorrhexis, an attempt to insert a flat hydrodissection cannula underneath the edge of the capsulorrhexis was unsuccessful. A membrane was detected after several attempts were made to hydrodissect the lens. The membrane was then cut with 25g disposable scissors (Alcon/Greishaber, Ft. Worth, TX) and partial completion of the second capsulorrhexis was achieved. The membrane was perforated using the hydrodissection cannula, and a small flap was torn following the contour of the first capsulorrhexis using the forceps (Fig. 1). With the hydrodissection, some of the cataract material drained to the anterior chamber. Once the capsular bag was empty of lens material, scar tissue in the posterior capsule was detected and could not be mechanically polished. The IOL was placed in the capsular bag, but the trailing haptic was not inserted in the bag due to

fibrosis of the anterior capsule. The IOL was well-centered, and the haptic was shortened and removed from the anterior chamber. The light pipe and vitrector were placed through the supero-temporal and supero-nasal cannulae and a RESIGHT viewing system (Zeiss, Dublin, CA) was used. The retina was noted attached and a fluid-air exchange was performed.

One week postoperatively, the patient's right eye exam demonstrated CF at 1 ft, IOP of 9 mmHg, no corneal epithelial defects and an attached retina. One month postoperatively, the patient's visual acuity was still CF at 1 ft and IOP was 15 mmHg, with an attached retina. Four months postoperatively, his exam showed CF at 2 ft, 13 mmHg IOP, retina attached, and 3+ posterior capsule opacification that required Nd:YAG laser capsulotomy, which improved his vision to CF at 8 ft.

The membrane found during surgery was submitted to pathology, and upon microscopic examination was found to represent benign fibrocellular tissue (Fig. 2A). A subset of the cells was positive in the nucleus for PAX8 (Fig. 2B), which can be seen in a range of intraocular tissues, including iris muscle and pigment epithelium, lens epithelium, and nonpigmented and pigmented epithelia of the ciliary body.<sup>5,6</sup> While the cells had a spindled appearance and lacked epithelial morphology, they strongly expressed cytokeratin (Fig. 2C).

### 3. Discussion and conclusions

PPV with silicone oil tamponade has been associated with cataract formation, primarily caused by oxidative stress.<sup>7</sup> Silicone oil can alter the biomechanical and ultrastructural properties of the anterior lens capsule in vitrectomized eyes.<sup>3,8</sup> Citirik et al. described irregularities present in the posterior surface of the anterior lens capsule in patients with silicone oil tamponade.<sup>9</sup> Yung et al. reported fibrous metaplastic lens epithelium in the histopathology of the anterior capsule obtained from two patients with intravitreal silicone oil, which is similar to the pathology of an anterior subcapsular cataract after trauma.<sup>10</sup> However, neither study reported cellular markers present in the sample, limiting the conclusions that could be drawn from these findings.

Though histopathology demonstrated benign fibrocellular tissue comprising cells that were not morphologically epithelial, many expressed cytokeratin AE1/AE3 and PAX8. Cytokeratins form intermediate filaments in epidermis and most epithelial tissues, including normal corneal epithelium.<sup>11</sup> Anti-cytokeratin AE1/AE3 has broad sensitivity for epithelial cells and it can be expressed in tumors such as adenocarcinoma of the nonpigmented ciliary epithelium and renal cell carcinoma.<sup>12,13</sup> PAX8 is necessary for the development of the eye, urogenital tract, and thyroid gland; it is commonly expressed in normal tissues as well as in neoplasms originating from these organs.<sup>5,6</sup>

PAX8 expression has been reported in lesions that retain epithelial morphologic characteristics, such as anterior polar pyramidal cataract and lens epithelial cells entrapped in capsular fibrosis.<sup>5</sup> Cells that have hybrid epithelial-myofibroblast features may be in a transition stage and co-express PAX8 and smooth muscle actin (SMA).<sup>5</sup> In a case of anterior capsular phimosis, immunohistochemical staining was positive to both SMA and cytokeratin AE1/AE3, indicating metaplasia of lens epithelial cells into myofibroblasts.<sup>14</sup> When the lens epithelium undergoes complete mesenchymal transition, such as during lens capsular fibrosis and anterior subcapsular cataract, PAX8 expression is lost.<sup>5</sup> Therefore, the presence of these cellular markers may be consistent with metaplastic lens epithelium. While less likely, other PAX8 positive epithelial cells could have undergone metaplasia to generate the lesion.

Unlike other similar studies, cellular markers were tested in this case report. A limitation was that the first capsulotomy sample was not submitted to pathology and would have been of great comparative value.

This case report presents an intraoperative finding that may better prepare ophthalmologists for similar pathologies they may encounter during complicated capsulorrhexis. The pathology findings are novel; therefore, we encourage cellular markers to be tested in similar cases and both capsulotomy samples to be submitted to pathology for comparative study.

#### Patient consent

The patient consented to publication of the case in writing. This case report was conducted in accordance with the Declaration of Helsinki. Formal ethical approval by the Johns Hopkins Medicine Institutional Review Board is not required for a case report in accordance with the

policy of our Institution.

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#### Authorship

**Laura E. Drew-Bear:** Writing – Original Draft, Visualization. **Mya Abousy:** Writing – Review and Editing. **Charles G. Eberhart:** Writing – Review and Editing, Resources. **J. Fernando Arevalo:** Writing – Review and Editing, Resources. **Ashley Behrens:** Writing – Review and Editing, Resources, Supervision. All authors read and approved the final manuscript. All authors attest that they meet the current ICMJE criteria for Authorship.

#### Declaration of competing interest

The authors declare no conflict of interest.

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