

Case report

Occult Descemet's membrane detachment after phacoemulsification surgery mimicking pseudophakic bullous keratopathy



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ABSTRACT

We herein report two cases of occult Descemet's membrane detachment (DMD) after phacoemulsification surgery, which initially presented as persistent corneal edema and had been considered as pseudophakic bullous keratopathy. The patients were thus scheduled to receive corneal transplantation. For Case 1, DMD was incidentally detected by slit-lamp examination 2 months postoperatively, only when part of the cornea became clearer. For Case 2, anterior segment optical coherence tomography demonstrated extensive DMD, which had lasted 5 months after the operation. DMDs in both patients had been successfully attached after descemetopexy. Occult DMD should be suspected in patients with persistent severe corneal edema after phacoemulsification surgery. Corneal transplantation may be avoided by timely diagnosis and treatment of DMD.

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1. Introduction

Descemet's membrane detachment (DMD) was considered a rare complication following ocular trauma or intraocular surgery.¹ However, as corneal transplantation has evolved into the selective-layered keratoplasty, an increasing number of DMD cases have been reported in patients undergoing deep anterior lamellar keratoplasty and Descemet's membrane endothelial keratoplasty (DMEK).^{2,3} The most common cause of surgically induced DMD is cataract extraction.⁴ DMD can develop at each step of phacoemulsification, including wound construction, improper viscoelastic cannula placement and injection through the side-port incision, irrigation/aspiration, intraocular lens implantation, or even postoperatively.⁵ Clinically, it presents as a translucent membrane in the anterior chamber and extensive DMDs may create a "double-anterior-chamber" appearance.⁴ As DMD prolongs, the cornea would become edematous due to the absence of corneal endothelial function. Reposition of the detached membrane is the key to induce resolution of corneal edema. Much more common than DMD, but also presenting as corneal edema after cataract

surgery, is pseudophakic bullous keratopathy (PBK). This is an irreversible condition caused by extensive loss of corneal endothelial cells during cataract surgery. To date, corneal transplantation is still the mainstay treatment for PBK. With the introduction of endothelial keratoplasty such as Descemet's membrane stripping automatic endothelial keratoplasty (DSAEK) or DMEK for PBK, most corneal surgeons would advocate the early treatment of PBK before the formation of corneal haze or scar associated with long-term corneal edema.⁶

Because severe and persistent corneal edema may preclude visibility of the delicate structure of Descemet's membrane (DM), occult DMD patients might be misdiagnosed as PBK, and thus are managed through corneal transplantation without attempts to reposition the DMD. Herein, we report two cases of extensive and occult DMD, mimicking PBK after phacoemulsification surgery, and referred to us for corneal transplantation. Both corneas have cleared up following DMD repositioning with intracameral injection of air or gas, even at 2 months and 5 months after extensive DMD.

2. Case reports

2.1. Case 1

A 67-year-old woman underwent a clinically seemingly uneventful phacoemulsification with a posterior chamber intraocular lens implantation in the left eye in April 2013. Since postoperative

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Day 1, severe corneal edema in the left eye was noted. Although intensified topical steroid therapy was administered post-operatively, the corneal edema persisted for 2 months without any improvement. Under the impression of PBK, she was referred to us for DSAEK 2 months postoperatively. On initial examination, the patient's best-corrected visual acuity (BCVA) was only counting fingers in her left eye. Slit-lamp examination of the left eye revealed diffuse corneal edema, which obscured the details of the anterior chamber (Fig. 1A). Because PBK was suspected, she was registered on the waiting list for DSAEK for the treatment of corneal endothelial decompensation.

One month later, at her follow-up visit to our clinic before proceeding to DSAEK, the inferior one fourth of the cornea became clearer (Fig. 1B), which allowed us to more closely observe the details of the anterior chamber. Under slit-lamp examination, we incidentally detected DMD extending up to the upper three quarters of the cornea where corneal edema persisted (Fig. 1C). To reposition the DMD, we injected approximately 0.1 mL of sterile air into the anterior chamber, which resulted in a successful attachment of DM on the next day and a clear cornea afterward. When the cornea became clear, a 4 mm × 2-mm DM defect near the clear corneal incision wound was noted (Fig. 1D), attributable to the occurrence of an extensive DMD. During 12 months of follow up, the visual acuity was 20/25 and the cornea remained clear with a central corneal endothelial cell density of 2004 cells/mm².

2.2. Case 2

A 76-year-old woman was referred to us for DSAEK for the treatment of PBK in November 2013. She had persistently blurred

vision in her right eye after a clinically seemingly uneventful phacoemulsification surgery 5 months before in a local clinic. On initial examination, her BCVA was 20/200 in the right eye. Slit-lamp examination of the right eye showed diffuse corneal edema, particularly over the inferior portion of the cornea, which prevented us from examining the anterior chamber in detail. Based on the lesson learned from Case 1, anterior segment optical coherence tomography (AS-OCT) was performed, which demonstrated extensive DMD involving approximately three fourths of the cornea in the right eye (Fig. 2). Over the region with less corneal edema, the corneal endothelial cell density was measured to be approximately 1329 cells/mm². Because the clinical course had lasted for almost 5 months, we injected approximately 0.1 mL of 20% sulfur hexafluoride (SF₆) into the anterior chamber of the eye. One day after the injection, the DM was well attached with rapid resolution of corneal edema. During 6-months follow up, the patient achieved a visual acuity of 20/60. The DM remained attached and notably, a 3 mm × 2-mm DM defect was observed at the entrance of the side-port incision, which was attributed to the occurrence of DMD.

3. Discussion

To date, PBK remains as one of the leading indications for corneal transplantation.⁷ Here, we reported two cases of occult DMD, which was originally diagnosed as PBK because of persistent corneal edema after apparently routine phacoemulsification surgery, lasting for 2 months and 5 months, respectively. Because the severe corneal edema precluded visibility while investigating the anterior segment in these two patients, it would be difficult to detect DMD simply under slit lamp examination on initial

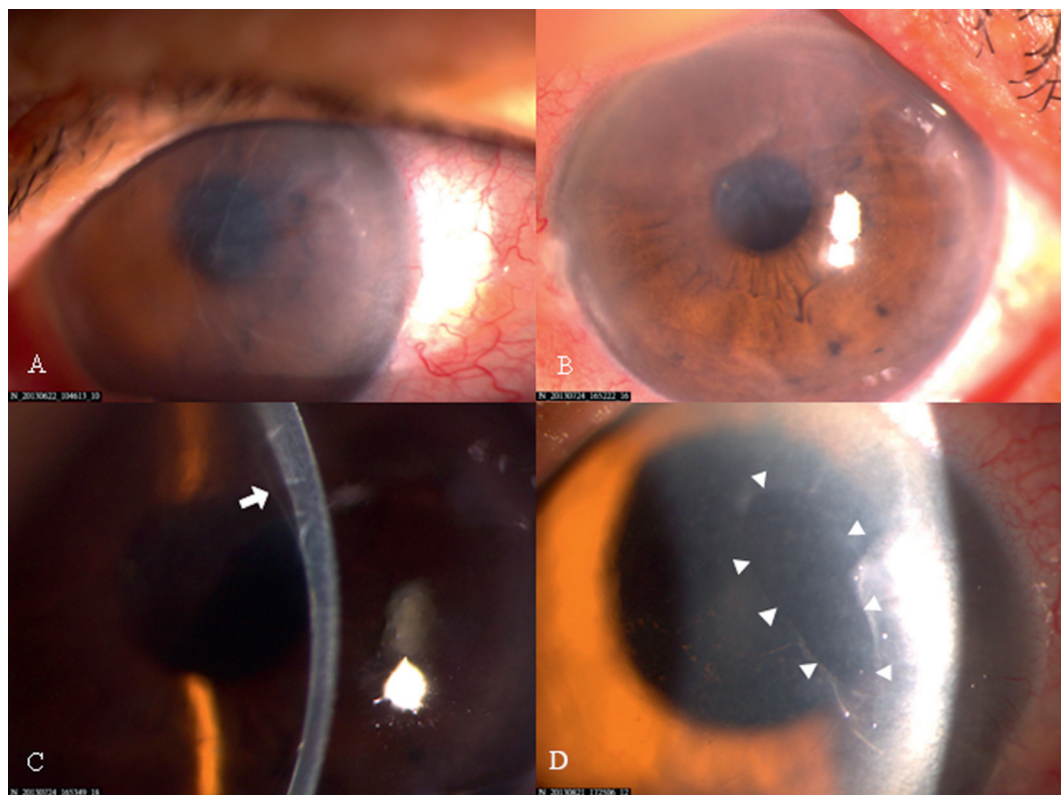


Fig. 1. Case 1. Slit-lamp biomicroscopy appearance of the left eye with Descemet's membrane detachment. (A) At the initial presentation the patient presented with a severe and extensive corneal edema simulating pseudophakic bullous keratopathy 2 months after phacoemulsification. (B) One month later, the inferior one fourth of the cornea became clear. (C) Descemet's membrane detachment was identified by slit-lamp examination, which extended up to the upper three quarters of the cornea (arrow). (D) One month later, the cornea became clear and, at a high magnification, a 4 mm × 2-mm Descemet's membrane defect (arrowheads) was noted near the clear corneal incision wound extending to the paracentral cornea.

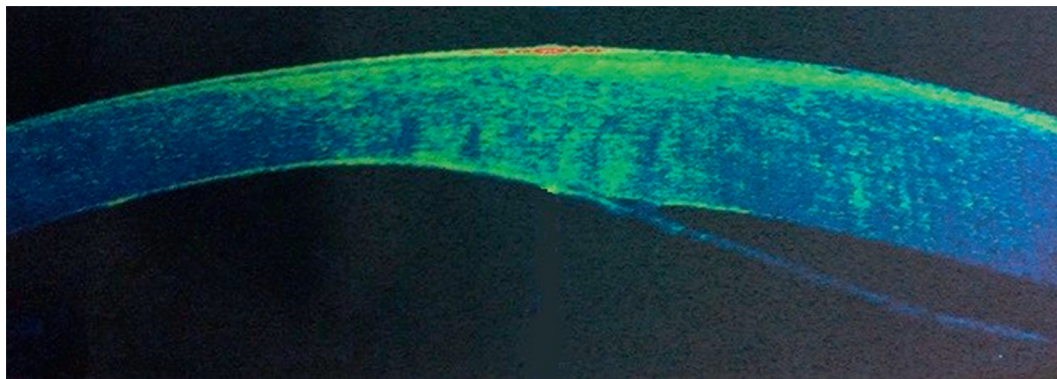


Fig. 2. Case 2. Anterior segment optical coherence tomography showing a localized Descemet's membrane detachment.

presentation. Fortunately, while Case 1 was on the waiting list for corneal transplantation, the inferior fourth of the affected cornea became clear because of the spontaneous reattachment of the DMD over that area, which led to the detection of the remaining DMD biomicroscopically over the upper three quarters of the cornea. Based on the lesson we learned from Case 1, occult DMD has since been placed at the top of the differential list of diagnosis in patients with persistent corneal edema after phacoemulsification, which enabled us to diagnose the condition without delay in Case 2.

To our knowledge, there has been no report in the literature on DMD patients initially considered as PBK and scheduled to receive corneal transplantation. However, we suspect that such situations might have been overlooked in the past before the widespread availability of AS-OCT or ultrasound biomicroscopy (UBM), and its contribution to persistent postoperative corneal edema may have been underestimated. A recent report from the Singapore National Eye Centre estimated that the incidence rate of acute DMD after phacoemulsification was at least 0.044%/y.¹ Therefore, it is possible that some DMD patients with severe and long-lasting corneal edema may have been treated with corneal transplantation simply because the presence of DMD may be masked by severe corneal edema.

For DMD patients with just mild corneal edema, the detached membrane can be easily observed by slit-lamp biomicroscopy. However, in cases with severe and extensive corneal edema, which was the case in our patients, it would be difficult even for an experienced clinician to detect the DMD without the assistance of AS-OCT or UBM. As shown in Case 2 and those in previous studies,^{8,9} anterior segment image systems are helpful to detect DMD, aid visualization of the detached DM during surgical repositioning of DMD, and monitor the outcomes.

To date, the timing of surgical options for DMD remains debatable. A number of ophthalmologists advocated that once DMD after phacoemulsification surgery has been detected, it should be repositioned as soon as possible.^{10–12} The rationale for immediate intervention relies on the fact that a delayed diagnosis and long-term DMD would allow for wrinkling and DM fibrosis to ensue, which might prevent a successful reattachment afterward, and subsequently resulting in poorer visual outcome.¹³ Moreover, if not treated early and properly, delayed DMD may ultimately progress to irreversible corneal decompensation. By contrast, some studies showed that patients with limited and unrolled DMD or DM separated <1 mm from the overlying stroma might develop spontaneous reattachment of DM.^{14–17} Consequently, close observation of such DMD patients might be an acceptable alternative before proceeding to surgical intervention. Although spontaneous reattachment of DMD might occur, it usually takes weeks or even

several months.³ Furthermore, it is difficult to predict whether DMD will spontaneously reattach. Thus, surgeons should make a judgment on whether to early repair DMD based on the extent and duration of DMD.

To date, gas bubble tamponade [air, 20% SF₆, 14% octafluoropropane (C₃F₈)] is the mainstay treatment for DMD mainly due to its ease of execution and subsequent good outcomes as shown in our patients and those in the literature.^{1,4,10–13} Each gas has a different half-life in the anterior chamber, with air having the shortest duration, and C₃F₈ having the longest duration (lasting for a few weeks). Surgeons can select the air or long-acting gas depending on the extent and duration of DMD. However, either air or long-acting gas should be used with caution due to the fear of pupillary block. For some recalcitrant DMD patients, surgeons may need to consider repeated gas bubble tamponade, manual unscrolling, full-thickness venting stromal incisions, or even suturing.⁴

As the corneal clarity in our patients was restored and reasonable endothelial cell density was preserved after 2 months and 5 months of DMD, we are intrigued by the relationship between the duration of DMD and the survival of the corneal endothelial cells over the detached DM. Vinekar et al¹⁸ reported a case of successful repositioning of DMD even at 14 months after cataract extraction with good visual prognosis. Therefore, it seems that corneal endothelial cells over the detached DM can survive for a long period in the anterior chamber. Consequently, even if DMD has persisted for years, ophthalmologists should try by all means to reattach the DM before proceeding to corneal transplantation.

In conclusion, ophthalmologists should be aware of occult DMD and have a high index of suspicion of this condition in patients presenting with prolonged corneal edema after phacoemulsification surgery before making the diagnosis of PBK. Our cases highlight the importance of increased awareness of this disease entity and the role of anterior segment imaging system, such as AS-OCT or UBM, in the timely diagnosis of DMD-associated severe corneal edema following phacoemulsification surgery and ultimately avoidance of unnecessary corneal transplantation.

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