

Case Report

Descemet Membrane Detachment Triggered by Contrast-Enhanced Computed Tomography in a Patient with a History of Penetrating Keratoplasty for Keratoconus Treatment

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Keywords

Descemet membrane detachment · Penetrating keratoplasty · Keratoconus

Abstract

Introduction: We report a case of late-onset Descemet membrane detachment triggered by contrast-enhanced computed tomography more than 30 years after penetrating keratoplasty for keratoconus and describe its successful treatment with air tamponade. **Case Presentation:** A 53-year-old woman with a history of uneventful penetrating keratoplasty more than 30 years ago for keratoconus presented with acute vision loss caused by corneal edema 2 days after undergoing contrast-enhanced computed tomography. Anterior-segment optical coherence tomography (AS-OCT) revealed corneal stromal edema in the graft and Descemet's fold and partial Descemet membrane detachment without a tear. The patient received 0.1% betamethasone eye drops once every hour, along with sub-Tenon's triamcinolone acetonide injection. Anti-inflammatory treatment improved corneal edema; however, the detachment area widened. Air tamponade facilitated complete Descemet membrane reattachment and improved corneal thickness with complete restoration of visual acuity. **Conclusion:** An immune response may have been involved in the progression of Descemet membrane detachment in this patient. Anti-inflammatory treatment may have facilitated Descemet membrane reattachment prior to air or gas tamponade. AS-OCT is an excellent imaging modality to detect Descemet membrane detachment in eyes with presumed late penetrating graft rejection or failure.

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Introduction

Descemet membrane (DM) detachment is a rare late-onset complication of penetrating keratoplasty (PKP) for keratoconus [1]. Although its mechanism is poorly understood, the efficacy of air or gas tamponade in managing DM detachment has been established. Nevertheless, DM detachment may require regrafting, such as repeated PKP or endothelial keratoplasty, despite repeated air tamponade. This case report describes an unusual case of DM detachment following contrast-enhanced computed tomography (CT) that was successfully managed with air tamponade.

Case Presentation

A 53-year-old woman presented with vision loss in the left eye 2 days after undergoing contrast-enhanced CT. She had a history of undergoing PKP for the treatment of keratoconus in her left eye over 30 years ago. In addition, she was diagnosed with rectal cancer 1 year ago. The patient had undergone rectal cancer resection and required contrast-enhanced CT for postoperative follow-up. After undergoing contrast-enhanced CT as part of the postsurgical examination after the surgical removal of rectal cancer, she experienced pruritus.

Initial examination revealed a best-corrected visual acuity of 20/600 in the left eye. Slit-lamp biomicroscopy and anterior-segment optical coherence tomography (AS-OCT) revealed corneal stromal edema in the graft and Descemet's fold, as well as partial DM detachment without a tear (Fig. 1a). The central corneal thickness was 1,030 mm. Although the inflammatory findings were not clear because of corneal edema, based on the presence of partial DM detachment, whole corneal edema, and the onset of vision loss immediately after contrast-enhanced CT, the patient was diagnosed with graft rejection triggered by contrast-enhanced CT. Treatment with sub-Tenon's triamcinolone acetonide injection and 0.1% betamethasone eye drops once every hour was initiated. The stromal edema improved slightly (central corneal thickness reduced to 830 mm) 2 weeks later, although complete DM detachment with a tear was observed at this point (Fig. 1b). Air tamponade was performed with approximately 70% of air maintained in the anterior chamber, and the patient was instructed to rest in supine position overnight. Slit-lamp examination performed the day after revealed DM reattachment with an improvement in the subjective symptoms (Fig. 1c). However, the patient complained of vision loss 4 days later. AS-OCT revealed detachment of over half of DM (Fig. 1d). Therefore, air tamponade was performed again. The anterior chamber was completely filled with air, and the intraocular pressure was maintained over 30 mm Hg for 5 min. Subsequently, some air was removed such that approximately 80% of air was maintained in the anterior chamber. The patient was instructed to rest in supine position overnight. Corneal stromal edema was found to improve the next day, with 60% of air maintained in the anterior chamber. AS-OCT revealed no detachment 1 week later, and visual acuity improved to 20/25 (Fig. 2). The corneal endothelial cell density was 1,350 cells/mm² 388 days after the second air tamponade.

Discussion

Late-onset complications of PKP, such as endothelial loss, allograft rejection, progressive astigmatism associated with peripheral corneal thinning, and glaucoma requiring corticosteroid administration for the prevention of rejection, are well known. DM detachment after PKP for keratoconus has been reported recently [1–4] and should be differentiated from acute

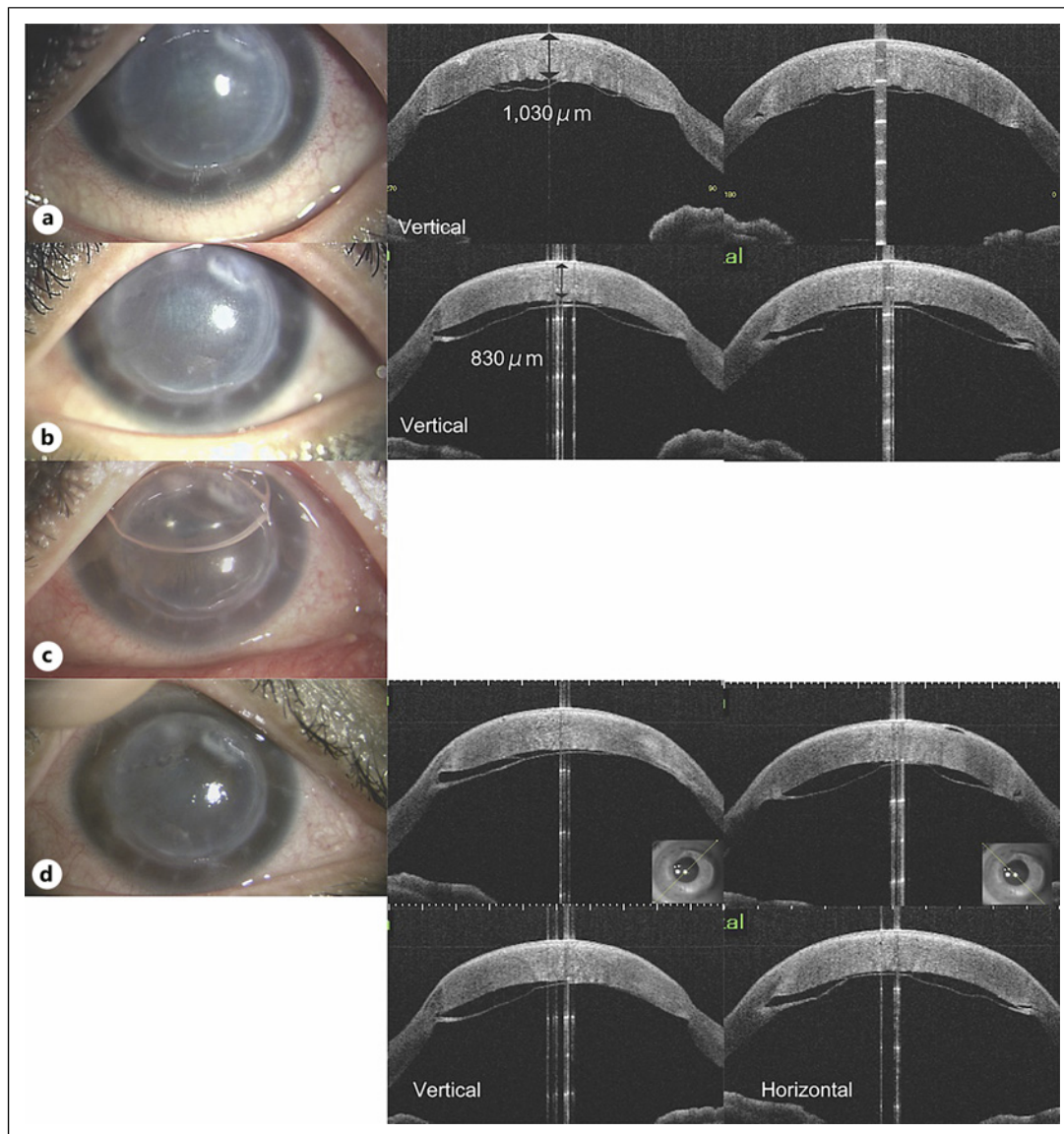


Fig. 1. **a** Slit-lamp examination showing edema of the graft and anterior-segment optical coherence tomography (AS-OCT) showing partial Descemet membrane (DM) detachment with stromal edema. The central corneal thickness (CCT) is 1,030 mm. **b** Although slit-lamp examination shows no changes, AS-OCT shows full DM detachment with improvement in stromal edema. CCT has reduced to 830 mm. **c** Slit-lamp examination showing improvement in the corneal edema with 50% air in the anterior chamber. **d** AS-OCT showing partial DM reattachment in the upper area.

rejection, as a complication that typically occurs 1–3 decades after surgery [2]. DM detachment is characterized by minor symptoms, such as pain and conjunctival redness without intraocular inflammation, and sudden onset. The causes of DM detachment remain unclear, which has led to some speculation. Gorski et al. [1] proposed mechanical changes, retrocorneal membrane development along the graft-host interface, and mechanical traction due to progressive keratoconus on the host side as the causes of DM detachment. Traction of the retrocorneal membrane may also cause mechanical DM detachment [1, 5].

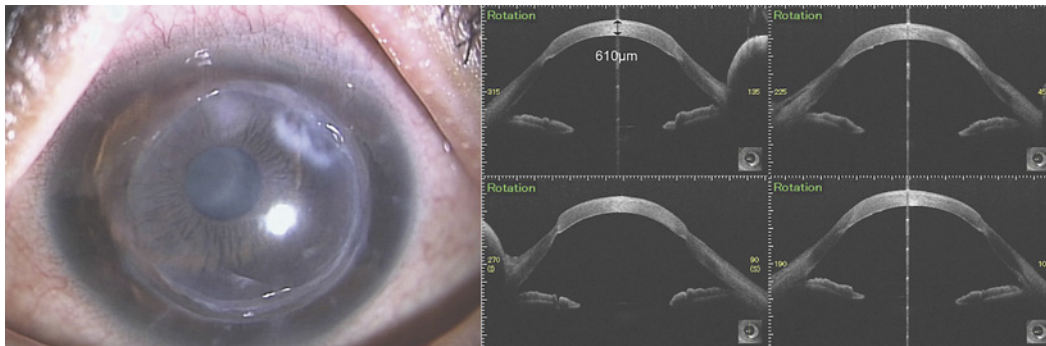


Fig. 2. Slit-lamp examination showing improvement in corneal edema and AS-OCT showing full DM reattachment. The central corneal thickness is 610 mm.

In the current case, DM detachment occurred after undergoing contrast-enhanced CT. Based on the onset of vision loss immediately after contrast-enhanced CT, DM detachment was attributed to the immune response due to allograft rejection in this patient, and anti-inflammatory treatment was initiated first. However, AS-OCT performed after anti-inflammatory treatment revealed widening of the DM detachment area with a slight improvement in stromal edema. Thus, air tamponade was performed repeatedly, leading to the complete DM reattachment. One hypothesis is that the corneal edema was caused by not only DM detachment but also corneal inflammation. Further studies are needed to clarify the precise mechanism.

Several treatment strategies have been introduced for the management of DM detachment after PKP, including observation until spontaneous resolution [2, 6], air or gas tamponade, partial descemetorhexis with air injection [1–3], Descemet-stripping automated endothelial keratoplasty, and repeat PKP [1, 2]. The factors affecting the success of air tamponade remain unclear. Weller et al. [4] examined histological changes using electron microscopy and proposed that migration of cells into the fissure between the anterior banded and posterior non-banded layers would occur if detachment persisted for a longer period. However, it is unclear whether duration of DM detachment affects the outcomes of air and gas tamponade [1, 3]. In the current case, air tamponade was first performed 2 weeks after the onset of symptoms, and the second air tamponade was performed 5 weeks after the onset of symptoms, resulting in complete DM reattachment. Fortunately, DM reattachment was achieved following the second air tamponade. However, SF₆ tamponade after the first failure may have been a better option [3].

This study had limitations. The outcome of the treatment had some unknown variables and currently unclear whether graft rejection was triggered by the contrast agents. Although the patient denied rubbing her eyes when asked, we could not rule out the possibility that she rubbed her eyes because of itching caused by the contrast agent, leading to DM detachment and edema; this mechanism is different from that of typical rejection.

Although the patient received STTA at the symptom onset, it is unclear whether the efficacy of the anti-inflammatory treatment contributed to the improvement after air tamponade. It is possible that an immune response was involved in the progression of DM detachment in this patient. Intensive anti-inflammatory treatments, such as STTA, oral steroids, and topical eye drops, may help improve DM detachment by reducing corneal inflammation. AS-OCT is an excellent imaging tool to detect DM detachment in eyes with presumed late penetrating graft rejection or failure. The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see <https://doi.org/10.1159/000538065>).

Statement of Ethics

This retrospective review of patient data did not require ethical approval in accordance with local/national guidelines. Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Conflict of Interest Statement

D.M. has no financial disclosures to declare. S.I. received lecturer's fees from Kowa and Novartis as well as grants from Chugai outside this work. T.H. has no financial interests to declare. H.K. received lecturer's fees from Otsuka, Senju, Mitsubishi-Tanabe, Kowa, Santen, Novartis, and Zeiss as well as grants from Senju, Linical, DeepEyeVision, HOYA, Santen, Heiwa-Iyou, and Bayer outside this work.

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Author Contributions

D.M. was in charge of the case. S.I. and T.H. were consulted about diagnosis and treatment. H.K. was involved in the pathophysiology study of this case. D.M. and S.I. wrote the manuscript and Figures 1 and 2. All the authors read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are not publicly available due to privacy reasons but are available from the corresponding author upon reasonable request.

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