

## Case Report

# 'Double Bubble' Technique for Successful Reattachment of Total Descemet Membrane Detachment after Deep Anterior Lamellar Keratoplasty

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## Abstract

**Background:** A double anterior chamber may be observed after deep anterior lamellar keratoplasty (DALK) and the management may be difficult especially in cases with a total descemet membrane detachment (DMD). **Case Observations:** We describe a novel "reverse double bubble" surgical technique for safe and effective reattachment of total DMD following DALK. Total DMD with air bubble in the interface was noted on the first postoperative day following DALK for healed keratitis. Intracameral air was injected via a 30-gauge needle inserted through a partial thickness MVR entry made at the posterior limbus, without disturbing the interface air-bubble. During this maneuver, the interface bubble did not change in size and moved towards the centre. The two distinct air bubbles, one in interface and other in anterior chamber indicated that air injection was in the anterior chamber, as per the reverse double bubble technique. The interface air bubble was removed by gently milking with an iris repositor towards the end of surgery. Thus, successful reattachment of DM was achieved despite difficult assessment of the plane of injection with the DM lying flat on the surface of the iris.

**Conclusion:** The reverse double bubble technique aids in the safe and successful reattachment of total DMD following intraocular surgeries.

**Key words:** Descemet membrane detachment, deep anterior lamellar keratoplasty, double anterior chamber

## Introduction

A double anterior chamber (AC) is characterised by the presence of an aqueous filled interface between the donor and the host cornea and

may occasionally be observed postoperatively in cases undergoing deep anterior lamellar keratoplasty (DALK) (Sugita et al, 1997).

Double AC with extensive descemet membrane detachment (DMD) often requires surgical intervention in the form of drainage of interface fluid and intracameral tamponade with air or long acting gases (Sugita et al, 1997, Chow et al, 2013). Due to the limited visibility under the surgical microscope, the management may be difficult especially in cases with a total DMD, and air may inadvertently be injected into the interface instead of the AC.

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We herein describe a simple technique to manage a double AC with complete DMD.

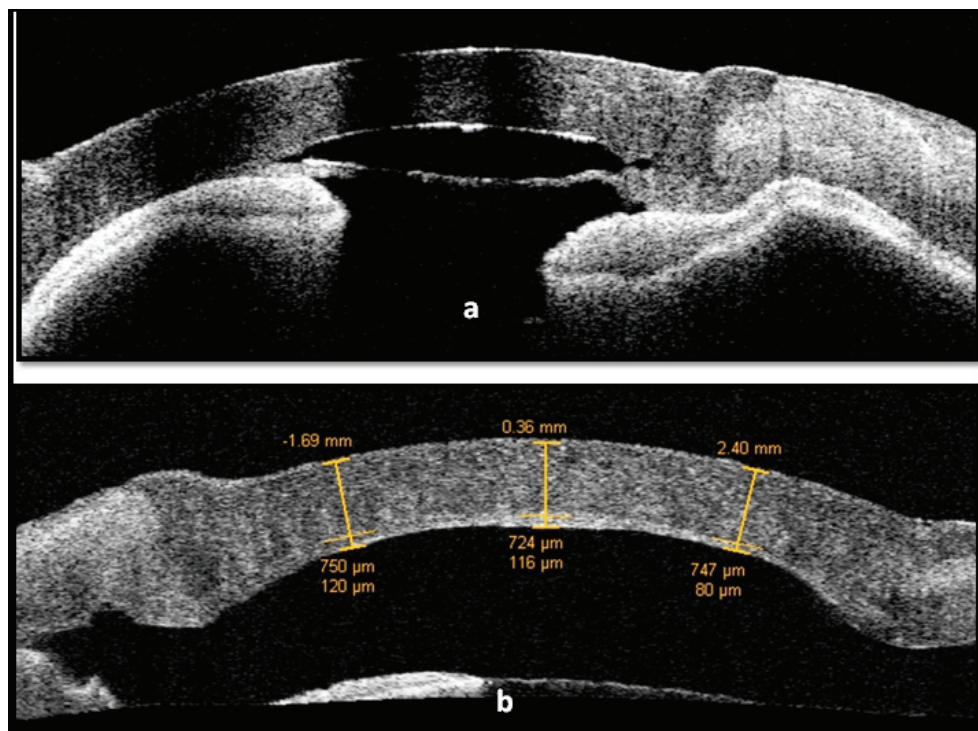
### Case history

A 56-year-old male with healed keratitis in the right eye underwent manual DALK. Layer by layer dissection of the stroma was done in an attempt to reach the pre-descemet plane. A microperforation of the descemet membrane (DM) was noted during deeper stromal dissection in the nasal quadrant. The remnant host tissue (1mm × 1 mm) in that area was left in-situ to act as a bandage. Surgery was completed and air was injected to reform the AC at the end.

On the first post-operative day, slit lamp examination revealed the presence of air bubble in the interface with the DM lying in apposition with the iris. Anterior segment optical coherence tomography (ASOCT)

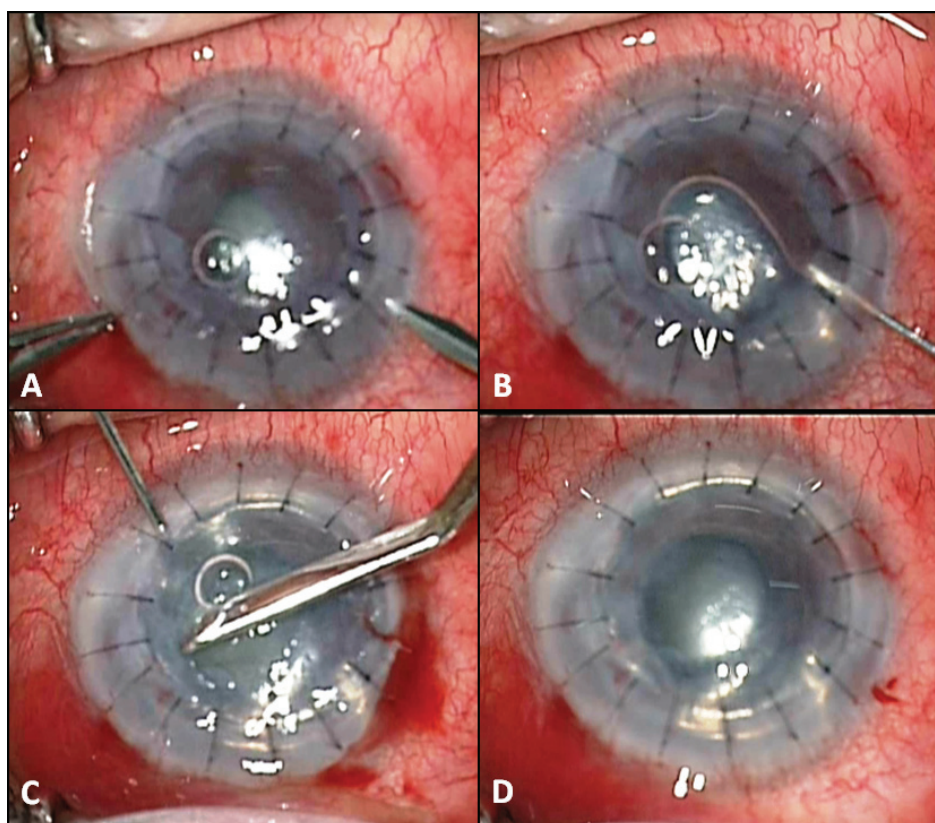
revealed a total DMD with a shallow AC and irido-descemet touch (Figure 1a).

Surgical intervention was planned on the same day. A partial thickness tunnel entry was made at the posterior limbus at 10 o'clock, away from the site of microperforation, using a micro vitreo retinal blade (Figure 2a). A 30-gauge needle mounted on a 5 cc air-filled syringe was introduced bevel down into the AC through the tunnel. The interface air bubble was not disturbed at this stage. Air was injected slowly into the AC. The smaller interface bubble remained static in size with movement towards the centre. A larger bubble beneath the small bubble was clearly visualized, which confirmed the presence of air in the AC below the detached DM (Figure 2b). Subsequently, the AC was completely filled with air. The small bubble in the interface was removed by gently milking it out using iris repositor and pressing down the



**Figure 1:** (a) Pre-operative ASOCT showing total descemet membrane detachment with irido- descemet touch and flat anterior chamber

(b) Post-operative ASOCT confirming re-attachment of descemet membrane



**Figure 2:** (a) Partial thickness MVR entry made at the posterior limbus  
 (b) Visualization of larger intracameral air bubble beneath the central interface air bubble - “reverse double bubble”  
 (c) Milking out of the interface air bubble with an iris reposer  
 (d) Complete air fill in anterior chamber with re-attachment of the descemet membrane

graft host junction in an area away from the site of perforation (Figure 2c). The complete air tamponade was maintained for 5 minutes by AC decompression to maintain a two-third air fill (Figure 2d). A strict supine position was advised for the next 8 hours.

On the first post-operative day, the DM was firmly attached to the overlying stroma. Graft remained clear with no interface air or fluid on ASOCT (Figure 1b). After 3 months, the best corrected visual acuity was 20/30. Graft clarity was 4+ with the DM firmly attached to the overlying stroma.

### Discussion

Early repair of DMD has been advocated since the DM becomes increasingly rigid with time and thus is less likely to be successfully repositioned (Passani et al, 2017, Walland et al, 1995). Various management options have been described for postoperative DMD. A rolled DM scroll may be unrolled by viscoelastic injection, replaced by saline and finally by gas (Chow et al, 2013). Gas tamponade may be followed by direct suture fixation (for planar detachments) or full-thickness sutures securing the membrane edge combined with



transcameral mattress suture fixation (for nonplanar detachments) (Walland et al, 1995). In our case, air tamponade was used to treat the DMD. However, inadvertent injection of air into the interface may lead to further separation of the remaining attached DM (Radhakrishnan et al, 2005).

Various techniques are employed to avoid an inadvertent entry into the interface during management of a double AC. The DM terminates at the mid-limbal Schwalbe's line, and a posterior limbal entry helps avoid an entry into the interface. Wylegela et al (2009) used ASOCT as a guide to avoid the area of DMD during entry into the AC.

In our case, the interface air bubble acted as a guide for the intracameral air injection. The interface air bubble remains static in size and moves to the centre during injection to form the AC. The two separate bubbles could be distinctly made out during the intracameral air injection. The double bubble technique has been described by Shimazaki (2010) to facilitate DM exposure in DALK. We have named this technique the "reverse double bubble", since the double bubble provides a definite indication that the needle is beneath the DMD. In cases not having an air bubble in the interface, a small air bubble can be injected into the interface through the host-graft junction to facilitate accurate intracameral injection of air/gas.

Our technique is specifically useful in cases with a total DMD after intraocular surgery and reduces the need for repeated interventions.

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