·Brief Report·

Descemet´s membrane detachments post cataract surgery: a management paradigm

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Abstract

• **Descemet´s membrane detachments (DMD) are relatively common after cataract surgery and most do not require any treatment. However, if large DMD are not treated appropriately, significant visual morbidity can ensue. We aim to develop a guideline for the management of DMD post cataract surgery based on a retrospective review of all cases encountered at the Royal Victorian Eye and Ear Hospital, Melbourne, Australia over a 4-year period from 2010 to 2014. We suggest conservative management if the visual axis is not involved; however, after 3mo surgical intervention may be warranted to prevent corneal sequelae. In cases where the visual axis is involved we suggest early intervention with air tamponade. The main risk factor for irreversible corneal oedema and subsequent endothelial transplant appears to be direct endothelial trauma rather than the DMD itself.**

• **KEYWORDS:** Descemet's membrane detachment; Descemet's membrane; anterior segment optical coherence tomography
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INTRODUCTION

Descemet's membrane detachment (DMD) is relatively common, occurring in up to 43% of cataract operations[1]. Most are small, peripheral detachments at the site of corneal incisions and are clinically insignificant, resolving without further intervention. Only 0.5% are large and involve the central cornea[2] and up to 8% of these subsequently require a corneal transplant to regain corneal clarity [3-4]. We present a case series of DMD encountered by our corneal unit at a tertiary referral hospital in Melbourne, Australia.

METHODS

A retrospective review was performed of cases of DMD following phacoemulsification surgery referred to the corneal unit at the Royal Victorian Eye and Ear Hospital, Melbourne, Australia, between 2010 and 2014. Ethics approval was obtained through the Hospital and the study adhered to the tenets of the Declaration of Helsinki. Slit-lamp photography (Haag-Streit, Germany) and anterior segment optical coherence tomography (AS-OCT; Zeiss, Germany) images were also obtained.

RESULTS

Demographics Patient demographics are shown in Table 1. Seven cases were identified of which 4 were female and 3 male. The average age was 75 (range 51-90)y. Three patients had a pre-operative diagnosis of corneal guttata. All patients had phacoemulsification surgery with clear corneal incisions on virgin eyes. There were no complications of cataract surgery such as posterior capsular tear or vitreous loss. All cases had the intraocular lens placed within the capsular bag.

Mechanism of Descemet´s Membrane Detachment All 7 cases were caused by intra-operative trauma from instrument insertion into a corneal wound creating a DMD.

Location of Descemet´s Membrane Detachment

Peripheral Descemet´s membrane detachment Two cases of peripheral DMD (not involving the visual axis) were recorded. These were managed conservatively with the DMD resolving spontaneously by 6wk with final best spectacle corrected visual acuity (BSCVA) of 20/20 and 20/30.

Example (Case 1; Figure 1): a 91 year-old female with corneal guttata underwent routine left eye cataract surgery. Post operatively her BSCVA was 20/60 with a peripheral DMD originating from the site of the temporal clear corneal incision and extending superiorly, with overlying corneal oedema. The DMD resolved spontaneously over 3mo. Final BSCVA was 20/30, with mild macula pathology limiting visual acuity.

Central Descemet´s membrane detachment Five cases of central DMD (involving the visual axis) were identified. These cases had more variable visual outcomes due to the configuration of the DMD and delayed recognition of the DMD postponing management. Three cases had subsequent irrigation/aspiration (I/A) injuries where the DMD was

Table 1 Patient demographics and characteristics of cases presenting with a post operative Descemet's membrane detachment

Patient	Age (a)	Gender	Corneal pathology	Location of DMD	Primary treatment for DMD	Subsequent treatment for DMD	BSCVA post phaco	Final BSCVA
1	91	F	CG	Peripheral (main wound)	Observation	Nil	20/60	20/30
2	78	M	Nil	Peripheral (main wound)	Observation	Nil	20/50	20/20
3	50	F	CG	Central (main wound)	Air bubble (day 3 postop.)	Nil	20/120	20/20
4	84	F	CG	Central (main wound)	Air bubble (6mo postop.)	DSAEK	20/400	20/25 (post DSAEK)
5	87	M	Nil	Central (irrigation/aspiration)	Air bubble (day 1 and 2 postop.)	Nil (elected not to undergo further surgery)	20/400	CF (20/25 6wk post second air bubble then deteriorated)
6	64	M	Nil	Central (irrigation/aspiration)	DSAEK	Nil	HM	20/25
7	74	F	Nil	Central (irrigation/aspiration)	DSAEK	Nil	HM	20/40

BSCVA: Best spectacle corrected visual acuity; CF: Counting fingers; DSAEK: Descemet's stripping automated endothelial keratoplasty; DMD: Descemet's membrane detachment; CG: Corneal guttata; HM: Hand movements.

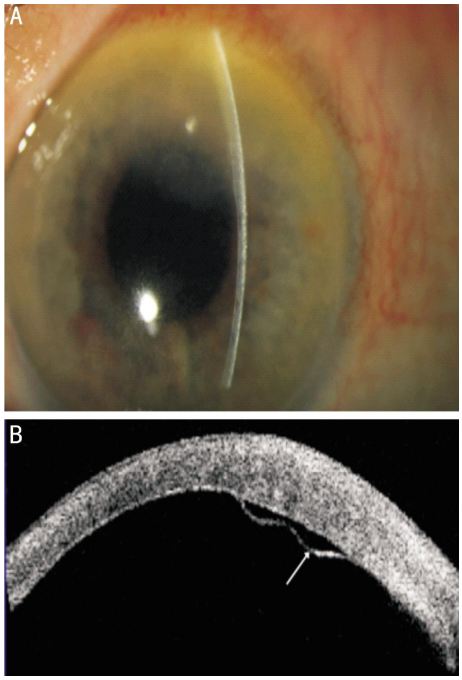

Figure 1 Peripheral Descemet´s membrane detachment of Case 1 A: Slit lamp photograph with corresponding; B: Anterior segment OCT.

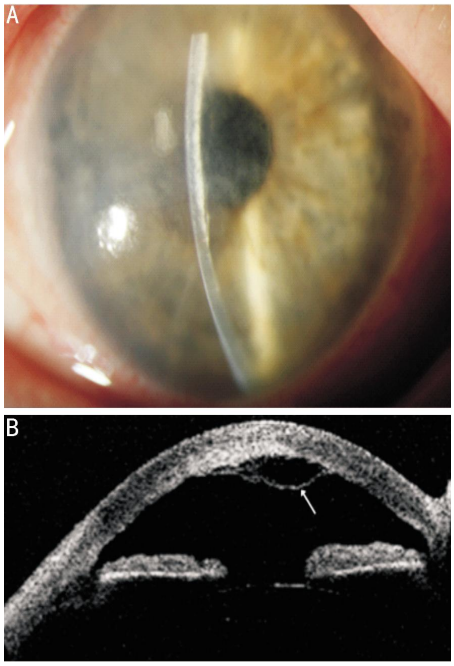

Figure 2 Early detection of central Descemet´s membrane detachments of Case 3 A: Slit lamp photo; B: Anterior segment OCT image.

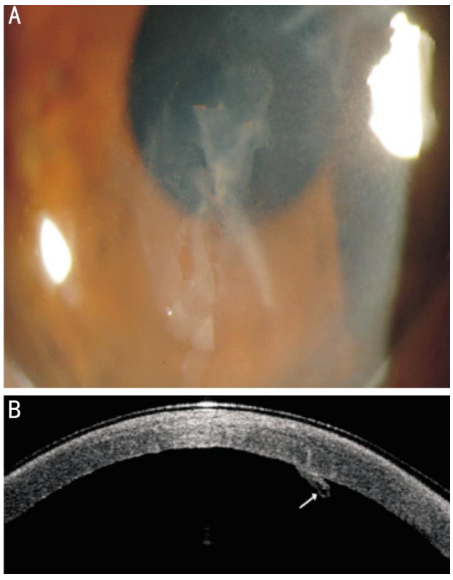

Figure 3 Central Descemet´s membrane detachments of Case 4, late recognition with a scrolled Descemet´s membrane A: Slit lamp photo; B: Anterior segment OCT image.

inadvertently aspirated during I/A, resulting in a large detachment and presumed severe endothelial cell trauma. All cases developed persistent corneal oedema that would require endothelial transplantation for visual rehabilitation.

Example 1 (Case 3; Figure 2): a 50 year-old female developed a DMD that was identified 3d following cataract surgery with BSCVA 20/120. This was managed with air tamponade as described in the Discussion. The DMD subsequently resolved and six weeks following the air tamponade BSCVA improved to 20/20.

Example 2 (Case 4; Figure 3): an 84 year-old female presented 6mo following cataract surgery with a scrolled Descemet's membrane (DM) flap. Her BSCVA was 20/400. Air bubble tamponade was attempted using the technique described below; however, the DM scroll did not unravel and her visual acuity did not improve. She subsequently underwent Descemet's stripping automated endothelial

keratoplasty (DSAEK) and her BSCVA 12mo post operatively was 20/25.

Example 3 (Case 5): an 87 year-old male underwent cataract surgery. When removing the ophthalmic viscoelastic device the surgeon inadvertently aspirated DM creating a large central DMD. An air bubble was immediately placed following the procedure but the DMD persisted on review the following day. A repeat air bubble tamponade was performed on the second postoperative day using the technique described below. The patient's BSCVA improved significantly over the post-operative period from 20/400 to 20/25 following reattachment of the DM and resolution of the corneal oedema. However, after 6mo, the visual acuity declined to "count fingers", presumably from endothelial attrition following the severe trauma induced by the I/A injury. An endothelial transplant was recommended for visual rehabilitation.

DISCUSSION

This case series highlights the varied presentations of DMD that can be encountered during phacoemulsification surgery. All were caused by instrumentation injuries with a significant proportion occurring in patients with corneal guttata, an observation commented on in the literature [5] and matching the ease of DM stripping during DSAEK that we have noted intraoperatively. We propose a guideline for clinicians to help determine the appropriate management for this complication of intraocular surgery.

Detachments were previously classified by Mackool and Holtz[6] as planar (DM and stromal separation less than 1 mm) and non-planar (DM and stromal separation greater than 1 mm). It was suggested that planar detachments may spontaneously resolve while non-planar detachments were less likely to reattach. The size or location of the detachment were not included in this classification system; however, larger detachments are more likely to involve the visual axis and be non-planar. The concept of a scrolled versus non-scrolled DMD has also been introduced[7]. A non-scrolled detachment may spontaneously reattach if observed for an adequate duration.

While these classification systems provide clinicians with guidance on the likelihood of spontaneous reattachment, they do not provide guidelines to determine whether surgical intervention is indicated or the timing for intervention. Modern day cataract surgery in many ways can be considered a refractive procedure, with high patient expectations for rapid visual recovery [8]. A DMD carries the risks of delayed visual rehabilitation as well as bullous keratopathy, which can cause pain and increase the risk of microbial keratitis and corneal scarring. Thus, prolonged observation of a central, planar detachment may not be ideal, highlighting the limitations of the existing classification systems and the need to modify it to better reflect the management strategies available to clinicians.

We propose classifying DMD into two categories: peripheral and central. Peripheral DMD are small, with minimal central corneal oedema and therefore conservative management can be adopted. We suggest observation for up to 3mo, balancing the risks of surgical intervention against the risks associated with prolonged corneal oedema. If the DMD is central, or resultant corneal oedema involves the visual axis we advocate early surgical intervention to re-oppose the DM to the overlying stroma. We suggest using a 100% air fill tamponade for 10min, followed by a air-fluid exchange leaving 80% residual air, dilating the pupil (to avoid pupil block) and positioning the patient supine for 2h. This is a common technique in DSAEK surgery to attach the endothelial lenticule and has been utilized to good effect to reattach DMD [5,8-10]. This classification simplifies the description and management of DMD. Alternatives to air tamponade include SF6 and C3F8[11-12]. Scheimpflug and high resolution optical coherence tomography imaging is an extremely useful tool in helping to delineate the extent of the DMD[9-10].

Prognostically, rather than size or position of the DMD, we found the degree of endothelial cell trauma was a better indicator of the likelihood of irreversible corneal oedema from endothelial cell failure. Four cases in our series had substantial endothelial trauma. Case 5 demonstrated the natural history of severe endothelial trauma. Immediately after reattachment of the DMD the BSCVA improved dramatically, but later decreased due to endothelial cell attrition.

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Conflicts of Interest: Samarawickrama C, None; **Beltz J,** None; **Chan E,** None.

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