**Title**: Complication of pre stripped DMEK

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Pre stripped DMEK

Introduction

Descemet Membrane Endothelial Keratoplasty (DMEK) is the first true posterior lamellar corneal graft, replacing the diseased Decemets and Endothelium with like for like tissue. Since its introduction to the ophthalmic community by Melles et al

1, DMEK has been increasingly adopted and the advantages over Descemet Stripping Endothelial Keratoplasty have been well demonstrated

2. However despite the obvious benefits, DMEK remains only the second most commonly perform form of endothelial keratoplasty

3. This is resultant from the steep learning curve in both DMEK surgery and also graft preparation

4 with reported loss of graft tissue of in 4.2-8% of preparations

5,6 . As a consequence re-stripped DMEK has become increasingly popular in recent years and many eye banks providing this service with loss of tissue is now reported in <1% in the hands of experienced surgeons/technicians 7. We receive a proportion of our DMEK tissue pre-stripped from the Venice Eye Bank (Address). The tissue comes trephined to 9.5mm and is already partially peeled and left on a hinge (figure 1a). Additionally, following partial stripping technicians at eye bank are able to create a 2mm punch though the stomal bed of the cornea to mark the graft with an “F” for orientation (1b), prior replacing the 2mm stroma punch to compete the cornea scleral disc (1c)

8. The 9.5mm trephination used in the eye bank allows for further trephining in the operating theatre on with a suction or similer trephine the corneo-scleral disc to a smaller desired custom diameter for the recipient eye. Following this the graft can be fully stripped, stained and implanted into the anterior chamber with the surgeons desired injector. We have found pre-stripped DMEK reduces tissue loss compared to surgeon preparation and increases efficiency in our operating room (unpublished data). However is not without its own unique sequalae compared to unprepared tissue. Here we 2 main intraoperative complications you can face using a prestripped DMEK

**Free floating pre-stripped DMEK tissue**

Although uncommon as pre-stripped grafts are only partially peeled, we have encountered at least 3 incidences of a free floating pre-stripped DMEK graft. Following pouring of the corneo-scleral disc from the transport solution it was noted that the DMEK was not attached to the disc on its unpeeled hinge as would have been expected. The transport solution was examined using a secondary non-axial light source from a endo-illuminator. Once the graft was identified within the transport medium-floating freely graft, it was retrieved using a tying forcep (make) and placed onto the centre of the corneo-scleral disc where it appeared folded (see figure 2a). As the pre-punched the graft was 9.5mm in diameter and deemed too large for the recipient eye, the DMEK graft needed to be re-trephined. In order to achieve this we would need to unfold the graft on the corneo-scleral disc with minimal trauma. We did this with a non-touch technique. Balanced salt solution (BSS) was used to manipulate the graft and pre wet Miracel sponges (make) were used the to drain the BSS creating a capillary action as the BSS was drained. These forces were used at each margin of the graft and were sufficient to unfold it. Once unfolded, it was repositioned on the centre of the corneo-scleral disc flat with the endothelial side upwards using forceps (see fig 2b) and re-trephined it to the desired 8.25mm using a Moria suction trephine (make) (see figure 2c). Following this the graft was stained and the rest of the case proceeded as planned.

**Mis-positioned pre-stripped DMEK tissue**

Although a free floating graft is rare as the graft is partially stripped and left on a hinge, mis-position of the free portion of the graft on the corneo-scleral disc is more frequently encountered. In a case of ours following pouring of the corneo-scleral disc, it was noted the cap of the 2mm cap which would normally be replaced in the corneo-scleral disc following marking was missing (see fig 1b). To complicate matters the DMEK had partially fallen though this hole in the absence of this cap (figure 3a). The pre-punched to 9.5mm diameter of the graft was deemed too large for the recipient eye which meant it was desirable to reposition the graft and re-trephine. On this occasion we would have to use forceps to manipulate the graft. Tying forceps (make) were selected to pull the DMEK graft from its edge. We accepted this would result in loss of peripheral endothelial cells however given the larger than desired diameter of the graft we planned to remove this peripheral edge later. The graft was successfully retrieved it from the hole (see figure 3b) and subsequently forceps, BSS and Miracel sponges (make) we were used to position the graft flat on the corneo-scleral disc as described in the free floating graft. Trephining was then carried out on a Moria suction trephine however in light of the absence of the 2mm cap, suction was not used on this occasion to avoid the DMEK being sucked though the hole again. The graft was successfully trephined to 8.5 mm removing peripheral edge that had been manipulated by the forceps (see figure 3c) and surgery thereon proceeded as planned.

Discussion

Pre-stripped DMEK carries obvious advantages over unprepared cornea-scleral discs. The time and tissue sparing benefits outweigh the infrequent complications for many surgeons. However it is noteworthy that unique complications can present as results of pre-prepared tissue such as the free floating and mis-positioned graft we have encountered. By using a non-axial light source such as the endo-illuminator; an adaptation we have taken from the technique described by Jacob et al we were able to identify the unstained free floating graft within the transport solution

9 . This technique was used as the unstained graft was difficult to visualise in the pink transport solution with the co-axial microsope lamp illumination and a non-axial light source provides better visualisation. Following this using non-touch manipulation techniques using BSS and Miracel sponges allowed us to reposition the graft, minimising trauma before trephining. In the case of the mis-positioned graft secondary to the missing 2mm cap, we found that by manipulating only the periphery of the graft with forceps avoided undue damage to the transplanted endothelial cells and avoiding the use of suction the graft could still be cut to the desired diameter before implanting. In the future it may be desirable for the eye banks to consider other means of marking to avoid this such as the asymmetrical trephine described by Bhogal et al10. However we have learnt from our experience that with these additional steps the desired surgical outcome can still be being achieved despite these complications encountered in pre-stripped DMEK grafts.

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