

A simplified *ex vivo* model to learn the correct orientation of Descemet membrane endothelial graft

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We describe a simple, endoilluminator-assisted technique, which enables an easy identification of the descemet membrane endothelial keratoplasty graft orientation, as well as provides its good visualization in the anterior chamber, during all the steps of surgery in the wet lab.

Key words: Anterior chamber maintainer, descemet membrane, descemet membrane endothelial keratoplasty

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Descemet membrane endothelial keratoplasty (DMEK) has emerged as a good alternative for the treatment of corneal endothelial dysfunction.^[1] For the novice surgeons, the main challenge in this procedure is the difficulty in donor graft preparation due to its fragility, correct orientation, insertion, and unfolding into the mounted eye.^[2]

Graft orientation is a crucial step in DMEK, as the insertion of an inverted graft can result in the graft failure. Various methods, such as staining the graft with trypan blue, marking, "S" stamp, and use of intraoperative anterior segment optical coherence tomography (AS-OCT) have been described to achieve correct graft orientation.^[3,4] Mastering this crucial step may pose a challenge to the novice surgeons especially during their initial learning phase. Surgical wet labs are a good means of acquiring the procedure-specific manual skills, before undertaking a new procedure in a patient.^[5,6]

We describe a simple, endoilluminator-assisted technique, which enables an easy identification of the DMEK graft orientation, as well as provides its good visualization in the anterior chamber, during all the steps of surgery in the wet lab. Jacob et al have described endoilluminator assisted DMEK in a case of bullous keratopathy, which helps in visualization of the graft intraoperatively.^[7]

Technique

We have designed a wet lab model that includes a donor corneoscleral disc mounted onto an artificial anterior

chamber (AAC) (CORONET ® Network medical products, UK).

One of the ports is attached to an intravenous (IV) tubing, which is connected to a bottle containing balanced salt solution, raised on an IV stand. This model closely mimics physiological human eye conditions, allowing the beginners to learn the correct orientation and unfolding of the DMEK grafts. A donor graft of 7.5–8 mm size is prepared, stained with trypan blue, and loaded into the injector. From a 3.2 mm size limbal incision, the graft is injected into the anterior chamber with the help of an injector into the mounted corneo-scleral disc [Fig. 1a]. The wound is sutured with 10-0 nylon suture to prevent the graft expulsion. The endoilluminator probe (20-, 23-, or 25-gauge tip) is used as an oblique source of illumination, to enhance the visualization of the DMEK graft [Fig. 1b]. the tangential light provided by the endoilluminator highlights the orientation of the descemets membrane in relation to the corneal stroma. The tip of the light probe is moved around the limbus while it is focused tangentially, to allow a good visualization and have a three-dimensional perception [Fig. 1c]. The direction of curvature of the graft edges and its orientation is confirmed by tapping the mounted cornea gently and appreciating the reflexes created by the light bouncing off the graft edges, as well as by appreciating the movement induced in the graft. Because of the elasticity of DM roll, the graft edges tend to scroll, with the endothelial side outside. A graft with its edges

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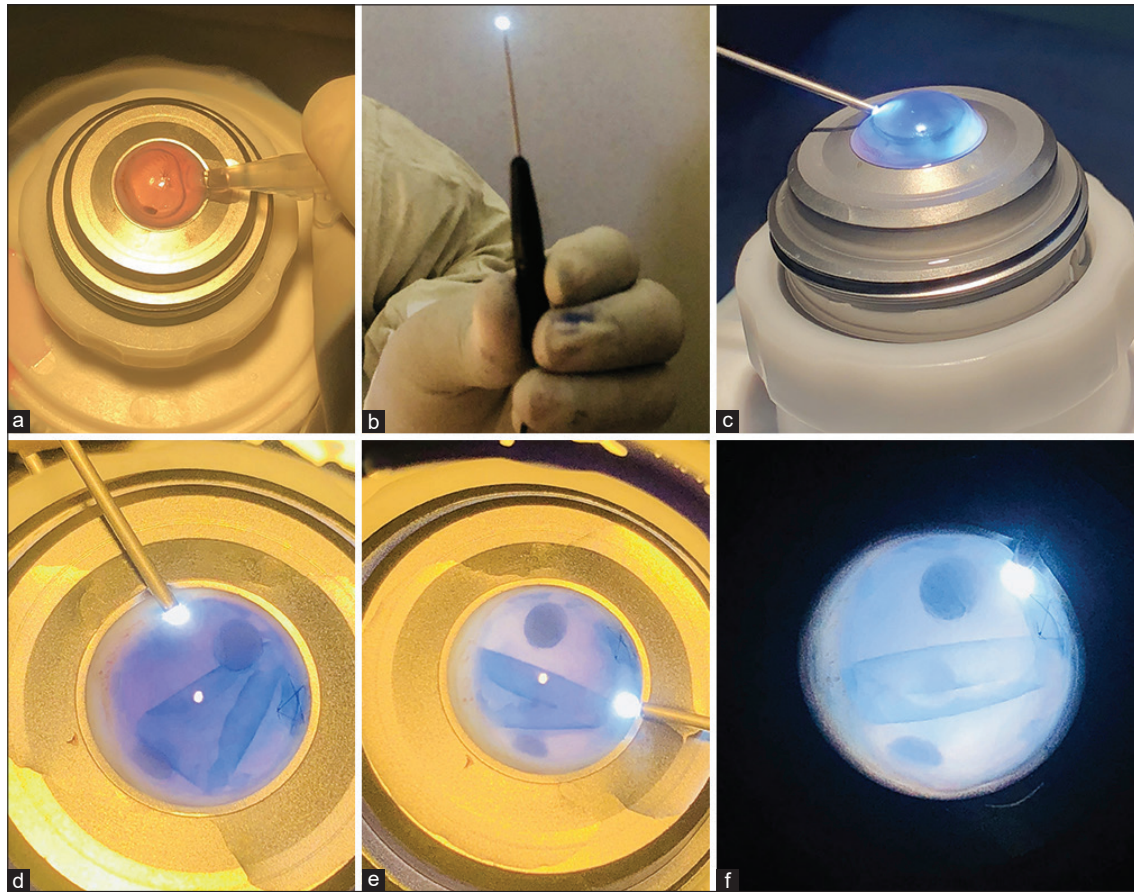


Figure 1: (a) Injection of the DM roll into the anterior chamber maintainer (AAC). (b) 23 G Endoilluminator with light at the tip. (c) Endoilluminator tip put at the limbus on the AAC. (d and e) DM roll with right orientation inside the AAC clearly seen by the reflection of the Endoilluminator light. (f) DM roll seen better with switching off the microscope and room lights

scrolling towards the mounted cornea (upward) is an important sign to know that the tissue is oriented the “right way up” [Figs. 1d and e]. Visualization can be further enhanced by switching off the room and microscope lights [Fig. 1f]. Using Endoilluminator, the graft is seen to be oriented the right way up so the edges curl upward and then centred under the stripped recipient site, after which an air bubble is injected under the graft to float it up against the overlying stroma.

This wet lab model of mounting a corneoscleral disc on an AAC closely mimics human eye conditions, allowing learning to unfold and correctly identify the DMEK graft orientation. Hence, technique can be replicated and adopted in human eyes by holding the Endoilluminator tip tangentially at the limbus which helps to identify the correct graft orientation especially in edematous, hazy corneas where a DMEK is performed. This aids the surgeon to reduce the operating time considerably, thereby decreasing the graft manipulation and subsequent endothelial damage.

In our experience, the use of Endoilluminator for the identification of a correct DMEK graft orientation is a cost-effective, novel technique in a tertiary eye care setting and can be easily learned by the novice surgeons to refine their skills and build up the confidence.

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Conflicts of interest

There are no conflicts of interest.

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