

Confounding factors influencing the scroll width of Descemet membrane endothelial keratoplasty graft

Dear Editor,

New challenges have emerged with increasing interest in Descemet's membrane endothelial keratoplasty (DMEK) graft preparation and transplantation. Multiple studies report confounding factors that influence scrolling and un-scrolling of DMEK graft, which is one of the crucial factors determining the success rate of a DMEK transplant. Some of these factors are reported as follows –

- a. *Endothelial cell count and type of surgical manipulation.* Descemet's membrane (DM), as a product of corneal endothelial cells, has been reported to be thicker in donors with high endothelial cell counts (ECC), thus contributing toward the unfolding time by making the tissue scroll tighter. In fact, in recent studies, spontaneous unfolding of the graft has been reported with pre-ECC of 2500-2800 cells/mm²; pre-loaded tissue with endothelium inward transplanted using bi-manual pull-through technique^[1] compared to a longer unfolding time (5.4 minutes) with pre-ECC of 2900 cells/mm²; loaded with endothelium inward and transplanted immediately without additional storage.^[2] This suggests that ECC or the method of storage and transplantation could influence graft unfolding time inside the recipient eye. In our previous report, we observed approximately 4% endothelial cell loss (ECL) when a pre-loaded DMEK graft was stored for 20-96 hours.^[3] This manipulation influences the ECC and may also affect the DMEK scroll tendency especially from pre-loaded tissues compared with surgeon prepared grafts.
- b. *Age of donors.* Tissues from young donors have been found to scroll tighter than the old aged donors (>60 years of age).^[4]
- c. *Tissue storage media and conditions.* Type (hypothermic or organ culture), composition, storage temperature, days and in particular, storing DMEK tissues at higher temperature have shown increased scroll width.^[5]
- d. *Composition of DM.* In relation to tissue's elastic properties, impact of storage media and conditions of collagen and elastin in the banded and non-banded zones of DM has

also been reported to have an impeding effect on DMEK scrolling and unscrolling.^[6]

- e. *Speed of peeling.* DMEK graft, when peeled slowly has shown to reduce the chance of tighter scrolls but increases ECL.^[7]
- f. *Recipient factors.* Small or shallow anterior chamber, aphakic eyes, previous posterior segment surgery or interference due to implanted devices like intraocular lens or a glaucoma tube have also been reported.^[8]
- g. *Other eye bank factors:* In our experience, we have observed that donor variability, characteristics and tissue manipulation in the eye bank may also account toward the unfolding time.

Limited literature and studies describe the scrolling and unscrolling/unfolding of the DMEK graft. Therefore, in order to further optimize DMEK surgery, it would be important to collect and report information like donor data such as pre-transplant ECC and age; tissue characteristics such as diameter of the graft, storage methods and conditions including the device used for pre-prepared DMEK grafts and; surgical considerations such as devices, methods of transplantation and recipient's anterior chamber status.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

**Mohit Parekh, Stefano Ferrari¹, Luca Pagano²,
Martina Angi³, Kunal A Gadhvi², Vito Romano²**

Institute of Ophthalmology, University College London, London,
²St. Paul's Eye Unit, Royal Liverpool University Hospital,
Liverpool, UK, ¹Fondazione Banca degli Occhi del Veneto Onlus,
Venice, ³Department of Surgery, Fondazione IRCCS Istituto
Nazionale dei Tumori, Milan, Italy

Correspondence to: Dr. Mohit Parekh,
Institute of Ophthalmology, University College London, 11-43 Bath
Street, London, EC1V 9EL, UK.
E-mail: m.parekh@ucl.ac.uk

References

1. Busin M, Leon P, D'Angelo S, Ruzza A, Ferrari S, Ponzin D, et al. Clinical outcomes of preloaded Descemet membrane endothelial

- keratoplasty grafts with endothelium Tri-folded inwards. *Am J Ophthalmol* 2018;193:106-13.
2. Price MO, Lisek M, Kelly M, Feng MT, Price FW Jr. Endothelium-in versus endothelium-out insertion with Descemet membrane endothelial keratoplasty. *Cornea* 2018;37:1098-101.
 3. Parekh M, Ruzza A, Ferrari S, Busin M, Ponzin D. Preloaded tissues for Descemet membrane endothelial keratoplasty. *Am J Ophthalmol* 2016;166:120-5.
 4. Bennett A, Mahmoud S, Drury D, Cavanagh HD, McCulley JP, Petroll WM, *et al.* Impact of donor age on corneal endothelium-Descemet membrane layer scroll formation. *Eye Contact Lens* 2015;41:236-9.
 5. Koo EH, Eghrari AO, Meshkin RS, Shi W, Feuer WJ, DeMarco KG, *et al.* Effects of temperature and fluid media on the scroll width size of the Descemet's membrane endothelial keratoplasty (DMEK) donor graft. *Clin Ophthalmol* 2017;11:1611-5.
 6. Moshirfar M, Jarstad A, Khalifa YM. Descemet membrane endothelial keratoplasty: Why does the donor tissue roll? *Cornea* 2013;32:e52-3.
 7. Borroni D, Gadhvi K, Wojcik G, Pennisi F, Vallabh NA, Galeone A, *et al.* The influence of speed during stripping in Descemet membrane endothelial keratoplasty tissue preparation. *Cornea* 2020;39:1086-90.
 8. Liarakos VS, Dapena I, Ham L, Korine VD, Melles GRJ. Intraocular

graft unfolding techniques in descemet membrane endothelial keratoplasty. *JAMA Ophthalmol* 2013;131:29-35.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_2642_20

Cite this article as: Parekh M, Ferrari S, Pagano L, Angi M, Gadhvi KA, Romano V. Confounding factors influencing the scroll width of Descemet membrane endothelial keratoplasty graft. *Indian J Ophthalmol* 2021;69:461-2.

© 2021 Indian Journal of Ophthalmology | Published by Wolters Kluwer - Medknow