

ARCHIVOS DE LA SOCIEDAD
ESPAÑOLA DE OFTALMOLOGÍAwww.elsevier.es/oftalmologia

Short communication

Spontaneous corneal clearance after graft
detachment in DMEKL. Fernández-Vega-Cueto^{a,*}, C. Lisa^a, K. Vasanthanathan^b, D. Madrid-Costa^a,
J.F. Alfonso^a, G.R.J. Melles^b^a Instituto Oftalmológico Fernández-Vega, Oviedo, Asturias, Spain^b Netherlands Institute for Innovative Ocular Surgery, Rotterdam, The Netherlands

ARTICLE INFO

Article history:

Received 23 July 2022

Accepted 4 November 2022

Available online xxx

Keywords:

DMEK

Graft detachment

Spontaneous corneal clearance

ABSTRACT

Descemet Membrane detachment is a potential complication after Descemet Membrane Endothelial Keratoplasty (DMEK). Here, we present a unique case of a DMEK surgery in a complicated eye that suffered a nearly complete DMEK graft detachment and later a graft opacification with a pseudo-anterior chamber. In Mid-November 2020, a planned DMEK was performed in a 64-year-old male patient due to corneal decompensation. Four months after DMEK, a fibrotic DMEK graft was seen across the anterior chamber with a pseudo-anterior chamber; however, the recipient cornea showed complete clearance with an endothelial cell count of about 1204 cells/mm² and a best-corrected visual acuity of 20/25. Three months later, we observed a significant opacification of the detached graft, and the best-corrected distance visual acuity decreased to 20/63. We proceeded with the graft removal without performing a second DMEK. Ten months after graft removal, the cornea remained clear with an endothelial cell count of about 510 cells/mm², and the best-corrected visual acuity was 20/25.

© 2022 Sociedad Española de Oftalmología. Published by Elsevier España, S.L.U. All rights reserved.

Aclaramiento corneal espontáneo tras desprendimiento del injerto en
DMEK

RESUMEN

El desprendimiento de la membrana de Descemet es una complicación potencial tras la queratoplastia endotelial de la membrana de Descemet (DMEK, acrónimo en inglés de after Descemet Membrane Endothelial Keratoplasty). En este artículo, presentamos un caso clínico de una cirugía DMEK en un caso complicado, que sufrió un desprendimiento casi completo del injerto y posteriormente una opacificación de éste y la formación de

Palabras clave:

DMEK

Desprendimiento del injerto

Aclaramiento corneal espontáneo

* Corresponding author.

E-mail address: lfvc@fernandez-vega.com (L. Fernández-Vega-Cueto).<https://doi.org/10.1016/j.oftale.2022.11.006>

2173-5794/© 2022 Sociedad Española de Oftalmología. Published by Elsevier España, S.L.U. All rights reserved.

una pseudo-cámara anterior. En noviembre del 2020, se realizó una cirugía DMEK a un paciente de 64 años debido a una descompensación endotelial. Tres meses después del DMEK, se observó el injerto desprendido y parcialmente adherido, fibrótico en la cámara anterior y formando una pseudo-cámara anterior. Sin embargo, la córnea se mantuvo totalmente transparente con un recuento endotelial de aproximadamente 1204 células/mm² y la agudeza visual con corrección fue 20/25. Tres meses más tarde, se objetivó una opacificación significativa del injerto despegado y la agudeza visual disminuyó a 20/63. Procedimos a la extracción del injerto sin realizar una segunda DMEK. Diez meses más tarde, la córnea permaneció transparente con un recuento endotelial de 510 cells/mm² y una agudeza visual con la mejor corrección de 20/25.

© 2022 Sociedad Española de Oftalmología. Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Introduction

Descemet membrane endothelial keratoplasty (DMEK) has gained popularity among surgeons due to its good visual and refractive outcomes, faster recovery, and greater patient satisfaction.¹ Theoretically, the key to success is that the graft is perfectly positioned, as it has been classically postulated that corneal clearance does not occur if an endothelial transplant is detached. However, it has been found on several endothelial keratoplasties corneal clearance with good visual acuity after graft detachment.^{2,3} These findings allow postulating that an endothelial migration might occur by the donor, host cells or both. This opens a new frontier to endothelial restoration in which more simplified surgical procedures might be implemented. But also, a question arises on how a graft detachment should be managed.

Here, we present a unique case of a visual recovery after DMEK surgery in a complicated eye that suffered a nearly complete DMEK graft detachment and subsequently an opacification of the detached graft. Both situations were managed without a secondary endothelial keratoplasty.

Case report

In July 2020, a 64-year-old male patient presented himself in our clinic with corneal decompensation in his left eye. His ocular history reported that he suffered from a traumatic cataract in 2007, which was managed by phacoemulsification with retropupillary iris-claw intraocular lens (IOL) implantation (Artisan, Ophtec, The Netherlands). Owing to subluxation, the iris-claw lens was replaced in 2017 by an iris-claw lens positioned in the anterior chamber. In July 2020, we began to manage this patient in our clinic. The patient was diagnosed with Fuchs endothelial dystrophy. Furthermore, corneal decompensation induced by the surgery of the traumatic cataract and anterior-chamber IOL was observed in the left eye. The surgical planning was first to reposition the claw lens behind the iris, and then in a second stage, In Mid-November 2020, a planned DMEK was performed. DMEK graft was prepared following the standardized protocol for the no-touch technique. For DMEK surgery, an 8.5 mm epithelial mark was made to outline the planned Descemet's membrane exci-

sion area, and a 2.2 main incision was then performed. After scoring the receptor endothelium with an inverted Sinsky hook, a circular portion of Descemet's membrane was stripped from the posterior stroma, creating an 8.5 mm descemetorhexis. Using a Geuder crystal injector (Geuder AG, Germany) filled with balanced saline solution, the Descemet's membrane rolls was inserted into the anterior chamber and then oriented endothelial side down. The anterior chamber was completely filled with air for 60 min, followed by the air-gas (SF₆-20%) exchange to pressurize the eye. A final GAS bubble occupying 60% of the anterior chamber was left in the eye overnight. Subsequently, two weeks later, a re-bubbling procedure was performed for subtotal graft detachment.

The postoperative course appeared uneventful, and at four of months follow-up, the best-corrected visual acuity had improved to 20/25 (0.8) and the manifest refraction was +2.00–4.00 × 80°. Surprisingly, while the recipient cornea showed complete clearance, a fibrotic DMEK graft was seen across the anterior chamber creating a pseudo-anterior chamber. The endothelial cell count of the clear cornea was 1204 cells/mm² and the corneal thickness was 535 μm. This observation agrees with substantial endothelial migration from the graft, host cells or both onto the recipient posterior stroma.^{2-4,6-9}

Although it could not be confirmed by analysis of the surgical video, and although we used intraoperative OCT, the clinical images seemed to indicate that the graft had been positioned upside-down since the peripheral edges of the graft showed an upward scroll (suggesting that the endothelium was on the anterior graft surface because the graft tends to scroll towards the endothelial side) (Fig. 1). The reversal corneal clearance pattern also supports the hypothesis that the graft had been positioned upside-down. As the cornea was clear, with a good endothelial cell count, and visual acuity was good, we opted to wait and a close patient's monitoring.

Three months later, the cornea remained clear with an endothelial cell count of about 730 cells/mm² and a corneal thickness of 521 μm. However, we observed a significant opacification of the detached graft, and the best-corrected distance visual acuity decreased to 20/63 (0.3) (Fig. 2A). We proceeded with the graft removal without performing a second DMEK. Ten months after graft removal, the cornea remained clear with an endothelial cell count of about 510 cells/mm² and

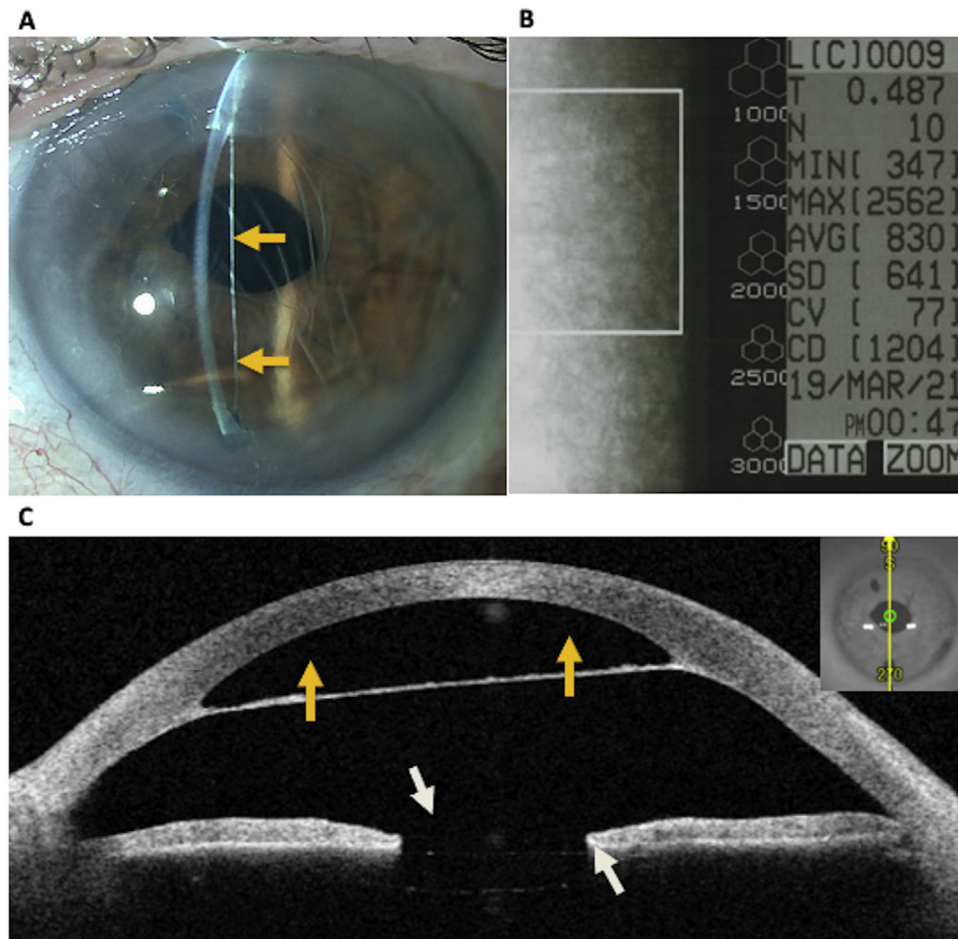


Figure 1 – Slit-lamp (A), specular microscopy (B) and AC-OCT images (C) of the recipient cornea, four months after DMEK surgery. While a fibrotic DMEK graft (yellow arrows) spans the anterior chamber of the eye, creating a pseudo anterior chamber, the cornea is clear, with a visual acuity of 20/25 (0.8). The eye is pseudophakic with a retropupillary iris-claw lens in-situ (white arrows) (C). Note that the central, re-endothelialized recipient cornea is clear and of normal thickness, while the peripheral cornea, where the graft is attached, shows oedema. This may be a typical sign of an upside-down graft position since the endothelium (on the anterior side of the graft) is dysfunctional in the periphery, while the central cornea is re-endothelialized through the migration of endothelial cells from the graft onto the recipient posterior stroma. The specular microscopy showed an endothelial cell count 1204 cells/mm² and the coefficient of variation was 77.

without significant changes in corneal thickness (Fig. 2B). The best-corrected visual acuity was 20/25 (0.8), and the manifest refraction was +2.00–4.50 × 75°. The intraocular pressure was normal at all time points, and no other adverse effects were observed.

Discussion

It has been previously reported that after DMEK, the recipient cornea may remain clear after a graft detachment. Our case report is in line with that finding.^{2–9} To explain the spontaneous corneal clearance found in this case report after endothelial graft detachment is valuable to bring two concepts: Descemet stripping only (DSO) and Descemet membrane endothelial transfer (DMET). DSO procedure, which involves not transplanting donor endothelium, might be a valuable alternative to maintain corneal clearance in some

cases, probably due to the migration of the endothelium cells from the periphery.⁸ DMET is a surgical concept which has demonstrated that solely the presence of donor endothelial cells on a carrier (a free-floating Descemet roll) inside the anterior chamber is effective in inducing corneal clearance.^{2,5} With these two concepts in mind, it has been postulated that spontaneous corneal clearance after endothelial graft detachment could relate to the endothelial regeneration capacity of the donor or recipient or both endothelium.² Although the mechanism behind this regenerative activity is unclear, it is worthy of note some considerations. Firstly, the disease leading to the endothelial graft seems to influence the capacity for the re-endothelialization of the recipient cornea. It has been reported that this mechanism is effective if the surgery's indication is a Fuchs endothelial dystrophy.² Our patient was primarily diagnosed with Fuchs endothelial dystrophy, but it is also important to point out that the surgery of the traumatic cataract and anterior-chamber IOL accelerated the

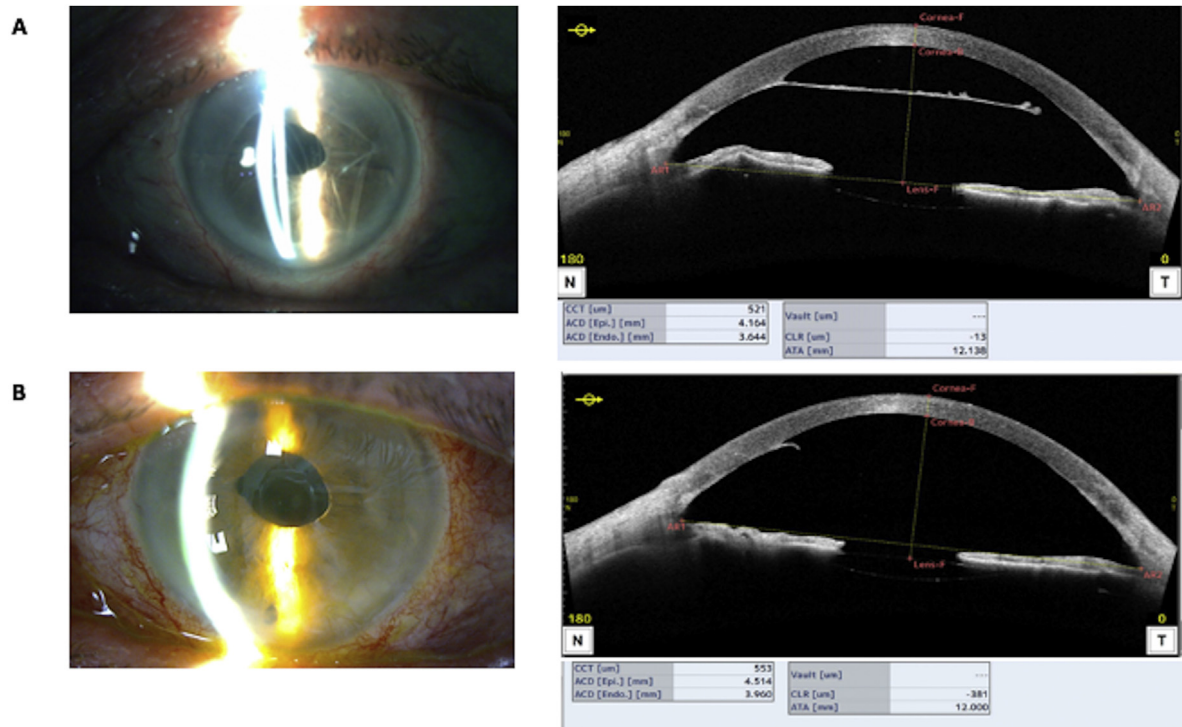


Figure 2 – (A) Slit-lamp and AC-OCT images of the recipient cornea six months after DMEK surgery. It could be observed the detached graft. The best corrected distance visual acuity decreased to 20/63 due to a significant opacification of the detached graft. (B) Slit-lamp and AC-OCT images ten months after graft removal.

corneal decompensation, and consequently, DMEK surgery was brought forward by a bullous keratopathy. Anitha et al.¹⁰ recently proposed that in patients with bullous keratopathy, the migration of the endothelial cells occurs from partially attached endothelial keratoplasty graft to the host stroma, in contrast to Fuchs endothelial dystrophy, where the endothelial cells would migrate from the periphery to the centre. Perhaps, in our case, both mechanisms concurred. Further efforts are required to understand the re-endothelization mechanism and determine the patient's profile that may respond positively to this regenerative activity. Secondly, as the remaining ring of recipient endothelium might be involved in the re-endothelization process, a descemetorhexis size of 8.5 mm could affect the mechanisms which involved the recipient endothelium in cells repopulation. Finally, it is important to keep in mind the findings that Birbal et al.¹¹ reported in 16 eyes who underwent DMET, in which authors concluded that the presence of a nearly completed attached Descemet graft is required to maintain corneal clearance over the long-term.

Graft detachment is the most frequent complication after endothelial keratoplasty. We might have learned two important lessons from our case. First, graft positioning may remain challenging even for experienced DMEK surgeons, especially when the visibility of the anterior chamber during surgery is compromised by corneal oedema and/or other anterior chamber abnormalities (for example after ocular trauma). Second, in cases which suffer a graft detachment may be worthwhile to wait three to six months to evaluate whether a spontaneous visual recovery is achieved² since re-intervention may also be associated with increased surgical risks in complicated eyes.

Finally, if the detached graft induces visual disturbances, it could be removed and subsequently also to wait three to six months to evaluate whether corneal transparency is maintained without the need to perform a second DMEK.

Conflict of interest

Gerrit Melles is a consultant for DORC International/Dutch Ophthalmic USA and SurgiCube International. All other authors have no conflicting relationship to disclose.

REFERENCES

1. Park CY, Lee JK, Gore PK, Lim CY, Chuck RS. Queratoplastia en los Estados Unidos: Una revisión de 10 años desde 2005 hasta 2014. *Ophthalmology*. 2015;122:2432–42.
2. Dirisamer M, Yeh RY, van Dijk K, Ham L, Dapena I, Melles GR. Recipient endothelium may relate to corneal clearance in descemet membrane endothelial transfer. *Am J Ophthalmol*. 2012;154:290–296.e1.
3. Balachandran C, Ham L, Verschoor CA, Ong TS, van der Wees J, Melles GR. Limpieza espontánea de la córnea a pesar del desprendimiento del injerto en la queratoplastia endotelial con membrana de Descemet. *Am J Ophthalmol*. 2009;148:227–34.
4. Zafirakis P, Kymionis GD, Grentzelos MA, Livir-Rallatos G. Corneal graft detachment without corneal edema after Descemet stripping automated endothelial keratoplasty. *Cornea*. 2010;29:456–8.

5. Dirisamer M, Dapena I, Ham L, van Dijk K, Oganés O, Frank LE, et al. Patterns of corneal endothelialization and corneal clearance after Descemet membrane endothelial keratoplasty for Fuchs endothelial dystrophy. *Am J Ophthalmol*. 2011;152:543-555.e1.
6. Jacobi C, Zhivov A, Korbmacher J, Falke K, Guthoff R, Schlötzer-Schrehardt U, et al. Evidence of endothelial cell migration after Descemet membrane endothelial keratoplasty. *Am J Ophthalmol*. 2011;152:537-542.e2.
7. Shah RD, Randleman JB, Grossniklaus HE. Spontaneous corneal clearing after Descemet's stripping without endothelial replacement. *Ophthalmology*. 2012;119:256-60.
8. Lagali N, Stenevi U, Claesson M, Fagerholm P, Hanson C, Weijdegård B, et al. Donor and recipient endothelial cell population of the transplanted human cornea: a two-dimensional imaging study. *Invest Ophthalmol Vis Sci*. 2010;51:1898-904.
9. Lam FC, Bruinsma M, Melles GR. Transferencia endotelial de la membrana de Descemet. *Curr Opin Ophthalmol*. 2014;25:353-7.
10. Anitha V, Swarup R, Ravindran M. Descemet Membrane Endothelial Transfer (DMET) in pseudophakic bullous keratopathy after DSEK—a case report and review of literature. *Cornea*. 2022;41:1179-81.
11. Birbal RS, Parker J, Dirisamer M, Janićijević A, Baydoun L, Dapena I, et al. Descemet Membrane Endothelial Transfer: Ultimate Outcome. *Cornea*. 2018;37:141-4.