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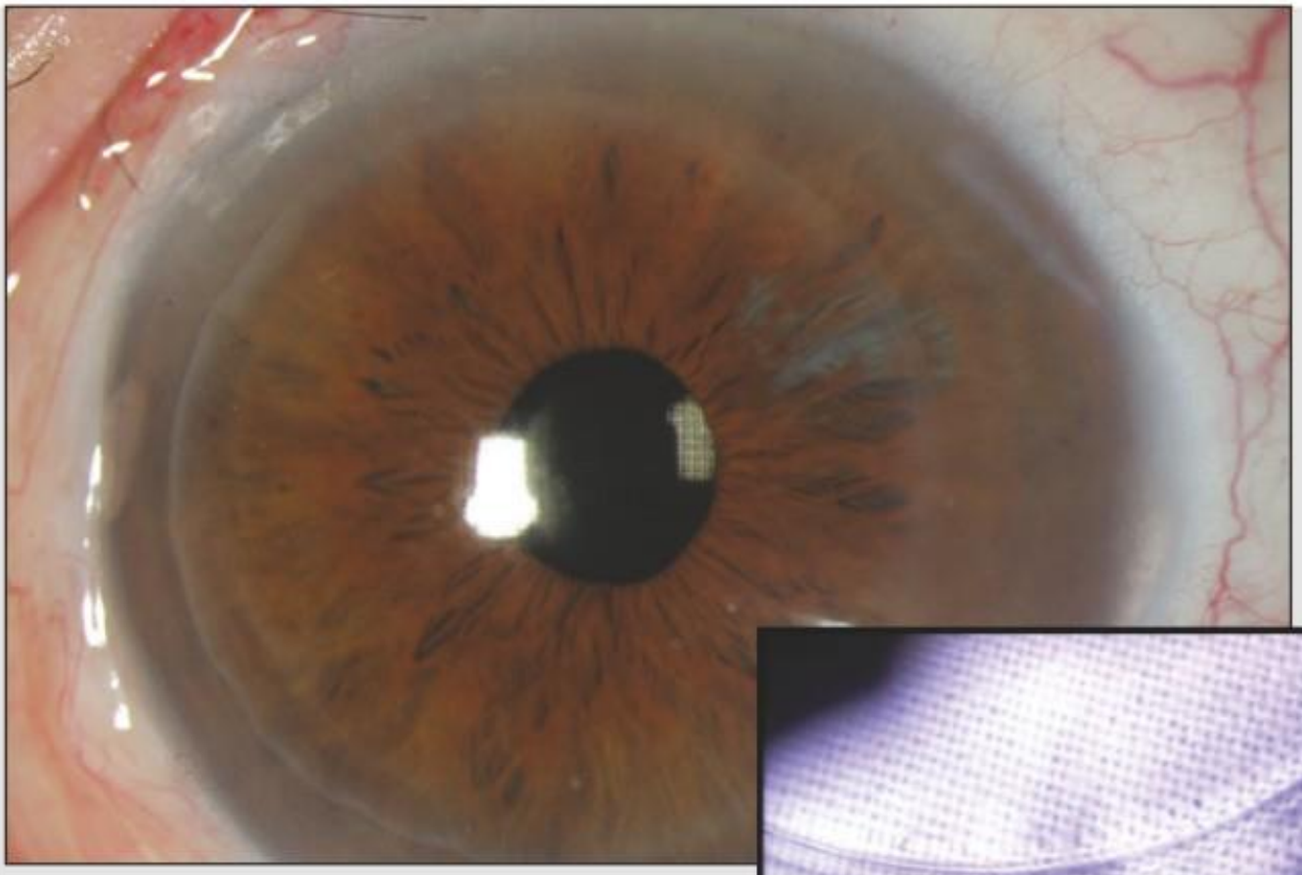

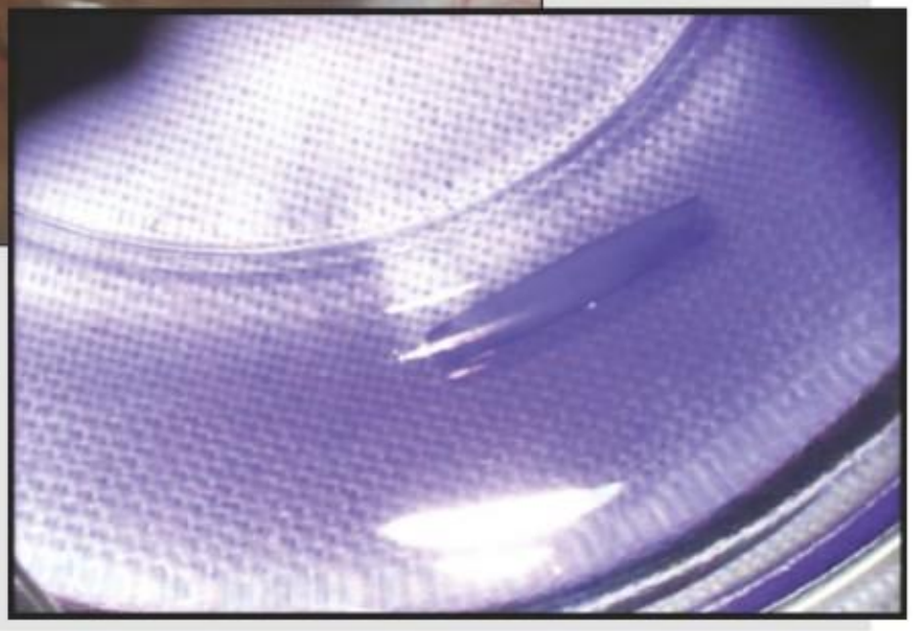

Transitoning from DSAEK to DMEK:
Why and How?

Micropulse Transscleral Cyclophotocoagulaton:
¿Where are we?

New Intracorneal Injectable Segments: i-ICRS Restorer Line
(Injectable Intra Corneal Rings Segments)

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Transitoning from DSAEK to DMEK: Why and How?

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Corneal surgery that seeks to solve endothelial dysfunction has had a huge breakthrough in the last 20 years.

Afer penetrating keratoplasty was used for decades as a technique of choice (and, indeed, the only technique available) for the management of endothelial dysfunction, for the past two decades, very significant progress has been made in the management of this dysfunction thanks to posterior laminar corneal surgery.

In the 1970s, penetrating keratoplasty was imposed as the technique of choice for the management of endothelial dysfunction. Paradoxically, 100% of the corneal thickness (550 microns) was transplanted when the diseased layer compromised the last 10-15 microns of the cornea.

This procedure was quickly popularized thanks to the improvement in microscopes, microsurgery instruments, sutures, and the better organization of eye banks. It became a reproducible technique, surgically easy, quick to perform, optically clean, and frequently allowed visual acuity of 20/20.

However, it has significant intra and postoperative risks: its main intraoperative risk is ejection hemorrhage, with a poorly defined but estimated incidence of around 0.45% and with catastrophic consequences for the eye.[1]

Among the most common post-operative complications are those related to sutures (loose 8.3%, erodes 10.8% or infiltrated 9.4%).[2] Graf failure is also found with an incidence of up to 22% in 10 years,[3] whose main cause is endothelial rejection, either acute or chronic.[4] Another common complication is chronic open-angle glaucoma, with a postoperative incidence ranging from 5.3% to 21%.[3]

Finally, it is not a complication *per se*, but if it is a great disadvantage: post-keratoplasty astigmatism. This is unpredictable, very ofen irregular and can disrupt effective visual rehabilitation of the patient.

All of the above led to a search for surgery that would serve to selectively replace the compromised corneal layer, further achieving a stable, minimal and predictable astigmatism eye surface, abolish the risk of traumatic eyeball rupture and - finally - faster and safer rehabilitation in our patients.

The first laminar endothelial replacement report dates from 1956, in which the posterior stroma of the cornea was replaced including descemet and endothelium, with a good result in transparency, but unfortunately with an uncontrollable glaucoma.[5] Many years later his idea was taken up by authors such as William Ko,[6] Melles GR, *et al.*,[7] and Mark Terry.[8] These were technically complex surgeries, difficult to perform and with less good results than expected, so they did not get a significant reception in the guild.

Consequently, they were replaced by a new technique, the DSEK (Descemet's Stripping Endothelial Keratoplasty) published by Gerrit Melles MD,[9] which manually obtained a donor disc comprising

some of the later stroma, descemet and endothelium, and afer removing the descemet and endothelium from the receiver, it was implanted. This was a real innovation, as it allowed for rapid, reliable, and safe rehabilitation, without compromise of the eye surface. **Click here for Video 1.** Obtaining the DSEK disk.

The same technique was later popularized, but using microkeratome - DSAEK: Descemet's Membrane Automated Endothelial Keratoplasty,[10] which gave surgeons more confidence as obtaining the donor is easier and more predictable. **Click here for Video 2.** Obtaining the DSAEK disk.

The only difference between DSEK and DSAEK is visual recovery speed, which is a few weeks faster on DSAEK; there is no difference in the incidence of endothelial loss, graf detachment, or rejection.

So why, if DSAEK works well, is reliable, fast and reproducible, do we want to make a DMEK (Descemet Membrane s Endothelial Keratoplasty) that is substantially more difficult?

There are several reasons:

- Visual acuity of 20/20 is achieved much more frequently than with DSAEK. [11]
- Visual recovery of patients is faster, with an average of 3-4 weeks. [12]
- Most important in my opinion: there are fewer high-order aberrations, which is especially beneficial in patients with premium intraocular lenses. [13]
- And finally, to the surprise of many of us, it has a significantly lower incidence of graf rejections. [14]

INITIATING THE TRANSITION

1. Patient selection

- Ideally, your first patient is already pseudophakic, with average biometrics (avoiding previous cameras out of the ordinary).
- That it has a standard orbit (not enophthalmos).
- And, **very importantly**, that the iris and pupil are normal.
- Always, a few days before taking the patient to surgery we do a peripheral iridotomy with lower broad laser.

2. Donor preparation

- It is a completely different concept from obtaining the DSAEK disc. The ideal donor is over 55 years old, and without an antecedent of diabetes.
- It is an extremely fragile, friable, and sometimes difficult to identify tissue.
- The technique that has gradually been established is the SCUBA technique, where the donor is dissected under liquid, with triple trypan blue, under a microscope.

It is important to tilt the head of your microscope about 25 degrees to decrease the reflections of the liquid when dissecting. Make your peripheral dissection with an inverted sinskey or a Becker rotator hook, taking care not to put too much pressure so as not to insert your Descemet flange into the underlying stroma. Afer this, proceed to lif the distal free edge of the Descemet with a delicate and fine instrument, playing only the stromal side, in 360 degrees. Then, with a clawless clamp, lif a quadrant of Descemet at a time, without reaching the center, and taking care that the traction edge is straight and not smile-shaped as the latter increases the risk of peripheral tears.

Finally, trephine the donor button with the chosen diameter, remove the Descemet-endothelium complex with very thin tweezers and place it in trypan blue at 0.06%. Make sure you have this liquid at a temperature of approximately 30 degrees, as this is easier to unfold. **Click here for Video 3.** Obtaining the DMEK donor.

3. Descemetorhexis

Use the same method you use on the DSAEK, whether it's air, liquid or viscoelastic.

Unlike the DSAEK, you should make the rrhexis larger than the donor diameter. The Descemet graf is very sensitive to the presence of the host, does not stick well, and will have greater landslides. We ofen have a small ring of exposed stroma lef, which over time resolves itself.

Your rrhexis should be absolutely continuous, with no spikes, tears or flaps. Peaks and irregularities increase the risk of poor adhesion of the graf to the exposed stroma.

Upon completion of your descemetorrexis, inject trypan blue in the anterior chamber to identify irregularities, or areas not well debrided, and proceed by removing the residual Descemet from those sites. **Click here for Video 4.** Check descemetorrexis with trypan blue.

4. Introduction of the donor

This is another of the big differences with DSAEK.

First of all, we want to introduce the Descemet-Endothelium roll **without touching it.** For this we must use some injection system, either an intraocular lens injector, or a plastic or glass injector that is attached to a syringe. Gradually, the glass injectors have been imposed by being kinder with the graf and allowing a better visualization of it.

Unlike DSAEK, when we make a DMEK we want **a shallow** previous camera, so that the donor roll is unrolled and stabilized easier. Therefore, before inserting the injector into the incision, we must empty the previous chamber.

Once in the previous chamber, and before removing the injector, the donor roll has a frank tendency to exit through the incision. For this reason, we must lock the incision with a clamp before removing the injector so that the donor does not get ejected by it, and immediately place a suture that seals the previous chamber. **Click here for Video 5.** Introduction of the DMEK donor.

5. Donor positioning

- The DMEK donor roll does not open on its own, unlike that of a DSAEK. It stays coiled, and this is one of the most difficult steps of this surgery.
- Once the donor roll has been injected into the previous chamber, it is necessary to verify that the initial orientation is adequate. This is with the free edges of the disc facing the surgeon. At this point the roll has endothelium outward and Descemet inwards itself. There are multiple ways to identify the correct orientation: with indirect light in limbo, with an intense separate external light, or by introducing cannulas.
- Being sure of the correct orientation of the donor, we proceed to unroll it. Unlike DSAEK, in this case we do not touch the donor, but manipulate it by indirect waves of aqueous humor, which indirectly pull and unroll it. As the minutes pass the donor loses their tryptan blue stain and this procedure becomes more difficult.
- Finally, once expanded, and centered on the receptor cornea, we proceed to inject air or gas to attach it to the receiving stroma. In my case I have never used gas in any type of endothelial graf: only air. We leave this air for about 20 minutes under pressure, and then we do an air-liquid exchange leaving an air bubble of 90% (greater than in the

DSAEK). **Click here for Video 6.** Positioning of the DMEK donor.

6. Postoperative

- These patients should be examined in the slit lamp about 4 hours afer surgery to make sure the donor is in position, and the intraocular pressure is correct.
- They are regularly reviewed during the first week which is the risk period for a donor detachment, and in the event of any doubt about the status of the donor an Optical Coherence Tomography (OCT) should be ordered to verify its adherence at 360 degrees.
- Finally, we must be willing to re-inject air into the anterior chamber in the event of any alteration or initiation of donor detachment. For this, I prefer to always take the patient to a surgery room with all the conditions of asepsis, and I do it under topical anesthesia.

Differences between DSAEK's Lenticule and DMEK roll

DSAEK LENTICULE		DMEK ROLL
Easy	PREPARATION	Difficult
Easy	MANIPULATION	Difficult
Easy	ADHESION	Difficult

Differences between DSAEK's Lenticule and DMEK roll

DSAEK LENTICULE	DMEK ROLL
Opens only in Anterior Chamber	Stays rolled
It doesn't get easier from Anterior Chamber	Easy ejected from Anterior Chamber
Easy visualization	Difficult visualization
It doesn't flip easily	It flips very easily
If flipped: endothelium anywhere	If flipped: always keep the endothelium out of the roll

Big differences between DSAEK and DMEK

DSAEK	DMEK
Previous non-iridotomy	Yes prior iridotomy
Unrelevant iris status	Fundamental iris status
No donor stain	Trypan Blue
Descemetorhexis equal to or less	Major descemetorhexis
Introduction touching it	Introduction without touching it
Direct-easy unfolding	Indirect-hard unfolding
24-hour revision	4-hour revision

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