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ROYAL MAXIM PALACE KEMPINSKI, CAIRO

Cataract Surgery in FECD-How to avoid DMEK

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HISTORICAL BACKGROUND - DEFINITION



Prof. Ernst Fuchs (1851-1930)

- Fuchs Endothelial Corneal Dystrophy (FECD) was first described in 1910
(Fuchs E. Albert von Graefes Arch Klin Exp Ophthalmol, 1910)
- Fuchs dystrophy was initially identified as an epithelial disorder: *dystrophia epithelialis corneae*
- *Guttae were not described until 1916*
(Koeppel L. Albert von Graefes Arch Klin Exp Ophthalmol, 1916)



IC3D classification:

"FECD is a bilateral disease of the corneal endothelium characterized by accelerated loss of corneal endothelial cells (CECs) with changes in Descemet membrane (DM), including accumulation of extracellular matrix (ECM) and formation of posterior focal excrescences called guttae"

MORPHOLOGICAL FEATURES OF ENDOTHELIAL DAMAGE

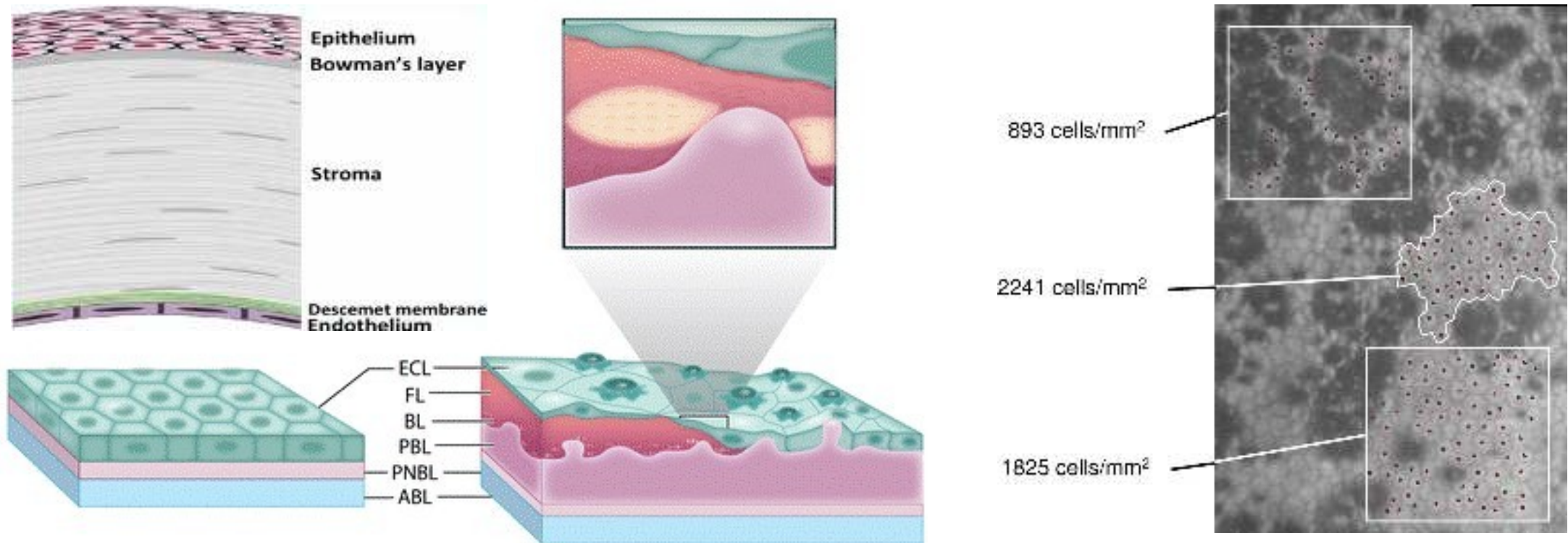


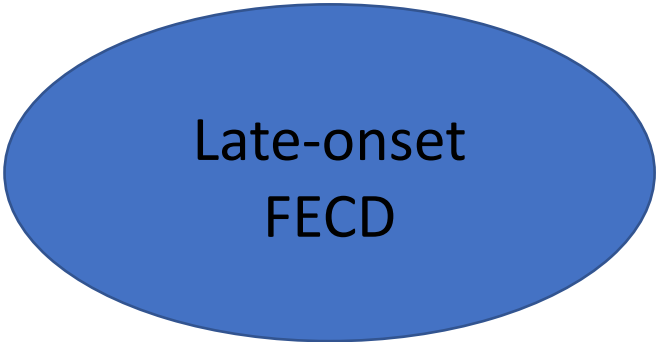
Figure adapted from Imwamoto & Devoc (1971)

- Accelerated endothelial cell loss
- Loss of hexagonal shape (polymorphism)
- Loss of uniform size (polymegathism)
- Thickening of Descemet membrane (DM)
- Focal excrescences of DM (guttae)

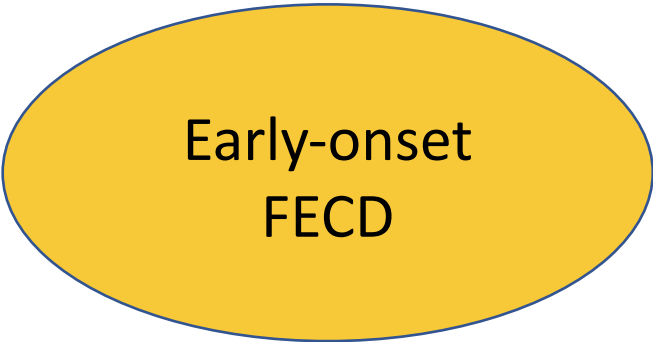
EPIDEMIOLOGY & RISK FACTORS

Designation as orphan disease – Orphanet: **ORPHA:98974**

Approximately 4.5% of individuals above 50 years manifest FECD



Late-onset
FECD



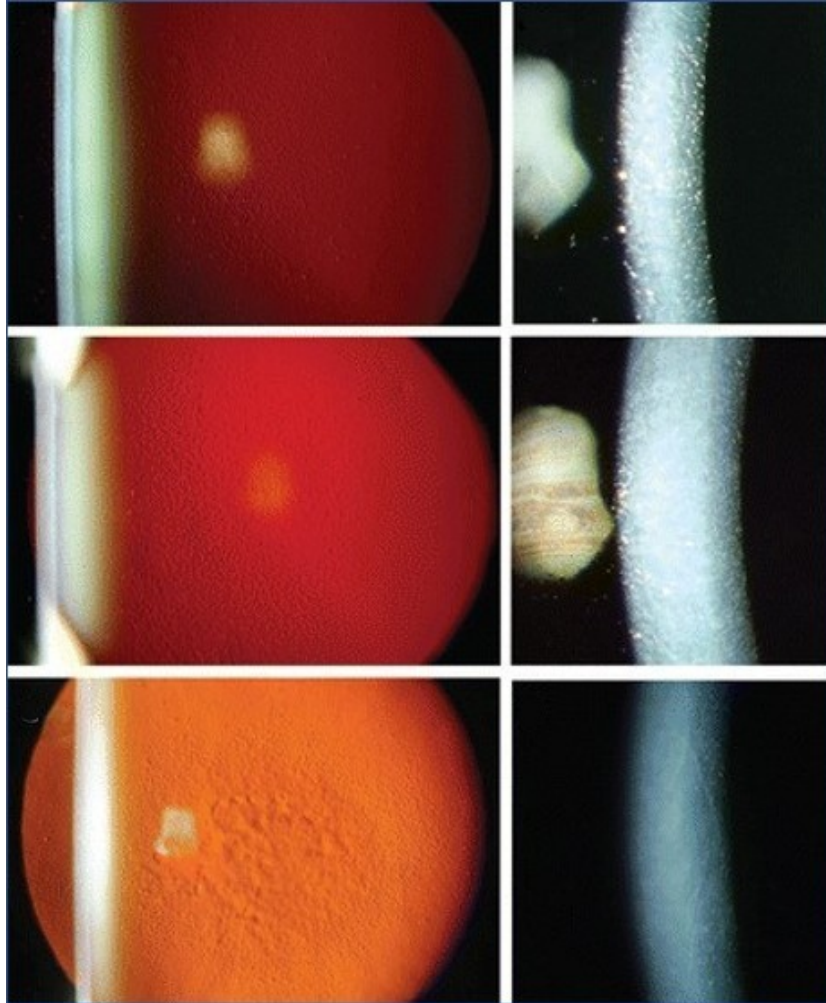
Early-onset
FECD

- More prevalent
- Autosomal dominant with variable penetrance
- First symptoms in 5th to 6th decade of life
- Female-male ratio is 2.5:1 to 3.5:1

- Rare
- Autosomal dominant
- Evident in 1st decade of life
- Female-male ratio is 1:1

Diseases associated with FECD: myotonic dystrophy, diabetes, cardiovascular disease, keratoconus, axial hypermetropia, glaucoma, ocular hypertension and macular drusen.

CLINICAL FEATURES & VISUAL SYMPTOMS



Mild FECD:

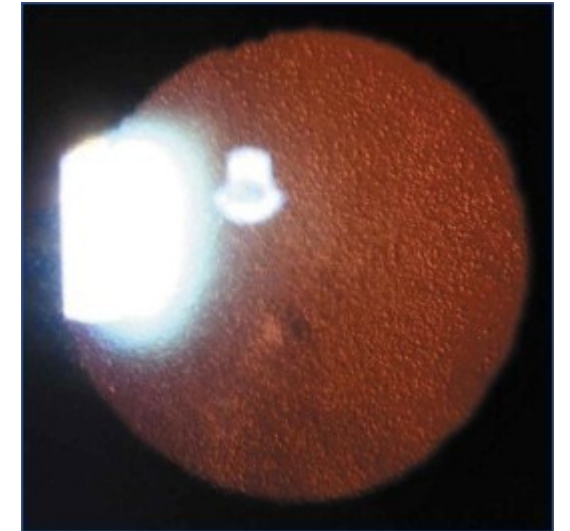
- Guttae
- Glare
- reduced contrast sensitivity

Moderate FECD:

- Corneal edema
- Stromal thickening
- Descemet folds
- Blurred vision

Advanced FECD:

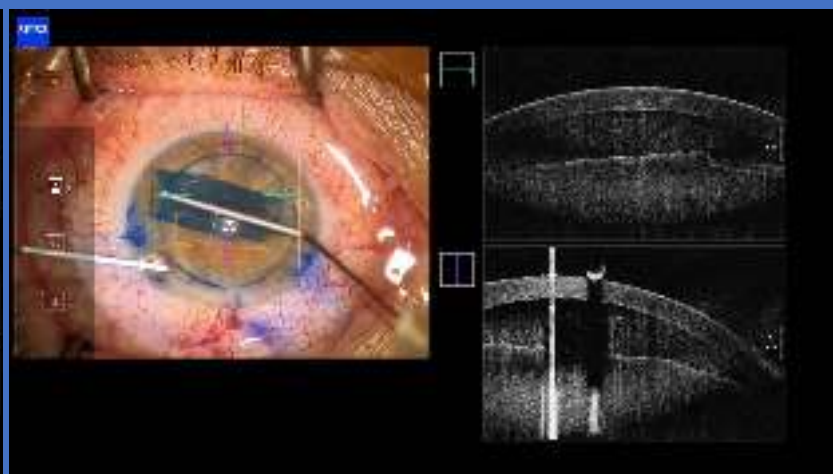
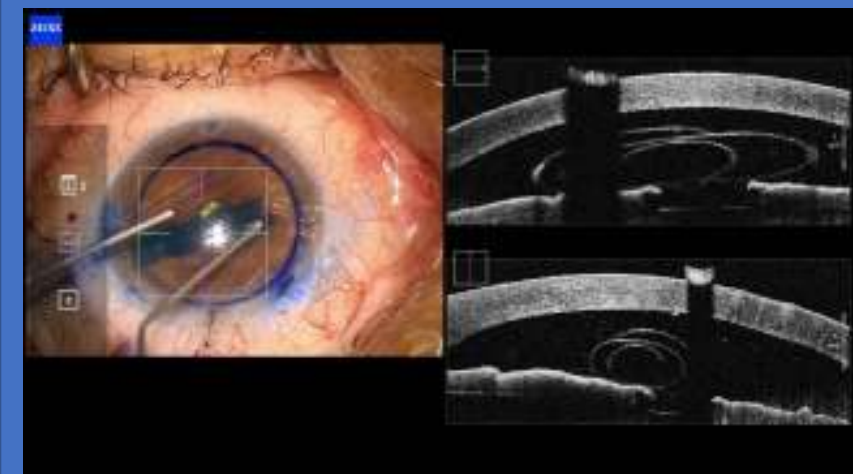
- Epithelial bullae
- Stromal clouding
- Visual loss
- Discomfort





DMEK

iOCT-assisted 3D DMEK



CATARACT & FECD

Up to 39% of patients with FECD will require DMEK after cataract surgery

Arnalich-Montiel F, et al. Am J Ophthalmol 2019;208:76-86.

Arnalich-Montiel F, et al. Am J Ophthalmol;231:70-78

Cataract surgery '*alone*' vs combined cataract surgery and DMEK

Cause of visual impairment; cataract or FECD?

Assessment of corneal decompensation risk

Probability of avoiding DMEK after cataract surgery '*alone*'

Management of patient expectations

Realistic visual expectations

PREOPERATIVE CONSIDERATIONS – Risk Assessment

Clinical symptoms

Cataract: glare, decreased contrast sensitivity, **myopic shift**, **altered color perception**.
FECD: glare, decreased contrast sensitivity, **diurnal variation of blurring**, **discomfort**.

Central corneal thickness

- $CCC > 620 \mu m$ → increased probability of corneal decompensation after phaco.

Endothelial cell count

- There is not an absolute ECC threshold for maintaining corneal transparency.
- ECC measurement is not valid in moderate to severe FECD.
- $ECC \leq 900 \text{ cells/mm}^2$ - high risk for corneal decompensation after cataract surgery.

Cataract density

- Dense cataract and/or shallow anterior chamber – very likely that phaco alone will not be enough!

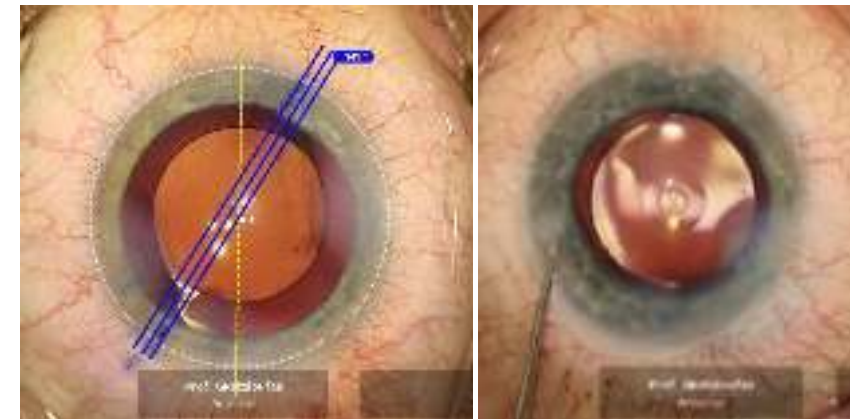
IOL CALCULATION & SELECTION - TARGET REFRACTION

Challenges in biometry

- Inaccurate IOL calculation due to keratometry alteration in corneal edema.
- Corneal edema-induced astigmatism and HOAs.

IOL selection

- Monofocal IOLs – the best choice!
- Be cautious with toric IOLs!
- Monofocal plus/EDOF IOLs – it depends
- Multifocal IOLs – not a good idea!
- Use hydrophobic IOLs!



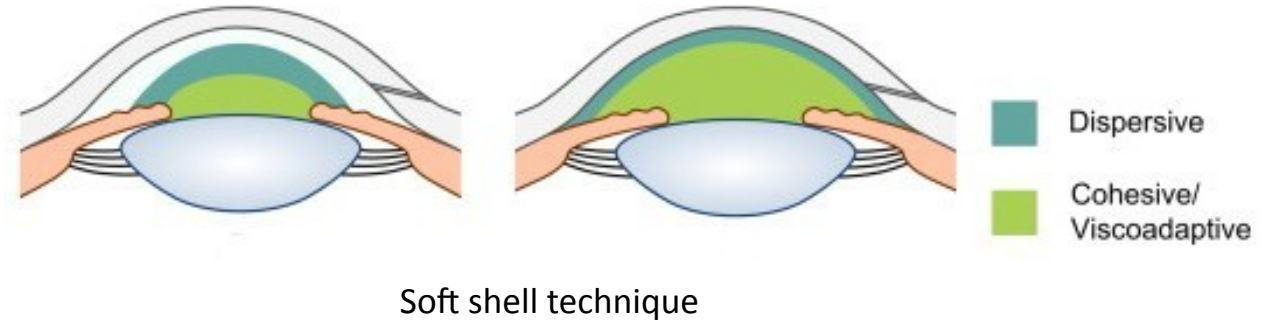
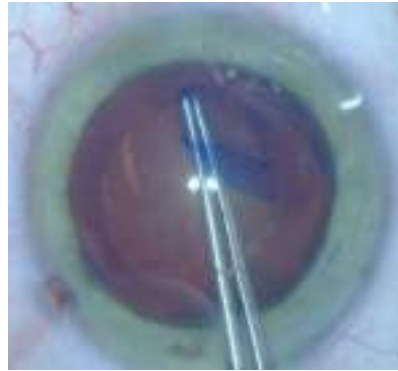
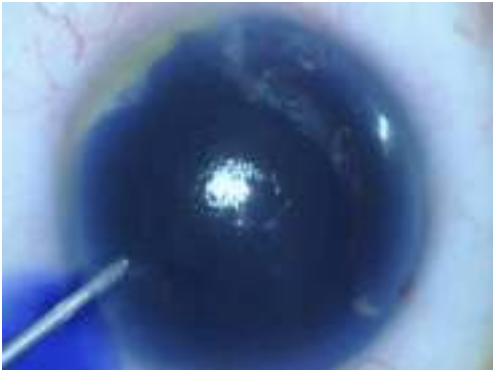
toric IOL

EDOF IOL

Target refraction

- Hyperopic shift after DMEK/DSAEK.
- Aim for up to -0.5 dpt. if DMEK is planned and up to -1.0 dpt. if DSAEK is planned.

INTRAOPERATIVE CONSIDERATIONS – Protect the Endothelium



Anterior lens capsule staining

Incision & rhexis adaptations

Low flow settings

Soft-shell technique

- Use of trypan blue if visibility is compromised due to corneal edema.
- Remember - trypan blue is not friendly to CECs; risk of toxicity!
- Main corneal incision not too anterior, relatively short to avoid interference with future DMEK graft – plan paracenteses accordingly!
- Rhexis ideally no larger than 5 mm.
- Less fluid through the eye during surgery – less corneal endothelial damage!
- Use of dispersive OVD for protection of corneal endothelium.

INTRAOPERATIVE CONSIDERATIONS – Reduce Ultrasound Energy

Phaco technique adaptations

- Phaco 'in the bag' – keep away from corneal endothelium
- Bevel to the side – don't face the corneal endothelium!
- Direct chop for less ultrasound energy consumption
- Non-continuous phaco modes i.e. pulse or burst mode, for higher efficiency
- Femtosecond laser-assisted cataract surgery – controversial!

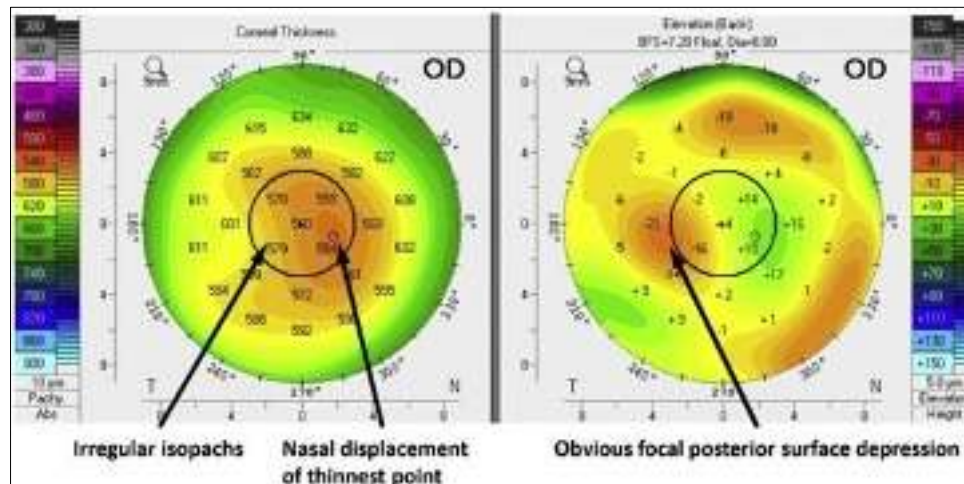


Pearl 1 – Subclinical Corneal Edema in FECD



Predicting the Prognosis of Fuchs Endothelial Corneal Dystrophy by Using Scheimpflug Tomography

Sanjay V. Patel, MD FRCOphth,¹ David O. Hodge, MS,² Emily J. Treichel,¹ Matthew R. Spiegel,² Keith H. Baratz, MD¹



Subclinical Corneal Edema:

- Irregular isopachs
- Displacement of thinnest point
- Focal posterior surface depression

- Four Year Follow-up after Phaco

- Zero variables: 0%
- One or two variables: 50%
- Three variables: 75%

Probability of corneal decompensation requiring EK

Pearl 2 – FLACS in FECD

Controversial data!

> J Cataract Refract Surg. 2018 May;44(5):534-540. doi: 10.1016/j.jcrs.2018.03.023.

Outcomes of conventional phacoemulsification versus femtosecond laser-assisted cataract surgery in eyes with Fuchs endothelial corneal dystrophy

Dagny C Zhu ¹, Parth Shah ¹, William J Feuer ¹, Wei Shi ¹, Ellen H Koo ²

Comparative Study > Am J Ophthalmol. 2018 Dec;196:173-180. doi: 10.1016/j.ajo.2018.08.006.
Epub 2018 Aug 8.

Comparing Outcomes of Phacoemulsification With Femtosecond Laser-Assisted Cataract Surgery in Patients With Fuchs Endothelial Dystrophy

Wei Wei Dayna Yong ¹, Hui-Chen Charmaine Chai ², Liang Shen ³, Ray Manotosh ⁴,
Wee Tien Anna Tan ⁵



Real-word experience

Less phaco energy with FLACS - more cornea-friendly!

Pitfall – Premium IOLs in FECD

Premium IOLs should be generally avoided in FECD!

Ophthalmol Ther (2023) 12:1747–1755
<https://doi.org/10.1007/s40123-023-00700-5>



ORIGINAL RESEARCH

Clinical Outcomes of Toric Intraocular Lenses in Patients with Fuchs Endothelial Corneal Dystrophy

Michal Blau-Most · Adi Levy · Ehud I. Assia · Guy Kleinmann 

► Sci Rep. 2023 Jan 16;13:786. doi: [10.1038/s41598-023-27830-x](https://doi.org/10.1038/s41598-023-27830-x) 

Clinical outcomes of presbyopia-correcting intraocular lenses in patients with Fuchs endothelial corneal dystrophy

[Michal Blau-Most](#) ^{1,2,3,✉}, [Olga Reitblat](#) ^{1,3}, [Adi Levy](#) ¹, [Ehud I Assia](#) ^{1,2,3}, [Guy Kleinmann](#) ^{1,3,4}

- **Toric IOLs**

- comparable results with healthy subjects for regular astigmatism if no corneal edema

- **EDOF IOLs**

- inferior UDVA compared to normal controls
- less spectacle independence
- comparable photic phenomena

- **Multifocal IOLs**

- similar UDVA compared to normal controls
- similar spectacle independence
- more photic phenomena

Staged Procedure - Cataract Surgery 'alone'

Pros

- **Potentially avoid corneal transplantation**
- **Stable IOL condition – no surprises**
- **Higher reimbursement for surgeon**

Cons

- **Potentially two surgeries**
- **Higher cost for patient and healthcare system**

Combined Cataract Surgery and DMEK

Pros

- **One surgery**
 - convenient
 - cost-effective

Cons

- **Potentially unpredictable refractive outcomes**
- **Special care during phaco part – surprises may jeopardize the DMEK procedure**
- **Lower reimbursement for surgeon**

Sequential DMEK vs Combined DMEK

Review > Acta Ophthalmol. 2024 Feb;102(1):e22-e30. doi: 10.1111/aos.15691. Epub 2023 May 8.

Combined or sequential DMEK in cases of cataract and Fuchs endothelial corneal dystrophy-A systematic review and meta-analysis

Vito Romano^{1 2}, Maria Laura Passaro³, Bjoern Bachmann⁴, Lamis Baydoun^{5 6},
Sorcha Ni Dhubhghaill^{7 8}, Mor Dickman^{9 10}, Hannah J Levis¹¹, Mohit Parekh¹²,
Marina Rodriguez-Calvo-De-Mora¹³, Ciro Costagliola³, Gianni Virgili^{14 15}, Francesco Semeraro¹

- 667 eyes included (5 studies)
- 292 eyes (43.77%) – combined DMEK
- 375 eyes (56.22%) – sequential DMEK

Main outcome: improvement of CDVA

Secondary outcomes:

- postoperative ECD
- rebubbling rate
- primary graft failure rate

No difference between the two groups

However, randomized controlled trials are required!

Staged Procedure - Cataract Surgery 'alone'

Pros

- **Potentially avoid corneal transplantation**
- **Stable IOL condition – no surprises**
- **Higher reimbursement for surgeon**

Cons

- **Potentially two surgeries**
- **Higher cost for patient and healthcare system**

When cataract surgery 'alone'?

Take Home Message

Risk assesment

- CCC < 620 μm
- No subclinical edema
- Measurable ECC > 900 cells/mm²

particularly if cataract is mild to moderate and anterior chamber is deep

low risk for DMEK

Protect endothelium

- Dispersive OVD
- Low flow settings
- Bevel side/down

Reduce phaco energy

- Adapt phaco technique
- Phaco 'in the bag'
- FLACS

Thank you for your attention

