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# Updates in Ophthalmology

## Keratoprosthesis , lamellar transplantation and corneal refractive surgery

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# Updates in Ophthalmology

- **Keratoprosthesis**
  - Boston I/II
  - OOKP
- **Lamellar transplantation**
  - DMEK
  - DSAEK
- **Corneal refractive surgery**
  - PRK
  - LASIK
  - SMILE

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# Keratoprosthesis: Introduction

- Patients with severe bilateral corneal opacification who are not candidates for traditional penetrating or lamellar grafts.
- Central optical cylinder and a carrier donor cornea.
- The most widely used device is the Boston Keratoprosthesis, which has evolved in design to improve retention, biocompatibility, and safety.
- The alternative osteo-odonto-keratoprosthesis (OOKP) remains a last resort in patients with no wet ocular surface, such as in severe Stevens-Johnson Syndrome or ocular cicatricial pemphigoid.

- Source: Aldave AJ et al. Ophthalmology. 2012;119(8):1534–1539.

# Keratoprosthesis: Types and Materials

- The Boston Type I is composed of a front plate with optical stem, a donor corneal graft, and a backplate made of PMMA or titanium.
- Boston Type II extends through the eyelid for severely dry eyes.
- The osteo-odonto-keratoprosthesis (OOKP) uses an autologous tooth-bone lamina for support and a PMMA optical cylinder. Choice of device depends on surface wetness, immune status, and prior surgical history.

- Source: Dohlman CH et al. Cornea. 2007;26(9 Suppl 1):S3–S7.

# Boston KPro I: Surgical Technique

- The procedure begins with a central trephination of the host cornea.
- The preassembled KPro is integrated into a full-thickness donor corneal graft and sutured into place.
- A bandage contact lens is applied, and postoperative management includes long-term antibiotic and anti-inflammatory therapy.
- Close monitoring of intraocular pressure is essential, often requiring digital palpation or use of Tono-Pen due to altered anatomy.

- Source: Zerbe BL et al. Ophthalmology. 2006;113(10):1779.e1–7.


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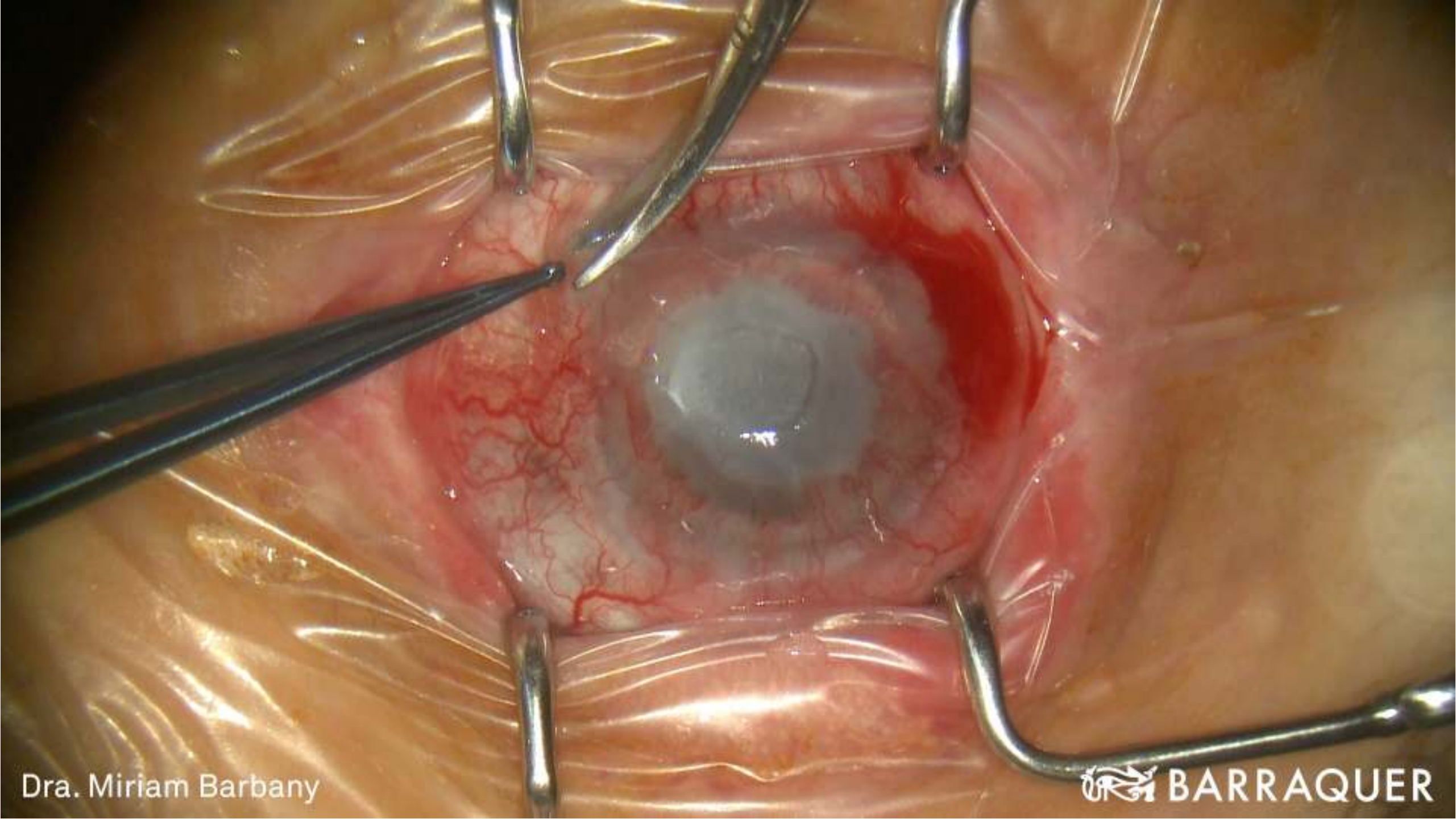
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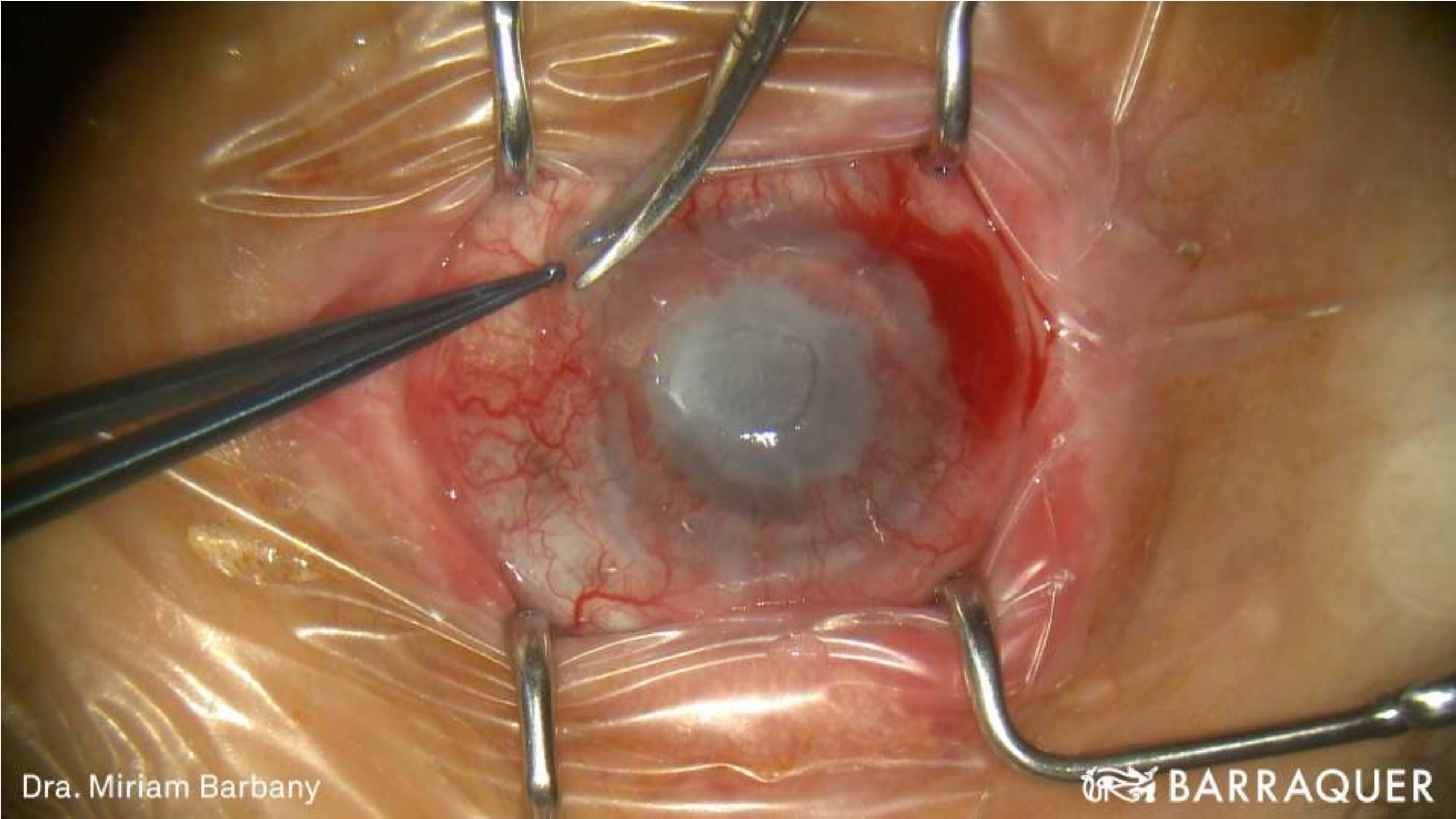
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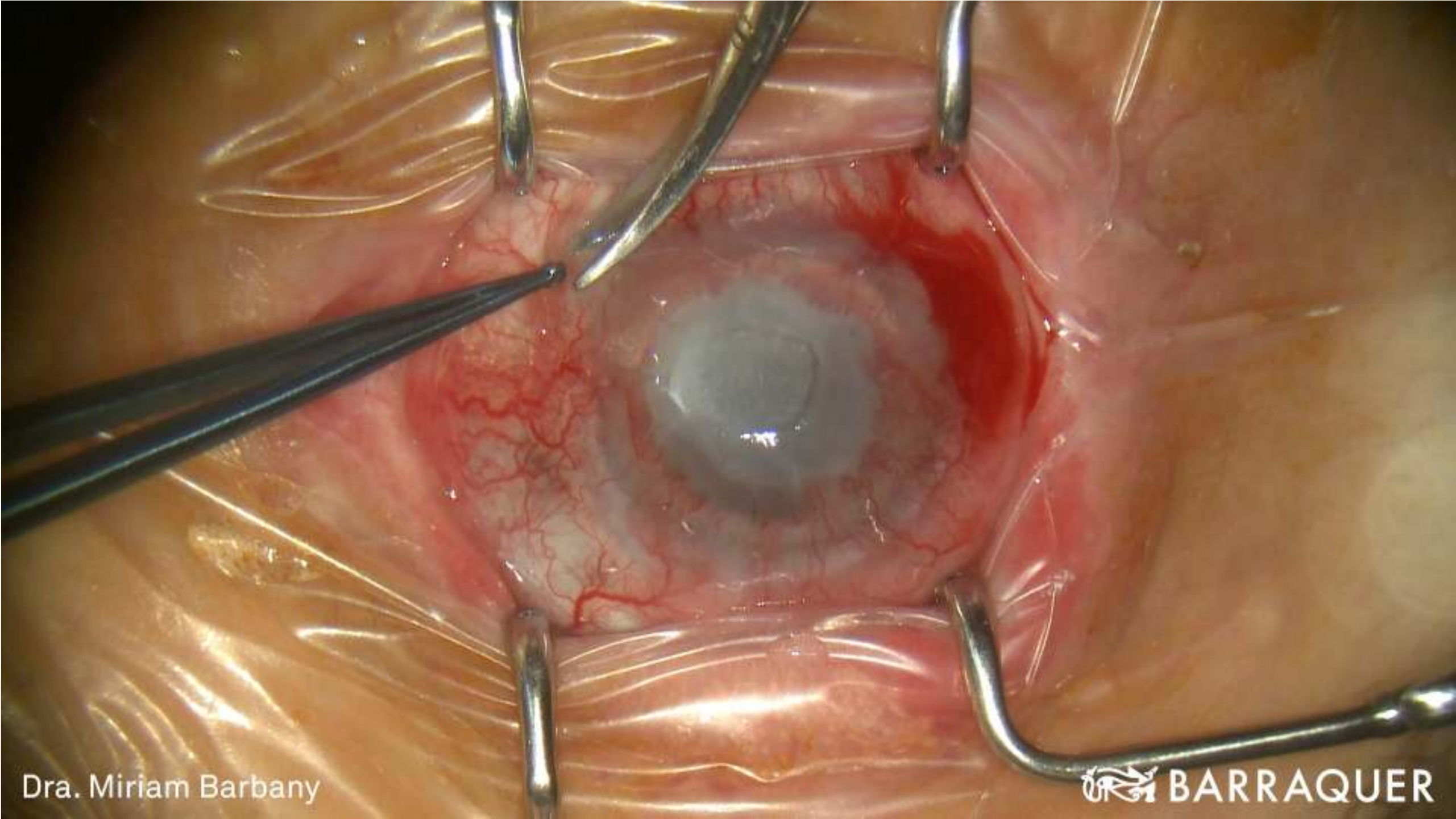
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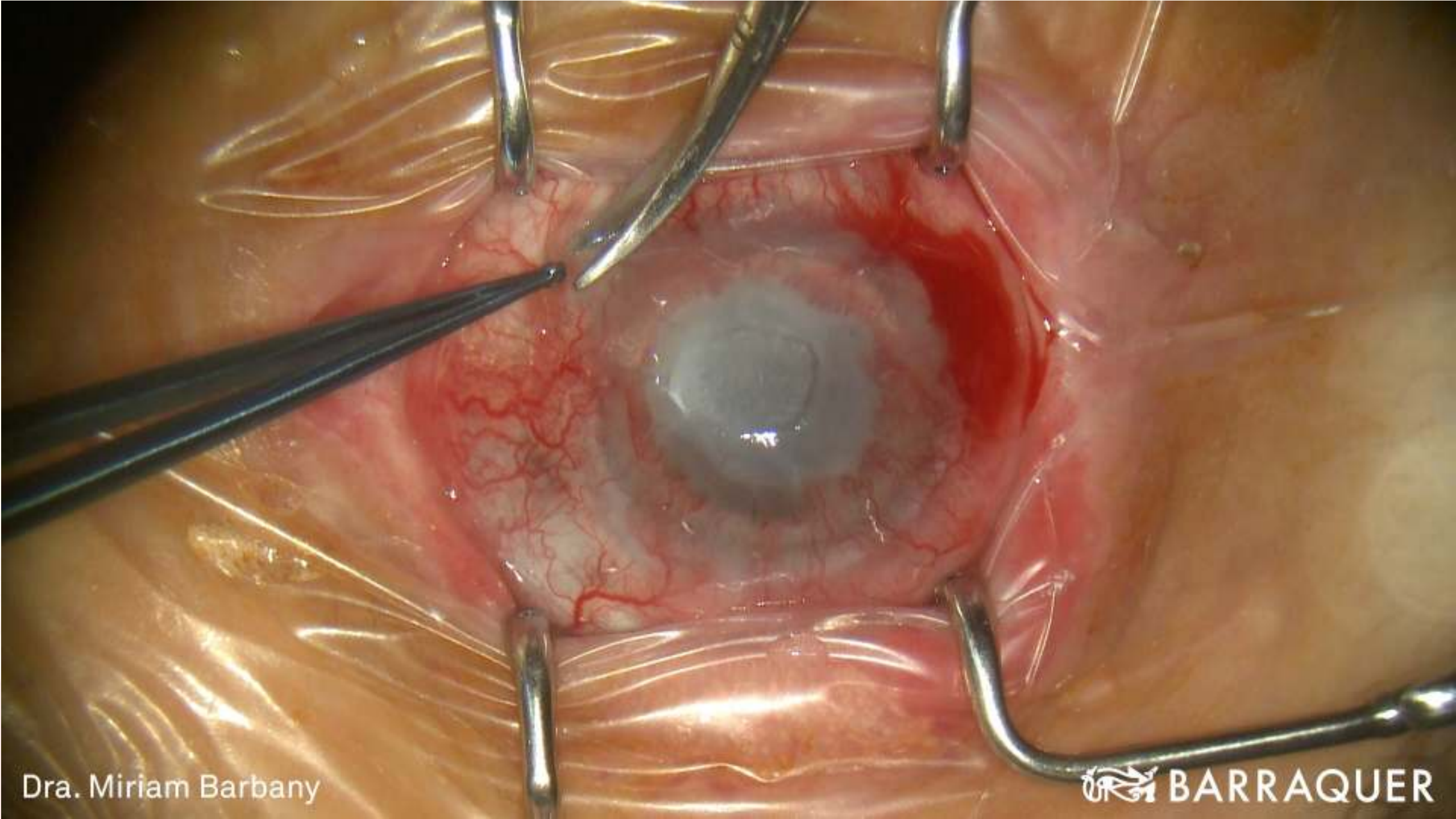
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# OOKP: Surgical Phases

- Stage 1 involves harvesting a tooth and surrounding bone, shaping it to accommodate the optical cylinder, and implanting it in a subcutaneous pocket for vascularization.
- Stage 2 includes exposure of the lamina, removal of keratinized conjunctiva, and ocular implantation of the lamina with mucosal grafting. Surgical planning requires dental and maxillofacial collaboration. Visual outcomes are favorable, but the procedure is invasive and complex.

- Source: Falcinelli G et al. Br J Ophthalmol. 2005;89(10):1215–1219.


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# Keratoprosthesis: Complications and Management

- Common complications include
  - Retroprosthetic membrane (YAG laser or membranectomy)
  - Endophthalmitis
  - Chronic glaucoma
  - Corneal melt (tectonic grafts or amniotic membrane)

Source: Sayegh RR et al. Am J Ophthalmol. 2014;158(3):498–504.e2.

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# Lamellar Keratoplasty: Introduction and Rationale

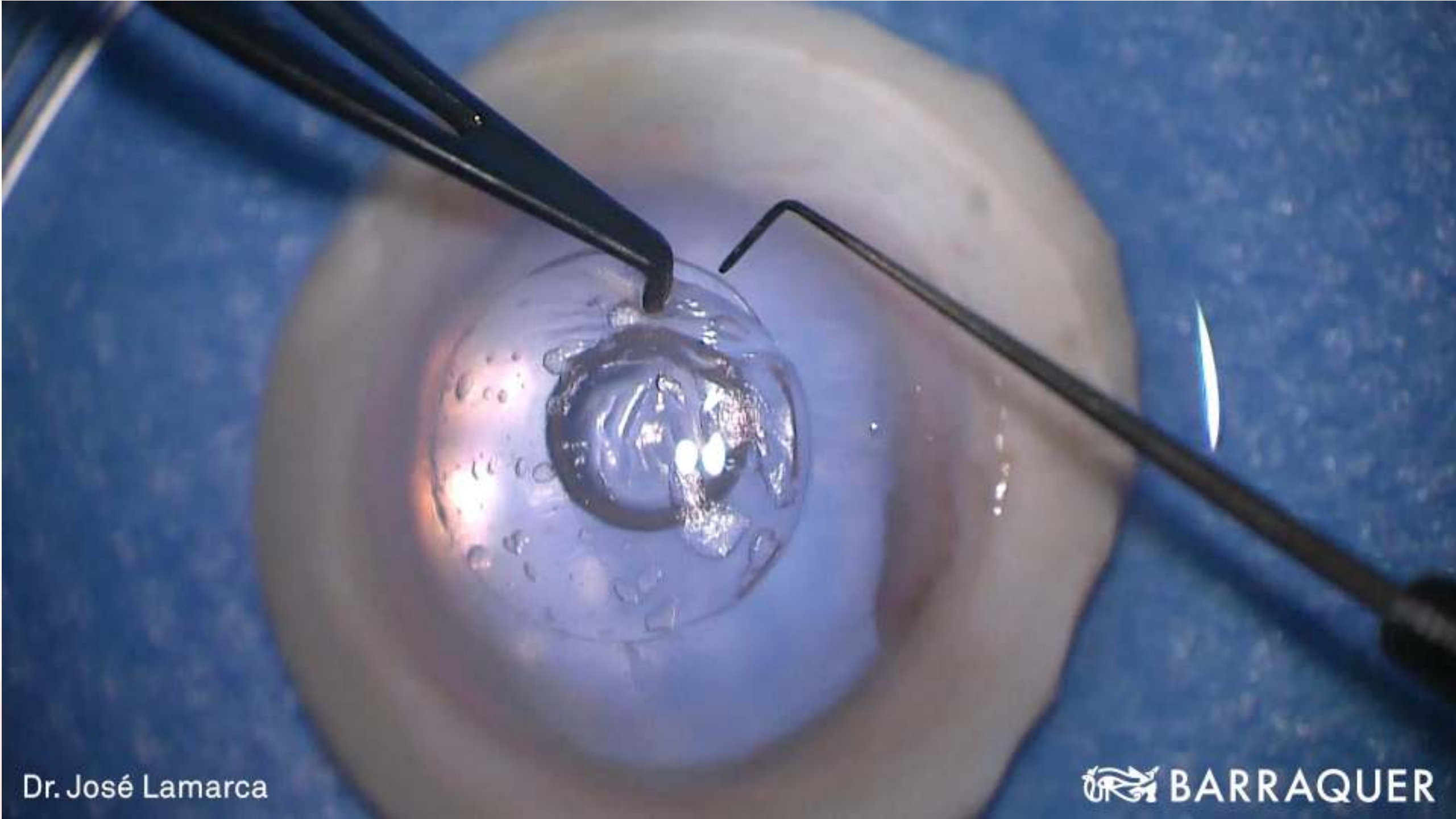
- Lamellar keratoplasty preserves host endothelium or anterior stroma depending on the pathology, reducing rejection risks. It is divided into anterior lamellar (e.g., DALK, SALK) and posterior lamellar (e.g., DSAEK, DMEK) approaches. These procedures offer faster recovery, better tectonic stability, and fewer immune complications compared to full-thickness penetrating keratoplasty (PK).
- Source: Anwar M, Teichmann KD. J Cataract Refract Surg. 2002;28(3):398–403.

# DALK: Indications and Preoperative Planning

- DALK is indicated for stromal dystrophies, advanced keratoconus, scars, and infectious keratitis with preserved endothelium. Corneal topography, pachymetry, and endothelial cell count confirm suitability. Deep cone apex or prior hydrops may increase risk of DM perforation. Use of anterior segment OCT is helpful for planning depth of dissection.
- Source: Fontana L et al. Am J Ophthalmol. 2007;143(1):117–124.

# DALK: Surgical Techniques

- Two major techniques: the 'big-bubble' technique uses air injection to separate DM, while manual layer-by-layer dissection is used if the bubble fails. The donor button is placed without endothelium and sutured with interrupted or combined sutures. Intraoperative complications include perforation of DM, leading to conversion to PK.
- Source: Archila EA. Am J Ophthalmol. 1984;98(6):731–736.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# DALK: Outcomes and Complications

- Visual acuity outcomes are variable (Interface haze can affect visual quality)
- Postoperative complications
  - microperforation-related double anterior chamber
  - Stromal rejection
  - Suture-related vascularization
  - Recurrence of disease (e.g., granular dystrophy).
- Source: Watson SL et al. Cornea. 2005;24(3):281–288.

# DSAEK: Indications and Tissue Preparation

- DSAEK is used for endothelial dysfunction, mainly Fuchs dystrophy and pseudophakic bullous keratopathy. It involves stripping DM from the recipient and replacing it with donor endothelium, DM, and a thin stromal layer. Donor tissue is prepared with a microkeratome.

- Source: Gorovoy MS. Cornea. 2006;25(8):886–889.

# DSAEK: Surgical Technique

- Insertion devices include Busin glide, Tan EndoGlide, or modified forceps.
- The graft is inserted through a 3–5 mm incision and unfolded in the anterior chamber.
- An air bubble is used to press the graft against the posterior stroma. Correct centration and adhesion are key. Post-op positioning is supine for several hours.

- Source: Terry MA et al. Cornea. 2009;28(3):327–333.

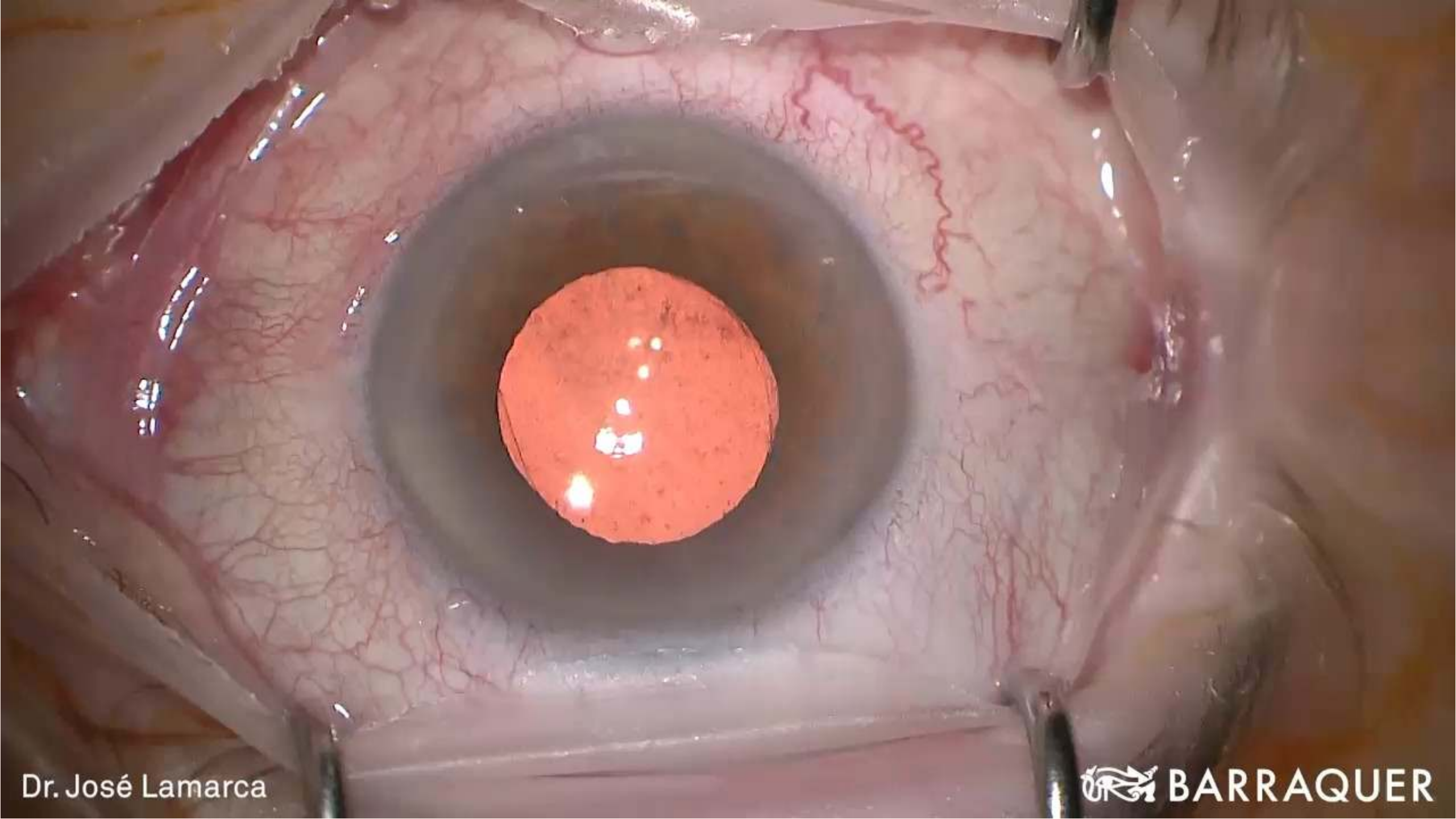
# DMEK: Indications and Advantages

- DMEK involves transplantation of only DM and endothelium.
- It provides better visual outcomes and lower rejection rates compared to DSAEK.
- Suitable for Fuchs dystrophy and other isolated endothelial failures.
- Not ideal in eyes with complex anterior segment due to difficulty unfolding.
- Source: Price MO et al. Ophthalmology. 2012;119(2):228–234.

# DMEK: Surgical Technique and Complications

- Donor preparation requires delicate stripping and staining.
- The graft is injected into the AC using a glass injector.
- Unfolding techniques vary (e.g., tap technique, no-touch).
- Complications include
  - graft detachment (bubbling may be required)
  - Primary failure,and rejection. Re-

- Source: Melles GRJ et al. Cornea. 2006;25(8):987–990.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# Corneal Refractive Surgery: Overview and Patient Selection

- Refractive surgery modifies corneal curvature to correct ametropia. Techniques include PRK, LASIK, SMILE, and phakic IOLs. Preoperative evaluation includes corneal topography, pachymetry, tear film assessment, and stability of refraction. Contraindications include keratoconus, thin corneas, autoimmune diseases, and unstable vision.
- Source: Reinstein DZ et al. J Refract Surg. 2010;26(11):769–776.

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# Corneal refractive surgery

## General Contraindications

- Stability of prescription
- Age under 18 years
- Unrealistic expectations
- Severe dry eye
- Severe glandular dysfunction
- Severe allergy
- Cataract
- Poorly controlled systemic conditions (collagen disease, HIV, diabetes, etc.)

# PTK-PRK

**PRK ( Keratectomy) Photorefractive ):**

- PRK was one of the first laser refractive surgery techniques and has been performed since the late 1980s. Although its popularity has declined with the introduction of LASIK, it is still performed in select cases.
- **Estimate** : Several million PRK procedures have been performed worldwide. It is estimated that it currently represents a small fraction of all refractive surgeries.

# PRK: Technique and Indications

- Photorefractive keratectomy (PRK) involves epithelial removal using alcohol or a brush, followed by excimer laser ablation of the stromal surface.

# PRK: Technique and Indications

## Mechanics /topography

- Thickness less than 480 microns (up to 300 microns?)
- Intention to avoid ectasia
- Asymmetric topography
- Keratometry greater than 48 to less than 40 (if we use microkerato )

## Profession

- Military athletes, police, etc.

## Anatomy

- Basement membrane dystrophy
- Mild dry eye
- Damaged peripheral retina
- Pupils larger than 8mm ( Scotopic )
- Reduction of eyelid clefts
- PTK in epithelial opacities or irregularities

# PRK: Technique and Indications

## Complications

- Pain (dage lenses)
- Haze (mitomycin C)
- Non-infectious infiltrates
- Delayed epithelial healing
- Bacterial keratoconjunctivitis
- Under/overcorrection, ectasia and regression
- Dry eye
- Visual recovery is slower than LASIK.
- Enhancements possible after 6 months.

# LASIK

**LASIK (Laser- Assisted In Situ Keratomileusis ):**

- LASIK is the most commonly performed refractive surgery and has been the dominant technique since the mid-1990s.
- **Estimate** : It is estimated that more than 40 million LASIK procedures have been performed worldwide. Annually, approximately 1 to 2 million LASIK procedures are performed worldwide.

# LASIK: Technique and Indications

- LASIK uses a femtosecond laser or microkeratome to create a stromal flap, followed by excimer ablation. Flap is repositioned without sutures. Indicated in patients with adequate corneal thickness, myopia, hyperopia, and astigmatism. Visual recovery is rapid.
- Source: Solomon KD et al. Ophthalmology. 2009;116(4):691–699.

# LASIK: Technique and Indications

## General

- Stromal > 300 microns Ablation less than 20% of the thickness -10 to +4.5 diopters?
- Femto vs Ks
- Presbyond

# LASIK: Technique and Indications

## Complications

- Epithelial defect
- Incomplete flap, buttonhole, Loss of suction (abnormal plane)
- OBL
- Decentration
- Striae, flap displacement
- DLK
- Epithelial growth
- Infectious keratoconjunctivitis Changes in correction, ectasia, regression, halos, and dry eye
- ectasia

# LASIK: Avoid ectasia

## Suggestions

- Corneal thickness < 500 microns
- < 24 years
- Astigmatism against the rule
- Astigmatism > 6
- Non -orthogonal axes
- 47 diopters
- Postoperative stroma < 300 microns
- History of atopy , dermatitis , QD

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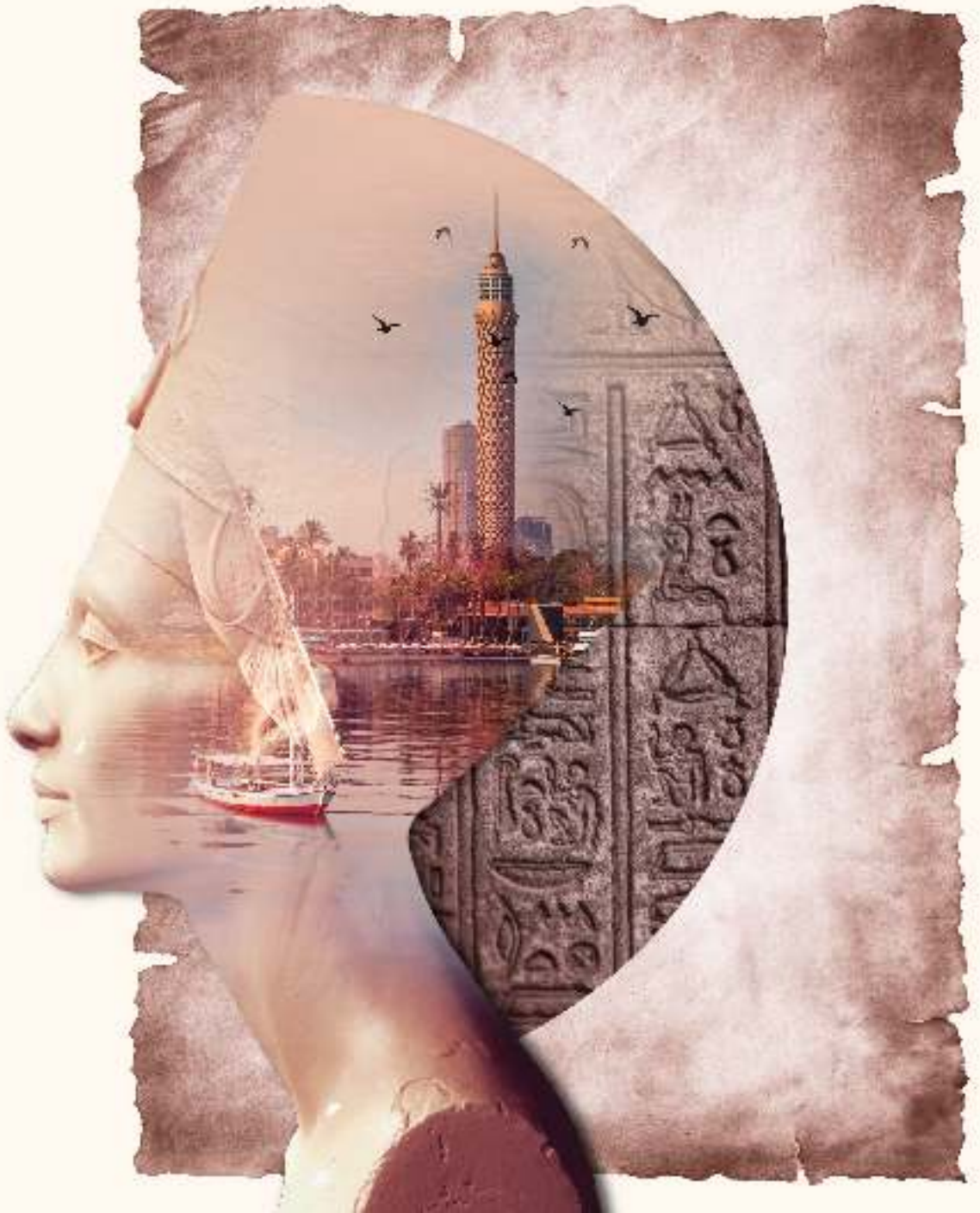
# Thank you



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