INTERNATIONAL CONGRESS OF THE
EGYPTIAN
OPHTHALMOLOGICAL SOCIETY

In collaboration with: MEACO

Corneal Epithelial Regeneration: From Limbal Stem Cell Transplant to Descemet's Membrane Transplant - KKESH Experience

Muhammad A Ahad, MRCOphth, FRCS, PhD

Senior Academic Consultant & Head of Anterior Segment Division

King Khaled Eye Specialist Hospital, Riyadh

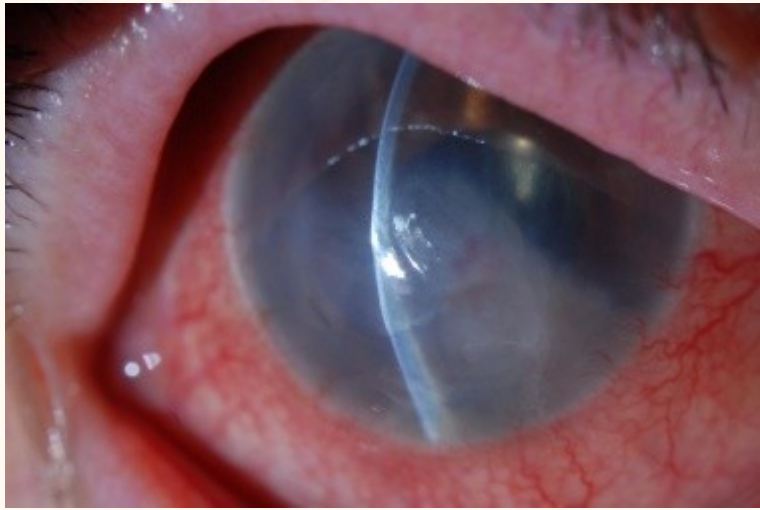
مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

Disclosure

No financial interests related to this talk

Causes of Poor epithelial regeneration

- **Limbal stem cell deficiency**
- **Neurotrophic**
  - Diabetes/Viral/Dry eyes/ Nerve damage/ PKP
- **Defective epithelial adhesion**
  - RCEs/dystrophies /drops/ Bullous keratopathy /Vitamin A deficiency
- **Inflammation**
  - Microbial/ viral keratitis
- **Mechanical/Physical**
  - Entropion/ PKP



Causes of LSCD

- Alkali-induced chemical injury
- Congenital/ Aniridia
- OCP/SJS
- multiple surgeries
- Preservatives in drops*
- Vernal keratoconjunctivitis
- Infections

Invest Ophthalmol Vis Sci2013 Sep 24;54(9):6314-25

Management

TREAT THE UNDERLYING CAUSE

SUPPORTIVE TREATMENT

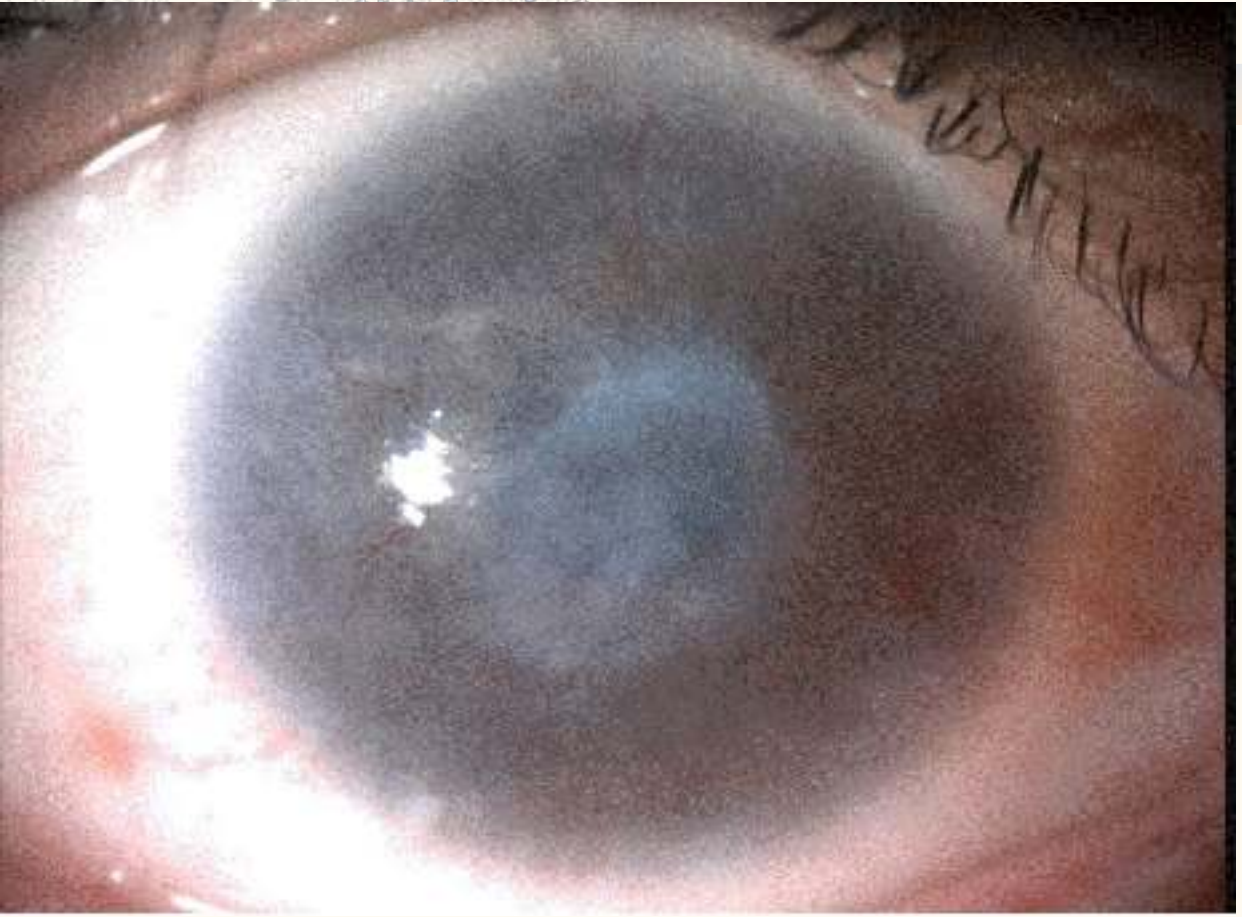
MANAGEMENT OF REFRACTORY CASES

- Control the inflammation
- Fix the lids and Fornices

مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

LSCD Surgical Options

- Conjunctival Limbal Autograft 1989
- Kerato-limbal Allograft 1997
- CLET: 2004
- SLET: 2012
- Holoclar: 2015 (commercial)
- CALEC : 2019 (xeno free)**/ USA**



مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

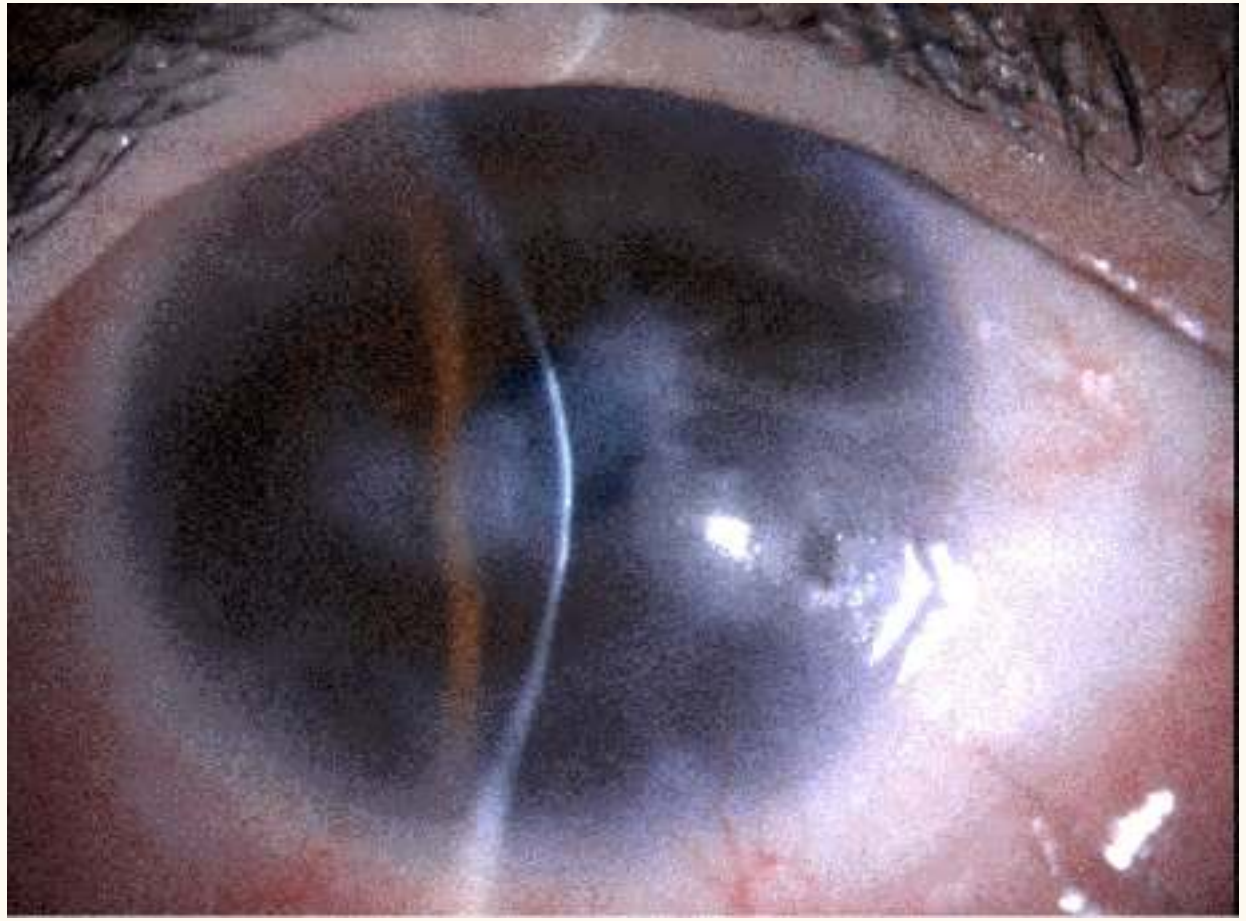
26 years old with 12 months history of chemical injury
VA 20/400

EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY


مستشفى الملك خالد
التخصصي للعيون
King Khaled Eye
Specialist Hospital

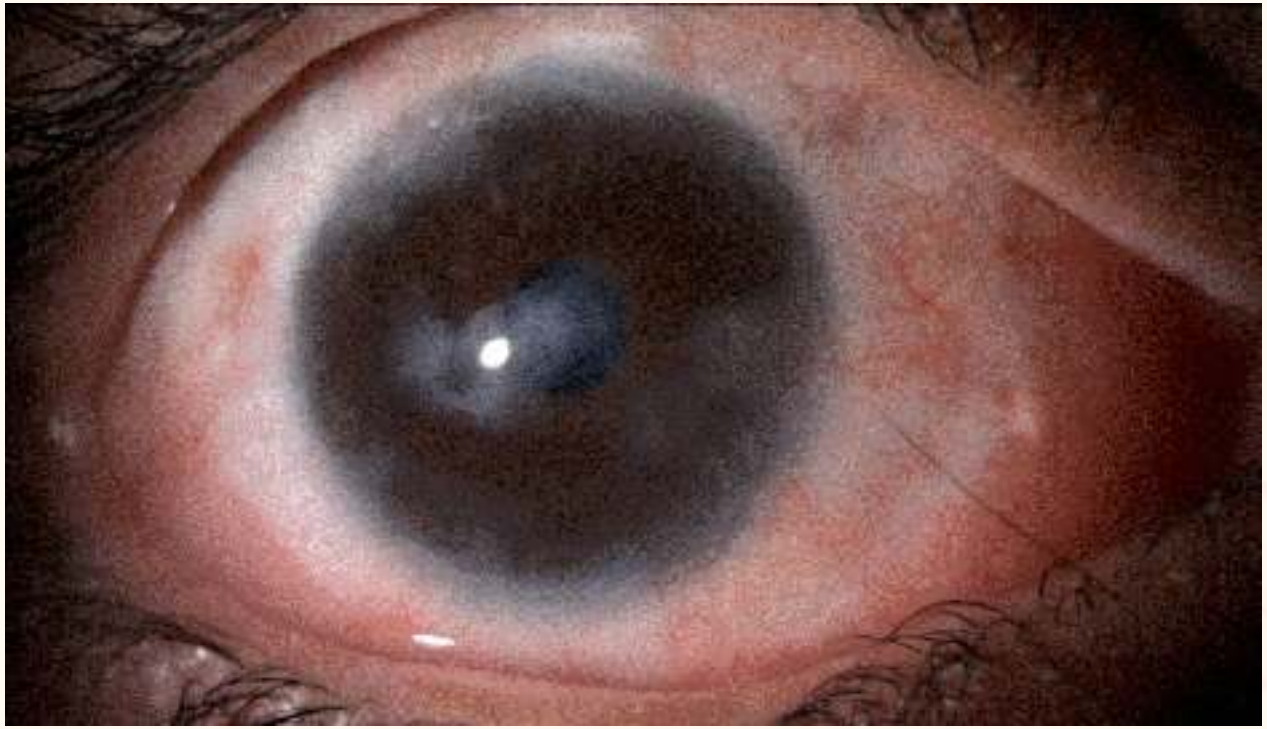
1 week Post Op

2m post Op
VA 20/50



مستشفى الملك خالد
التخصصي للعيون
King Khaled Eye
Specialist Hospital

32 with LSCD due to VKC (h/o shield ulcers as well)



EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

مستشفى الملك خالد
التخصصي للعيون
King Khaled Eye
Specialist Hospital

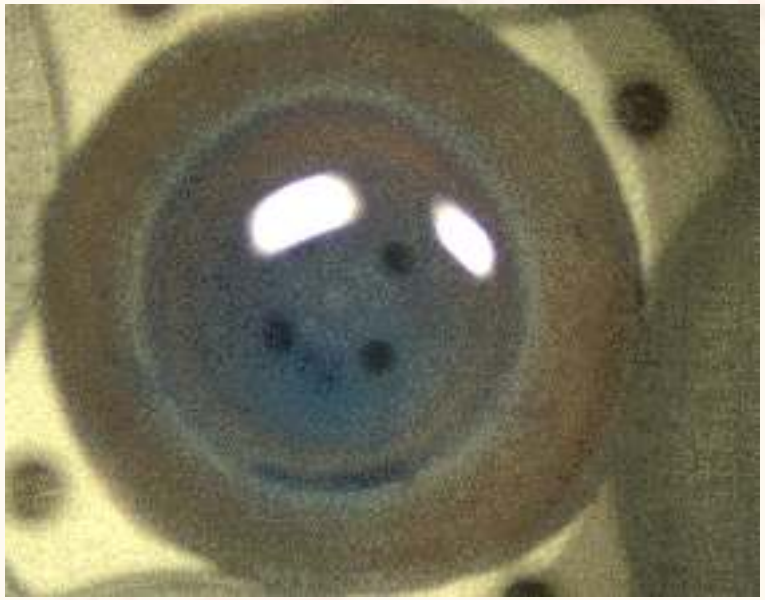
EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

What if there is Partial LSCD

- Superficial Keratectomy with AMT
- Sequential Sectoral Conjunctival Epitheliectomy (SSCE)
- Decellularized Descemet's Membrane transplant

BrightMEM® : Decellularized Descemet's Membrane



- **Decellularized Descemet's membrane (DM)**
- Retains **native DM ultrastructure** free of cellular antigens.
  - (no immunogenic response)
- Acts as a scaffold for limbal epithelial cell migration and proliferation.

Bright Star Therapeutics

Theory

- When LSC leaves the niche they lose their stem cell ability and just divide into mature epithelial cells

- Anterior side of Descemet's membrane, contains proteins

- Same proteins that are found in the limbal niche but not found in the central cornea so this DM can act like a limbal niche, ideally keeping stem cells alive long term in the center.

Case Reports > Cornea. 2025 Jan 1;44(1):108-112. doi: 10.1097/ICO.0000000000003565. Epub 2024 May 8.

Decellularized Descemet Membrane Anterior Keratoplasty With Allogeneic Simple Limbal Epithelial Transplantation for Partial Limbal Stem Cell Deficiency Following Partial Keratolimbal Allograft Failure

Albert Y Cheung [1, 2], Cameron R Krinsky [1], Joshua H Hou [3]

Affiliations + expand

PMID: 38713471 DOI: 10.1097/ICO.0000000000003565

Abstract

Purpose: The purpose of this study was to describe the use of Descemet membrane anterior keratoplasty (DMAK) with modified allogeneic simple limbal epithelial transplantation to treat a case of partial limbal stem cell deficiency (LSCD) following keratolimbal allograft failure.

Methods: Case report.

Results: A 21-year-old woman with autoimmune polyglandular syndrome-related LSCD presented with pain and decreased vision. There was partial failure and recurrence of LSCD after a severe/acute keratolimbal allograft rejection that led to persistent epithelial defects refractory to conservative therapy. This was treated with a superficial keratectomy and placement of a DMAK. A modified allogeneic simple limbal epithelial transplantation was performed with an overlying amniotic membrane and temporary tarsorrhaphy. There was epithelialization of the corneal surface by 3 to 4 weeks with an improved ocular surface. Despite partial recurrence of late staining, the cornea has remained epithelized, vision has improved, and the patient has remained pain-free more than 1.5 years following the procedure.

Conclusions: DMAK may be a long-term substrate to help improve and maintain epithelization of the cornea up to 1.5 years. DMAK may be a viable alternative to using amniotic membrane as a scaffold in allogeneic simple limbal epithelial transplantation for treatment of partial LSCD. While late epithelial staining recurred in our patient, DMAK appears to prevent recurrent epithelial defects and reduce ocular surface pain, conveying an improvement in quality of life in patients at high risk of rejection/

> Cornea. 2025 May 2. doi: 10.1097/ICO.0000000000003892. Online ahead of print.

Use of Decellularized Descemet Membrane Anterior Keratoplasty to Facilitate Epithelialization of Pediatric Penetrating Keratoplasty for Total Sclerocornea

Radwa Hisharawi [1], Daniel Lee [2], Abhiniti Mittal [1], Winston D Chamberlain [1], Joseph Tauber [1], Travis K Redd [1]

Affiliations + expand

PMID: 40315360 DOI: 10.1097/ICO.0000000000003892

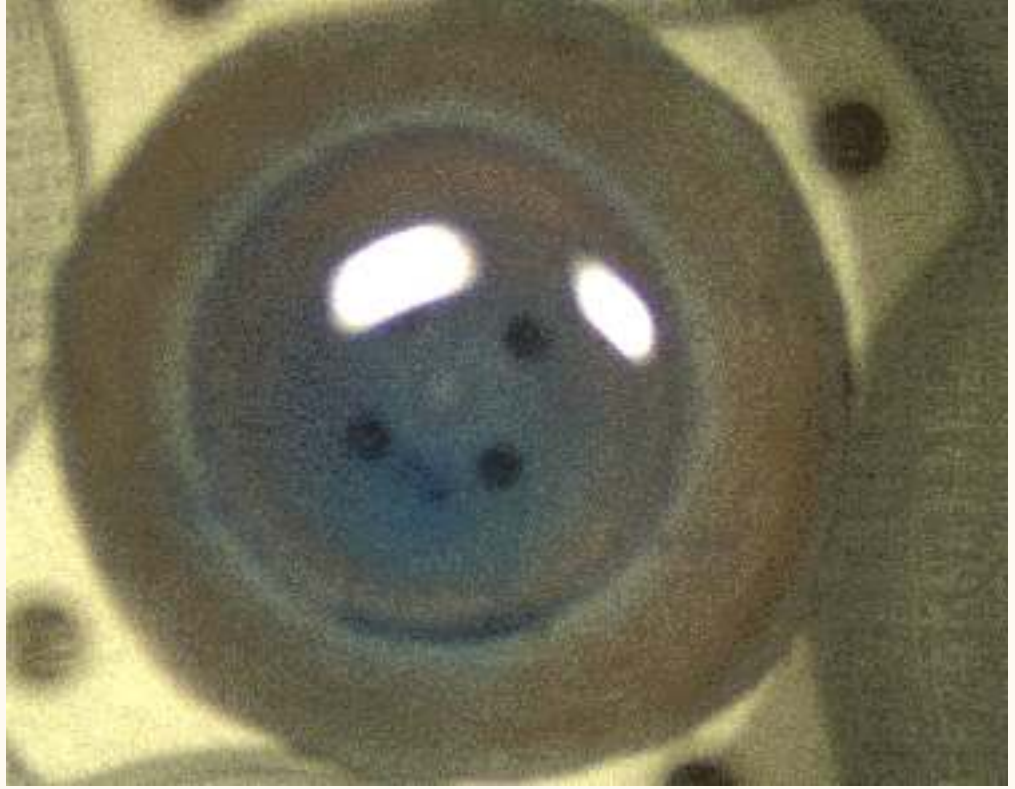
Abstract

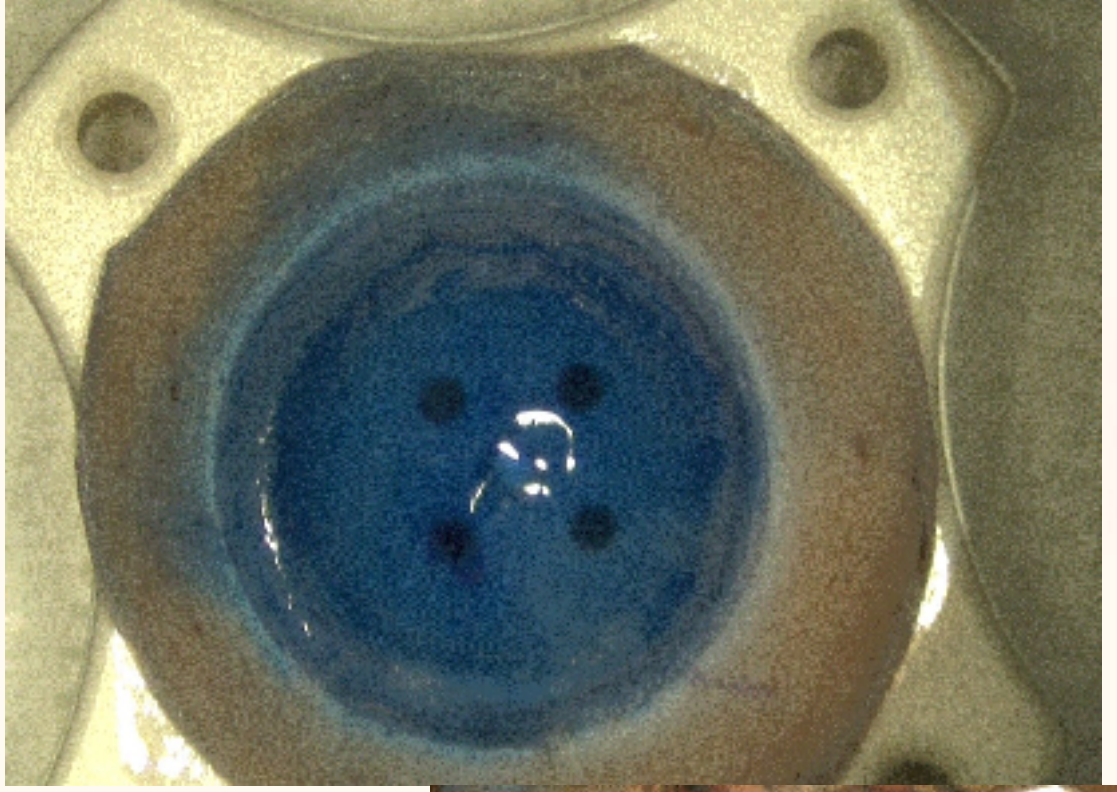
Purpose: To report the first known use of combined decellularized Descemet membrane anterior keratoplasty with penetrating keratoplasty (PKP) in a pediatric patient.

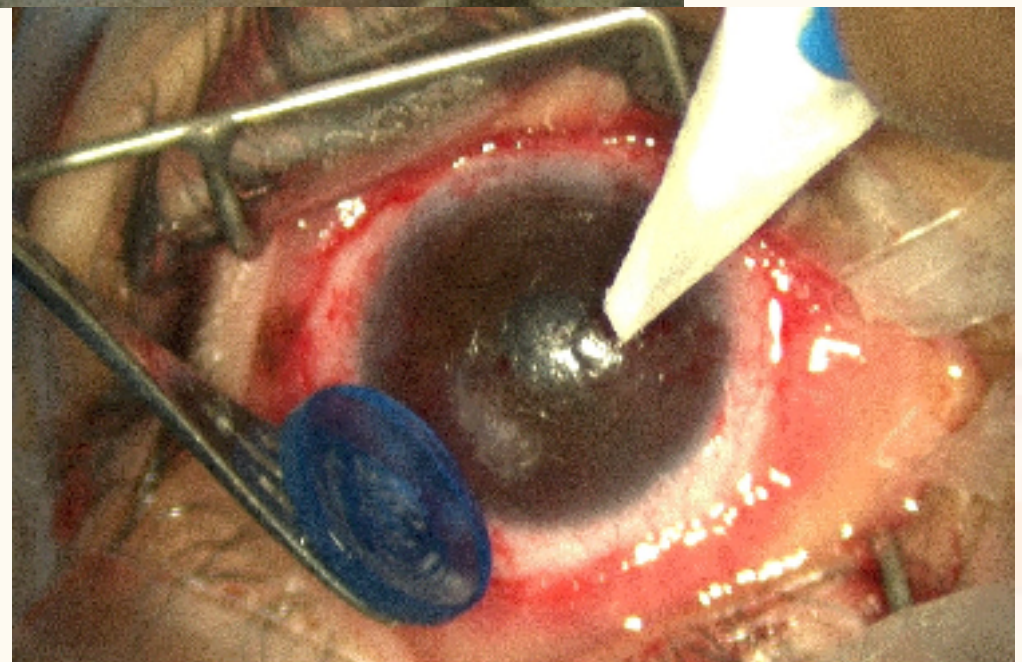
Methods: A 2-month-old boy with bilateral sclerocornea underwent bilateral sequential PKP. In the left eye, PKP performed at 2 months of age was complicated by a persistent epithelial defect postoperatively with a 1 month delay in epithelialization. As a result, the patient underwent PKP with a combined decellularized Descemet membrane corneal allograft implantation in the right eye at 3 months of age to enhance early postoperative healing. This was performed by creating a central 3-mm superficial keratectomy before placing Descemet membrane allograft onto the full-thickness graft.

Results: Compared to the 1-month delay in epithelialization after PKP in the left eye, the right eye, which underwent combined PKP and decellularized Descemet membrane corneal allograft, was fully epithelialized by the first postoperative week. The grafts remain clear and intact at 12 months of age. The patient exhibited significant improvement in visual behavior.

Conclusions: This case highlights the successful use of decellularized Descemet membrane anterior keratoplasty in preventing a persistent epithelial defect in the early postoperative period for a pediatric patient with sclerocornea. This may be a viable option for similar pediatric cases with delayed epithelial healing while promoting graft survival and minimizing the need for additional surgical interventions.



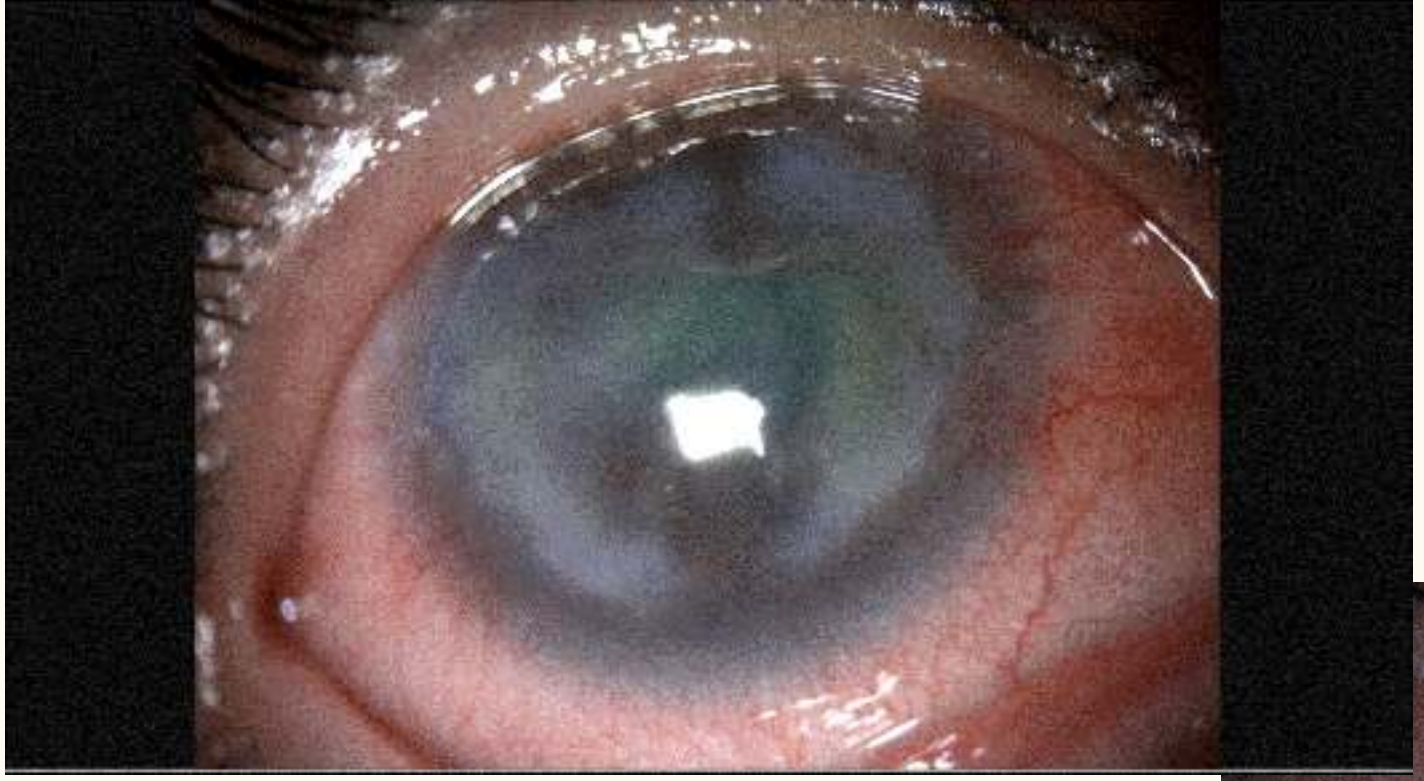




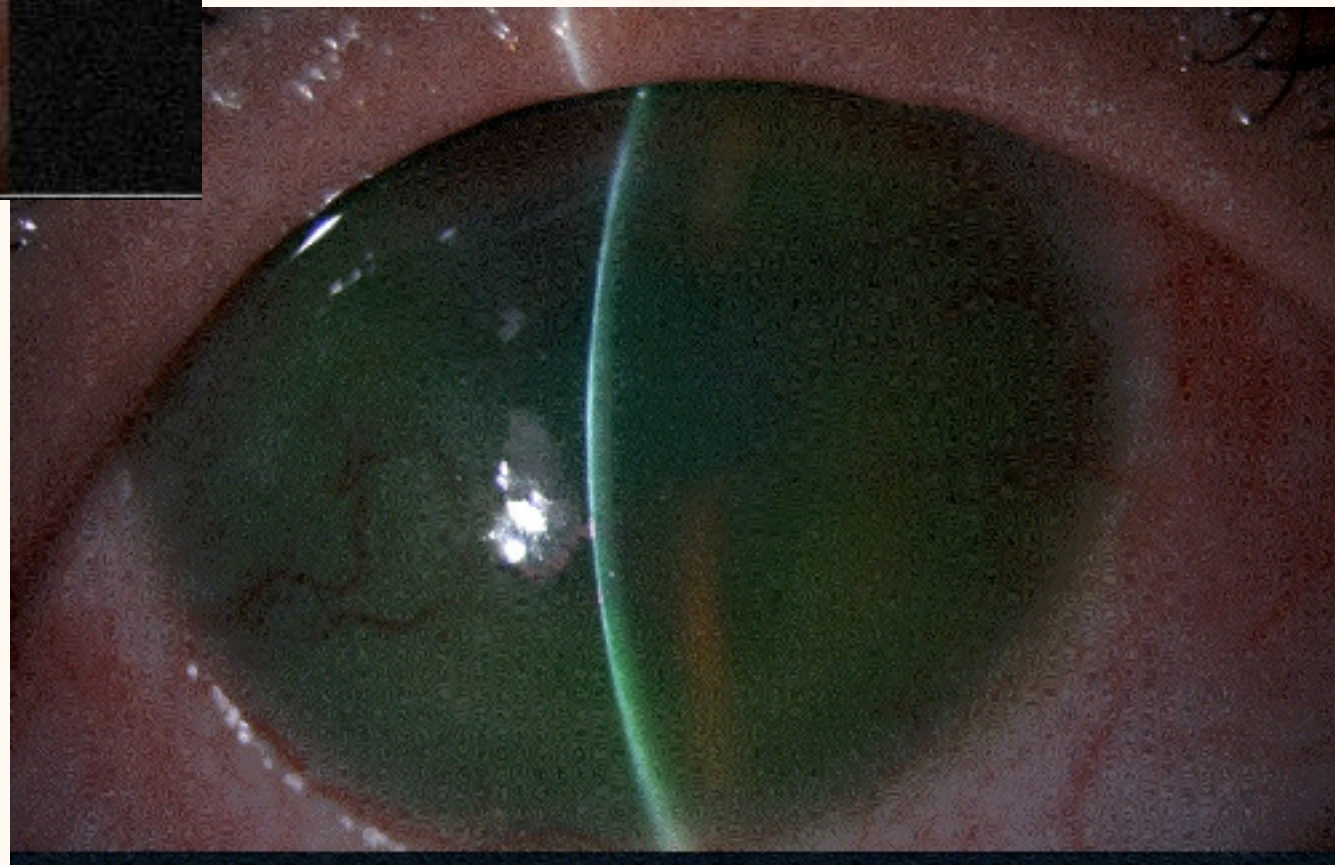
EOS 2025

EGYPTIAN OPHTHALMOLOGICAL SOCIETY

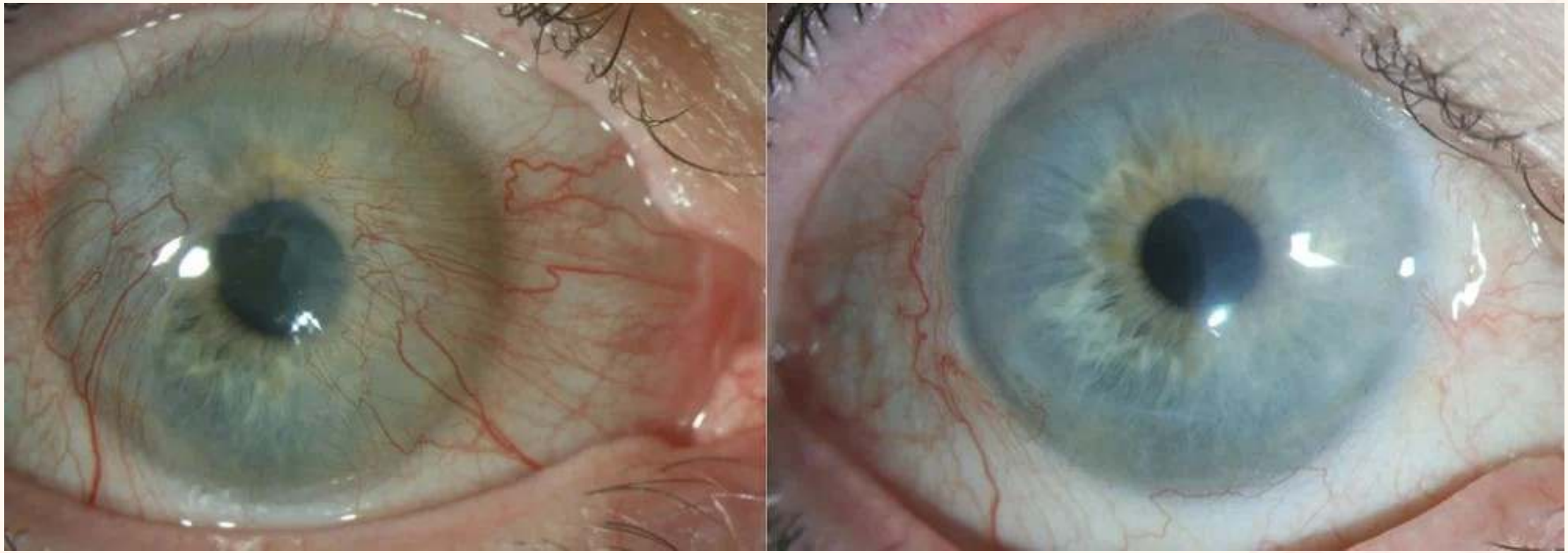

مستشفى الملك خالد
التخصصي للعيون
King Khaled Eye
Specialist Hospital

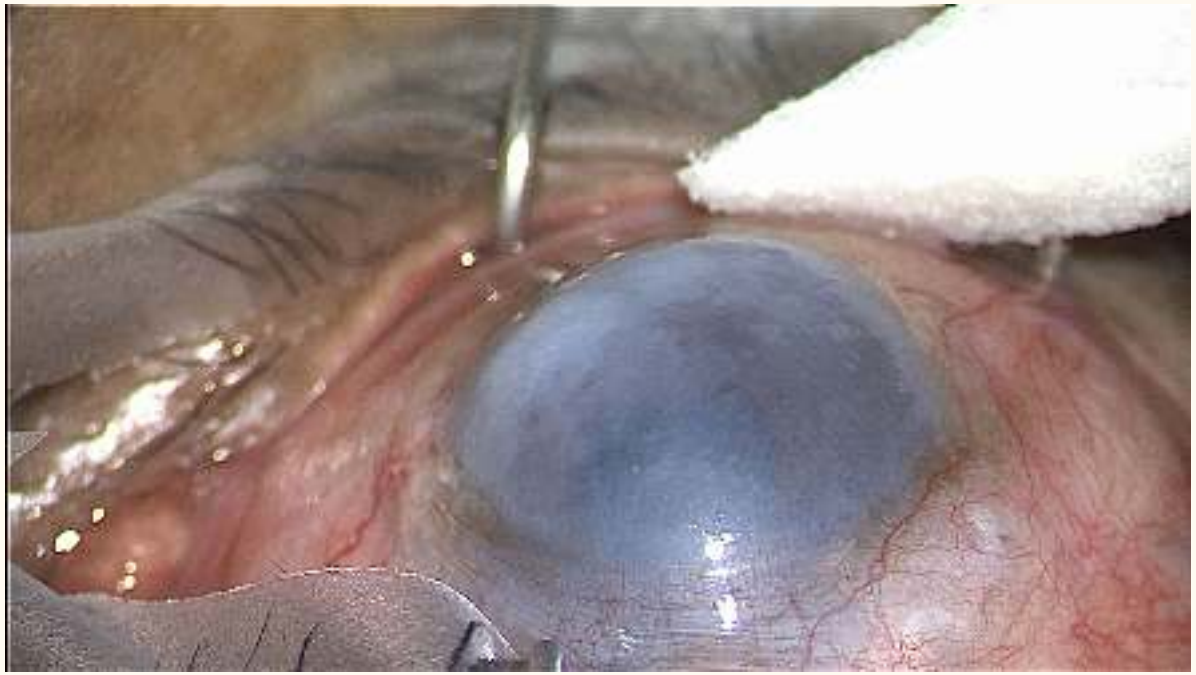


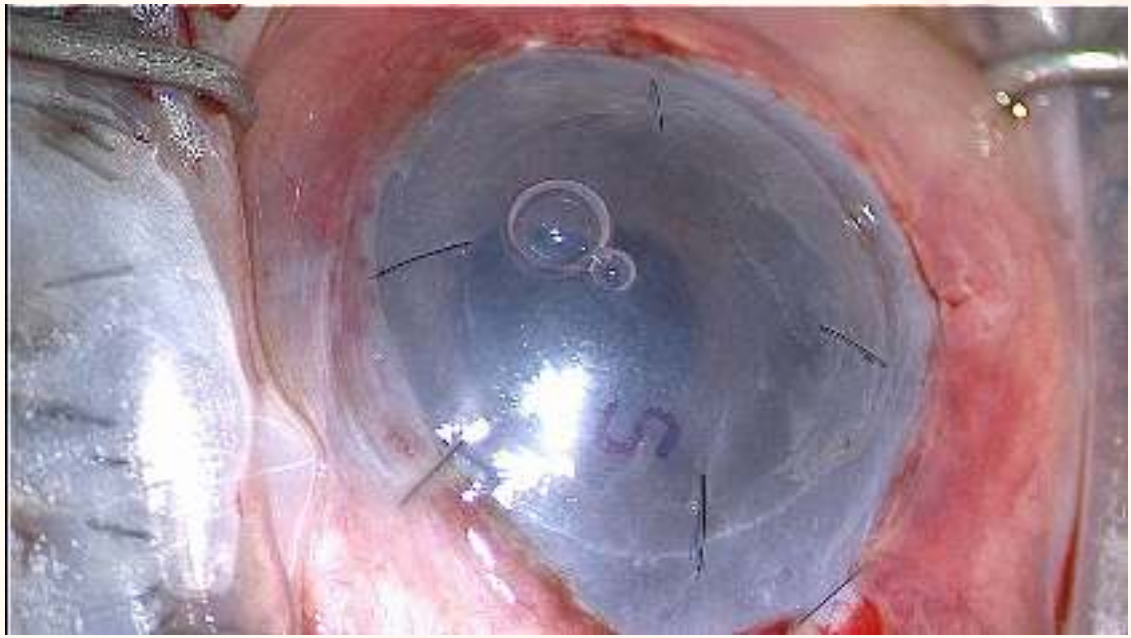
مستشفى الملك خالد
التخصصي للعيون
King Khaled Eye
Specialist Hospital

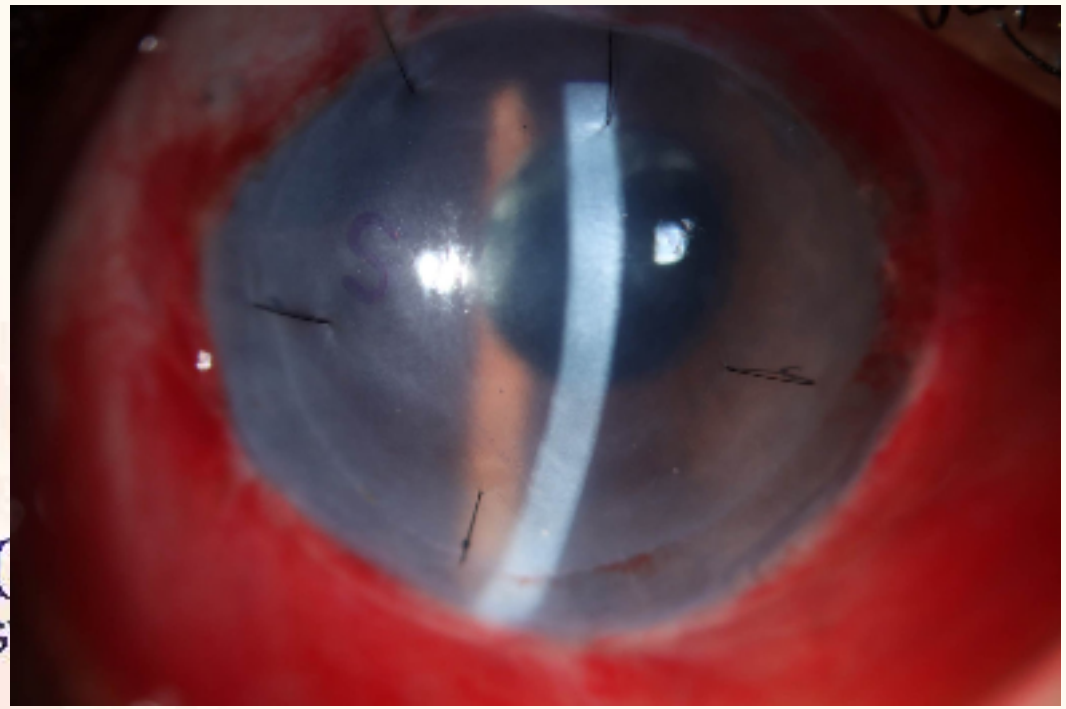


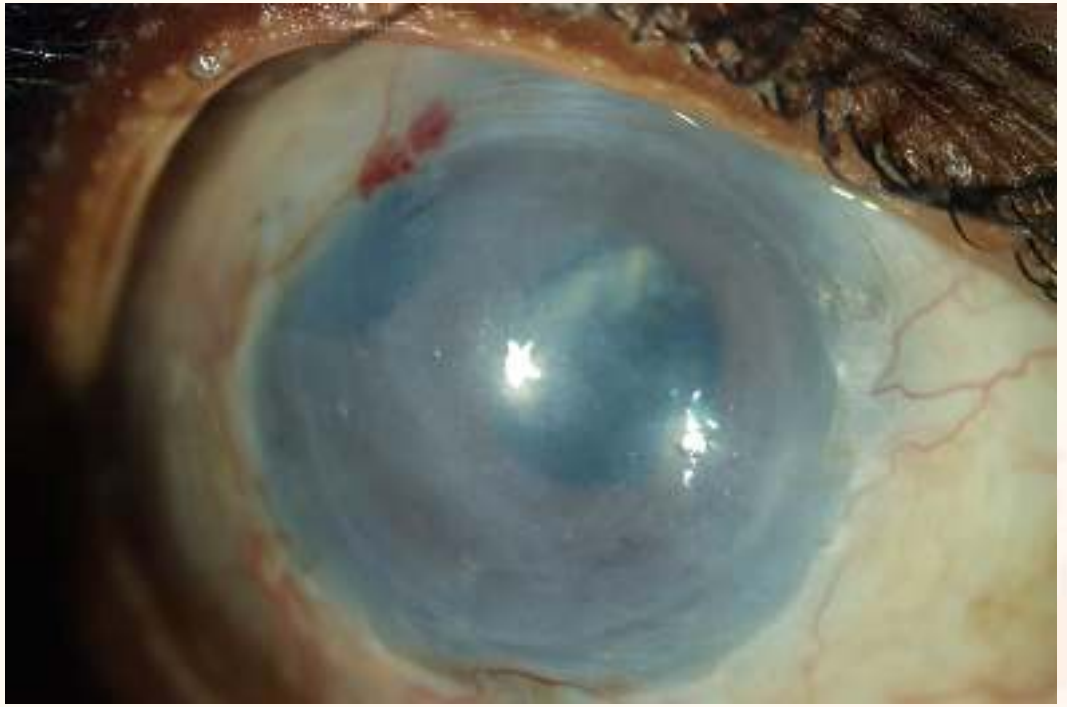
EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY











Insulin Eye drops

- Promotes Epithelial migration
- Indicated for PED due to
  - NK
  - LSCD
- Multiple Concentration

EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

Review > J Curr Ophthalmol. 2024 Oct 16;36(1):69-72. doi: 10.4103/joco.joco_82_24. eCollection 2024 Jan-Mar.

Topical Insulin for Neurotrophic–Related Epithelial Defects: Where do We Stand? A Systematic Review

Colette Wouters, Isabelle Saelens, Heleen Delbeke

Affiliations + expand

PMID: 39991318 PMCID: PMC11836618 DOI: 10.4103/joco.joco_82_24

Abstract

Purpose: To review the existing literature to evaluate the utility of insulin eye drops as a treatment for neurotrophic related epithelial defects.

Methods: A comprehensive literature search of Medline, Embase, and Web of Science and additional manual searches were conducted using relevant keywords. All articles published from January 2000 to January 2024 were examined. Studies on the use of topical insulin drops in neurotrophic epithelial defects were included.

Results: A total of 16 articles were found relevant to be discussed in the review. All included patients had neurotrophic related epithelial defects ranging from 3.8 mm² to 144 mm². After treatment with topical insulin, most of the epithelial defects showed a complete epithelialization. Various concentrations and types of insulin were used. The studies also varied in the type of vehicle used in the preparation of insulin drops. Two randomized controlled trials demonstrated that topical insulin drops were more effective than conventional treatment with artificial tears or autologous serum. All included studies, except for two, reported the absence of local or systemic side effects.

Conclusions: Topical insulin is a promising and effective (adjuvant) treatment for neurotrophic keratopathy. It facilitates the healing of neurotrophic epithelial defects and offers many advantages over the current treatment options; insulin is widely available and it is relatively inexpensive. Topical insulin drops do not affect systemic blood glucose levels and are well tolerated. However, further investigation is needed.

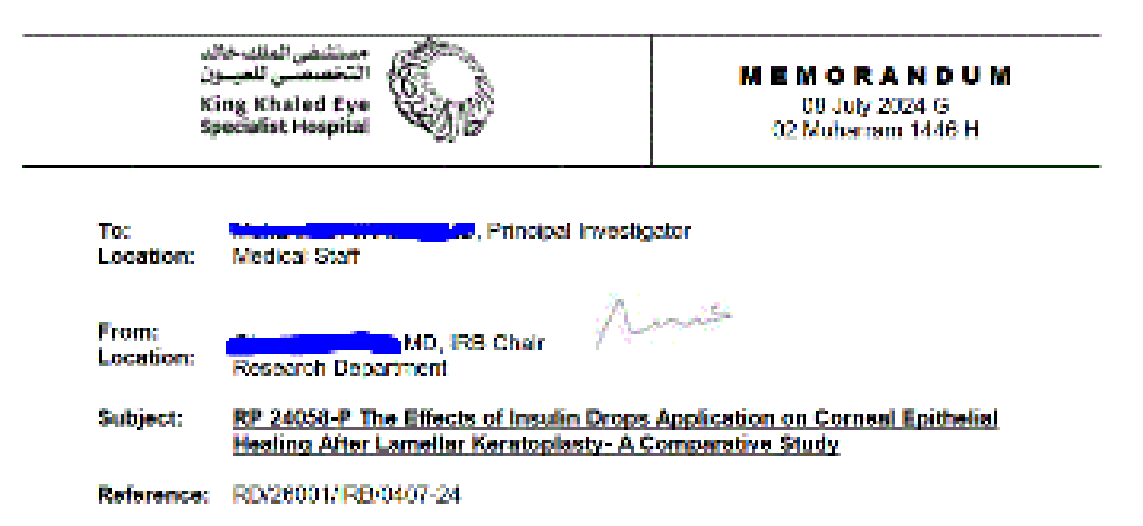
Eye drops Preparations	Insulin	Insulin
Concentration	25 IU/ml	1 IU/ml
Source:	Injection	Injection
Solvent base	Normal Saline	Propylene Glycol
Preservatives?	No	No
Expiry	4 days	30 days
Shelf life once prepared	4 days	30 days
storage	Refrigerated	Refrigerated

Moreker MR, Insulin eye drops for neurotrophic keratitis. Indian J Ophthalmol. 2023 Jul;71(7):2911-2912. doi: 10.4103/IJO.IJO_872_23.
Bastion, M. L., "Topical insulin for healing of diabetic epithelial defects?: A retrospective review of corneal debridement during vitreoretinal surgery in Malaysian patients." Med J Malaysia 68.3 (2013): 209

مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

Insulin drops

- Good Response post Keratoplasty (LKP/PKP)
- Modest response in simple PED
- Modest response in established NK
- Good response post multiple surgeries (combination of NK/LSCD)



King Khaled Eye Specialist Hospital

MEMORANDUM

09 July 2024 G
02 Muharram 1446 H

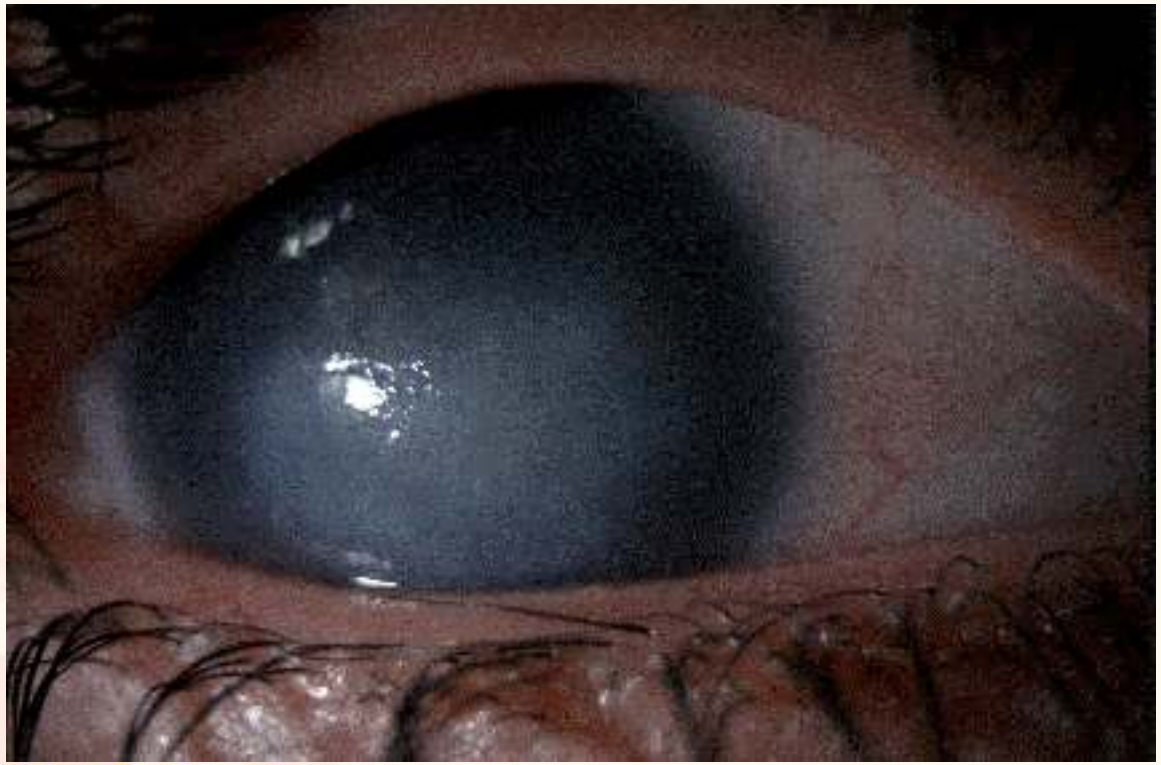
To: [redacted], Principal Investigator
Location: Medical Staff

From: [redacted] MD, IRB Chair
Location: Research Department

Subject: RP 24058-P The Effects of Insulin Drops Application on Corneal Epithelial Healing After Lamellar Keratoplasty- A Comparative Study

Reference: RDV26001/RB-0407-24

Better response in LSCD



EGYPTIAN OPHTHALMOLOGICAL SOCIETY

مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

In Summary

- SLET appears very effective procedure in cases of total LSCD particularly due to chemical injury
- In cases of partial/less than total LSCD, BrightMEM has shown promising results
- Insulin eye drops can be used as an adjunct in promoting healing

مستشفى الملك خالد التخصصي للعيون
King Khaled Eye Specialist Hospital

THANK YOU

EOS 2025
EGYPTIAN OPHTHALMOLOGICAL SOCIETY