

17th Annual International Meeting of Research Institute of Ophthalmology (RIO)
Jan 30 - 31, 2025, Royal Maxim Palace Kempinski Cairo, Egypt.

Symposium 1: Ocular surface Surgeries

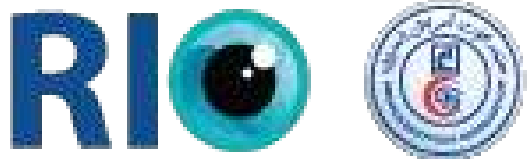
Keynote

Limbal stem cell transplantation – In vivo expansion techniques

Professor Harminder Sigh Dua, CBE, CMLJ, DL

MBBS(Nagpur), DO(Nagpur), DO(London), MS(Nagpur), MNAMS(NAMS, India),
FRCS(Edinburgh), FRCOphth.(UK), FEBO(EU), FCOptom.(UK, Hon.), FRCP(Edinburgh, Hon.),
FRCOphth.(UK, Hon.), FAICO(India, Hon.), MD(Aberdeen), PhD(Nagpur)

Chair and Professor of Ophthalmology



**The University of
Nottingham**

Declaration of Interests

Consultant: Artic Vision, Santen, Thea

Medical Advisor: NuVision Biotherapies

Shares: Glaxosmithkline, NuVision Biotherapies

Limbal Stem Cell Transplantation: Algorithm

Establish the Diagnosis:

Corneal and Conjunctival involvement (impression cytology, IVCN)

Inflammation: Active or Quiescent

Disease: Limited (Chemical burns) or Progressive (SJS, OCP)

Evaluate the Extent of SC deficiency:

Partial or Total

Unilateral or Bilateral

Visual Axis involved or not

Evaluate the Eye and Patient:

Eyelids

Cataract

Tear function

Fundus

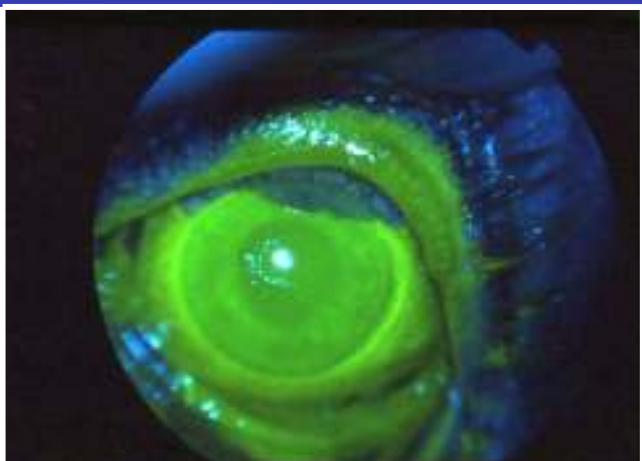
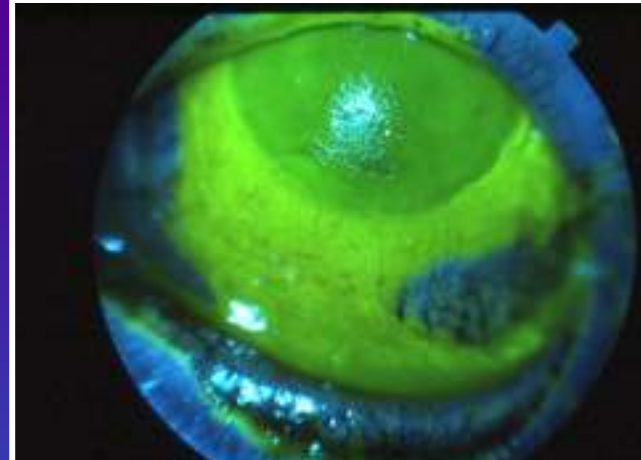
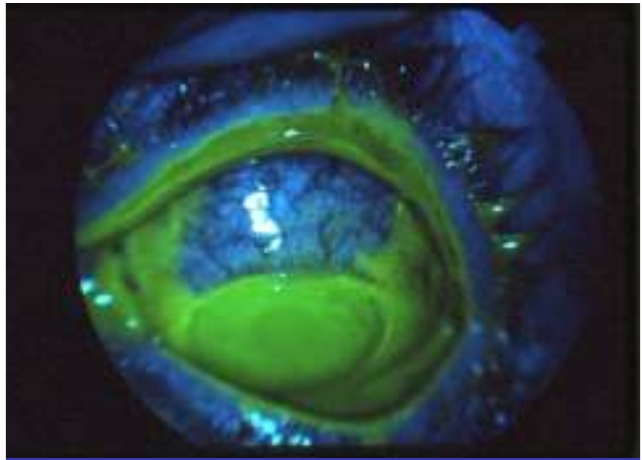
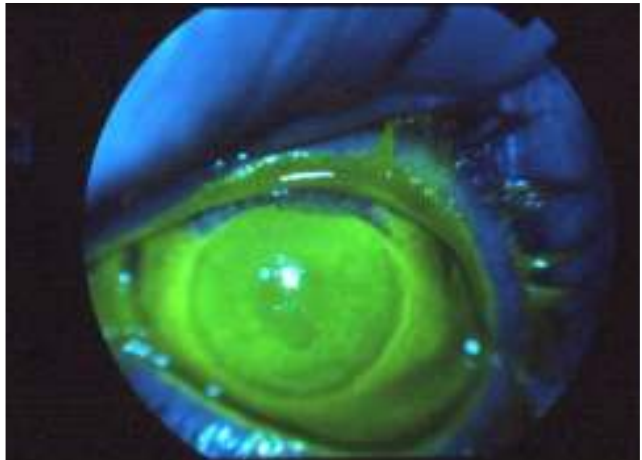
IOP

Systemic workup (immunosuppression)

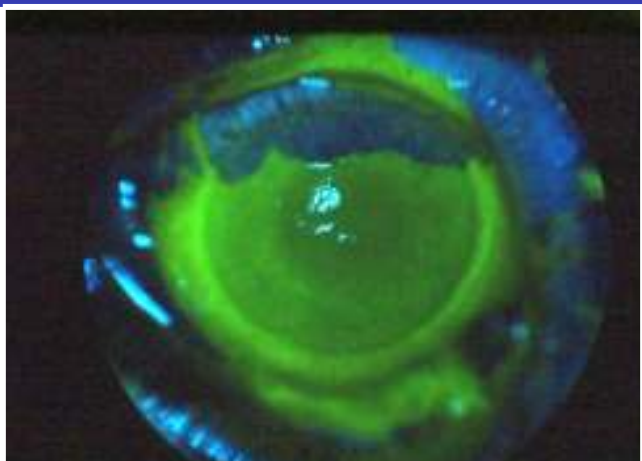
Try and Operate on a Quiet Eye when all inflammation is controlled

- **PARTIAL LSCD:**
 - **With conjunctivalised, metaplastic epithelium on cornea:**
 - **Visual axis not involved: Leave alone?**
 - **Visual axis involved: Sequential Sector Conjunctival Epitheliectomy (SSCE)**
 - **With fibrovascular pannus on part of cornea:**
 - **Sector limbal transplant.**

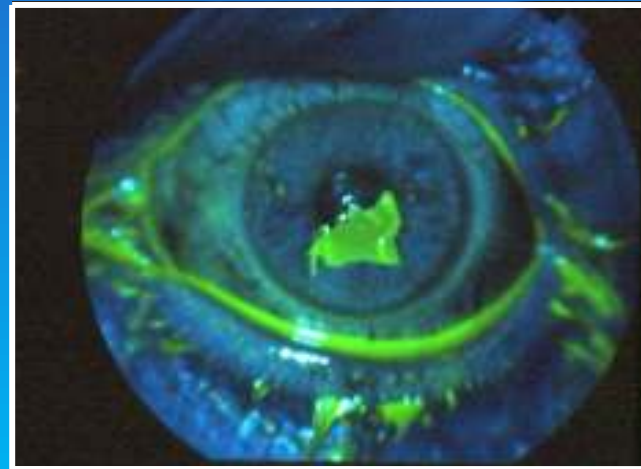
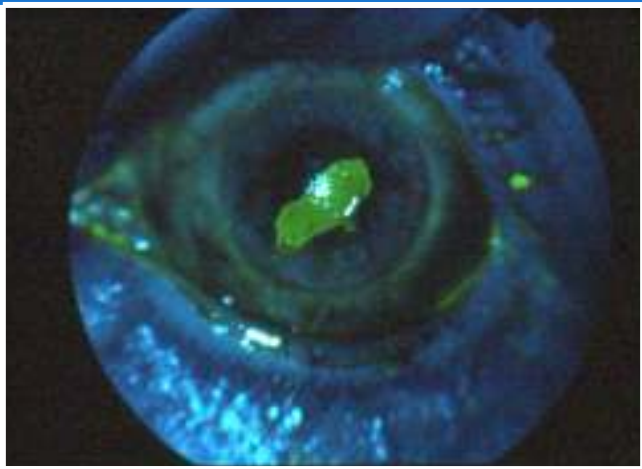
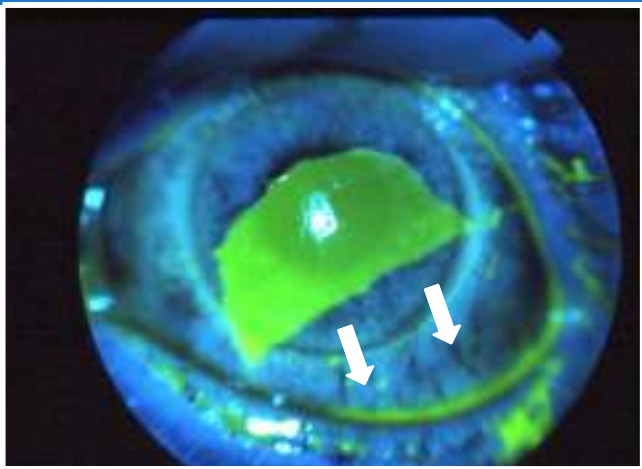
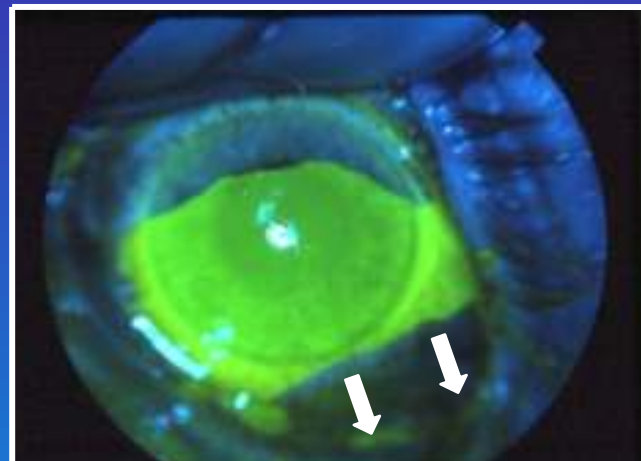
Amniotic membrane may be combined with the above



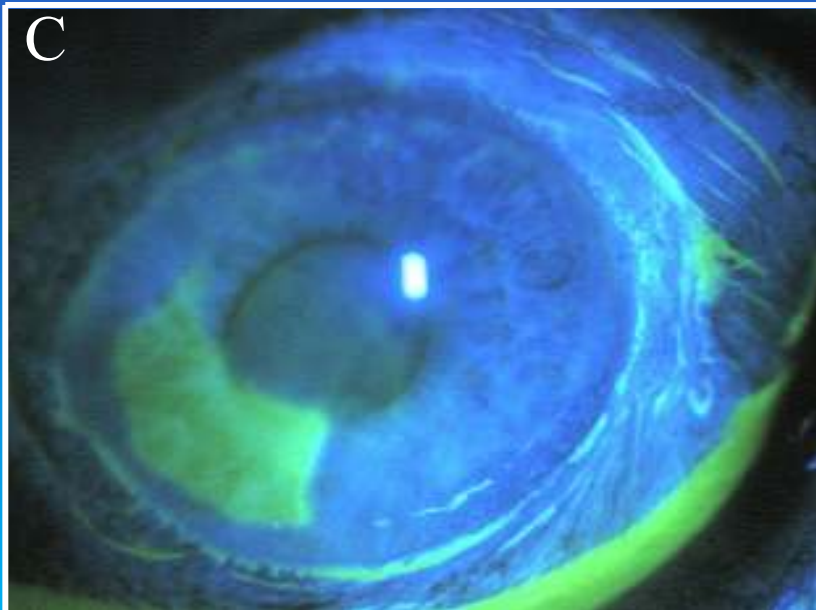
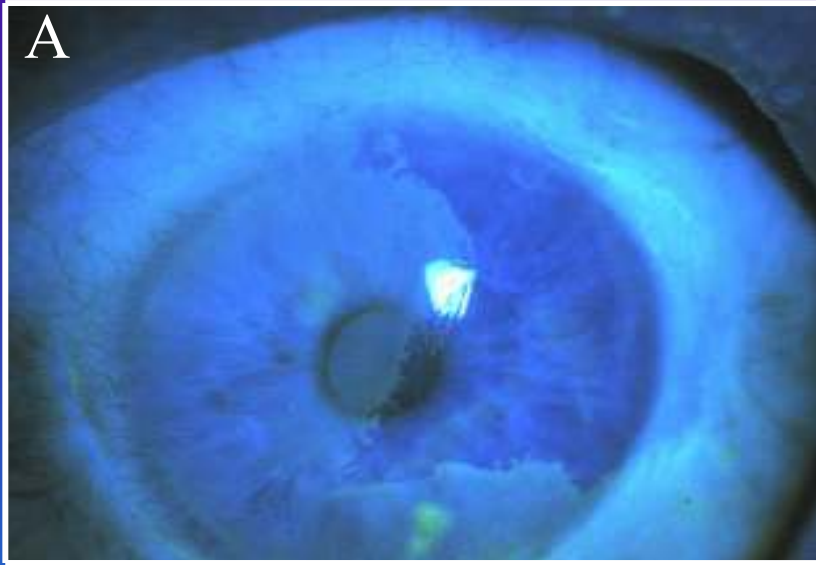
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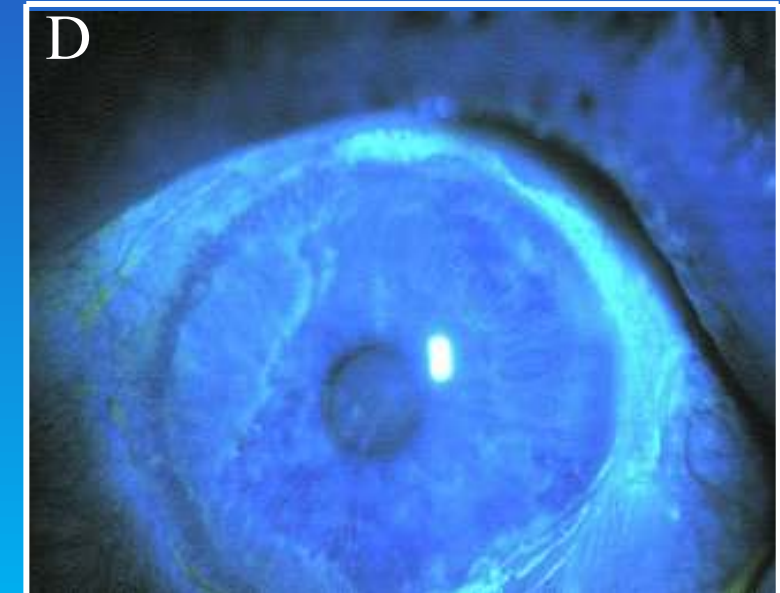
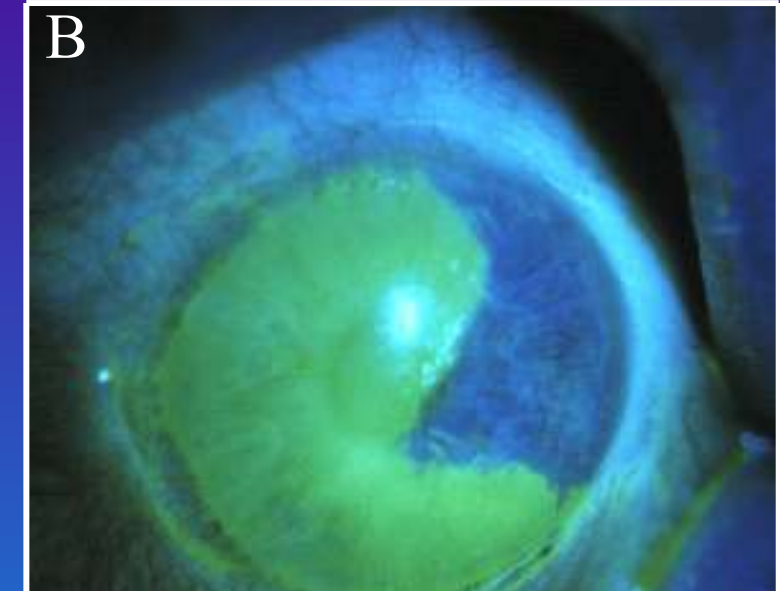
Limbal Stem Cell Transplantation: In vivo expansion from surviving limbus



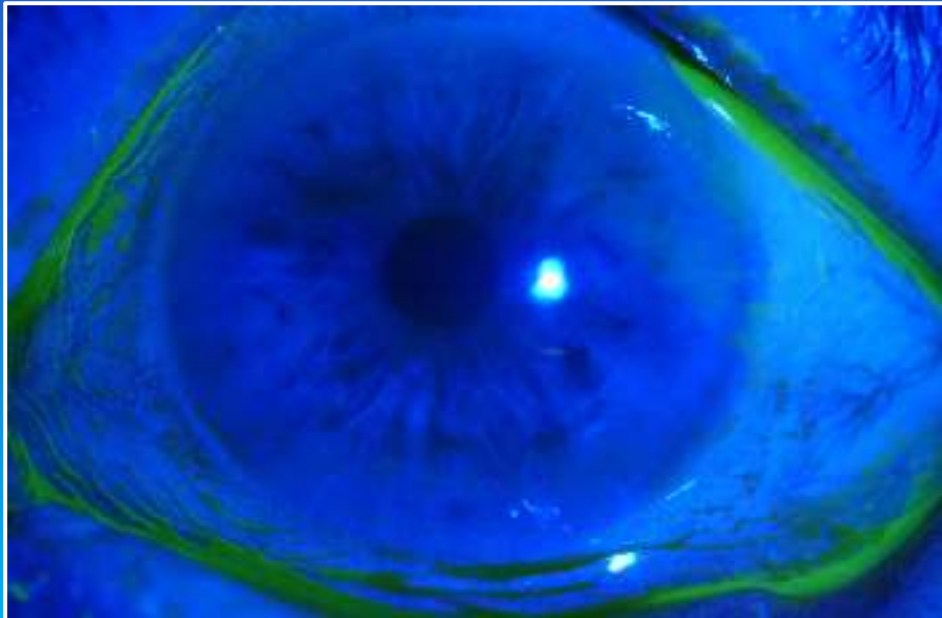
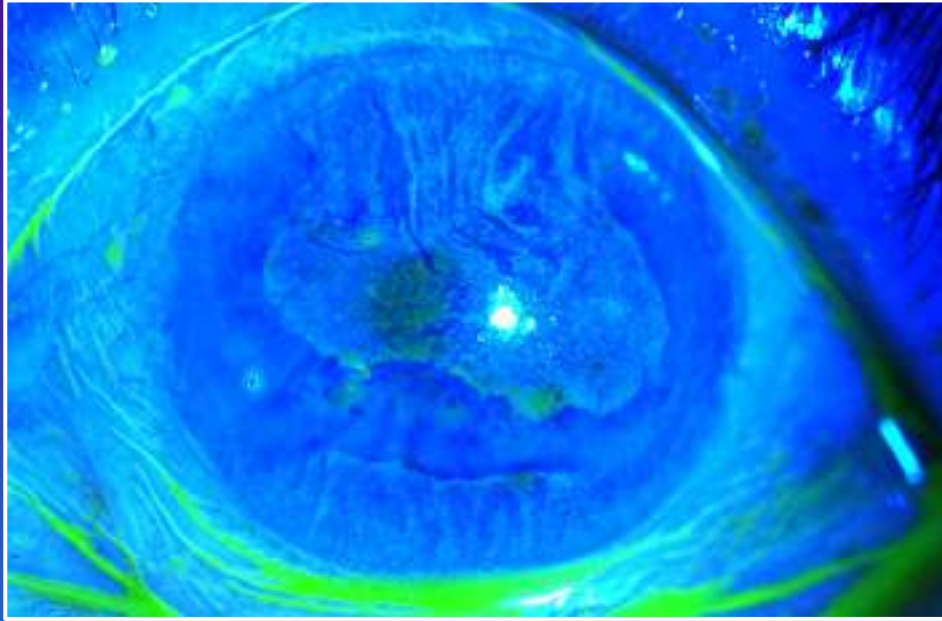
Sequential Sector Conjunctival Epitheliectomy (SSCE)

Dua HS. The conjunctiva in corneal epithelial wound healing. Br J Ophthalmol. 1998; 82:1407-1411.

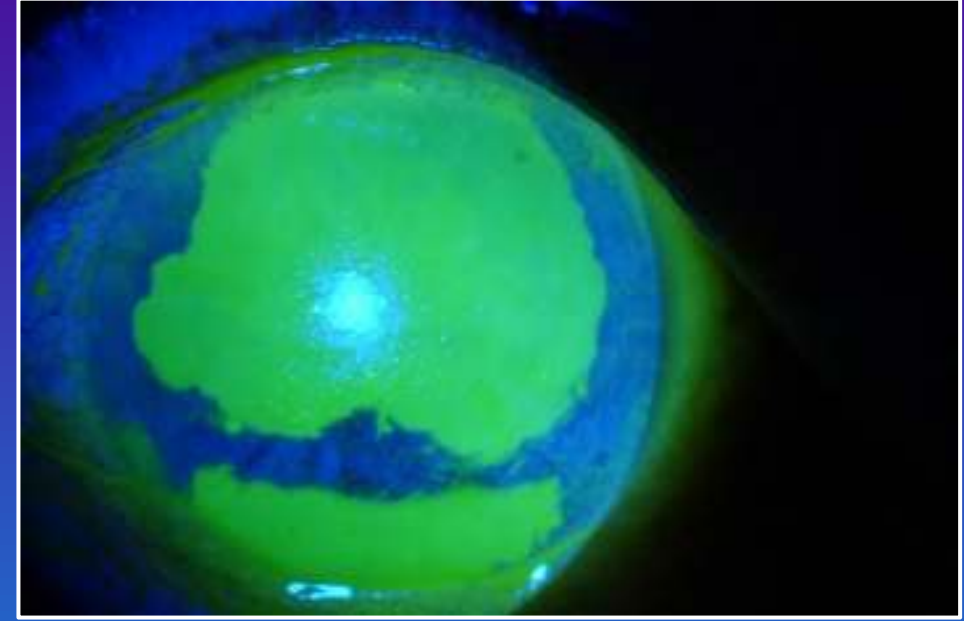
*Dua HS. Sequential Sector Conjunctival Epitheliectomy. Ocular Surface disease Medical and Surgical management 2001:168-74.
. 2016*



Limbal Stem Cell Transplantation: In vivo expansion from surviving limbus



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Limbal Stem Cell Transplantation: In vivo expansion from Donor limbus

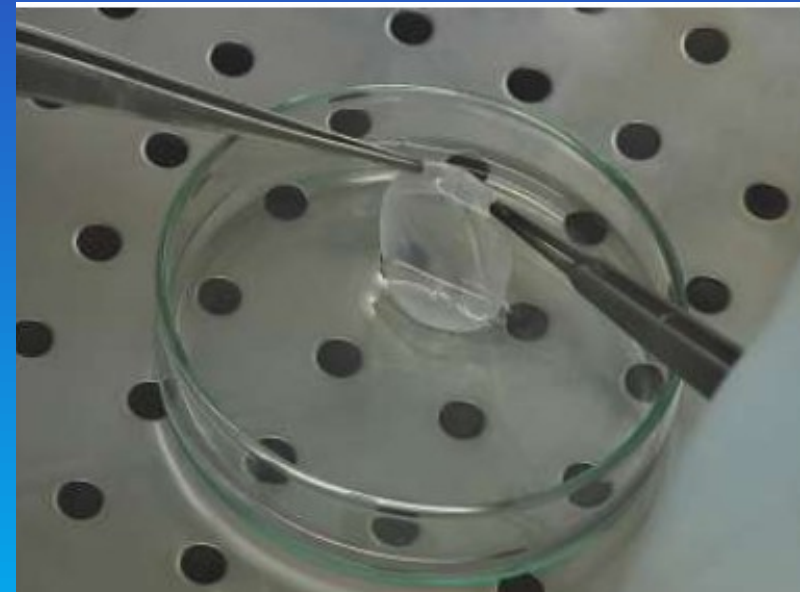
TOTAL LSCD:

In – vivo expansion

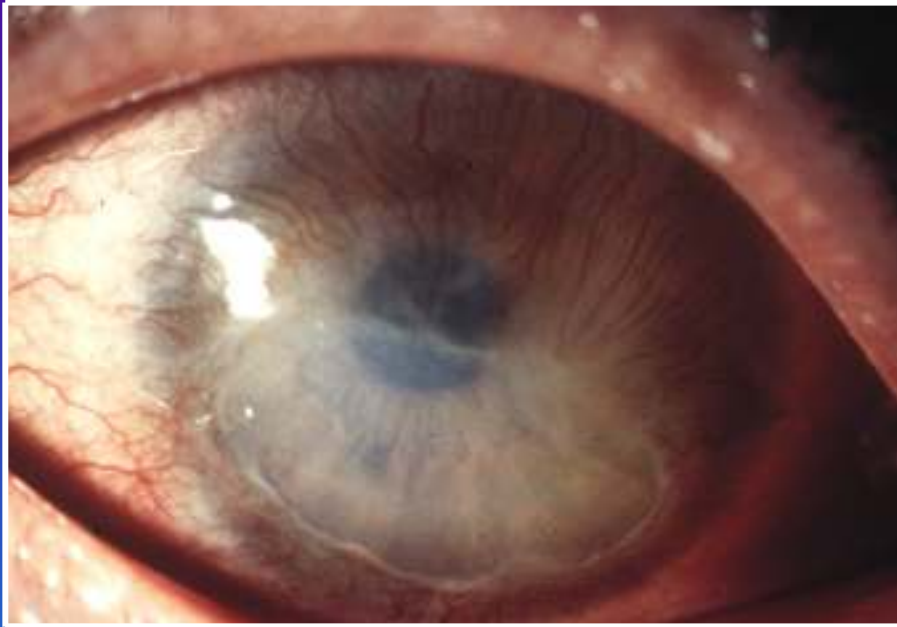
- **Auto Limbal Transplant:** Unilateral total stem cell deficiency
- **SLET** (Simple Limbal Epithelial Transplant – *V Sangwan*)
- **Allo Limbal Transplant:** Bilateral total stem cell deficiency
 - Living Related [tissue typed] (or non-related) Donor
 - Cadaver Donor

Ex-vivo expansion of - Limbal, Conjunctival, Buccal mucosal cells

- On Amniotic membrane
- Fibrin, collagen, other substrates (Holoclar



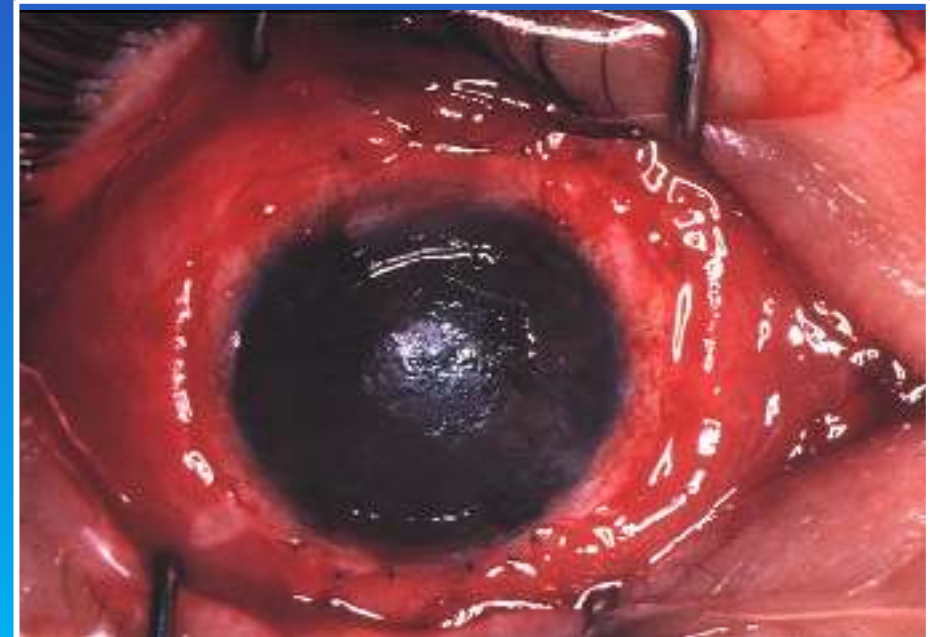
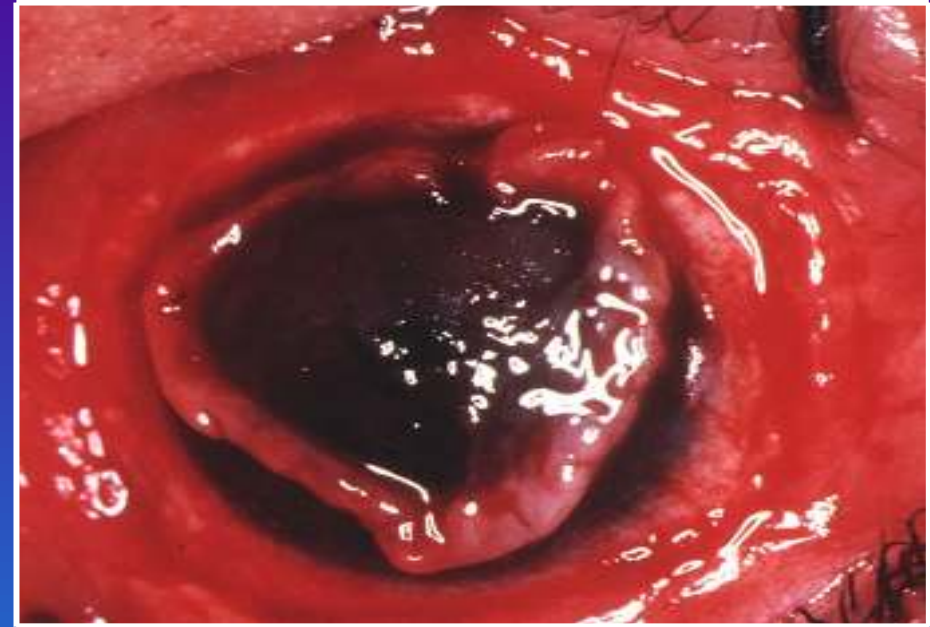
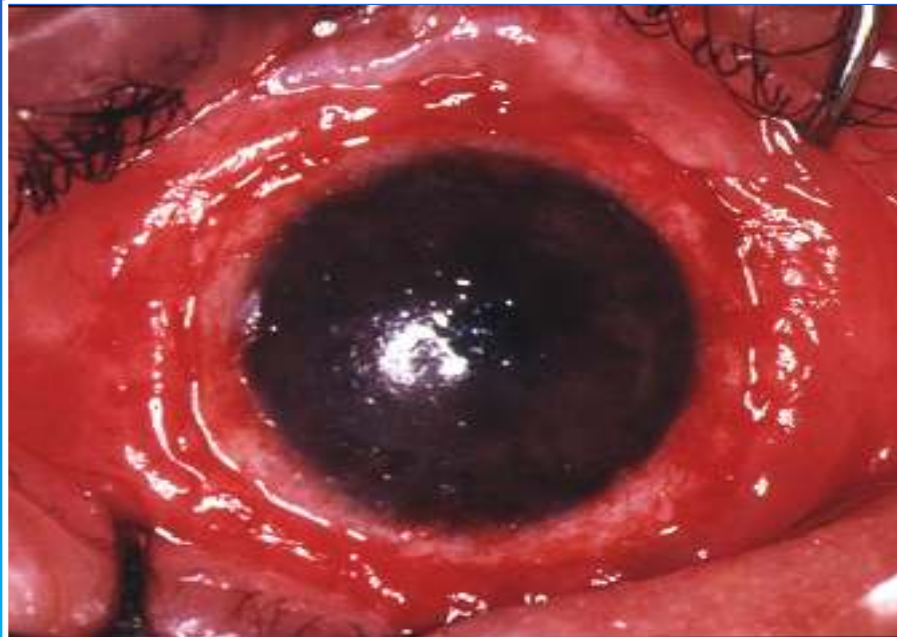
Auto-limbal Stem Cell Transplantation: In vivo expansion from Donor limbus



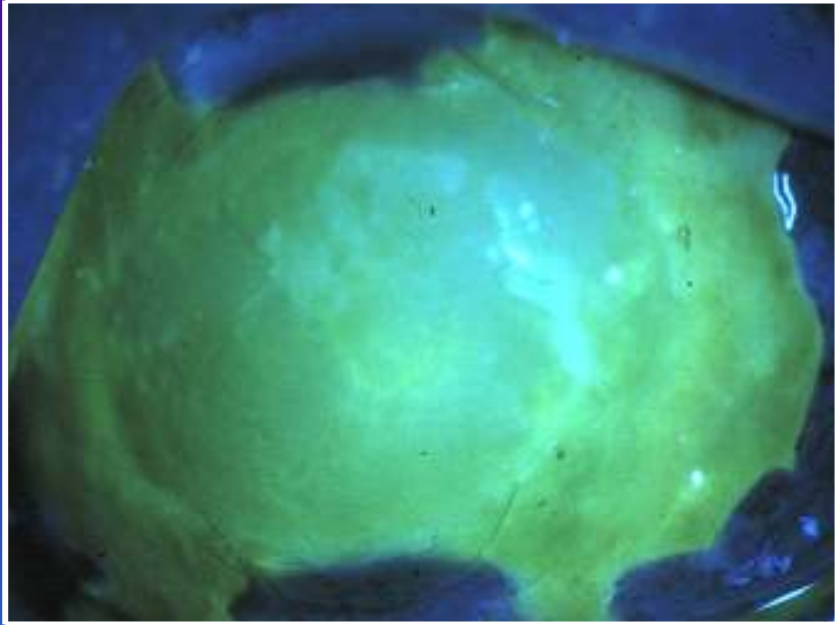
Unilateral Chemical Burn

Dua HS, et al. Limbal stem cell deficiency: Concept, aetiology, clinical presentation, diagnosis and management. Indian J Ophthalmol 2000; 48:83-92.

Dua HS, Azuara-Blanco A. Limbal stem cells of the corneal epithelium. Survey of Ophthalmology 2000; 44:415-425

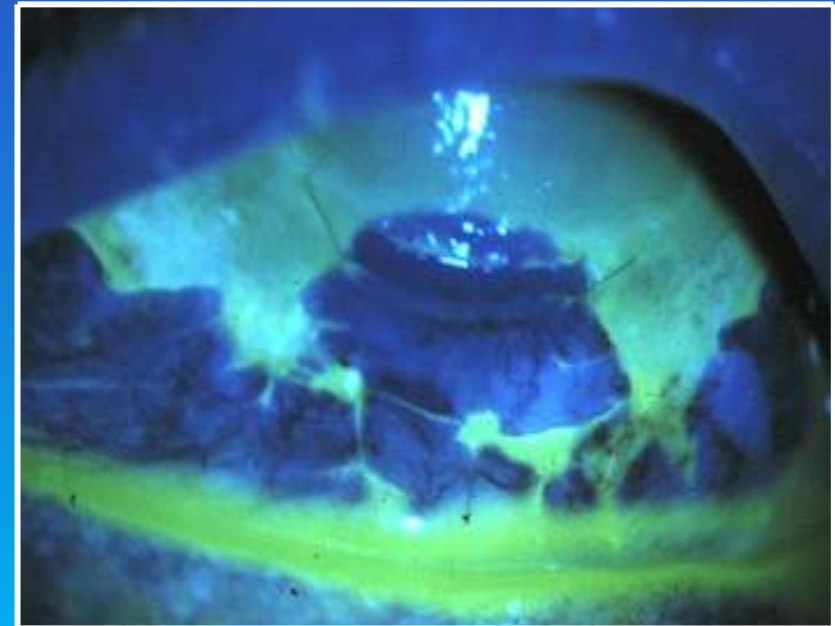
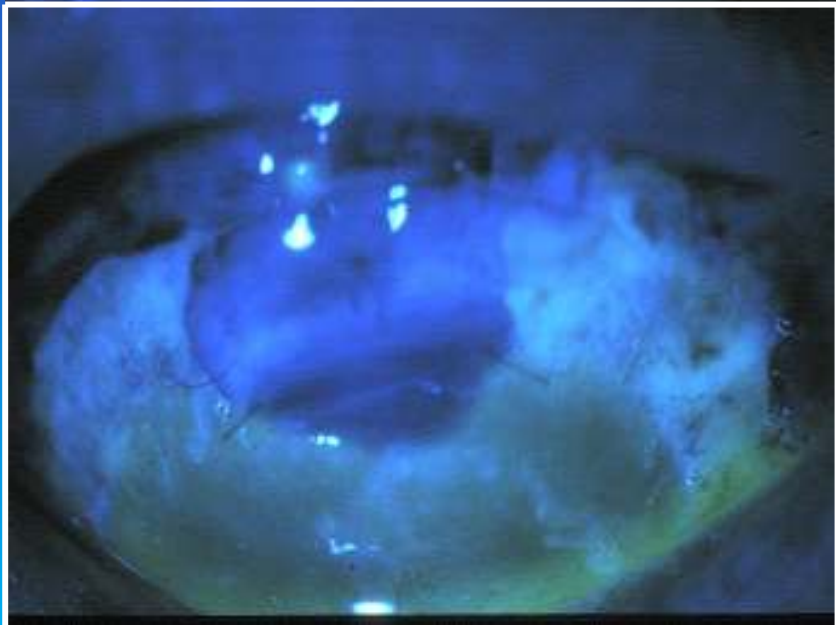
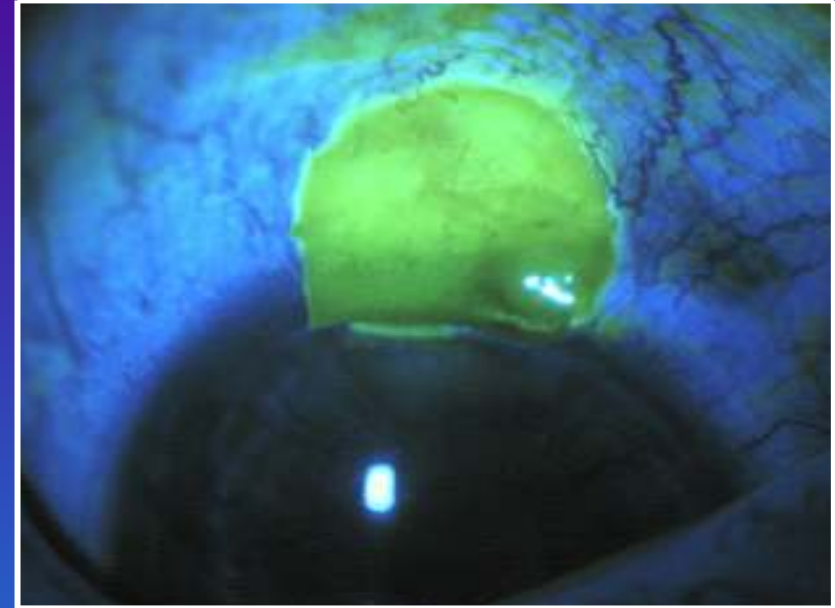


Auto-limbal Stem Cell Transplantation: In vivo expansion from Donor limbus

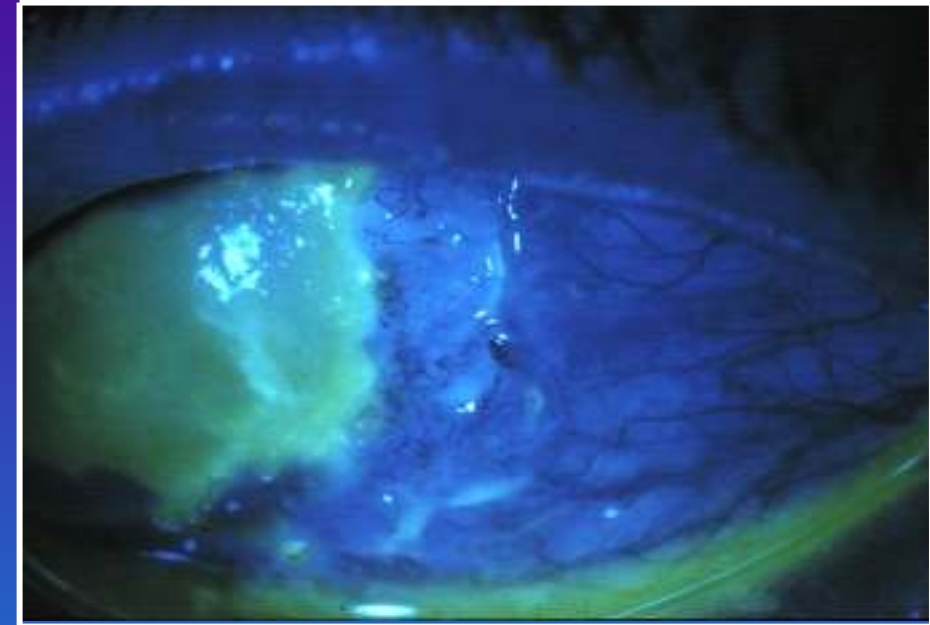
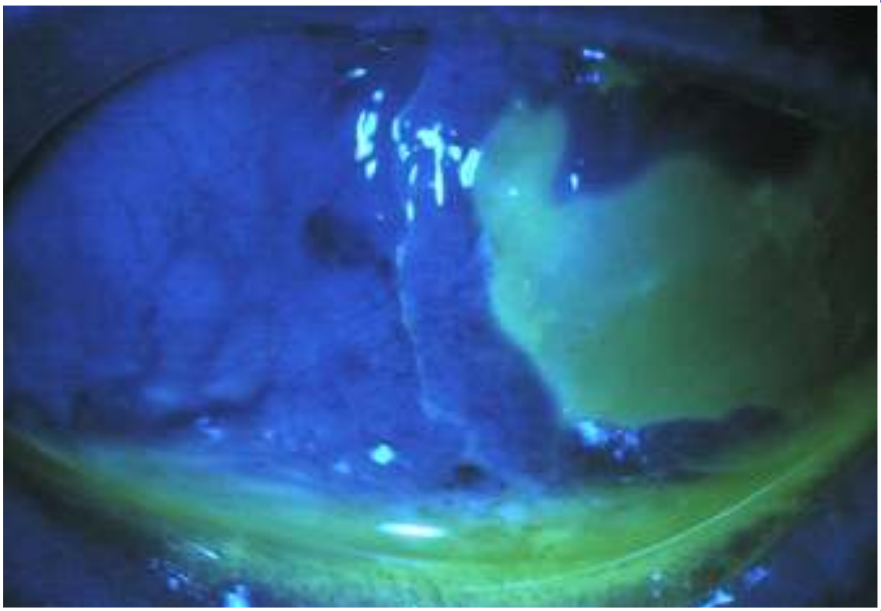


Unilateral Chemical Burn

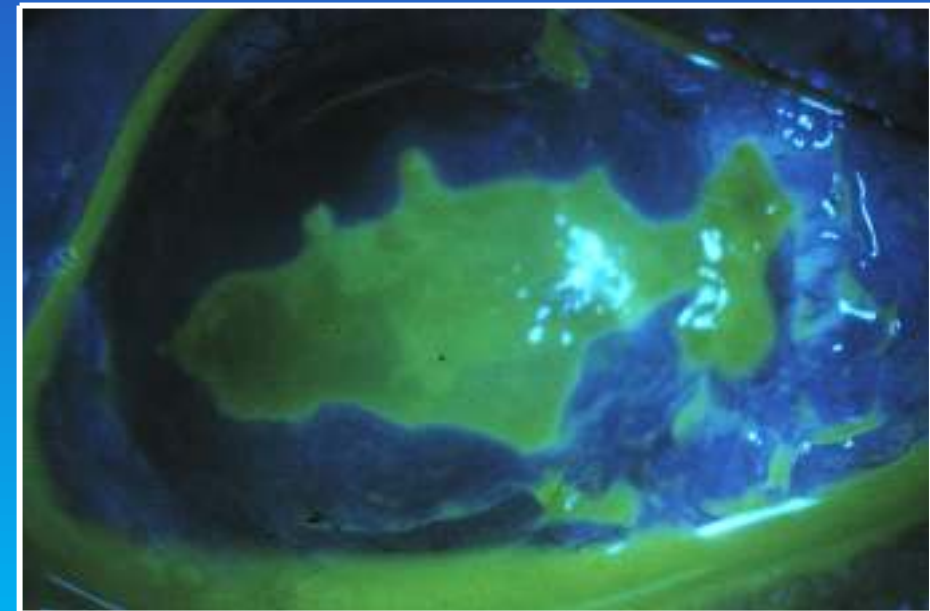
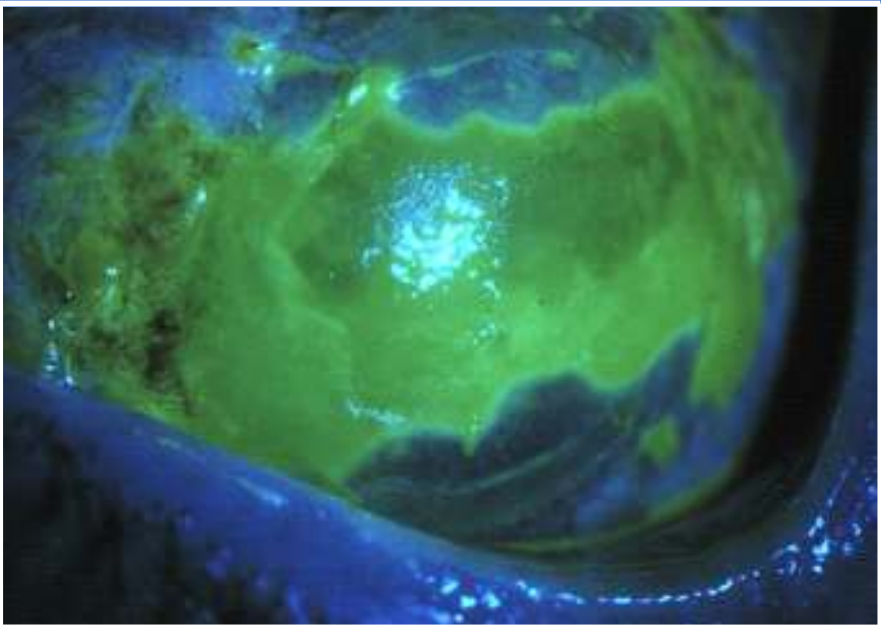
Dua HS, Azuara-Blanco A.
Autologous limbal transplantation
in unilateral stem cell deficiency.
Br J Ophthalmol 2000; 84:273-278.



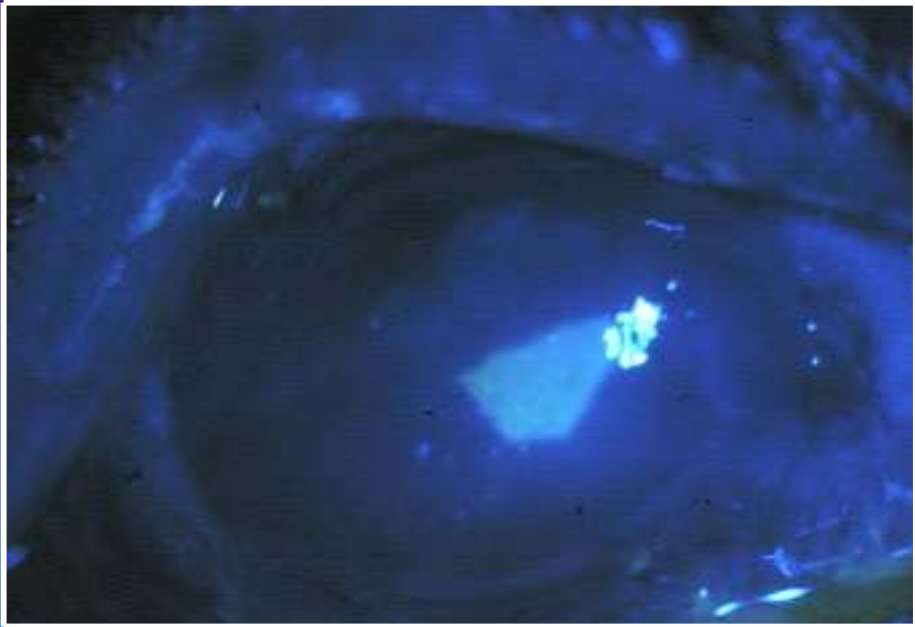
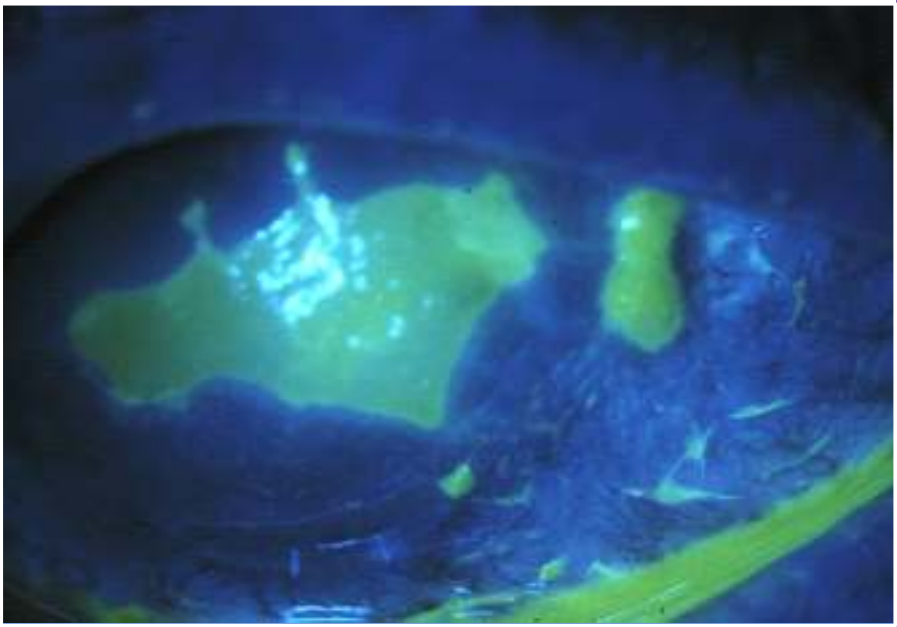
Auto-limbal Stem Cell Transplantation: In vivo expansion from Donor limbus



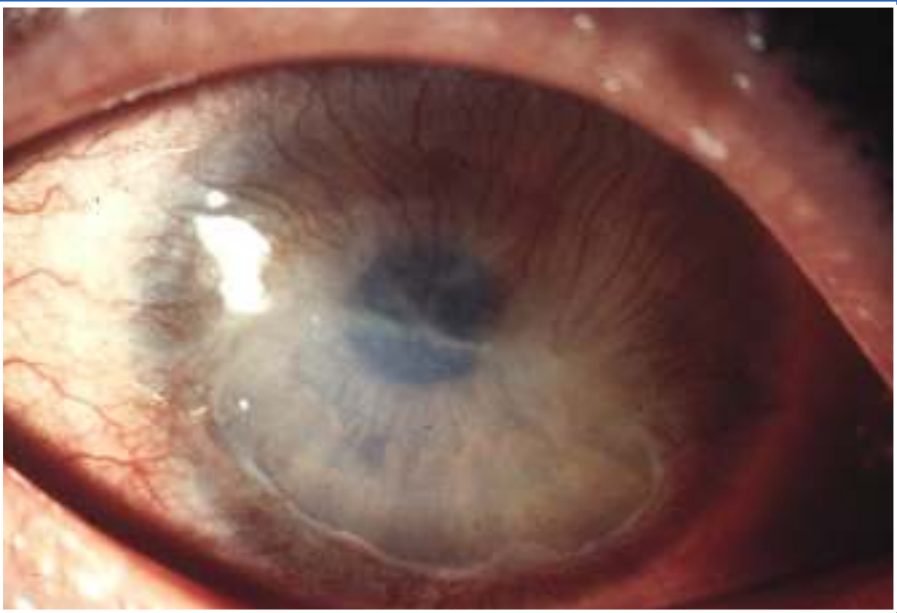
Unilateral
Chemical Burn



Auto-limbal Stem Cell Transplantation: In vivo expansion from Donor limbus

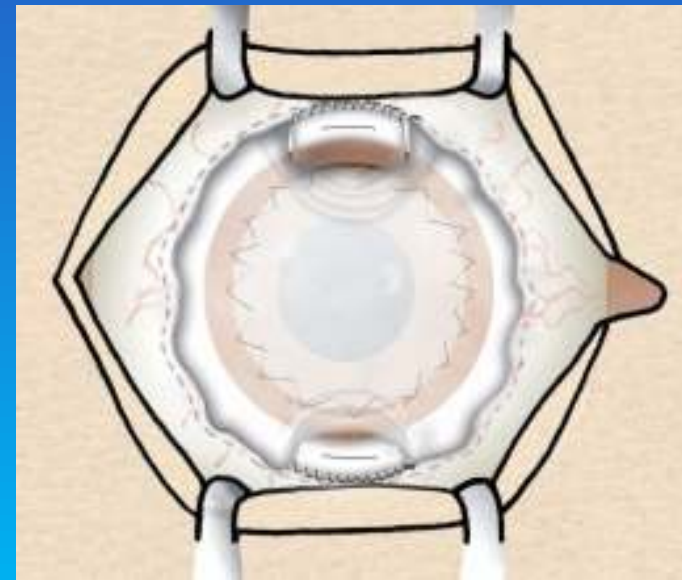
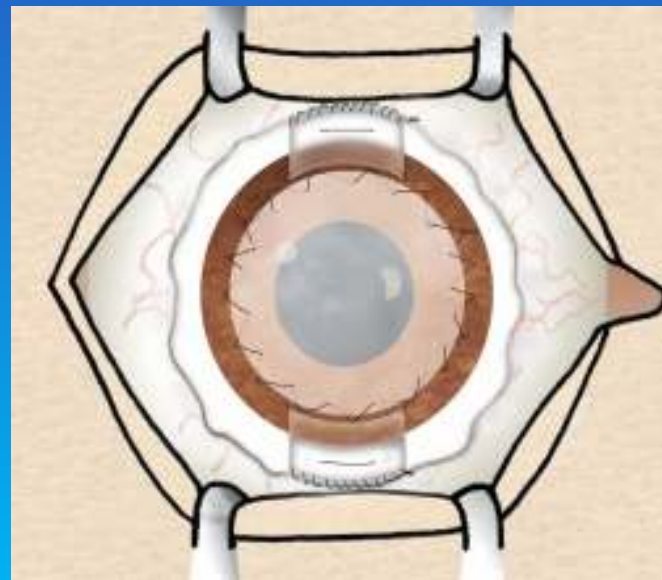
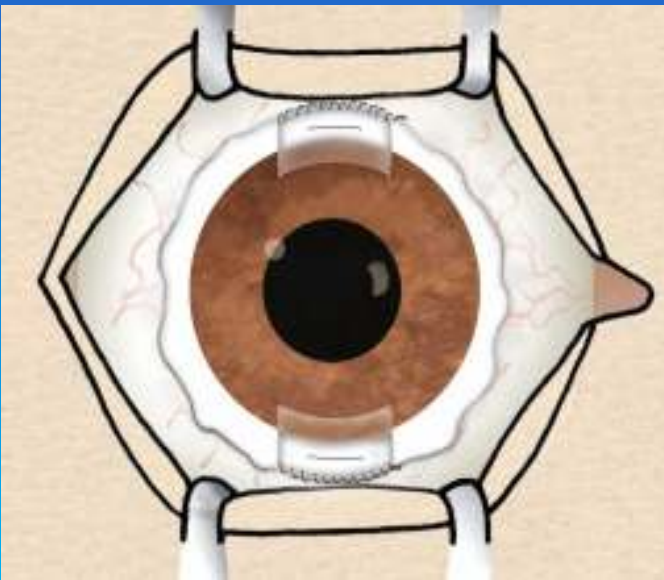
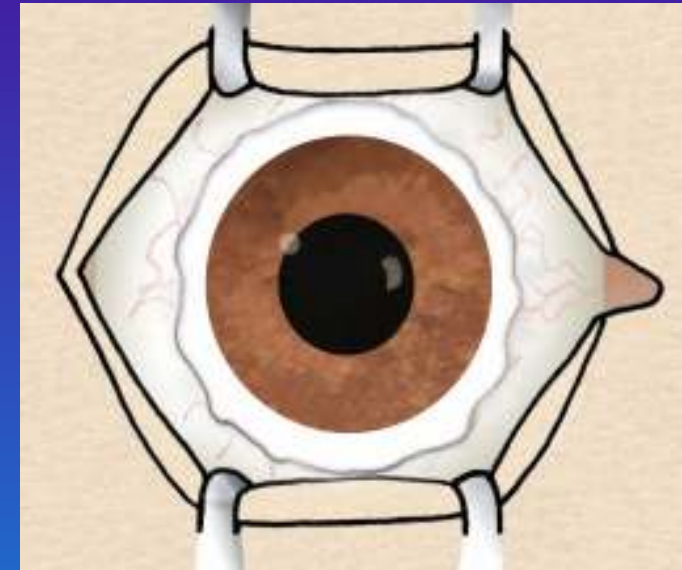
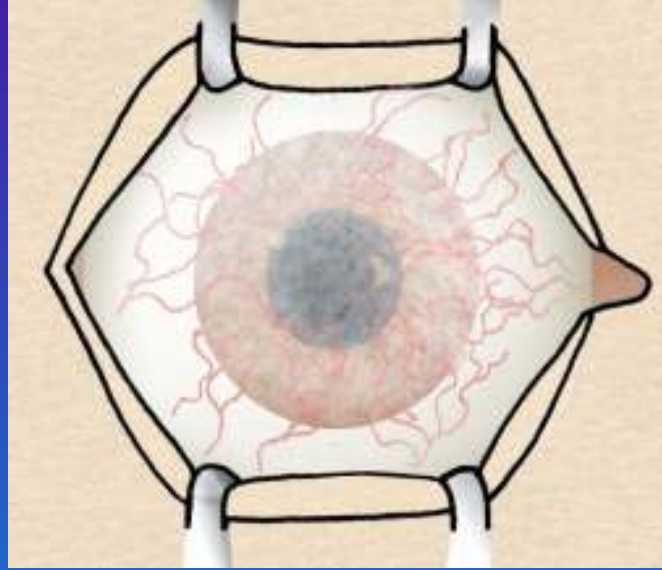
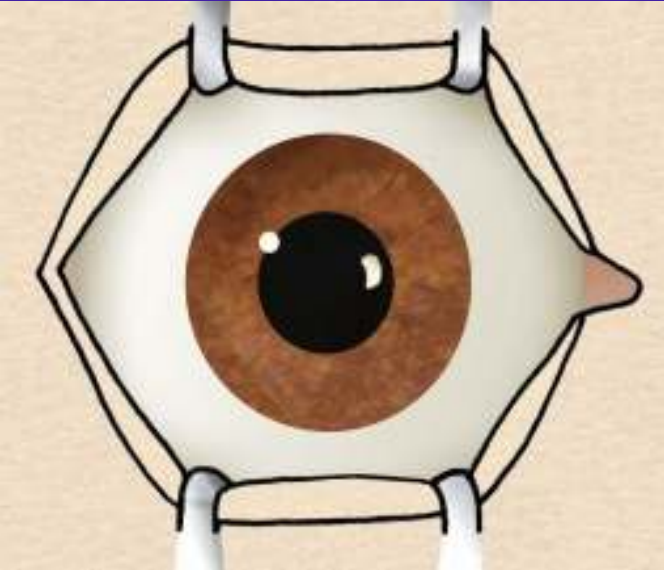


Unilateral
Chemical Burn

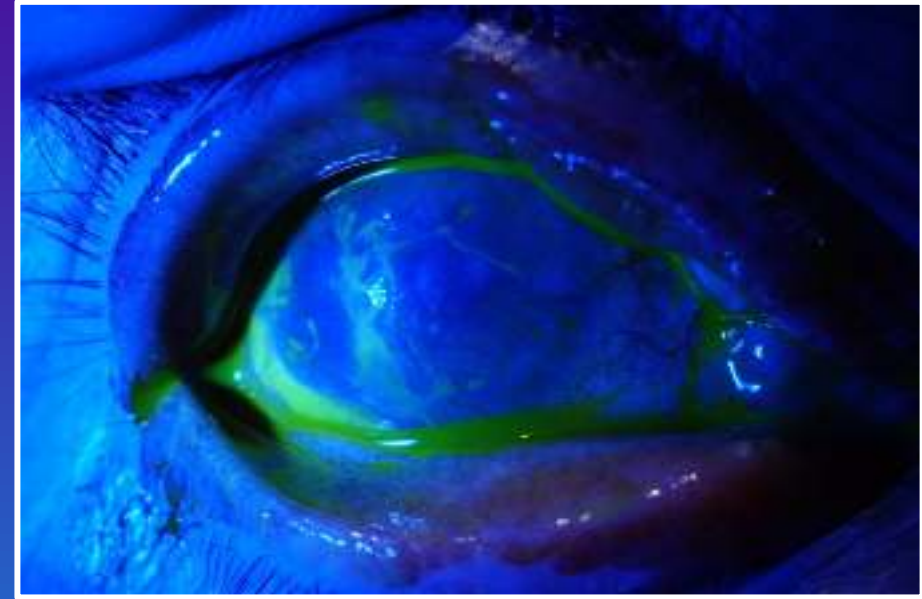


Auto-limbal Stem Cell Transplantation: In vivo expansion from Donor limbus

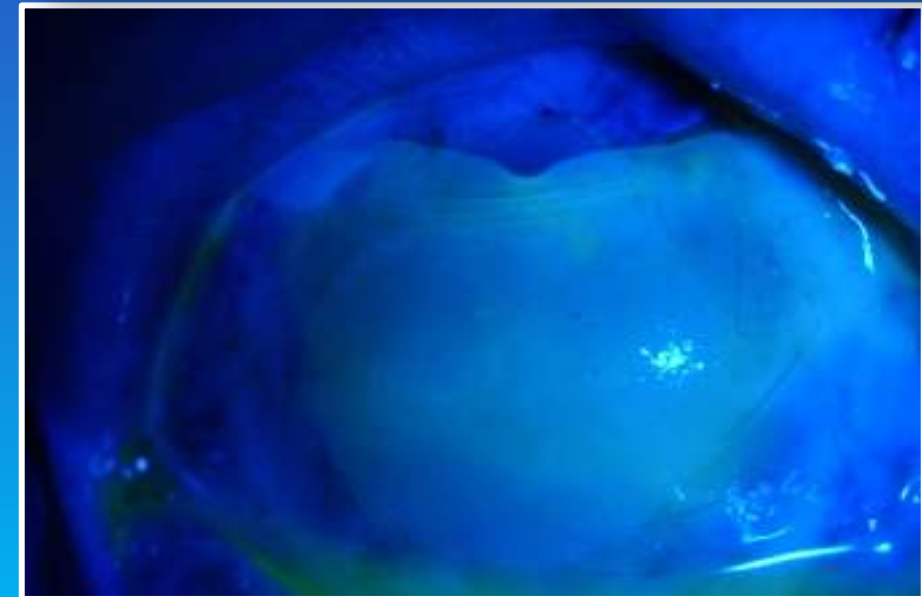
Amnion-assisted conjunctival epithelial redirection (ACER), Dua HS et al. BJO Nov. 2016



Auto or Allo limbal Stem Cell Transplantation: Invivo expansion from donor limbus

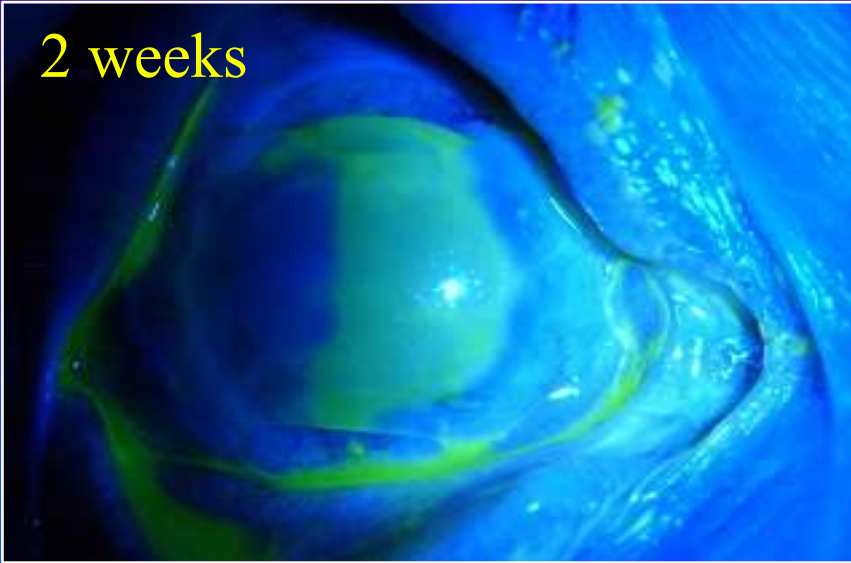


Amnion Assisted
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Redirection



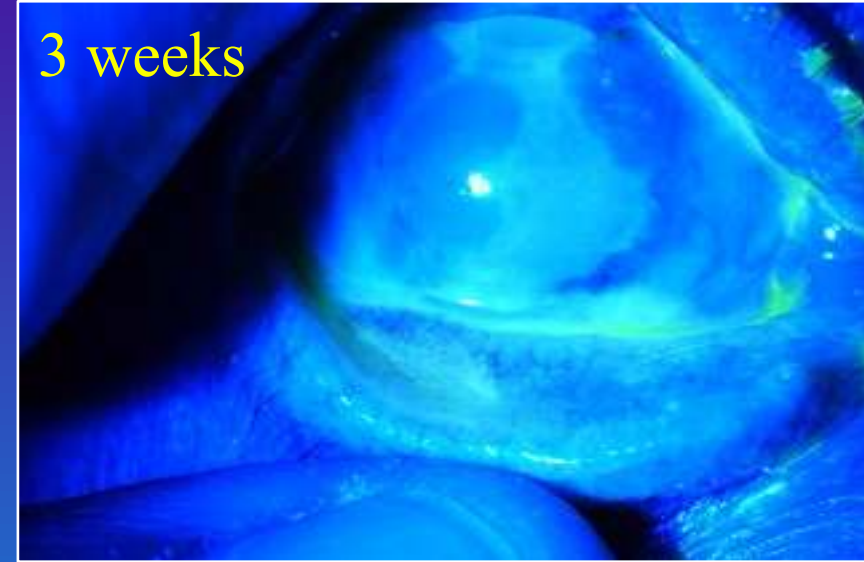
Auto or Allo limbal Stem Cell Transplantation: Invivo expansion from donor limbus

2 weeks



Dua HS et al. Amnion-assisted conjunctival epithelial redirection in limbal stem cell grafting. Br J Ophthalmol. 2017 Jul;101(7):913-919.

3 weeks

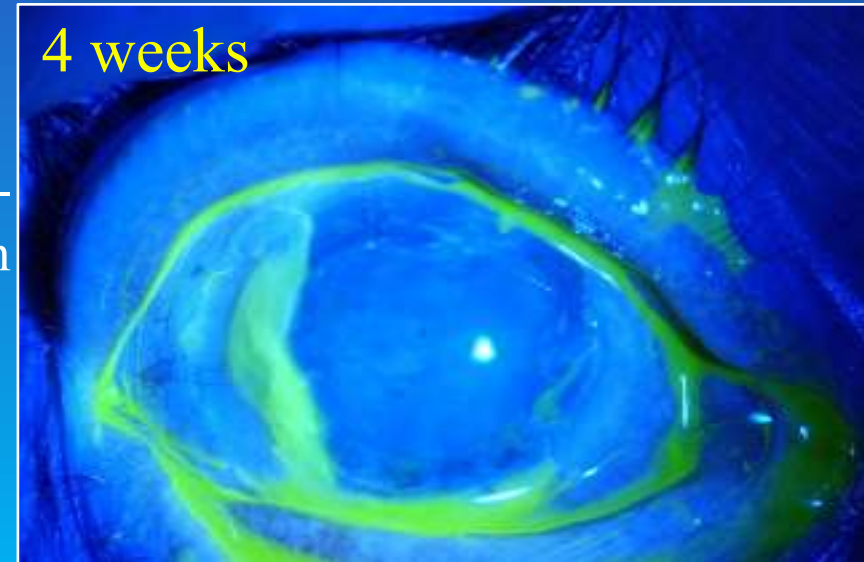


4 weeks

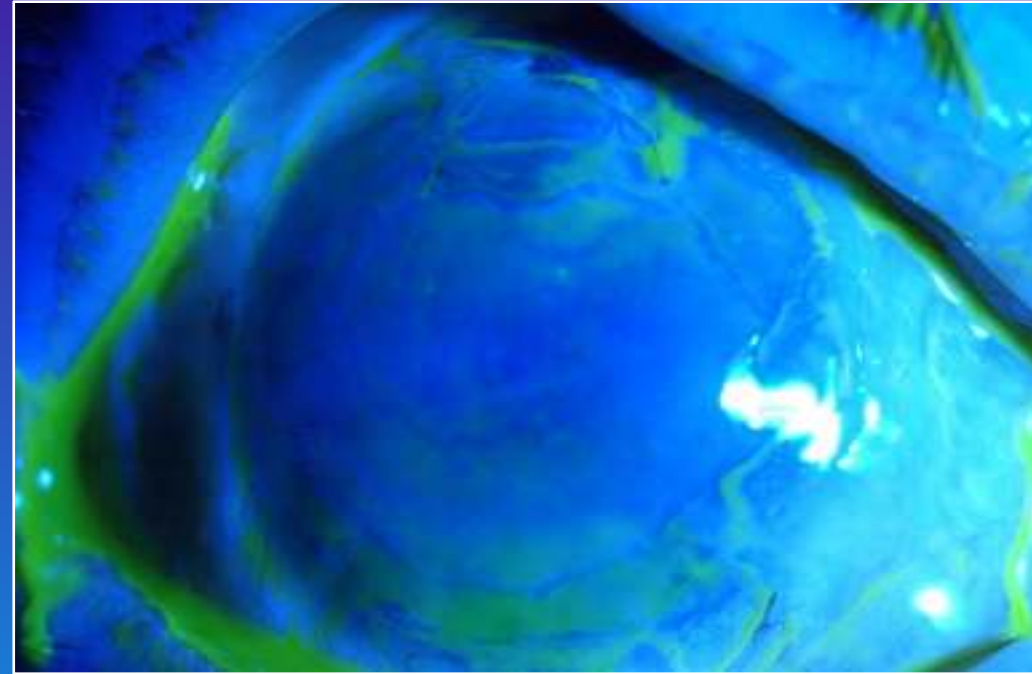


Dua HS, et al. Management of limbal stem cell deficiency by amnion-assisted conjunctival epithelial redirection using vacuum-dried amniotic membrane and fibrin glue. Br J Ophthalmol. 2021 Oct 5:bjophthalmol-2020-318496.

4 weeks

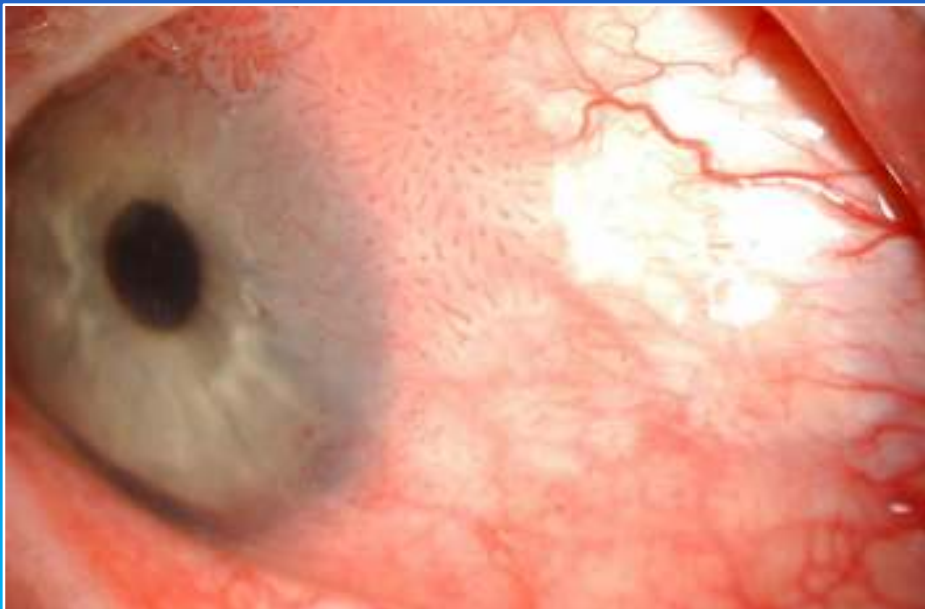
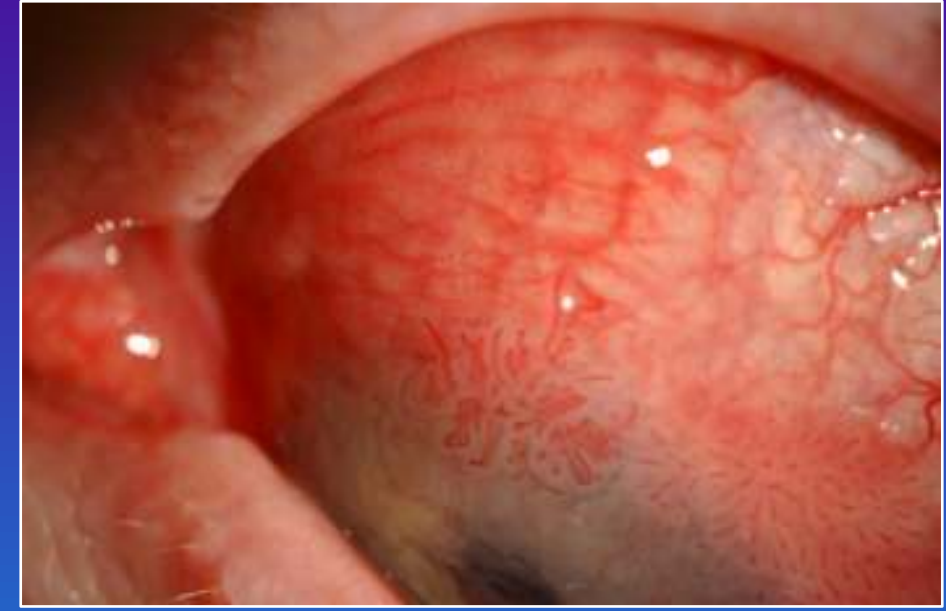


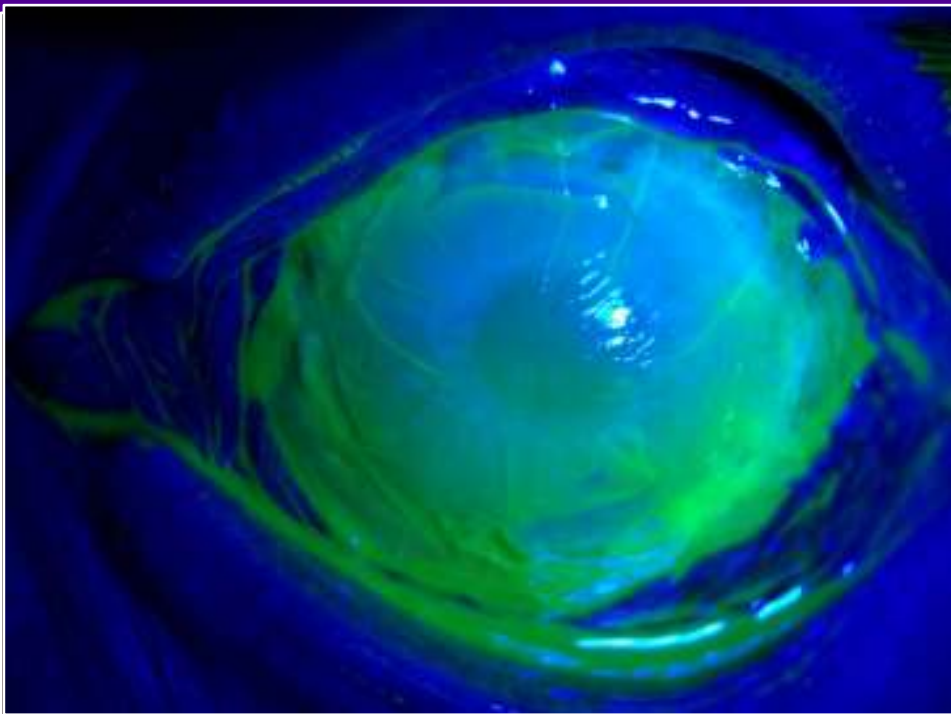
Auto or Allo limbal Stem Cell Transplantation: Invivo expansion from donor limbus



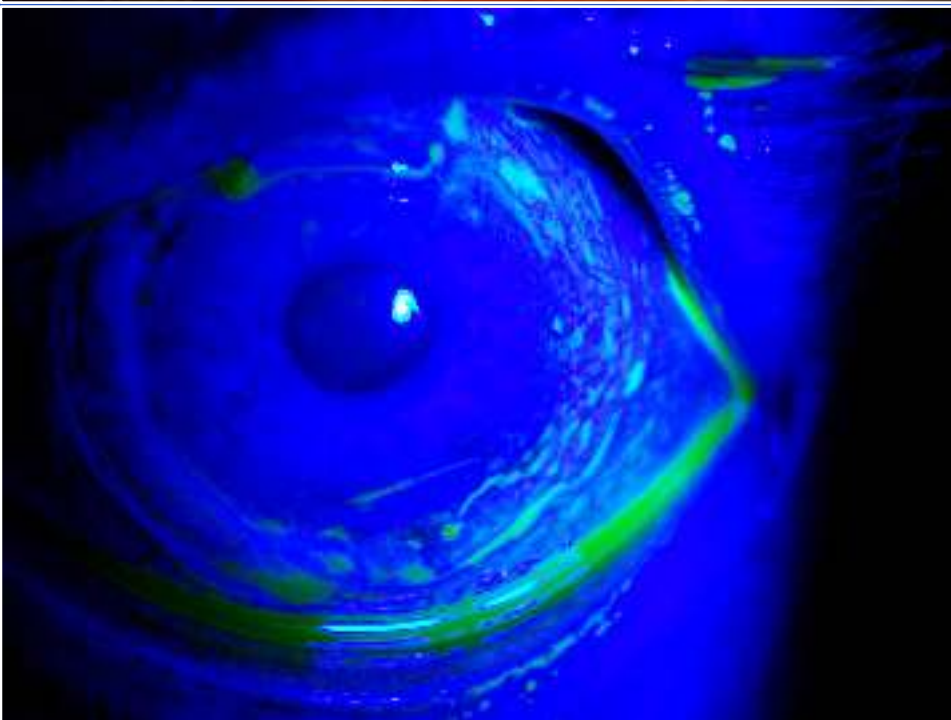
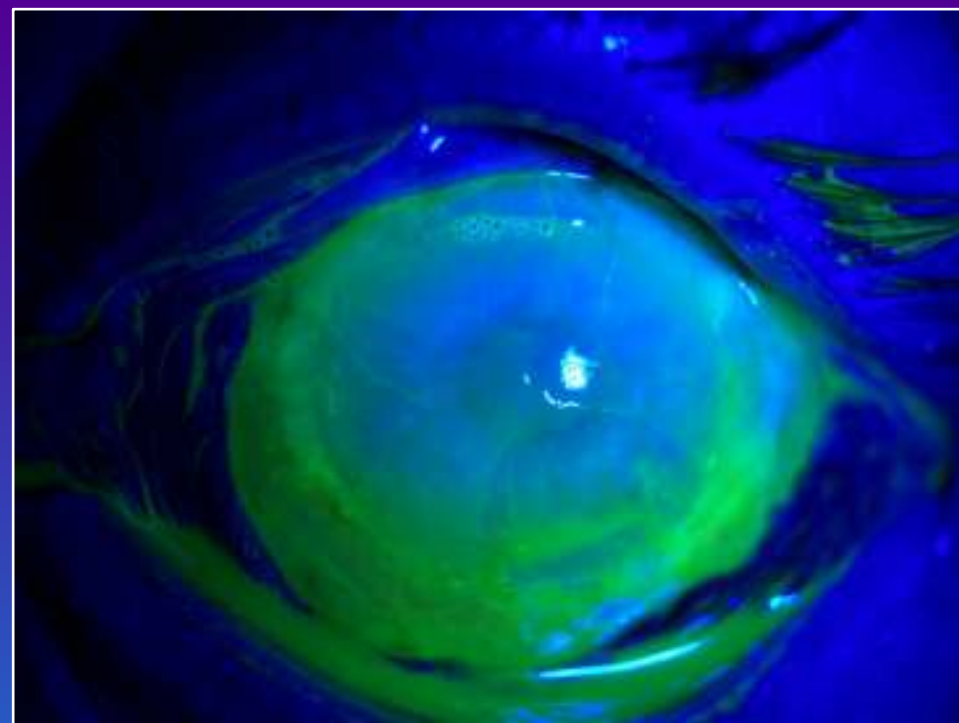
5 weeks after removal of outer (redirecting) membrane

Auto or Allo limbal Stem Cell Transplantation: Invivo expansion from donor limbus



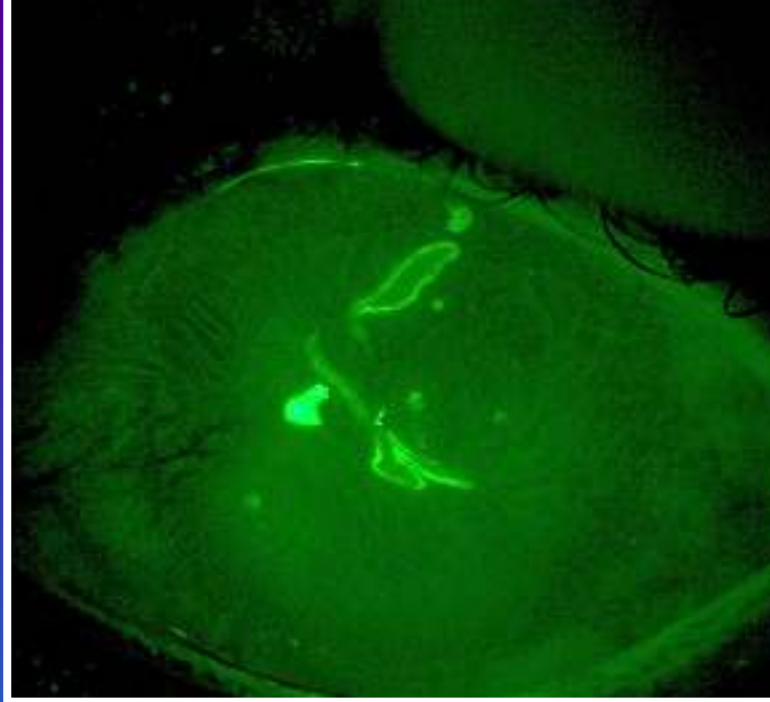


Auto-limbal graft
and ACER
with
OMNIGEN

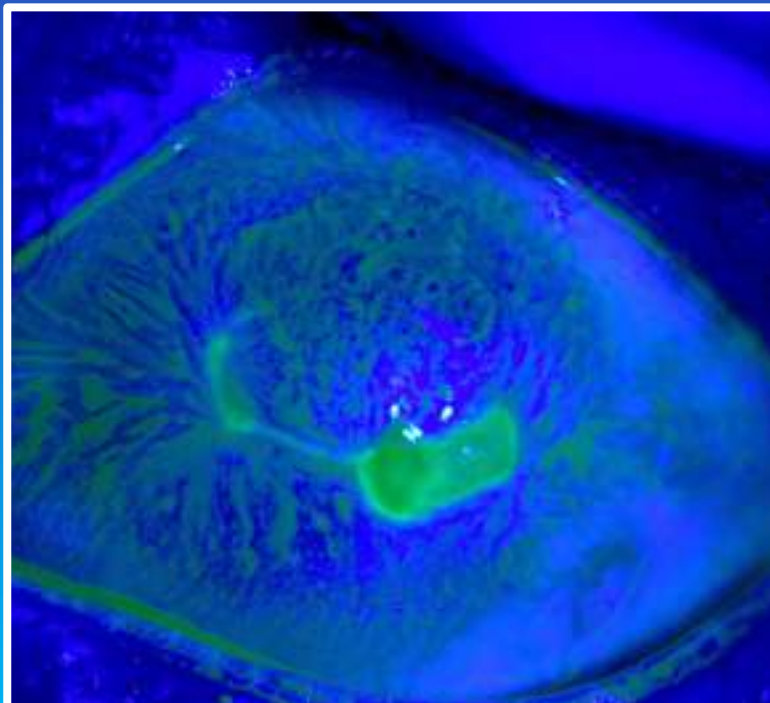


6/9 in two weeks

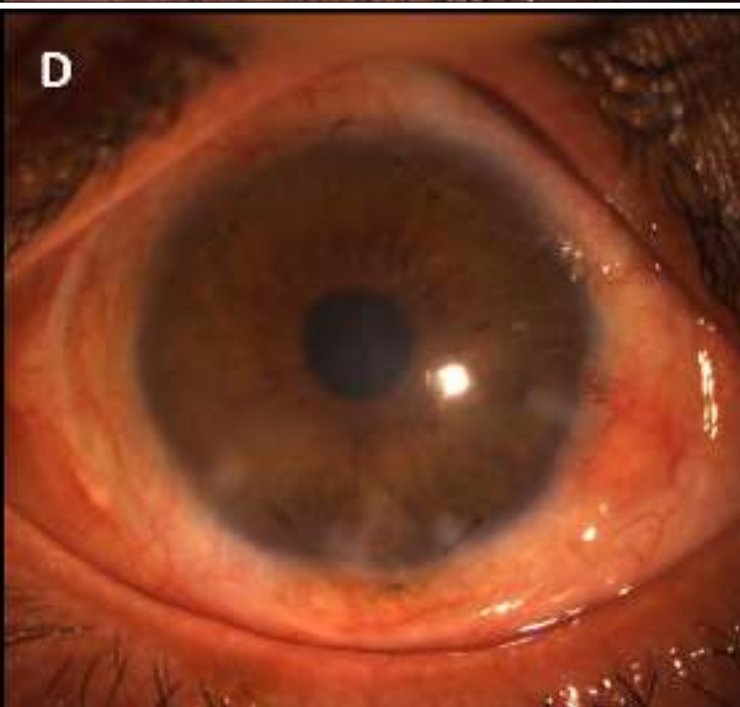
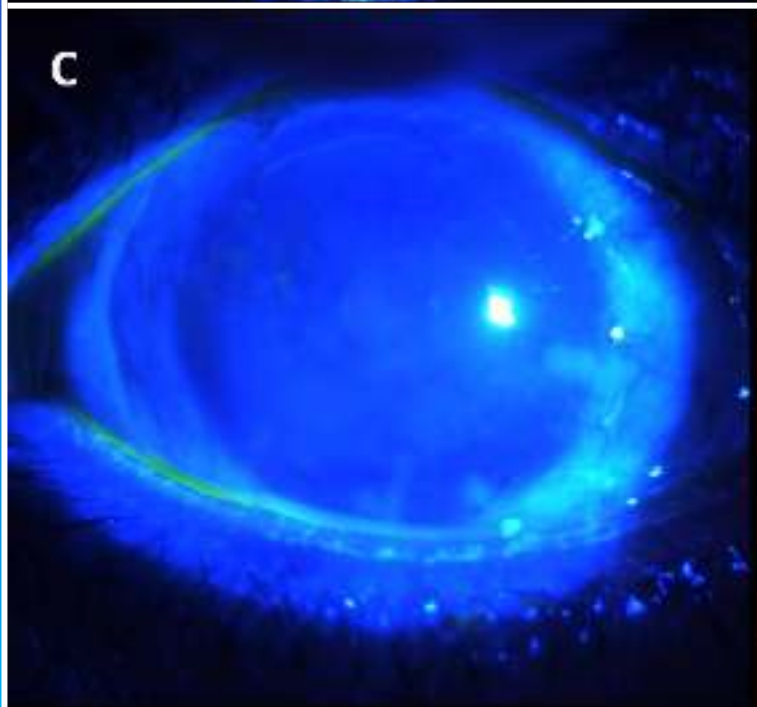
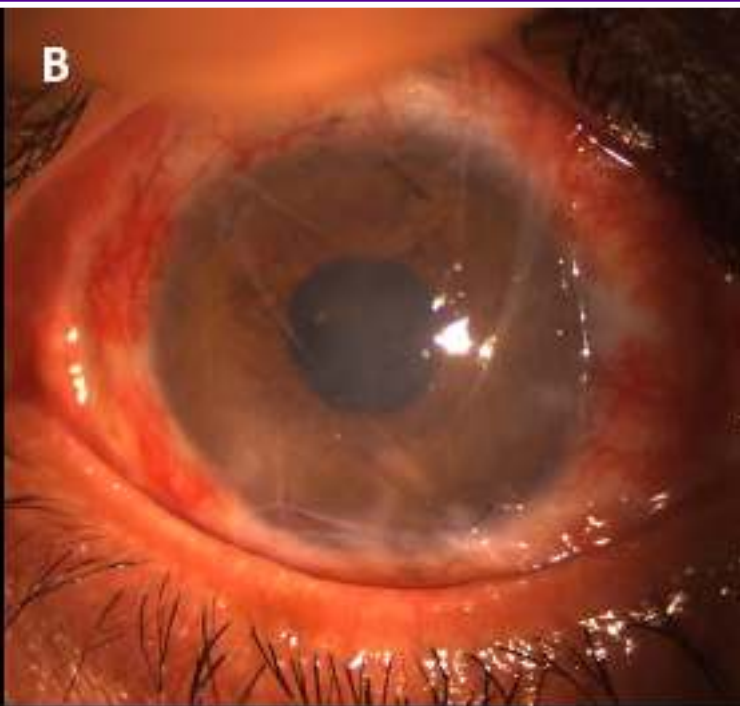
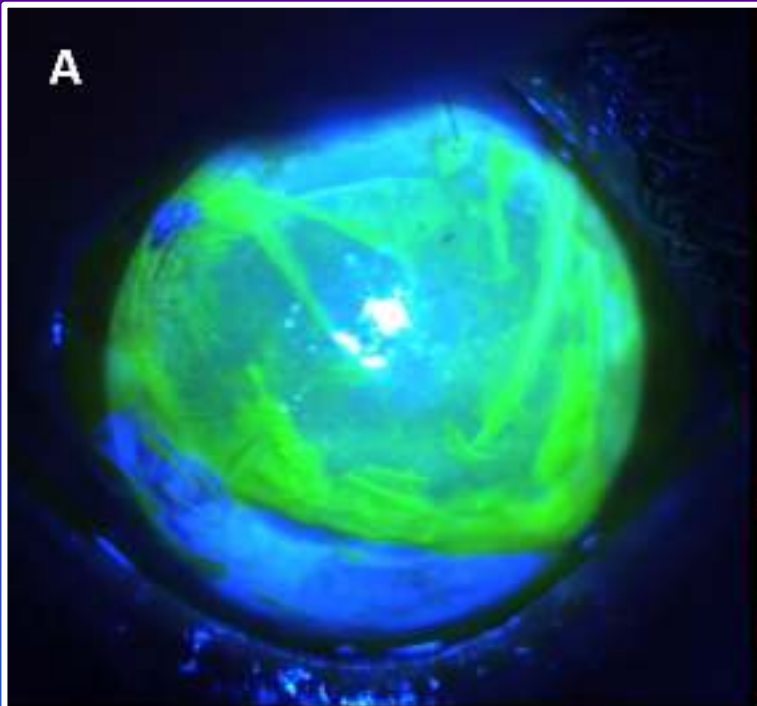




Pre-Operative Unilateral
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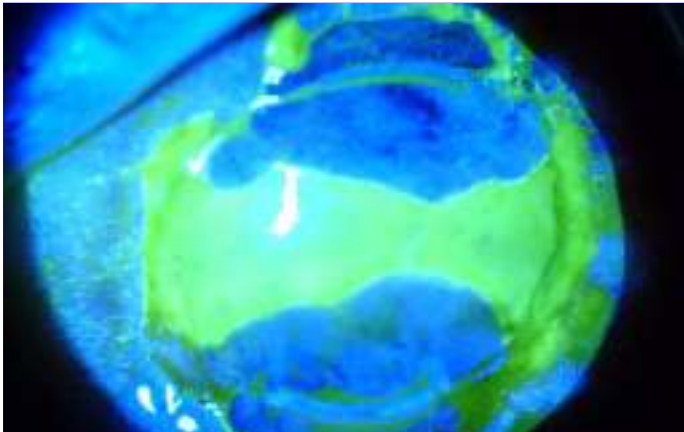
Fibrovascular pannus
and changing persistent
epithelial defect



Auto-limbal graft
and ACER
with
OMNI-GEN

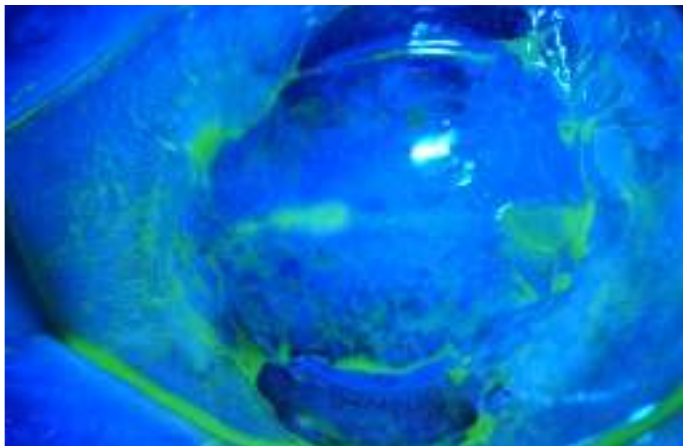
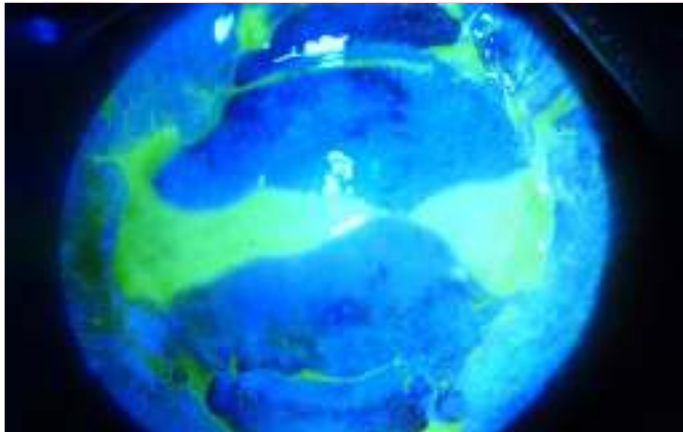
6/9 in four weeks

Allolimbal Stem Cell Transplantation: Invivo expansion on AM from donor limbus

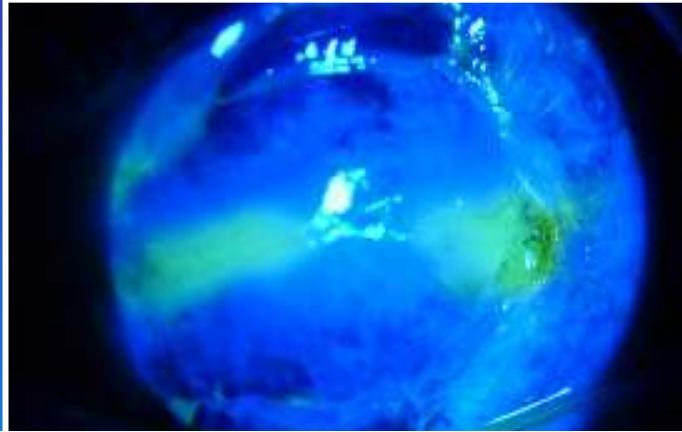
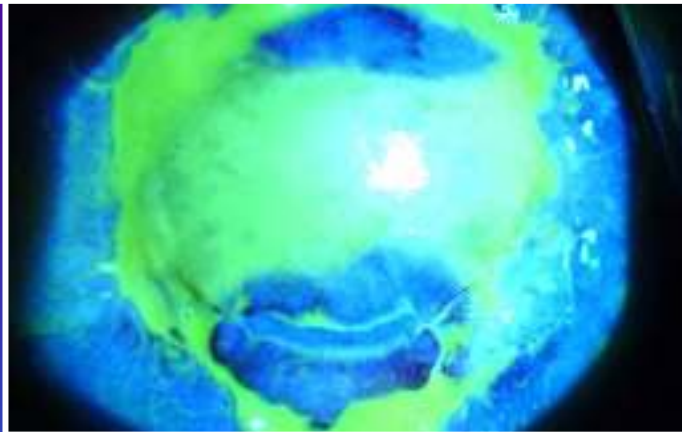


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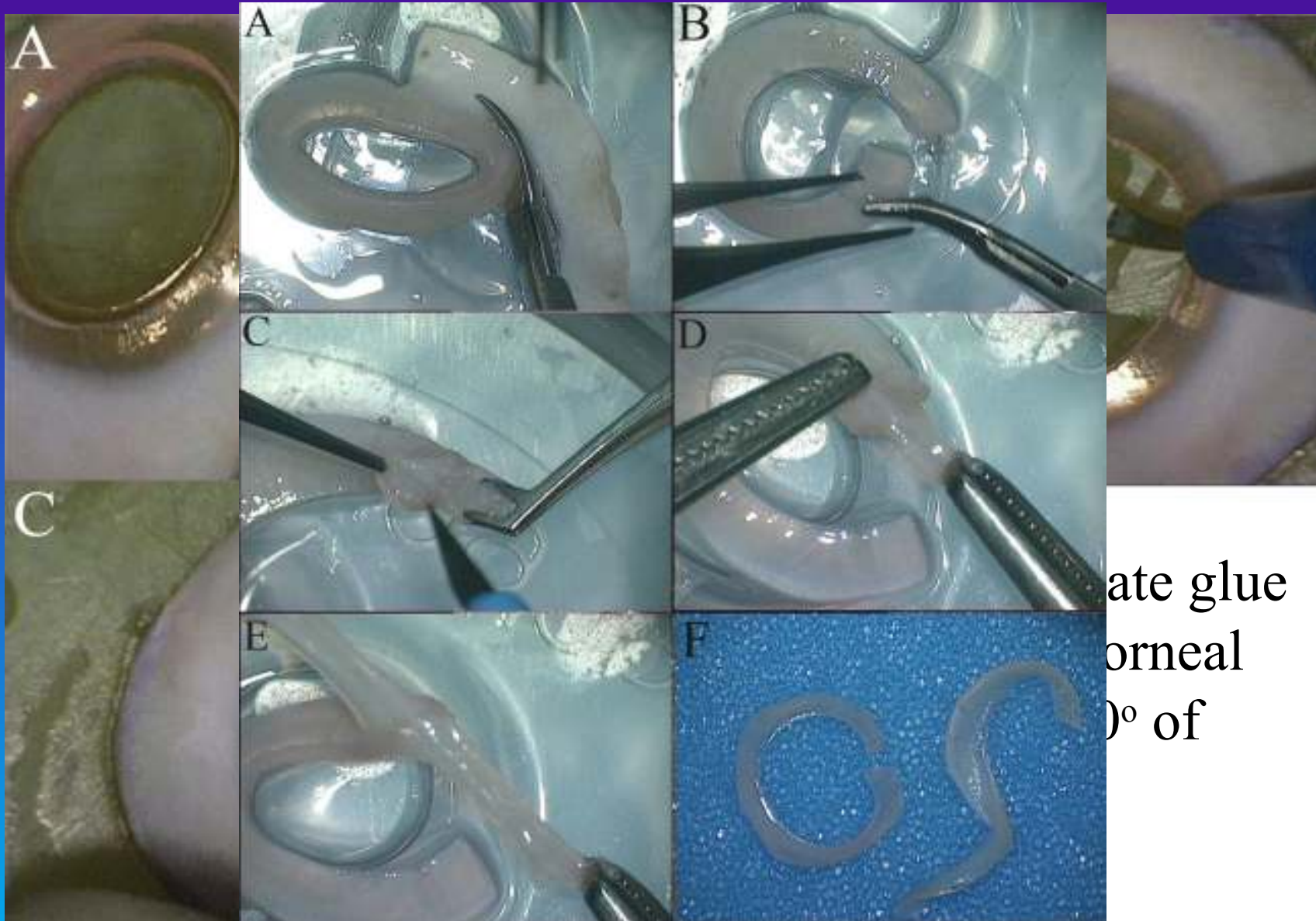
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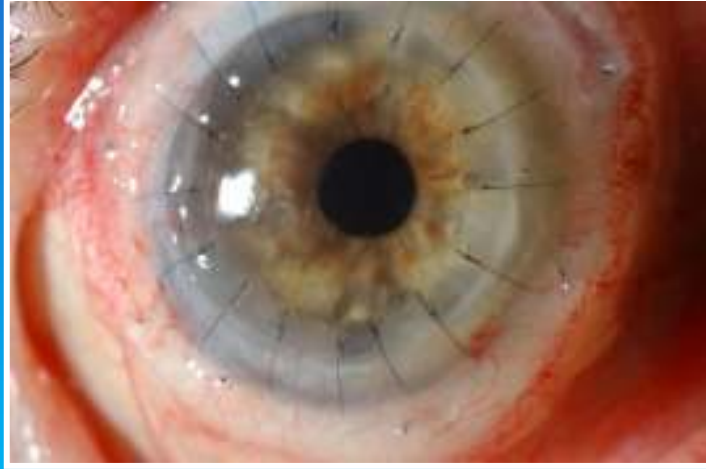
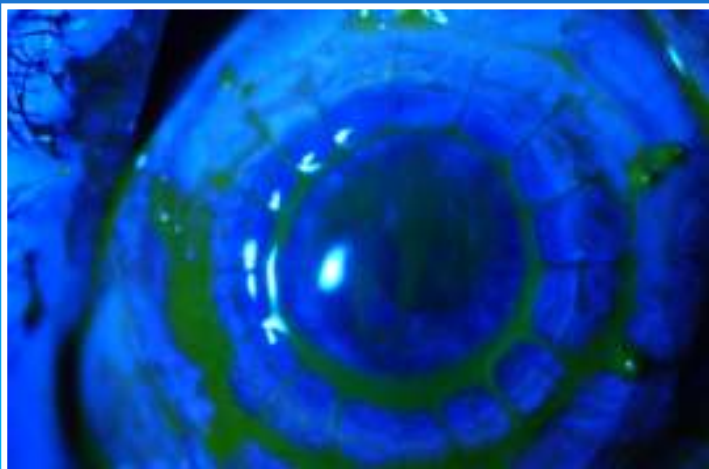
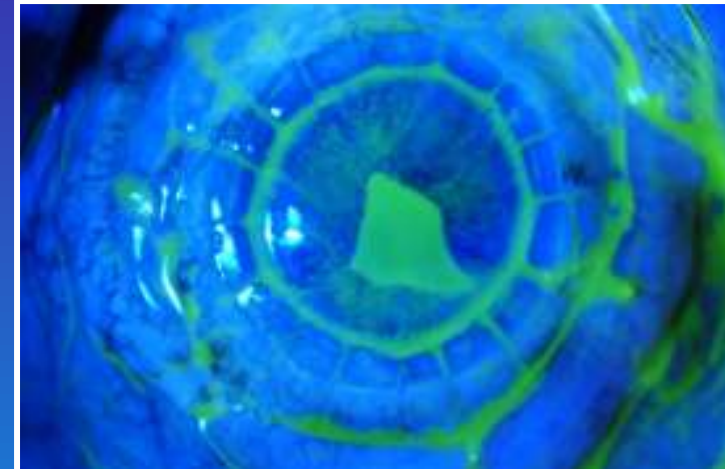
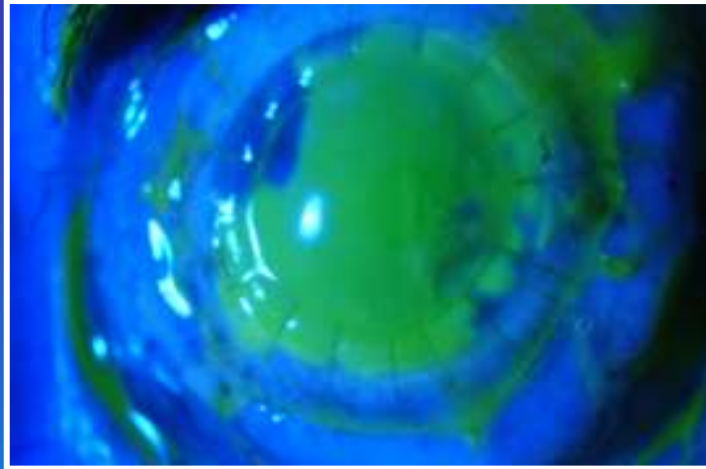
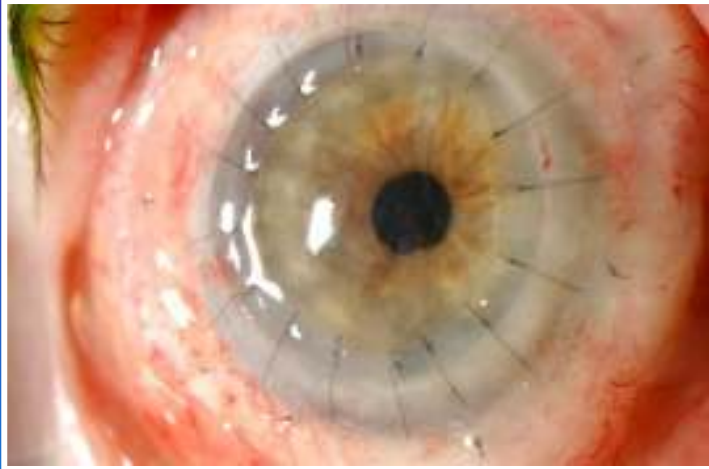
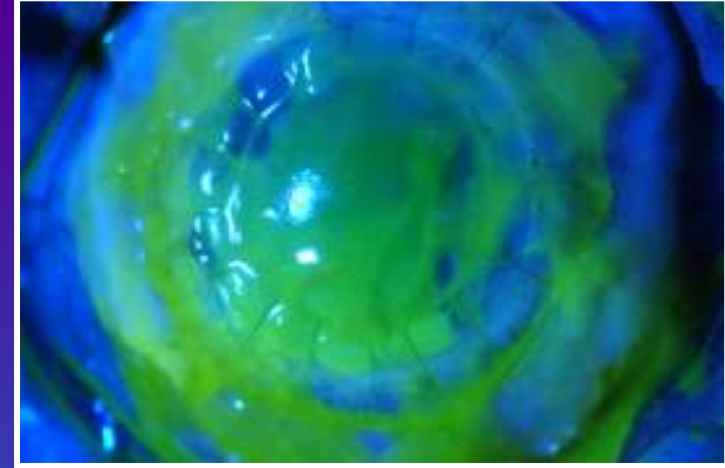
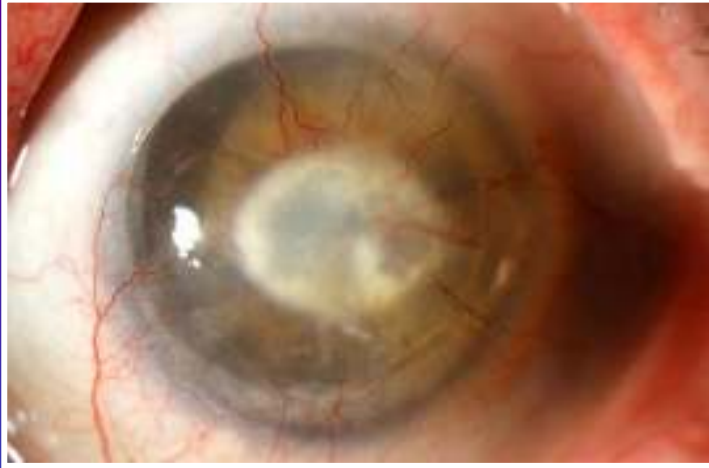
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Allolimbal Stem Cell Transplantation: Harvesting cadaver donor limbus



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Cadaver Allo limbal Transplant
with in vivo expansion.

Dua HS, Azuara-Blanco A. Allo-limbal
transplantation in patients with limbal stem-
cell deficiency. Br J Ophthalmol 1999;
83:414-419.

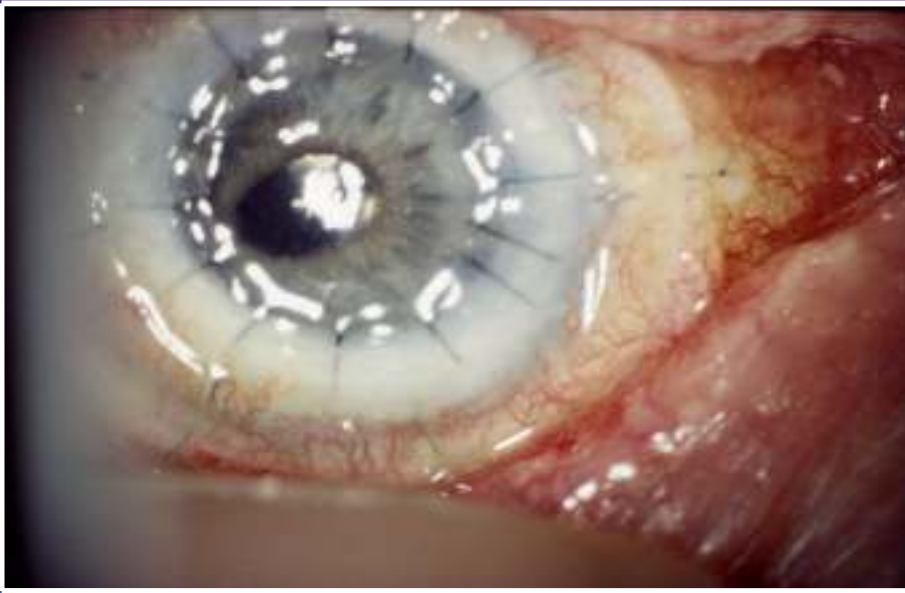
Allolimbal Stem Cell Transplantation: In vivo expansion from cadaver donor limbus



Combined
Cadaver Allo-
limbal transplant
+ Cataract
extraction with
implant +
Penetrating
keratoplasty



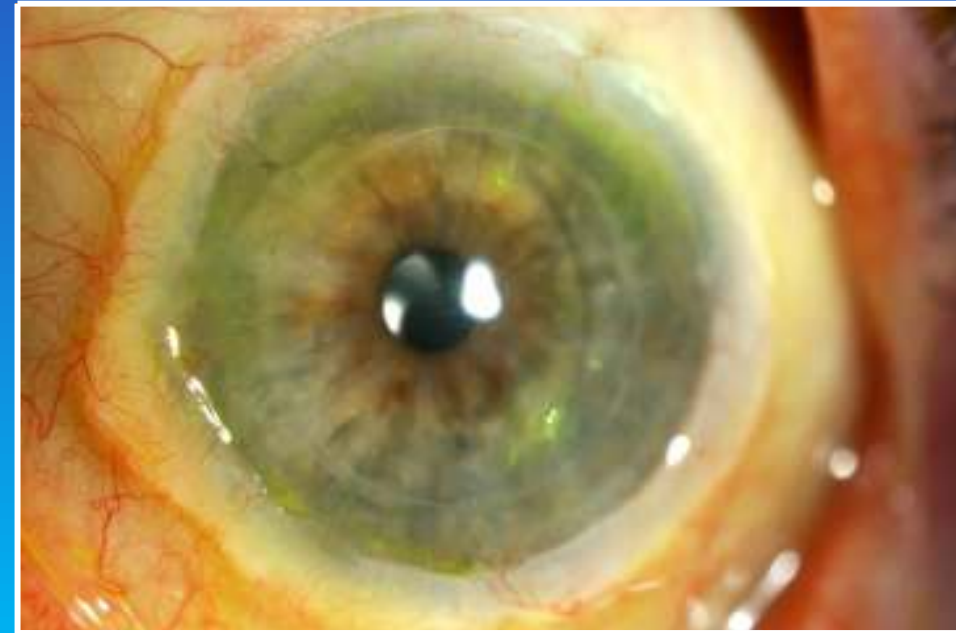
Allolimbal Stem Cell Transplantation: Invivo expansion from cadaver donor limbus



Combined Cadaver Allo-limbal
transplant + Cataract extraction with
implant + Penetrating keratoplasty



21 years follow up



Post operative management

Topical antibiotics, steroids, mydriatics – Preservative free

For Allografts, long term systemic immunosuppression is required: 18 months, or 18 months from last rejection episode. Cyclosporin/Tacrolimus, Steroids, Mycophenolate.

Timely removal/replacement of sutures

Monitor IOP – iCare, tonopen, digital

Monitor for side effects of systemic immunosuppression

Summary comments

SSCE is a simple clinical procedure, can be repeated. Good results.

Surgery should be performed (limbal transplants) only when inflammation has been controlled. Risk of losing donor tissue.

Auto-limbal transplants give best results, cadaver donors the worst.

Amniotic membrane as patch or graft, is a useful adjunct.



Queens Medical Centre, Nottingham.

THANK YOU