

RIO 14<sup>th</sup> international meeting  
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**Acute management of Chemical burns**

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**Acknowledgement  
Prof. Harminder S Dua**



*Non Mechanical Injury to the eye*

**Alkali**



Fertilizers  
( $\text{NH}_3, \text{NH}_4\text{OH}$ )



Drain cleaner  
(Caustic Soda  $\text{NaOH}$ )



Plasters, Cement  
 $\text{CaOH}_2$



House hold  
Cleaners

## *Non Mechanical Injury to the eye*

### **Acid**



(Car battery  $H_2SO_4$ )



(Bleaches  $H_2SO_4$ )

### **Alcohol**



(Swimming pool disinfectant HCL)

- 11% to 22% of ocular trauma
- Young males (2/3)
- Alkali injury 2/3 Acid injury 1/3
- Industrial accidents/Home accident/Assaults

1500 Acid attacks/year

## SYMPTOMS

- Pain
- Photophobia - Blepharospasm
- Lacrimation
- Visual impairment

## *I. First Aid Measures*

- ◆ Check if patient has inhaled or ingested the chemical
- ◆ Check PH
- ◆ Topical anesthesia +/- Speculum
- ◆ Irrigate with BSS (1 Liter)
- ◆ Check and remove debris/double evert the lids
- ◆ Recheck PH ( 7) after 10 min



The Morgan lens



## *II. Prevention of further damage (PH Management)*



Irrigation reduces pH (1.5 units)

Paracentesis reduces pH (1.5 units)

Buffered phosphate solution into AC reduces pH (1.5 units)

## *III. Assessment and Grading*

### Ocular surface:

- ◆ Lids
- ◆ Cornea
- ◆ Limbus
- ◆ Conjunctiva

### *III. Assessment and Grading*

Destruction of eye lids is one of the biggest challenges: Skin grafts and buccal mucosal grafts



### *Roper-Hall classification (1965)*

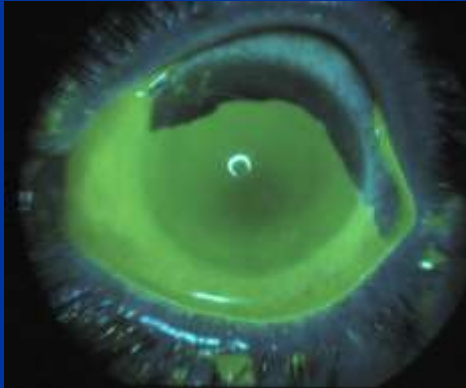
GRADE	PROGNOSIS	CORNEA	CONJUNCTIVA/LIMBUS
I	GOOD	CORNEAL EPITHELIAL DAMAGE	NO LIMBAL ISCHAEMIA
II	GOOD	CORNEAL HAZE, IRIS DETAILS VISIBLE	<1/3 LIMBAL ISCHAEMIA
III	GUARDED	TOTAL EPITHELIAL LOSS, STROMAL HAZE, IRIS DETAILS OBSCURED	1/3 – 1/2 LIMBAL ISCHAEMIA
IV	POOR	CORNEA OPAQUE, IRIS AND PUPIL OBSCURED	>1/2 LIMBUS ISCHAEMIA

### Drawbacks of the Roper Hall Classification:

Introduced before concept of stem cells was established.

Does not account for conjunctival involvement.

Does not allow for overlap between grades.



**ROPER-HALL GRADE IV**



**ROPER-HALL GRADE IV**

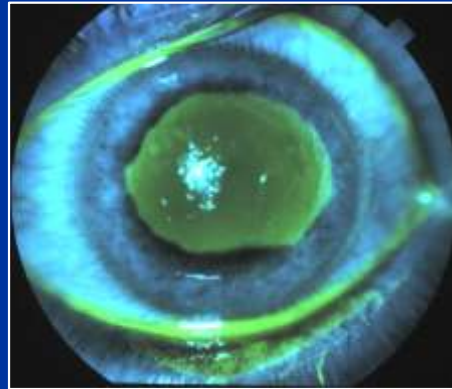
### *Dua's classification (Dua 2001)*

GRADE	PROGNOSIS	LIMBAL INVOLVEMENT	CONJUNCTIVAL INVOLVEMENT	ANALOGUE SCALE
I	VERY GOOD	0 CLOCK HOURS	0%	0/0%
II	GOOD	<=3 CLOCK HOURS	<=30%	0.1-3/1-30%
III	GOOD	> 3 - 6 CLOCK HOURS	> 30 TO 50%	3.1-6/30.1-50%
IV	GOOD TO GUARDED	> 6 - 9 CLOCK HOURS	> 50 TO 75%	6.1-9/51-75%
V	GUARDED TO POOR	> 9 - <12 CLOCK HOURS	> 75 TO < 100%	9.1-11.9/75.1-99.9%
VI	VERY POOR	TOTAL LIMBUS (12 CLOCK HOURS)	TOTAL CONJUNCTIVA (100%)	12/100%

## *Dua's classification (Dua 2001)*

### **Grade (1) (0/0%)**

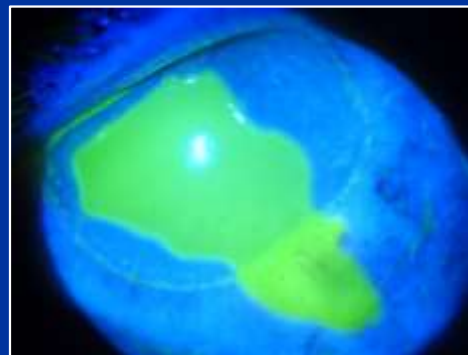
- ◆ Limbal involvement 0 clock hours
- ◆ Conjunctival involvement 0%
- ◆ Very good Prognosis



## *Dua's classification (Dua 2011)*

### **Grade (2) (01-3/1-30%)**

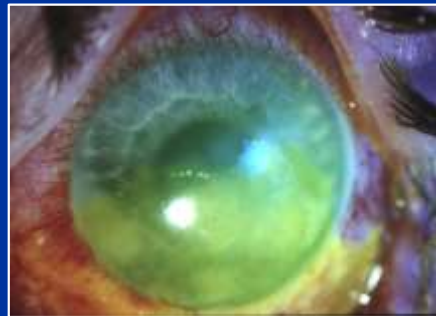
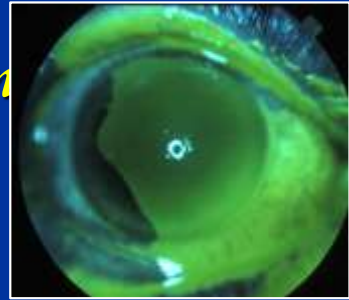
- ◆ Limbal involvement  $\leq 3$  clock hours
- ◆ Conjunctival involvement  $\leq 30\%$
- ◆ Good Prognosis



## *Dua's classification (Dua 2001)*

### Grade (3) (3.1-6/30.1-50%)

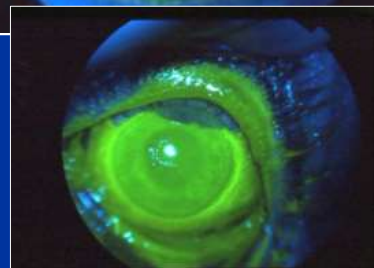
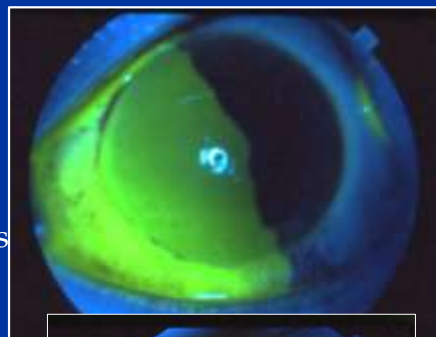
- ◆ Limbal involvement >3-6 clock hours
- ◆ Conjunctival involvement >30%- 50%
- ◆ Good Prognosis



## *Dua's classification (Dua 2001)*

### Grade (4) (6.1-9/50.1-70-%)

- ◆ Limbal involvement >6-9 clock hours
- ◆ Conjunctival involvement >50-75%
- ◆ Good to Guarded Prognosis

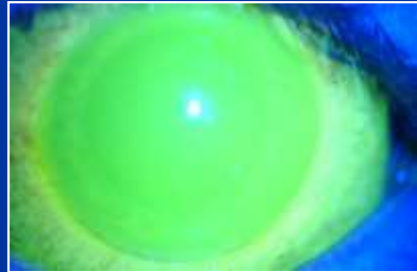




## *Dua's classification (Dua 2001)*

### Grade (5) (9-11.9/75.1-99.1%)

- ◆ Limbal involvement 9 to <12 clock hours
- ◆ Conjunctival involvement 75 to <100%
- ◆ Guarded to Poor Prognosis



## *Dua's classification (Dua 2001)*

### Grade (6) (12/100%)

- ◆ Limbal involvement 12 clock hours
- ◆ Conjunctival involvement 100%
- ◆ Very poor Prognosis



### *III. Assessment and Grading*

#### **CORNEA STROMA**

- ◆ Stromal haze or opacification
- ◆ Stromal edema/thickening
- ◆ Impaired corneal sensations

### *III. Assessment and Grading*

- **IRIS:** haemorrhage, hyperaemia, necrosis, pigment dispersion
- **PUPIL:** limited or absent pupil response
- **LENS:** swelling or cataract



### *III. Assessment and Grading*

#### **Intraocular pressure**

- **Normal, low or raised (Bimodal)**
- (*Goldman vs Tonopen vs iCare vs finger palpation*)



### *IV. Controlling inflammation*

- **Steroids:** 1% Pred Acetate or 0.1% Dexamethasone..
  - Does not enhance collagenases in first 6 days and week 4-6.
  - Can be used judiciously if patient is monitored daily.

## *IV. Controlling inflammation*

- **Antiproteases:** Reduce or prevent ulceration.
- Na Citrate 10%
- Ca or Na EDTA 0.2%
- Acetylcysteine (10-20% )
- Autologous serum (20% - 100%)
- Oral Tetracycline .

## *V. Facilitation of the healing process*

- **Ascorbate:** (5-10%) and oral ascorbate (1 to 2 grams/day). Increases aqueous ascorbate levels and prevents collagen degradation and ulceration. Better in combination with citrate.

## *V. Facilitation of the healing process*

- Artificial tears
- Autologous serum
- Fibronectin, epidermal growth factor, subconjunctival heparin, vasodilators, others.

## *V. Facilitation of the healing process*

- Broad Spectrum antibiotics: Fluroquinolone PF
- Mydriatic and cycloplegics: Avoid 10% PE.
- Antiglaucoma: Oral Diamox.  
Topical: Dorzolamide/ Beta blockers

## *V. Facilitation of the healing process*

- Bandage contact lens and Glued on Contact lens (several months).

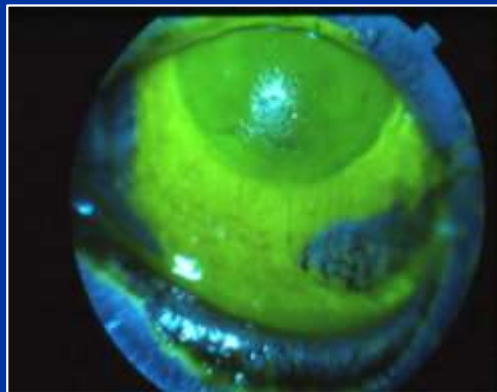
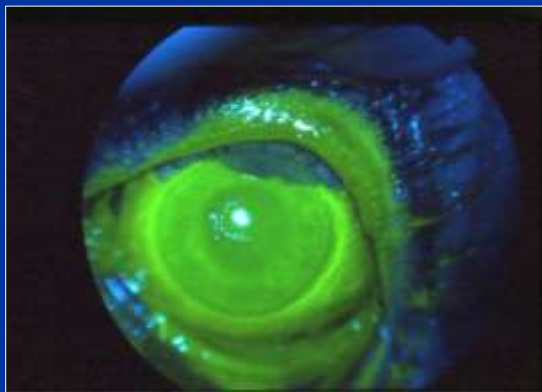


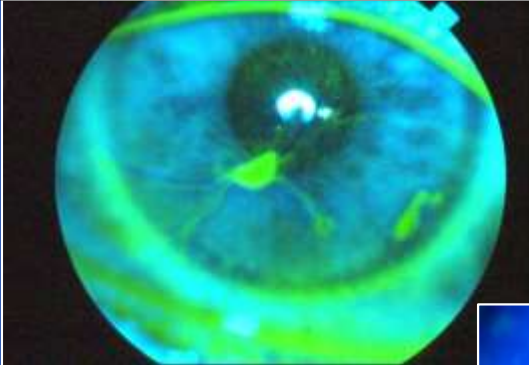
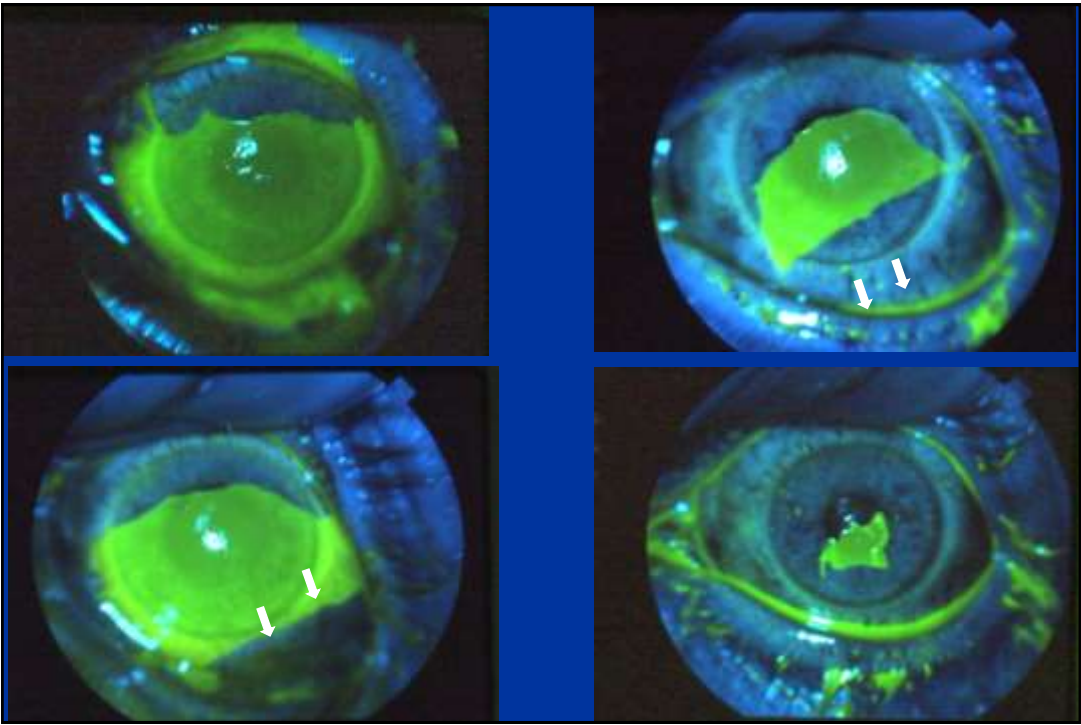
Protect the denuded stroma from collagenase-containing epithelium, PMNs, and tears.

CL is glued along its circumference to denuded corneal stroma with cyanoacrylate glue

## *VI. Surgery in the Acute stage*


*Sequential Sector Conjunctival Epitheliectomy (SSCE)  
When to use it in Acute Stage?*



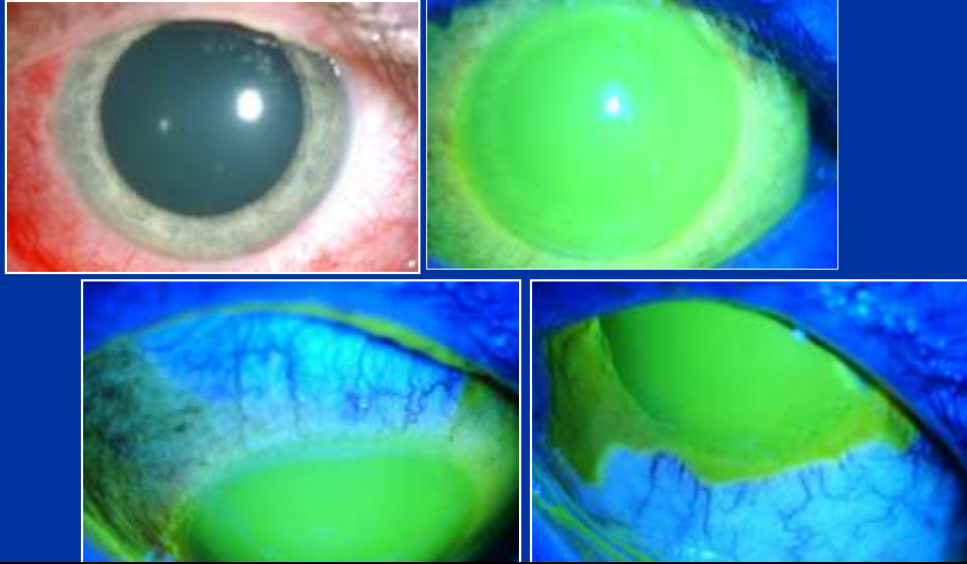


**Sequential Sector  
Conjunctival  
Epitheliectomy (SSCE)**

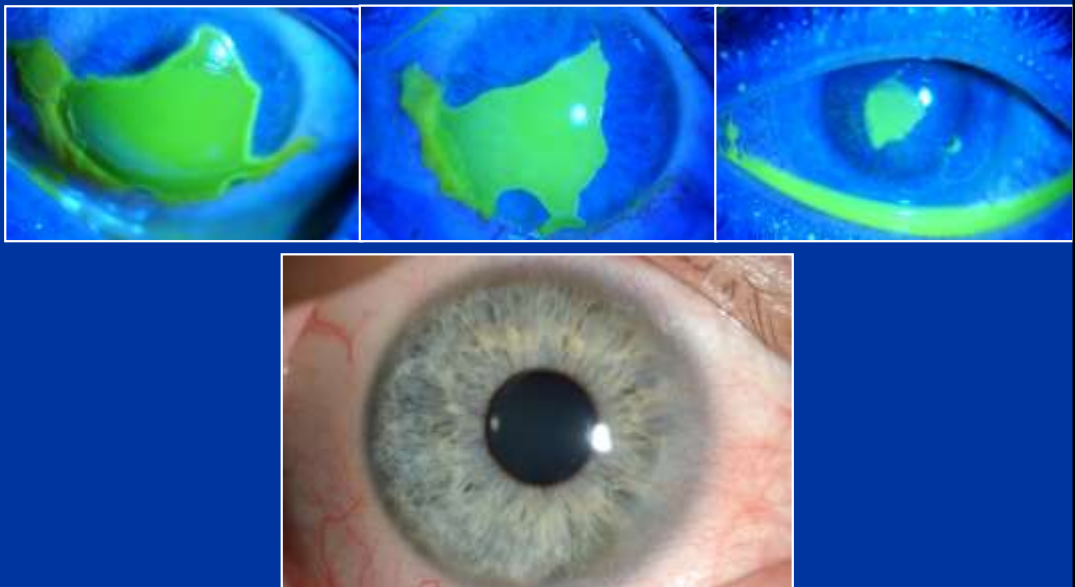
SSCE can prevent this



*When NOT to use (SSCE) in Acute stage?*



*When NOT to use (SSCE) in Acute stage?*





## VI. Surgery in the Acute stage

### ➤ Amniotic Membrane

OmniLenz®

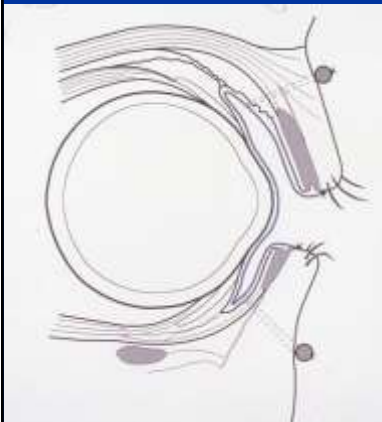


PROKERA®

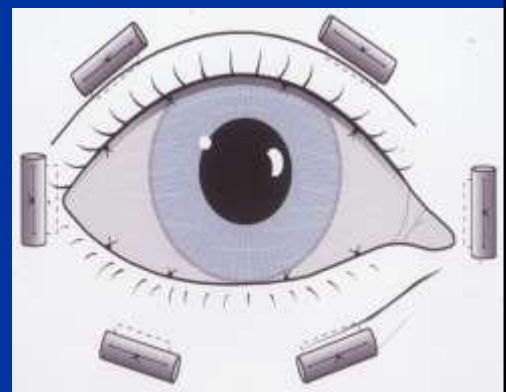


## VI. Surgery in the Acute stage

### ➤ Amniotic Membrane



Total or  
partial  
amniotic  
membrane  
cover



Amnion with conformer



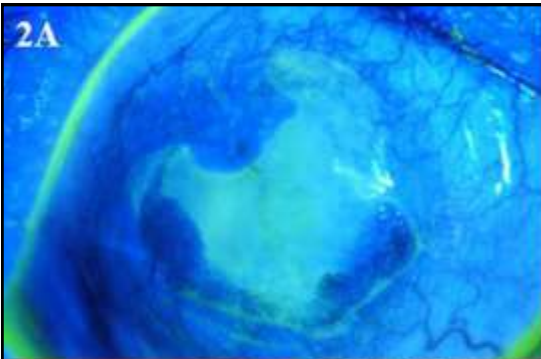
Omnigen 500

“low temperature vacuum dehydrated AM”

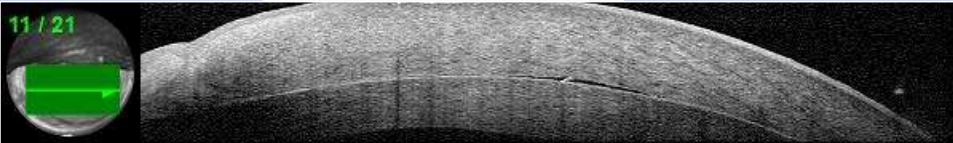
## *VI. Surgery in the Acute stage*

- Tenoplasty
  
- Free Conjunctival Autografts
  - As an alternative to amniotic membrane when corneal melting is not responding to other measures.
  - Also as an alternative to tenoplasty.

## Conjunctival Free Graft



## VI. Surgery in the Acute stage



11 / 21

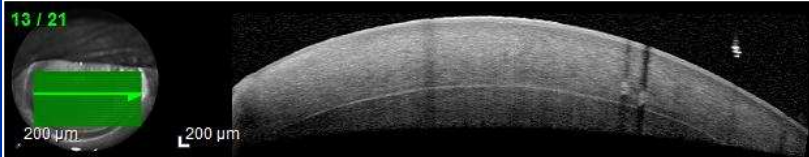
10/01/2017, OS

IR&OCT 30° [HS] ART(9) Q: 27

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ENGINEERING



Maintaining epithelialization  
and complete attachment after  
six weeks



13 / 21

200 μm

200 μm

07/02/2017, OS

IR&OCT 30° ART [HS] ART(9) Q: 27

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ENGINEERING



The Hidden Face of Ocular Burns.....



...Can Have A Devastating Outcome.



## ***Remember!!***

- 1. First Aid Measures***
- 2. Prevention of Further damage***
- 3. Assessment and Grading***
- 4. Controlling Inflammation***
- 5. Facilitating Healing***
- 6. Surgery in Acute Stage***