

**Perioperative Corneal
Abrasion Prevention Project**

**Mayo Clinic, Rochester
Minnesota**

What is the Perioperative Corneal Abrasion Prevention Project?

- **Department of Anesthesiology Performance Improvement Committee initiative**
- **Goal: to reduce the incidence of perioperative corneal injuries**

What is the Perioperative Corneal Abrasion Prevention Project?

- **Consists of:**
 - ✓ **Nursing-initiated ophthalmologist consultation for all postoperative complaint of “eye pain”**
 - ✓ **Consulting ophthalmologist reports case to anesthesia department *via* web tool**
 - ✓ **All anesthesia personnel involved with case receive automatic notification (see next slide)**
 - ✓ **Education with formal lectures to all members of the Department**

Automatic E-mail notification received by each anesthesia provider involved with a case of corneal injury

From: Joe, J MD (Ophthalmology Physician)

Sent: Tuesday, April 18, 2006 6:13 PM

To: ANESCAESUPPORT

Subject: Perioperative Corneal Abrasion Event

Joe J, MD (Ophthalmology) has submitted a Perioperative Corneal Abrasion Event to be followed up on.

Patient Name: John Doe

Mayo Clinic Number: X-XXX-XXX

Date of Anesthetic: 4/18/2006 7:33:46 AM

Final Diagnosis: Corneal Exposure, Right

Additional Information: Inferior ridge of superficial punctate keratopathy consistent with lagophthalmos.

Procedure Information: General – Axillary dissection; Left; General – Mastectomy

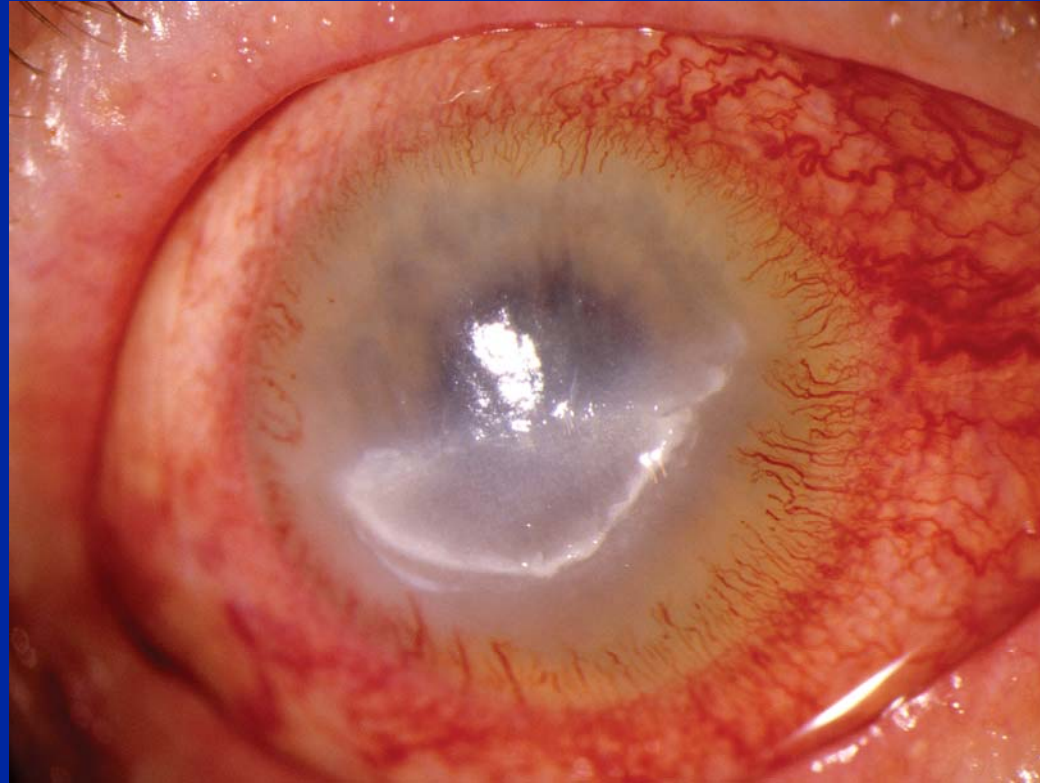
Medical Team: John J MD (Anesthesiologist), Jane J (Student Nurse Anesthetist)

User's Information: Joe, J MD, Ophthalmology Physician (consult performing physician)

User's Email: Joe.J,MD@Mayo.Edu

Corneal Injuries

Corneal Abrasion

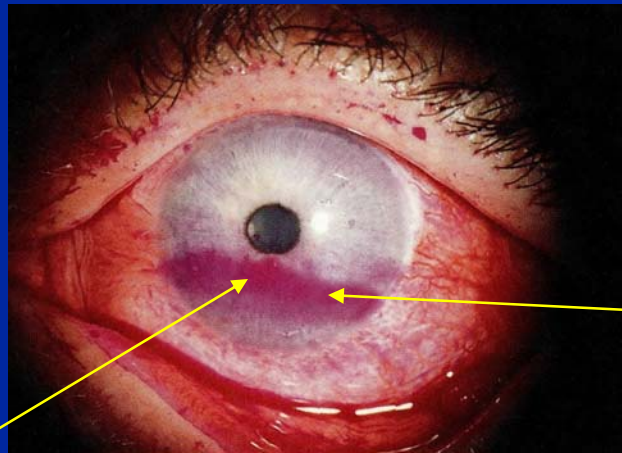


Complete loss of corneal epithelium caused by trauma

Corneal Injuries

Corneal Exposure

- **Damage to corneal epithelium caused by prolonged exposure (open eye)**
 - ❖ **Long exposure leads to loss of tear film protection necessary for maintenance of the integrity of corneal epithelium**



Rose bengal staining showing dry epithelium demarcation zone

Rose bengal is used to stain devitalized epithelial cells, and/or areas with dysfunctional mucin layer

Corneal Injuries

Acute Angle-Closure Glaucoma



Flow of intra-ocular fluid (aqueous humor) becomes impeded by an obstruction in the drainage system

All 3 types of injuries are **painful conditions** and cause **blurred vision** and or **“red eye”**

Permission granted from <http://retinasurgeon.tripod.com/id1.html>, Narciso F. Atienza, Jr., M.D., Accessed July 23, 2008.

How common are postanesthesia corneal exposure/abrasion injuries?

- **University of Chicago**

- ✓ 1988-1992

- ✓ 34 of 60,965 (0.056%) consecutive cases

Anesthesiology 1996; 85:1020-7

- **Mayo Clinic Rochester**

- ✓ January through May 2006

- ✓ 30 of 8,300 (0.15%) consecutive cases

Do postanesthesia eye injuries results in medical-legal claims?

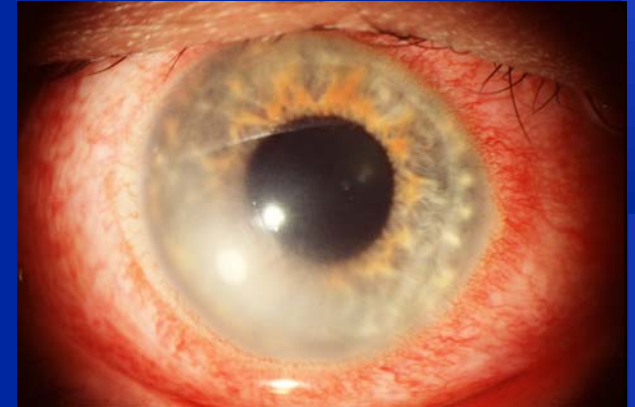
- **Yes!**
- **1992 ASA closed claims project:**
 - ✓ 3% of all claims were eye injuries
- **35% of these related to corneal exposure/abrasions**
- **Median corneal exposure/abrasion payment**
 - ✓ Was \$3,000

Anesthesiology 1992;76:204-8

Risk Factors for Corneal Abrasion

- **Anything giving propensity for direct trauma to eye**
- **Risk of anesthesia provider traumatizing corneas during airway management**
 - ✓ Jewelry, wrist watch
 - ✓ Dangling name tag, stethoscope, etc.
 - ✓ Checking the eyelid reflex

Risk Factors for Corneal Exposure Injury



- **General anesthesia**
- **Longer case duration**
- **Head and neck procedures**
- **Prone or lateral patient positioning**
 - ✓ Injury rate is higher in the more dependent eye

Risk Factors for Corneal Exposure Injury

- Superficial punctate keratopathy due to prolonged corneal exposure



Risk Factors for Corneal Exposure Injury

- **Lagophthalmos (incomplete lid closure)**
 - **5% of normal population**
 - **60% of patients under general anesthesia**

Risk Factors for Corneal Exposure Injury

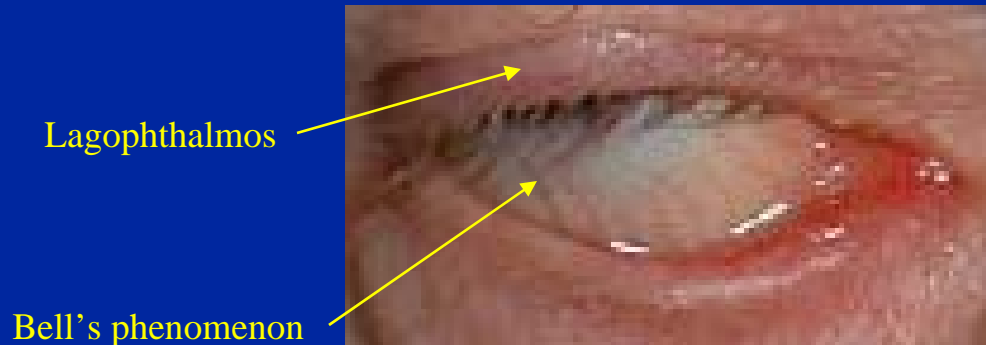


- **Proptosis (exophthalmos)**
 - ✓ **Common with Graves' disease**

Risk Factors for Corneal Exposure Injury

- **Absence of Bells' phenomenon**

Bells Phenomenon: Eyeball turns up during attempt to close the eye, which together with lid closure protects the cornea from exposure drying (this is normal defensive mechanism)



Bell's phenomenon is abolished by general anesthesia, which increases the propensity for corneal exposure injury in improperly taped eyes or in patients with lagophthalmos.

Prevention Strategies

- Tape eyes after induction immediately after the loss of lid reflex (before endotracheal intubation or mask ventilation)
- Be very careful with checking the eyelid reflex !
- Take care when taping eyes to full shut/close the eyelids



PROPER TAPING



IMPROPER TAPING

Prevention Strategies

- **Check eye tape periodically**
 - ✓ **Particularly following repositioning**
 - ✓ **Tape may lose adherence with exposure to moisture or tears**
- **Retape when indicated, as confirmed by visual inspection**

Prevention Strategies

- Do not place the pulse oximeter on the index or middle finger
- Apply pulse oximeter to nondominant hand
 - ✓ May increase risk of injury on emergence



CORRECT



INCORRECT

Prevention Strategies

Ophthalmic Ointment

- **Consider supplementation to tape for higher-risk cases**
 - Long cases (consider periodic reapplications)
 - Head/neck procedures
 - Difficulty closing eyes
 - ✓ Exophthalmos
 - ✓ Lagophthalmos

Eye Ointment Selection

- Two main choices exist for selection of eye ointment
Which one should be used ?
- **Petrolatum-based**
 - ✓ Long-lasting
 - ✓ Disadvantage: longer postoperative blurring of vision
 - ✓ Do not use petrolatum-based eye lubricant for surgery around the face where cautery is used (flammable)
- **Methylcellulose-based**
 - ✓ Does not last as long as petrolatum-based
 - ✓ Advantage: less postoperative blurring of vision
- **BOTTOM LINE**
 - ✓ Petrolatum-based: longer cases
 - ✓ Methylcellulose-based: shorter cases

Departmental Guidelines for Eye Protection

- **Manual closure alone**
 - ❖ May be used for VERY short cases (minutes)
- **Lid taping only**
 - ❖ Good for cases less than 90-minutes
 - ❖ Supine patient positioning
 - ❖ Non-head/neck procedures
 - ❖ No proptosis or lagophthalmos

Departmental Guidelines for Eye Protection

- **Ointment alone**
 - ❖ **Only if contraindication to taping (this is almost never an issue except in rare cases)**

Acute periorbital ecchymoses ('raccoon eyes') during gentle eye taping for short general anesthesia in a patient with primary amyloidosis (capillary fragility)



Permissions granted by International Anesthesia Research Society.
Weingarten TN, et al. Anesth Analg 2007;105:1561-3

Departmental Guidelines for Eye Protection

- **Lid taping + Ointment**
 - ✓ Cases lasting more than 90 minutes
 - ✓ Prone/lateral positioning
 - ✓ Head/neck procedures
 - ✓ Proptosis/severe lagophthalmos
- **Bandage contact lens**
 - ✓ Cumbersome and not practical
- **Suture tarsorrhaphy**
 - ✓ Not practical and traumatic

Departmental Guidelines for Eye Protection

- **Main dilemma**

Tape lids only or Tape + Ointment

- **Tape alone**

- ✓ A great option if the lids will remain shut and/or the tape will not come OFF
- ✓ Tape alone avoids postoperative blurring of vision, which occurs from the use of ointment

- **Tape + Ointment**

Gives great protection if there is the concern of tape coming OFF, e.g. head/neck procedure/manipulations, prolonged case, proptosis, lagophthalmos

Suggested Algorithm to Diagnose/Treat Corneal Injury

- **Place one drop proparacaine**
 - ✓ If eye pain resolves injury is abrasion or exposure
 - ✓ If not, consult ophthalmology to rule-out acute angle-closure glaucoma
 - ✓ Never use topical anesthetic drop to relieve chronic eye pain – will damage corneal epithelium
- **Fluorescein or Rose Bengal stain to visualize injury**
- **Erythromycin ointment 3x daily for 2 days**
 - ✓ No improvement in 24 hours, consult ophthalmology
 - ✓ No need to patch eye

Conclusions

- ❖ Always use great care when taping the patient's eyes shut
- ❖ Tape the eyes early after induction
- ❖ If eyelid reflex is checked it may be done by exercising great care
- ❖ Keep the eyes free from pressure, harmful rays and secretions, e.g. blood and suctioning of the airway
- ❖ Do not put the pulse oximeter on patient's index or middle finger
- ❖ Consider using ophthalmic ointment for high-risk procedures
- ❖ Check proper eye closure and reapply ointment every 60 to 90 minutes in high-risk patients

Disclosure

It is important to recognize that the guidelines set forth herein are presented only as recommendations rather than as rigid rules. They are intended as general guidelines that can be modified in accordance with the physician's professional judgment and may be adapted to many different situations, taking into consideration the needs of individual patients. Variations and innovations to the guidelines that demonstrate improvement in the quality of patient care are encouraged.

**Mayo Clinic, Department of Anesthesiology
Performance Improvement Committee**