Ocular Surface Procedures in the Treatment Room

University of Toronto

Conjunctival biopsy

Clara Chan, MD, FRCSC, FACS
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Department of Ophthalmology and Vision Sciences

Disclosures

• Off-label use of fibrin glue will be mentioned in this presentation
• I have an industry relationship with Alcon (B), Allergan (A, B, D), Bausch & Lomb (B)
• I do not have any financial interest in any products mentioned in this presentation
Types of conjunctival biopsy

- Excisional
- Incisional

Indications for Excisional Biopsy

Lesions that:
- Threaten vision
- Cause irritation
- Are related to systemic disease
- Possible malignancies

Indications for Incisional Biopsy

- OCP suspect
- Obtain sample to aid in diagnosis of a larger area of abnormality
Step by Step

1) Topical anesthetic
2) Betadine prep, drape, lid speculum
3) Mark area of conjunctiva to be biopsied
4) Weck cell pledgets soaked with topical anesthetic (proparacaine or tetracaine) applied to area of conjunctiva x 30 seconds +/- subconjunctival injection of 2% lidocaine with epinephrine to balloon up the area

5) 0.12 forceps and westcott scissors used to excise conjunctiva
6) Place specimen onto piece of paper indicating orientation (blue paper from weck cell packaging)
7) Hemostasis with weck cells pressure +/- handheld cautery
8) Primary closure using 9-0 vicryl or fibrin glue
9) If large area, then use amniotic membrane
Post-operatively

- Tobradex ointment and patch x 4 hours
- Tobradex and artificial tears qid x 1 week
- Tylenol PRN for pain
- Follow-up at 1 week
- Finish the Tobradex, then Maxidex 1 drop qid tapering 1 drop per week
- Follow-up again after 4-6 weeks

Pocket Tattoo

David S. Rootman, MD, FRCSC
Professor, University of Toronto
Adjunct Professor, Ben Gurion University

Technique

- Vertical, corneal incision 50% depth
- Lamellar pocket
- Insertion of pigment on crescent knife blade
Video

Avastin Treatment for the Management of Corneal Neovascularization

Allan Slomovic MA, MD, FRCS (C),

Owen and Marta Boris Endowed chair in Cornea and Stem Cell Research

Research Director, Corneal Service. University Health Network

President Elect, Canadian Ophthalmological Society

DISCLOSURE

• Consultant for:
  1. Alcon Canada
  2. Allergan
  3. Bausch and Lomb Canada

  I have no financial interests that specifically pertain to my presentation

• The use of Anti-VEGF antibodies for the treatment of corneal vascularization is currently an **Off-Label** use of this medication
Anti-VEGF Antibody Treatment of Corneal Vascularization

- Avastin is the 1st specific angiogenesis inhibitor available in North America.
- Since it’s landmark study for the treatment of Macular Degeneration, Avastin has been used in Ophthalmology to treat no fewer than 51 different disease processes, all having in common pathological vascularization.

VEGF plays a major role in Corneal angiogenesis and vascular permeability by causing a signaling cascade in endothelial cells

- Differentiation into mature Blood Vessels
- Migration
- Proliferation

Angiogenesis
Vascular Permeability

• To address the topic of “PEARLS” for the use of Anti-VEGF antibodies for Corneal Vascularization, I would like to summarize 2 studies that we recently published on this topic and compare our outcomes with current world literature.
1. Subconjunctival Bevacizumab Injection for Corneal Neovascularization
Bahar I, Kaiserman, McAlum P, Rootman D, Slomovic AR
Cornea 2008 Feb;27(2) 142-7

- 10 eyes/10 consecutive patients with corneal vascularization.

- Etiology for vascularization:
  - Herpetic eye disease (n=3)
  - Failed graft (n=3)
  - Graft versus host disease (n=1)
  - Post infectious keratitis (n=1)
  - Chemical burn (n=1)
  - Interstitial keratitis (n=1).

- All had extensive superficial and deep corneal vascularization and had a h/o failure of regression of the vessels with the use of topical steroid drops QID.

Avastin Injection:

- All injections were performed at the slit lamp using topical anesthetic (Proparacaine Hydrochloride drops)

- Subconjunctival injection of 2.5 mg / 0.1 ml bevacizumab was performed at the limbus, adjacent to the pathologic blood vessels growing into the cornea.

- All eyes had at least two Avastin injections, except for 1 patient, who refused further injections.

- The average number of Avastin injections per eye was 2.1 ± 0.8 (Rg: 1 – 4)
Grading of Pathologic Vessels:

- Digital photographs of the cornea were graded by two masked observers before and after Avastin injection.
  1. Density was graded on a scale from 1-4 (compared with standard photos given to observers).
  2. Extent number of clock hours affected by neovascularization (score 1-12).
  3. Centricity the distance the new vessels extended from the limbus towards the visual axis:

- Image analysis software was used to determine the area of cornea covered by neovascularization as a percentage of the total corneal area.

Results:

- There were no intra-operative complications.
- Seven eyes (70%) demonstrated partial regression of vessels, whereas 3 eyes (30%) did not react to the injection.
- Six (60%) patients had at least 1 clock hour decrease in the extent of blood vessels, and 4 (40%) had at least 2 clock hour decrease in the extent of vessels.
- Seven (70%) patients had a decrease of 1 level in density.

"WHEN YOU HAVE A HAMMER, EVERYTHING LOOKS LIKE A NAIL"

- Up to the present there has been no effective pharma-therapy to treat corneal vascularization, despite the significant deleterious effect that it can have on vision and corneal transplant survival.
- Since the advent of anti-VEGF antibodies in ophthalmology, this drug has found useful application in the treatment of pathological vascularisation: retina, iris, and now cornea.
Conclusion

- Our study as well as other researchers have shown a beneficial effect of subconjunctival and intra-stromal Avastin in limiting corneal vascularization in humans caused by various etiologies.
- We also showed that it was not effective in causing regression of corneal vessels in recurrent pterygia
  - Subconjunctival Bevacizumab Injection for Corneal Neovascularization in Recurrent Pterygium
    Bahar I, Kaiserman I, McAllum P, Rootman D, Slomovic AR

3 SURGICAL PEARLS

1. Intracorneal and subconjunctival Avastin is beneficial in regressing corneal neovascularization and lipid deposition
2. In a separate study, we showed that it was not effective in causing regression of corneal vessels in recurrent pterygia
  - Subconjunctival Bevacizumab Injection for Corneal Neovascularization in Recurrent Pterygium
    Bahar I, Kaiserman I, McAllum P, Rootman D, Slomovic AR
3. Our current regimen consists of 3 injections (subconj and intrastromal) separated by 4-6 weeks and then PRN injections.

Corneal Biopsy

Mauricio A. Perez, MD
University of Toronto
Department of Ophthalmology and Vision Sciences
Disclosures
• No financial disclosures

Indications
• Infections
• Distrophies
• Degenerations
• Manifestations of systemic diseases
• Drug-induced changes

Requirements
• Speculum
• 2-3 mm diameter punch
• 0.12 mm forceps
• Crescent blade
Technique

1) Topical anesthetic
2) Lid speculum
3) Use punch to trephine +/- 250 microns
4) Lift edge of trephination with 0.12 mm and use Crescent blade to remove button
5) Split in half:
   1) ½ for pathology
   2) ½ for microbiology

Post-operatively

- Tobradex ointment and patch x 4 hours
- Tobradex and artificial tears qid x 1 week
- Tylenol PRN for pain
- Follow-up at 1 week

Punctal cautery

Yakov Goldich, MD
What do we need?

- Cautery pen

What do we need?

- Topical anesthetic drops (Proparacaine 0.5%)
- Weck-cel Pledgets
- Local anesthetic (2% lidocaine solution) – optional
Post op management

- Topical antibiotics qid for 1 week.
- No steroids allowing scarring
- Continue dry eye management

Amniotic membrane use in the minor surgery operating room

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Disclosures

• I do not have any financial interest in any products or procedures mentioned in this presentation

Amniotic membrane

• The innermost layer of the placenta
• Consists of a thick BM and an avascular stromal matrix

Preparation

• Caesarean section
• Screening for HIV, Hepatitis and Syphilis
• The placenta is cleaned with a mixture of BSS, Penicillin, Streptomycin, Neomycin and Ampohoterin B
• The amnion is separated from the chorion by blunt dissection under sterile conditions
• Attached to nitrocellulose paper strips and stored in glycerol solution
• Fresh use or cryopreserved at a temperature of -80 degrees C
Indications

- Chemical injury
- Limbal stem cell deficiency (partial or total), combined with stem cell graft
- Persistent epithelial defects
- Symptomatic bullous keratopathy
- Corneal ulceration
- Corneal diseases

Indications

- Synechiae bands
- Conjunctival scarring/scar
- Symblepharon
- Conjunctival surface reconstruction
- Pterygium surgery
- Conjunctivitis
- Trabeculectomy:
  - Bleb leakage or revision

Step by step

- Topical anesthetic
- Betadine prep, drape, lid speculum
- Weck cell pledgets soaked with topical anesthetic applied conjunctiva x 30 seconds
- Container with amniotic membrane is thawed at room temperature just before its use
- The membrane is then gently separated from the nitrocellulose paper with blunt forceps
Surgical technique

• Stromal side of the membrane is sticky, epithelial BM side is shiny and non-sticky
• Contradictory reports concerning the right way to place the amnion on the ocular surface
• Spread on to the ocular surface and trimmed to the appropriate shape and size
• Secured in place using 10-0 nylon/vicryl interrupted/continuous sutures
• Large therapeutic contact lens

Movie

Post-operatively

• Tobradex drops QID and artificial tears PRN
• Tylenol PRN for pain
• Follow-up at 1 week
• Follow-up after 2-3 weeks
• BCL removal usually after 2-3 weeks as soon as AM has dissolved
Risks

- No published reports of communicable disease transmission from AMT
- One report exists of a sterile hypopyon after repeated transplantation of human amniotic membrane on cornea surface*
- Loose or dislocated as a result of loose/broken sutures
- Hemorrhage under the membrane


Corneal Relaxing Incisions

Randall Ulate, MD
University of Toronto
Department of Ophthalmology and Vision Sciences

Corneal Relaxing Incisions

- Treatment of Astigmatism
- Radial Incisions: central flattening
- Relaxing incisions: incised meridian flattening
- AK and LRI
- Maximal effect in 5-7 mm zone
- Maximum of 4 incisions
Post-Keratoplasty
- Incisions central or in graft-host junction
- 6 mm
- Length from 45-90 degrees
- Planned Keratotomy
- Topography
- Difference in response

Instrumentation
- Microscope
- Speculum
- Marking instrument
- Fixation instrument
- Incisional instrument

Complications
- Under-Overcorrection
- Infection
- Perforation
- Irregular astigmatism
EDTA Chelation

Randall Ulate, MD
University of Toronto
Department of Ophthalmology and Vision Sciences

Chemical chelation

- Band keratopathy
  - Calcium deposition
  - Bowman's layer
  - Symptoms
  - Causes

Chemical chelation

- Indications
  - Pain
  - Epithelial defects
  - DVA
  - Cosmesis

EDTA
Chemical chelation
- S/L or Microscope
- Instrumentation
- Surgical Technique
- Complications

Pterygium Surgery with Sutured Conjunctival Autografts
David S. Rootman, MD, FRCSC
Professor, University of Toronto

Why Sutures When We Can Glue?
- More secure fixation of autograft
- Less likely to dislocate
- Stretches out a smaller autograft
- Long track record
- No bovine or foreign blood products
- Less messy
- Good suturing practice
- Less expensive
Disadvantages of Sutures

- Takes longer
- More difficult
- Sutures irritate patient
- More likelihood of bleeding
- May have to remove sutures

Seven Principles of Procedure

1. Smooth partial keratectomy
2. Release of Tenon’s capsule constriction
3. Thin autograft
4. Alignment of graft
5. Secure suturing of graft
6. Bandage contact lens
Keratectomy

- As described by Richard Abbott
- 7-0 Silk fixation suture
- Inject under pterygium with 1% xylo with epi
- Angled cut at anterior edge of pterygium
- Smooth dissection in anterior stroma
- Removal of all scar tissue on cornea
- Similar to making a phaco scleral tunnel

Release of Tenon’s Capsule

- Do not over dissect
- Release medial rectus on both sides
- Allow conjunctiva to slide back to caruncle
- Mark extent of excision
- Minimal removal of conjunctiva
- Stay away from caruncle
Autograft harvesting

- Measure area of resection
- Pull eye downward
- Use Gentian violet to mark area
- Central mark to help orientation
- Rhomboidal shape, wider at posterior edge
- Make graft as thin as possible

Alignment of Graft

- Slide conjunctiva on cornea, Tenon up
- Appose limbal cells to limbus at site of excision
- Secure with 10-0 monofilament vicryl
- Turn graft over after secured at limbus
Suturing of Autograft

- Secure in all four corners with scleral bite
- Avoid medial rectus to minimize bleeding
- Close nasal conjunctiva to conjunctiva of graft, no scleral bite here
- Close edge to edge superiorly and inferiorly
- No exposed Tenon capsule, prevents granuloma
- Do not advise running suture

Bandage Contact lens

- Apply at end of procedure
- More comfort for patient
- No patch needed
- Leave on for 2 weeks
- Lessens chance of Dellen
- Steroids for 6 weeks qid or until eye white
Complications

- Recurrence
- Inflammation
- Melting (more common with Mito C)
- Infection
- Bleeding
- Dellen
- Granuloma

Recurrence

Inflammation
Necrosis

Infection

Dellen
Conclusions

• Pterygium excision with conjunctival flap is a good procedure with low complication rates
• Using sutures is a good alternative compared with tissue glue
RECURRENT PTERYGIUM

What is considered a recurrence?

1. Conjunctival recurrence:
   - Manifests as vascular injection and heaped up subconjunctival connective tissue in the area where the conjunctival portion of the pterygium was previously removed.

2. Corneal Recurrence:
   - "Any new fibrovascular growth across the limbus that was not present on the first post-operative day" (Hirst, 2009).

What does the evidence tell us about:

1. How best to prevent recurrence from occurring?
2. How to surgically treat a recurrent pterygium if it does recur?
1. Recurrences- both primary and recurrent pterygium

1. CONJUNCTIVAL AUTOGRRAFT DECREASES THE LIKELIHOOD OF RECURRENCE

2. COMPARED WITH THE USE OF AMNIOTIC MEMBRANE, A CONJUNCTIVAL AUTOGRRAFT IS MORE EFFECTIVE IN PREVENTING A RECURRENCE

   - lower recurrence rates, better cosmetic result, more cost effective

3. INTRAOPERATIVE MMC DECREASES THE LIKELIHOOD OF RECURRENCE

   - 0.02-0.04% administered 2-5 minutes
   - Most commonly used concentration/duration: - 0.02% for 3 min.

4. A COMBINATION OF A CONJUNCTIVAL AUTOGRRAFT WITH MMC FURTHER REDUCES RECURRENCE RATES COMPARED WITH EITHER A CONJUNCTIVAL AUTOGRRAFT OR MMC ALONE

2. Safety

1. Of the adjuvants studied in Kaufman et al. paper, only MMC was associated with vision threatening complications: scleral thinning, scleral ulceration and delayed conjunctival epithelialization.

2. Increased concentration and duration of exposure to MMC is associated with increased complication rate.

3. Increasing concentration and duration of exposure to MMC is associated with increased complication rate.
Evidence-based review of some of the newer treatments to prevent pterygium recurrence:

1. anti-VEGF therapy
2. Extensive tenonectomy (“PERFECT for PTERYGIUM” technique)
3. Tissue Glue vs sutures

1. Subconjunctival Bevacizumab Injection for Corneal Neovascularization in Recurrent Pterygia
   Bahar I, Kaisermani, McAllum P, Rootman D, Slomovic AR
   Current Eye Research (2008)

   • VEGF is increased in patients with pterygium
   • several studies have shown that increased release of VEGF and other factors correlates with pterygium recurrence

Conclusions:
• subconjunctival bevacizumab is well tolerated
• subconjunctival bevacizumab did not prevent the recurrent pterygium from developing
How does this study compare with other research on the use of bevacizumab to prevent recurrent pterygium?

- 18 studies (2008-2012) on the use of bevacizumab for recurrent pterygia
- EXCLUDING CASE REPORTS, THE EVIDENCE HAS BEEN UNDERWHELMING WITH MOST OF THE STUDIES SHOWING NO EFFECT OF ANTI-VEGF THERAPY TO PREVENT A PTERYGium FROM RECURRING


- **Pros:**
  - The surgical technique looks very promising
  - Very low recurrence rates and excellent cosmetic results
  - Recurrence rates:
    - 0.4% by pterygium (1/250 eyes)
    - 0% recurrent pterygium (0/115 eyes)

- **Cons:**
  - Significantly more postoperative pain/transient diplopia 1-2 weeks (Recurrent pterygium). Patients cannot work or drive during this period
  - Requires an operating room, peribulbar block and surgical assistant
  - Unfortunate use of an acronym for the procedure, perhaps instilling unrealistic expectations in our patients regarding outcomes
  - Randomized clinical studies are needed to assess and compare the efficacy and safety of this procedure.

3. What about tissue glue vs sutures to adhere the conjunctival autograft?
Management of Recurrent Pterygium with Intraoperative Mitomycin C and Conjunctival Autograft with Fibrin Glue

AJC, July 2011
Raneen Shehadeh Mashor, MD; Sathish Srinivasan, MD; Corey Bohrer; Kenneth Lee, MD; Allan R Slomovic, MD, MA, FRCSC

28 eyes 28 patients with recurrent pterygium who underwent P.E.C.A.
- 0.02% MMC for 2 minutes
- Tissue glue to adhere the conjunctival autograft

Conclusion:
1. Safe and effective surgical option for treating recurrent pterygium.
2. Recurrence rate =3.5%

Evidence-Based Protocol for Managing 1e and Recurrent Pterygium

- Primary Pterygium-
  - P.E.C.A. using Tissue Glue to adhere the graft
    - 0.02% MMC for primary, 0% MMC for recurrent (Slomovic et al, 2009)

- Recurrent Pterygium
  - P.E.C.A. with 0.02% MMC for 2-4 minutes and Tissue Glue
    - 3.5% recurrence rate (Slomovic et al, 2011)
“Fibrin Glue Versus Sutures for Attaching the Conjunctival Autograft during Primary Pterygium Surgery”
BJO 2008
S Srinivasan, M Dollin, P McAllum, Y Berger, D S Rootman, A R Slomovic

- 40 eyes 40 patients
- 20 Tisseel; 20 10-0 vicryl

Results:
1. “The degree of postoperative inflammation was significantly less in eyes undergoing pterygium surgery with fibrin glue at 1 and 3 mos. postoperatively (p=0.19)”
2. “Conjunctival grafts secured with fibrin glue were as stable as those obtained with sutures”

Conclusion:
- “The conjunctival graft secured with fibrin glue during pterygium surgery is not only as stable as those obtained with sutures, but also produce significantly less inflammation at 1 and 3 months post-operatively”

Implications
- Reduction of inflammation associated with the use of Fibrin glue may reduce Pterygium recurrence rate
- Koranyi et al. in a large retrospective study demonstrated a statistically significant decreased recurrence rate with the use of fibrin glue compared to the use of sutures.
  - Acta Ophthalmol Scand 2005

Corneal Tattooing

Yakov Goldich, MD
When?

- To improve eye cosmetic appearance
- Reduce glare from large iridotomies

What do we need?

- Operating microscope
- Coloring agents
- Needle (21G)

Step by step

1) Topical anesthetic
2) Betadine prep, drape, lid speculum
3) Mix dye according to patient’s iris color.
Video

Postoperative management

• Topical antibiotics and steroids (Tobradex qid) for 1 week.
• Bandage contact lens for 1 week
• Continue steroid topical drops for another 2-3 weeks

Results
Pocket Tattoo

David S. Rootman, MD, FRCSC
Professor, University of Toronto
Adjunct Professor, Ben Gurion University

Technique

- Vertical, corneal incision 50% depth
- Lamellar pocket
- Insertion of pigment on crescent knife blade

Video

![Video Image]
Anterior Stromal Puncture

Noa Avni Zouberman M.D

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Recurrent corneal erosion syndrome

• Loose adhesion between corneal epithelium and underlying basement membrane

• Repeat episodes of dislodgment of corneal epithelium

• Primary or secondary
**Symptoms and signs**

- Pain, photophobia, tearing, redness and decreased vision
- Classically when the patient is awakened from sleep

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**Non surgical treatments**

- Topical lubricating drops
- Hypertonic saline and ointments
- Corticosteroids
- Inhibitors of MMP’s
- Topical gels
- Autologous serum drops

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**Surgical Intervention**

- Superficial keratectomy with or without a diamond burr
- Anterior stromal puncture with or without Nd:YAG laser
- Phototherapeutic keratectomy (PTK)
What do we need

• Anesthetic eye drops
• Short (5/8 inch) 25 Gauge needle
• 1 ml syringe
• Lid speculum
• Antibiotic drops

Surgical Technique

• Anesthetic eye drops
• Short (5/8 inch) 25 Gauge needle + 1 ml syringe
• Lid speculum
• Needle tip 90 degrees to corneal surface

Surgical Technique

• 25 gauge short bent needle
• 5%-10% stromal depth
• Punctures less than 1 mm apart
• The risk of corneal perforation is minimized
• No need for special equipment
• No chemicals are used
• Epithelium remains relatively intact- less discomfort
Performing the procedure with fluorescein staining and under cobalt blue light allowed the surgeon to determine that adequate treatment was complete as bubbles could be visualized.

**Potential risks**

- Corneal perforation
- Corneal scarring
- Changes in refractive power
- Topographic irregularities

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**Tarsorrhaphy**

Mauricio A. Perez, MD  
University of Toronto  
Department of Ophthalmology and Vision Sciences

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**Disclosures**

- No financial disclosures
Indications

- Exposure keratitis
- Persistent epithelial defects

Types

- Temporary
  - Mechanical
  - Pharmacological
- Permanent

Requirements

1) 2% lidocaine
2) Double-armed 5/6-0 nylon
3) Needle driver, toothed forceps, Kelly clamp/Snap, blade
4) 2 split silicone tubes
Technique

• Video

Pharmacological

• Botox:
  – Botulinum toxin, produced by Clostridium botulinum
• Full effect seen 4 days post procedure; lasts for 6 months:
  – Allows easy clinical exam

Pharmacological: Technique

• Skin cleansing
• 30G needle:
  – 5 Botox U under supraorbital rim, midline
  – 5 Botox units parallel to superior eyelid
Technique

- Video

Conjunctival biopsy

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- Excisional
- Incisional

Indications for Excisional Biopsy

Lesions that:
- Threaten vision
- Cause irritation
- Are related to systemic disease
- Possible malignancies

Indications for Incisional Biopsy

- OCP suspect
- Obtain sample to aid in diagnosis of a larger area of abnormality
Step by Step

1) Topical anesthetic
2) Betadine prep, drape, lid speculum
3) Mark area of conjunctiva to be biopsied
4) Weck cell pledgets soaked with topical anesthetic (proparacaine or tetracaine) applied to area of conjunctiva x 30 seconds +/- subconjunctival injection of 2% lidocaine with epinephrine to balloon up the area

5) 0.12 forceps and westcott scissors used to excise conjunctiva
6) Place specimen onto piece of paper indicating orientation (blue paper from weck cell packaging)
7) Hemostasis with weck cells pressure +/- handheld cautery
8) Primary closure using 9-0 vicryl or fibrin glue
9) If large area, then use amniotic membrane
Post-operatively

- Tobradex ointment and patch x 4 hours
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- Tylenol PRN for pain
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