Contemporary Uses of Bandage Contact Lenses

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Therapeutic Bandage Contact Lenses

Questions for consideration
- What is the rationale for therapeutic bandage lenses?
- What is the future for drug delivery bandage lenses?
- What are the most common clinical indications?
- What about amniotic membranes and scleral lenses?
- What ancillary therapies are necessary?

Therapeutic bandage contact lenses

Rationale for prescribing
A rich history of efficacy …
- Celsus - Honey soaked linen
- Ridley - Glass scleral shell
- Kaufman & Glasset - Hydrophilic lenses

Why hydrogels …
- Oxygen permeability
- Design flexibility & dimensional stability
- Optical clarity
- Absorption & elution

Therapeutic goals
- Pain reduction
- Wound protection & surface wetting
- Vision
- Drug delivery

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Drug absorption and elution

Is drug delivery feasible and practical?
  Sustained release rates
  Ciprofloxacin -> Etafilcon
  Prednisolone phosphate -> Polymacon
  Cromolyn Sodium -> Polymacon

  Assessed AC [Drug] in 21 cataract patients
  Group 1: Tobradex q15min x 3
  Group 2: Tobradex soaked collagen shield
  Anterior chamber levels of drug same for both groups
  Would drug impregnated contact lenses work better?

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Drug absorption and elution

What is the future for drug delivery bandage lenses?
- Challenges
  - Improve and control drug uptake and release
  - Impacted by drug ionicity, solubility, molecular size, etc
  - Impacted by contact lens ionicity, solubility, pore structure, etc
  - Impacted by patient tear film and blink dynamics

- Possible strategies
  - Sandwich (layer) drug within contact lens (Ciolino, Opht 2016)
  - Alter release kinetics via vitamin E (Shayani, Eye & CL 2017)
  - Alter release kinetics via fluorous chemistry (Quinn Biomat 2017)
  - Alter release kinetics and drug duration via nanoparticles
  - Alter release kinetics by molecularly imprinting contact lenses
    (White, Opt & Vis Sci 2016)

Therapeutic bandage contact lenses

What are the most common clinical indications?
- Bullous keratopathy
- Corneal Dystrophies
- Corneal abrasion
- Persistent & recurrent corneal erosions
- Keratoconus
- Ocular Surface Disease
- Penetrating keratoplasty & DALK
- Excimer laser PRK or LASIK
Therapeutic bandage contact lenses
What are the most common clinical indications?

**Bullous keratopathy**

- Reduces pain
- Reduces edema & improves vision
- Adjunct hyperosmotic? 
Pachymetry < 610μ. (Knezovic 2006).
- Additional considerations: 
  - DSAEK vs DMEK
  - Penetrating keratoplasty

**Reduces pain**
**Reduces edema & improves vision**
**Adjunct hyperosmotic?**
Pachymetry < 610μ. (Knezovic 2006).**Additional considerations:**

- DSAEK vs DMEK
- Penetrating keratoplasty

Therapeutic bandage contact lenses
What are the most common clinical indications?

**Clinical case – 56 yom with history of keratoconus and PKP failure**

- 8 weeks s/p DSAEK OS
- Lotemax OS bid
- Refit into scleral lens with BCVA = 20/25
- OD scheduled for DSAEK

**DSAEEK vs DMEK?**
Majmudar OSN  4-25-2014
97% of 23,000 keratoplasties in 2012 were DSAEK
DMEK quicker recovery – 3-4 wks vs several mths
DSAEEK 95% BCVA > 20/40 vs DSAEK 43% > 20/40
DMEK +0.24D shift vs DSAEK +1.1D shift
DMEK 1% rejection rate vs DSAEK 12% rejection rate
DMEK downside? Donor harvesting and procedure technique

**Clinical Case**

- 48 yof with history of corneal dystrophy
  Ocular History: Reis-Buckler’s corneal dystrophy. PTK OD 2006 and OS 2007. c/o intermittent irritation, photophobia, and blurred VA.
  Systemic History: Excellent. No medications. NKDA.
  Family History: Mother and Daughter with Reis-Buckler’s.
  - Biofinity Toric 8.6
    OD +2.00-125x40 = 20/25
    OS +6.00-075x140 = 20/20
  - Clear Care qhs
  - Polysporin ung OU qhs prn

**Clinical Case**

- 56 yof with history of Fuch’s Dystrophy
  Ocular history: No c/o. ‘vision in right eye a little blurry.’ Wearing soft lenses ou qd x 12+ hours. Clear care qhs. Replace q 1 mth. Muro ung qhs
  VA cc OD 20/60 & OS 20/30.
  Biomicroscopy – Grade 1 ABMD ou & grade 3 Fuch’s endothelial dystrophy.
  Impression: ABMD ou, Fuch’s corneal dystrophy ou.
  Plan: DMEK consult.
Therapeutic bandage contact lenses
What are the most common clinical indications?

**Corneal abrasion**
- Reduces pain
- Accelerates healing?
- Adjunct prophylactic antibiotics

N = 47 Eyes with corneal abrasion randomized to receive Patch vs Bandage lens vs Bandage lens & nsaid gtt.
- No significant difference in healing time between treatment groups
- Bandage lens groups returned to normal activities more quickly
- Significant decreased pain in bandage lens & nsaid group

**Persistent epithelial defect / recurrent corneal erosion**
- Reduces pain
- Accelerates healing?
- Adjunct prophylactic antibiotics

**Ocular surface Disease**
- Less pain, improved surface protection, & improved vision
- Maximal dry eye management essential prior to bandage lens
- Punctal occlusion critical
- Silicone hydrogel vs daily disposable … or scleral lens?
- Do the benefits outweigh the risks?

**Penetrating keratoplasty (PKP)**
- Reduces discomfort
- Facilitates epithelial healing
- Adjunct antibiotics & steroids

Additional considerations:
- Length of wear?

Hoefling, et al. CLAO 2002
- Bilateral PKP in Sjogren’s syndrome
- Bilateral c albicans infection

**Additional considerations:**
- For how long is bandage worn?

**Dohlman K-Pro synthetic cornea**
- Reduces discomfort
- Mitigates epithelial migration
- Adjunct antibiotics & steroids
  - Vancomycin 20 mg/ml bid
  - Pred Forte bid

Additional considerations:
- For how long is bandage worn?
Therapeutic bandage contact lenses
What are the most common clinical indications?

Perioperative Surface Ablation
- Reduces pain
- Accelerates healing?
- Adjunct NSAID, antibiotic, & steroid gtt.
- Oral analgesics prn

Biggest challenges of surface ablation
- Epithelial defect – pain
- Perioperative myopia – slow visual recovery

Mini-PRK (Scott MacRae, MD)
- 7 mm vs 8.5 mm = 34% reduction in epithelial defect size
- Prescribe bandage lens with -1.00 D Rx = better postoperative VA
- Bandage lenses for 1–2 weeks

Therapeutic bandage contact lenses
What are the most common clinical indications?

Traditional lens options (n = 273 eyes)
- Severe keratitis = 1.4%
- Infiltrative keratitis = 4.0%
- Neovascularization = 2.9%
- Lens spoilage = 6.8%
- Lens loss = 12.5%
- Lens rejection = 13.7%

Disposable lens options (n = 68 eyes)
- Severe keratitis = 3.4%
- Contact lens acute red eye = 1.7%
- Lens spoilage = 3.4%
- Lens loss = 19.0%
- Lens rejection = 8.6%

Therapeutic bandage contact lenses
What is the real risk of microbial keratitis (MK)?
- Retrospective review of 103 applications in 74 patients from 2006-2009
- 3 episodes of MK (2.9%) with 2 of the cases (2%) in LSCD
- Duration of wear ranged from 21 days (EBMD) to 187 days (PBK)
- Prophylactic antibiotic use in epithelial defect, postoperative, and high risk cases
- Highest risk for MK?
  - Patients with epithelial defect and concomitant use of prophylactic antibiotic gtt and topical steroid gtt

- Retrospective review of 6,385 bandage lens applications 2015-2018 in Zanjiang University Hospital
- Mean age 48 yrs and mean bandage lens wear time 20 days
- 8 cases of infectious keratitis (0.0013%)
- Highest risk for MK?
  - Patients > 50 yrs
  - Patients s/p PKP and CCXL
  - Patients wearing bandage lens > 23 days
  - Patients non-compliant with prophylactic AB’s and bandage lens replacement

Therapeutic bandage contact lenses
What are the most common clinical indications?

Clinical Case – AS 17 yom
Ocular history: ‘Cat scratch laceration’ 2 weeks prior. Soflens 38 bandage lens OD. Clodox OD qid. No c/o.
VA OD cc 20/100 & OS sc 20/20.
Biomicroscopy – OD bandage lens clean & well positioned. Lids flat, conjunctiva clear, isolated corneal ‘macrovacuoles’ OD, ac with occasional cell, irs normal, lens clear.

Plan:
1. Discontinue bandage lens OD
2. Sutures removed
3. Vigamox OD q2h

Therapeutic bandage contact lenses
What are the most common clinical indications?

Amniotic membrane therapy can:
- Retain moisture
- Decrease inflammation
- Promote healing
- Improve nerve density
- Enhance corneal sensitivity

Cryopreserved
- Prokera (BioTissue)
Dehydrated
- AmbioDisk (IOP Ophthalmics)
- BioDOptix (BioD)
Therapeutic bandage contact lenses
What about amniotic membranes (AM)?
- Fixing AM to stabilizing ring (AmnioClip) did not alter biologic properties
- Supportive growth factors expressed up to 7 days

John, et al. Ophth 2017
- Single application of Prokera in severe DED cohort
- Improved DED signs, symptoms, and corneal nerve density & function

McDonald. ASCRS Meeting May 2017
- Dry Eye Amniotic Membrane Study (DREAMS)
- Improved DEWS severity level in 88% of patients in 1 week

- While AM does not have stem cells, it provides short-term support in LSCD regeneration

Therapeutic bandage contact lenses
What about scleral lenses?
Increased popularity due to
- More oxygen permeable materials
- More sophisticated design
- Better understanding of fitting relationship (OCT)
- Expanded applications OSD -> ectasia
- Zheng, et al. GSLS 2015
  - N = 126 eyes for meridional elevation changes
  - If elevation delta > 300u, consider scleral lens
- Challenges
  - Multiple designs = confusion
  - Dynamic nature of fit
    - Lenses settle ~ 100u over 8 hours
  - Clinical limitations... handling, fogging, limbal compromise

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