Treatment and Management of Pseudophakic Bullous Keratopathy Status Post Anterior Chamber Intraocular Lens Implant

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Abstract: This case report examines the treatment and management of a patient with pseudophakic bullous keratopathy. Pentacam tomography is used to measure and monitor the corneal thickness to determine the effectiveness of various therapeutic medical interventions.

I. Case History:

- **Patient Demographics:** 58 year old white male
- **Chief Complaint:** Patient reported a left “painful, crusty eyelid that was swollen shut” upon awakening. He also reported yellow-white discharge and crusting of the eyelids. Pain level was 7/10 initially and had decreased to 2/10 within a few hours of awakening. The patient reported light sensitivity, and stated that vision in the left eye was unaffected
- **Other Information:** Patient was seen at the emergency department three days prior with eye pain and photophobia in the left eye. He was diagnosed with a central corneal ulcer and prescribed ofloxacin q2hrs OS. Two days later, the patient saw his retinal ophthalmologist due to increased pain and photophobia. Prednisolone acetate was prescribed q3hrs OS
- **Medical History:** benign tubular adenoma, vitamin D deficiency, iron deficiency, benign prostatic hypertrophy, gastroesophageal reflux disease, nephrolithiasis, hypercholesterolemia
- **Ocular History:** degenerative myopia OU, retinal detachments OD x 1, OS x 2 with NLP vision for 10+ years, cataract surgery OU (PCIOL OD, ACIOL OS)
- **Systemic Medications:** pravastatin, ranitidine HCL, terazosin HCL, ferrous sulfate, ascorbic acid
- **Ocular Medications:** ofloxacin q2hrs OS, prednisolone acetate q3hrs OS
- **Family and Social History:** unremarkable

II. Pertinent Findings

- **VAcc:** OD: 20/25 OS: NLP PHNI
- **IOP (NCT):** OD: 13mmHg OS: 10mmHg
- **Pupils:** OD: round, reactive OS: unable to assess 2’ to diffuse corneal edema
- **EOMS:** OU: FROM
- **CVF:** OD: FTFC OS: unable to assess
- **Other entrance tests:** (-) preauricular lymphadenopathy
- **Slit Lamp Exam:** OD: essentially WNL, OS: see below
  - **Visit 1:** 1+ diffuse palpebral conjunctival injection, 1.2x1.2mm epithelial defect with NaFl staining slightly below visual axis, 3-4+ diffuse epithelial and endothelial edema, 2-3 microcystic bullae temp, AC UTT 2’ dense corneal edema, (+) ACIOL
Visit 2: 1+ diffuse palpebral conjunctival injection, 1x1mm epithelial defect with NaFl staining slightly below visual axis with 2.5x2.5mm surrounding ring of disrupted epithelium, 3+ epithelial and endothelial edema, superior vertical endothelial folds, 2 microcystic bullae temp, 3+ diffuse SPK, AC UTT 2’ dense corneal edema, (+) ACIOL

Visit 3: 1-2+ diffuse palpebral conjunctival injection, no epithelial defect or NaFl staining centrally, foreign body tracking with sloughing epithelium and NaFl staining @5:00 near limbus, 2 microcystic bullae temp, 2+ diffuse epithelial and endothelial edema, 3+ diffuse SPK, AC UTT 2’ dense corneal edema, (+) ACIOL

Visit 4: no conjunctival injection, 2+ epithelial and endothelial edema, superior vertical endothelial folds, 2+ diffuse SPK, trace NaFl staining/FB tracking @5:00 (resolving), 2 microcystic bullae temp, AC UTT 2’ dense corneal edema, (+) ACIOL

Visit 5: no conjunctival injection, 2+ diffuse epithelial and endothelial edema, superior vertical endothelial folds, 2+ diffuse SPK, 1.2x1.2mm epithelial disruption below visual axis with negative NaFl staining, 2 microcystic bullae temp, AC UTT 2’ dense corneal edema, (+) ACIOL

- Additional Testing:
  - Corneal Sensitivity with Cotton Swab: OS significantly reduced compared to OD
  - Pentacam Tomography:
    - Visit 1-3: Unable to perform
    - Visit 4: OD: 521um  OS: 1044um
    - Visit 5: OD: 534um  OS: 1049um
    - Visit 6: TBD

III. Differential Diagnosis

- Primary:
  - Pseudophakic Bullous Keratopathy
  - Fuch’s Endothelial Dystrophy

- Secondary:
  - Recurrent Corneal Erosion
  - Posterior Polymorphous Dystrophy
  - Congenital Hereditary Endothelial Dystrophy
  - Chandler’s Syndrome

IV. Diagnosis and Discussion

- Diagnosis: Pseudophakic Bullous Keratopathy
  - Defined as irreversible corneal edema secondary to cataract extraction. The edema occurs from damage to the corneal endothelial cells, which normally act to maintain the dehydrated state of the cornea by controlling the Na+/K+ ATPase pumps

- Etiology: endothelial damage from ocular surgery, intraocular inflammation, subluxed intraocular lens, or preexisting endothelial dysfunction

Koskey 2
A history of cataract surgery puts this patient at a 15% long term risk of developing pseudophakic bullous keratopathy, with the risk increasing due to the presence of an anterior chamber IOL.2

- **Signs:** corneal edema (epithelial, stromal, endothelial), subepithelial bullae or erosions, superficial punctate keratitis, Descemet’s folds, subepithelial haze or scarring, corneal neovascularization, increased corneal thickness, infectious keratitis, +/- guttata, CME (rare)3
- **Symptoms:** asymptomatic, decreased vision, pain, tearing, foreign body sensation, photophobia, red eye, halos around lights3
- **Discussion:** The corneal ulcer at visit 1 was likely the result of a ruptured bullae secondary to pseudophakic bullous keratopathy, which occurs in 4.7% of patients with bullous keratopathy.4 Determining the underlying cause of the ulcerative keratitis was imperative for the long term treatment and management for this patient. Additional testing using the Pentacam tomography to measure the corneal thickness was helpful in monitoring the effectiveness of different therapeutic interventions, and to determine if further treatment was indicated. The treatment regimens were developed not only based on the effect on corneal thickness, but also took into account patient comfort and long term management.

V. **Treatment and Management**

- **Standard Treatments:**
  - Hypertonic saline solution (sodium chloride 5% ophthalmic solution QID and/or sodium chloride 5% ophthalmic ointment QHS)
    - This patient tolerated both treatments well, with improvement in symptoms, but the Pentacam tomography did not show a significant decrease in corneal thickness
  - Amniotic Membrane
  - Penetrating Keratopathy
    - Patient is scheduled for surgery in early November after all non-surgical interventions have been exhausted

- **Unconventional Treatments:**
  - Glaucoma medications
    - Beta-blockers and alpha-agonists (timolol 0.5% QAM or brimonidine 0.2% BID)
      - TBD if this patient responds well to timolol
  - Anterior Stromal Puncture
  - UV-A Collagen Cross Linking

- **Management**
  - General follow-up for ulcerative keratitis is 1-2 days until the epithelial defect heals
  - Once epithelium is healed and cornea is relatively quiet, monitor every 1-6 months depending on stability, patient symptoms, and treatment plan
  - This patient has been followed closely every 1-2 weeks due to poor healing of the epithelium and to monitor improvement of corneal thickness over time with the Pentacam tomography after numerous treatments
VI. Conclusion

- A proper diagnosis of pseudophakic bullous keratopathy was essential for the longstanding treatment and management of this patient. Pentacam tomography was valuable in measuring corneal thickness over time to evaluate the effectiveness of treatment and the need for further intervention. Comparing these thickness measurements at each visit helped determine which medications were the most effective for this specific patient. Various long term treatments were implemented to not only improve patient comfort, but also to attempt to reduce corneal thickness despite the disease being irreversible.

- Efforts to decrease corneal edema in patients with pseudophakic bullous keratopathy are imperative for those who are uncertain about having surgery, or patients otherwise unable to undergo surgery secondary to health, age, etc. This patient had an extensive history of ocular surgeries, and was therefore extremely hesitant about having an emergency penetrating keratoplasty. For this patient, multiple attempts were made to increase comfort and decrease edema, with surgical intervention the last resort. Unconventional treatments for reducing corneal thickness may outweigh the risk of surgery and should be considered in certain cases of pseudophakic bullous keratopathy.

VII. References


