AAO Resident’s Day 2011 Submission  
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Abstract  
A 26 year-old male exhibits high intraocular pressures post-implantation of bilateral implantable collamer lenses (ICL), secondary to general post-operative inflammation and a steroid response. An ICL can also be a source of such ocular complications.  

I. Case History  
A. 26 year old Pacific Islander male  
B. Wants to be free of spectacles to correct his myopia.  
C. Has always used glasses, no history of contact lens use, unremarkable ocular health  
D. Borderline hypertension, controlled with diet and exercise  
E. Not currently on any medication, no known allergies.  

II. Pertinent Findings  
A. Manifest refraction:  
   right eye (OD) -8.75-2.25x010 (20/20\textsuperscript{-1})  
   left eye (OS) -8.50-1.50x159 (20/20\textsuperscript{-2})  
B. Ocular health unremarkable OU  
C. Special Testing  
   1. Pachs 505, 516  
   2. Gonioscopy: ciliary body 360 OU  
   3. White to white 11.75mm, 11.78mm  
   4. OS dominant  
D. Implantable collamer lens w/ limbal relaxing incision recommended OU  
E. Intraocular pressure history OD  
   1. Baseline: 16, 17 mmHg  
   2. Same day post-op, using Vigamox TID, Nevanac TID, Pred acetate QID (tapered from Q1H since double PI 2 wks prior): 23 mmHg  
   3. 1 day post-op, using Vigamox TID, Nevanac TID, Pred acetate 6x/day, Alphagan P BID, Diamox BID: 15 mmHg  
   4. 1 wk post-op, using Vigamox TID, Nevanac TID, Pred acetate TID, Alphagan P BID: 34, 32 mmHg  
   5. 8 days post-op, using Nevanac TID, Pred acetate BID, Combigan BID, Diamox QHS: 20 mmHg  
   6. 2 wks post-op, using Nevanac TID, Pred acetate BID, Combigan BID: 23 mmHg  
   7. 4 wks post-op, using Pred acetate BID until ran out 4 days prior, Combigan BID until out 2 days ago, started Alphagan BID when ran out of Combigan: 48 mmHg  
F. Intraocular pressure history OS  
   1. Baseline: 16, 18 mmHg  
   2. Same day post-op, using Vigamox TID, Nevanac TID, Pred acetate QID (tapered from Q1H since double PI 1 wk prior): 29 mmHg  
   3. 1 day post-op, using Vigamox TID, Nevanac TID, Pred acetate TID, Alphagan P BID: 34 mmHg  
   4. 2 day post-op, using Vigamox TID, Nevanac TID, Pred acetate 6x/day, Alphagan P BID, Diamox QID: 10 mmHg  
   5. 1 wk post-op, using Vigamox TID, Nevanac TID, Pred acetate 6x/day: 26 mmHg
6. 8 days post-op, using Vigamox TID, Nevanac TID, Pred acetate TID, Alphagan BID, Diamox BID: 10 mmHg
7. 2 wk post-op, using Vigamox TID, Nevanac TID, Pred acetate TID, Alphagan BID: 21, 22 mmHg
8. 15 day post-op, using Nevanac TID, Pred acetate BID, Combigan BID, Diamox QHS: 12 mmHg
9. 3 wk post-op, using Nevanac TID, Pred acetate BID, Combigan BID: 10 mmHg
10. 4 wks post-op, using Pred acetate BID until ran out 4 days prior, Combigan BID until out 2 days ago, started Alphagan BID when ran out of Combigan: 14 mmHg

III. Differential Diagnoses
A. Primary dx: increased IOP secondary to combination of post-operative inflammation and steroid response OU
B. Other causes of increased IOP post-ICL implantation
   1. Pupillary block
   2. Excessive vaulting of ICL
   3. Non patent peripheral iridotomy (PI)
   4. ICL size larger than sulcus holds, thereby closing angle

IV. Diagnosis and discussion
A. Post-operative inflammation and relation to IOP
   1. Increased inflammation leads to swelling of the trabecular meshwork (TM), and therefore, an accumulation of inflammatory cells within the meshwork that ultimately results in increased resistance to outflow of aqueous.\textsuperscript{1,2}
   2. Retained viscoelastic has not definitively been a source of IOP increase in past studies\textsuperscript{3}
   3. Risk factors for an increase in IOP post-ICL
      a. high myopia\textsuperscript{4}
      b. smaller white to white measurement\textsuperscript{4}
      c. larger phototopic pupils\textsuperscript{4}
B. Steroids and IOP
   1. Steroids decrease aqueous outflow by:
      a. Decreasing the empty space within the TM by contraction of it \textsuperscript{1,2,5}
      b. Increasing production of proteins in the TM \textsuperscript{1,2,5}
      c. Decreasing phagocytosis in the TM \textsuperscript{1,2,5}
   2. Risk factors for developing a steroid response:
      a. >5 diopters of myopia\textsuperscript{1,2,5}
      b. Primary open angle glaucoma\textsuperscript{1,2,5}
      c. Younger than 6 years of age or geriatric\textsuperscript{1,2,5}
      d. Connective tissue disease\textsuperscript{1,2,5}
      e. Type I Diabetes\textsuperscript{1,2,5}
      f. Angle recession glaucoma\textsuperscript{1,2,5}
   3. Prevalence
      a. 30% of the general population have a 6-15mmHg increase in IOP in response to steroid use\textsuperscript{1,2}
      b. 4-6% have an increase of >15mmHg in IOP\textsuperscript{1,2}
   4. Timeline
      a. An increase in IOP can be seen 1-6 weeks after initial topical steroid use\textsuperscript{2,5}
      b. Rise has been seen as early as hours\textsuperscript{5}
      c. The increase in IOP is reversible if not on topical steroid for longer than 12-18 months\textsuperscript{2}
After discontinuing steroid use, it can take days to weeks for the IOP to return to baseline levels, or 2-4 weeks according to one study.  

C. Special considerations post-ICL that could affect IOP
   1. Vault: space between the anterior lens capsule and the posterior surface of the ICL.
      a. Measurement
         i. Subjectively measured by comparing the space seen as a percentage of corneal thickness
         ii. objectively measured by anterior segment optical coherence tomography.
         iii. high correlation between subjective and objective measures
      b. Changes in vault
         i. not affected by accommodation
         ii. decrease in vault with an increase in illumination and miosis
         iii. consistent decrease in vault as early as 3 months up to 10 years; aim for a minimum vault of 230 micrometers initially post-operatively in order to maintain sufficient vault long term
      c. Importance of vault
         i. Excessive vaulting could be indicative of an implant too large in size, pushing the peripheral iris as it sits in the sulcus, thereby closing up the angle
         ii. Insufficient vaulting would mean the implant lies too close to the crystalline lens, causing a significantly higher risk of anterior subcapsular cataracts

2. Pupillary block: 2 PIs are typically made 1 week pre-operatively in each eye to prevent pupillary block that could result from contact of the anterior ICL with the posterior iris

V. Treatment/Management
   A. Lower IOP by addressing etiology: patients should be monitored closely for inflammation and on a concurrent IOP lowering med with the steroid to ensure IOP control while decreasing inflammation.
      1. Alphagan P was initially used, but unable to lower the IOP to a desired level.
      2. Diamox was added in order to garner a quicker response.
      3. Alphagan P was eventually replaced with Combigan with the intention to slowly take the patient off the steroid as quickly as inflammation decreased, and concurrently the Diamox.
      4. Combigan alone was unable to achieve desired IOPs for both eyes consistently, so the patient was placed back on Diamox each time he exhibited an IOP spike.
         a. Diamox was well tolerated in this patient, and has been a mainstay of treatment for glaucoma before many of the topical agents used today were developed. Side effects include:
            i. blood dyscrasias and allergic skin reactions, but both are rare
            ii. drowsiness and paresthesia, both of which are reversible
      5. Prostaglandins were avoided because of their association with inflammation.
   B. ICL specific considerations
      1. Monitor for excessive (or insufficient) vaulting: the patient’s vault ranged from 30-110%, with the highest frequency being either 80 or 100%, subjectively measured.
      2. Monitor PIs for patency: LPIs were found to be patent in both eyes at every visit.

VI. Conclusion
A. IOP needs to be controlled as in any other case of acute IOP spikes, but additional factors need to be ruled out as the cause for IOP rise when determining the etiology in a patient who has undergone ICL implantation.

B. Frequent follow up is necessary to adjust medication appropriately and monitor possible changes in etiology that can occur with time.

Selected References