Pseudoexfoliation and the Cataract Surgeon:
Everything you must know about the effect of PXF on glaucoma, cataract surgery and intraocular lens management

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I. GENERAL ISSUES

A. Acronym nightmare: PXF

B. PXF – What is it?
   1. Lindberg, 1917
   2. Age-related disease characterized by
      a. Production of fibril-like extra-cellular material
      b. Three-classic zones visible on the anterior lens capsule
      c. Material present on endothelium, pupil border, angle, ciliary processes, zonules
      d. Pigment loss at pupil margin and iris sphincter
      e. Pigment deposition on endothelium and in angle
      f. Pigment release with dilation

C. Histopathology
   1. Central fibril-like component: amyloid, laminin, elastic fibers, collagen, basement membrane
   2. Surrounding amorphous ground substance
   3. Electron microscopy: amyloid-like material, cross-banded fibrils

D. Histopathology/clinical correlation
   1. Zonules
      a. Separated at origin of ciliary body
      b. Infiltrated by PXF material with ruptures
      c. Lifted off attachment to anterior capsule
   2. Glaucoma
      a. PXF material in outer trabecular meshwork and juxtacanalicular tissue
      b. Fragmentation of Schlemm’s canal
      c. Endothelial cell proliferation leading to a pre-trabecular layer

E. Systemic issues
   1. PXF material documented in heart, lung, liver, kidney, gallbladder, meninges, skin, blood vessels
   2. Associated with sensory-neural hearing loss, hypertension, cardio/cerebrovascular disease, Alzheimer’s disease
   3. Elevated plasma homocysteine – associated with low dietary folate levels and increased coffee consumption

F. Genetic issues
1. LOXL 1 (lysyl oxidase-like 1) – gene makes protein responsible for elastin
2. Association between PXF and DNA sequence variants and gene-coding for LOXL 1

G. Etiology and pathogenesis: Multifactorial
1. Genetic
2. Non-genetic – geographic distribution- northern tier (solar exposure and reflection)/coffee consumption/other factors (Norway has highest rate of PXF in the world- north, 24 hour summer sun/reflection, high coffee consumption)
3. Bilateral/high-level of asymmetry: progression to bilaterality 15-50% in 5-10 years

H. Prevalence
1. Approximately 70 million people worldwide
2. Prevalence varies – all races but rare in Eskimo, Greenland Inuit and Peruvian peoples
   a. 0.5% Chinese undergoing surgery; 5.8% prevalence North China
   b. 7% South Africa Blacks (0.5% Blacks in southern US)
   c. 20% Scandinavian/Eastern Europeans
   d. 35% Navajo Indians
   e. 39% Egyptians

I. Clinical Impact
1. Glaucoma
2. Cataract
3. Zonular weakness
4. Reduced pupil dilation
5. Keratopathy
6. Increased postoperative inflammation/PC opacification
7. Anterior capsular contraction/phimosis
8. IOL issues – subluxation/dislocation

J. Important review article – Shingleton, Crandall, Ahmed: Pseudoexfoliation and the Cataract Surgeon: preoperative and postoperative issues related to intraocular pressure, cataract and intraocular lenses JCRS 35:1101-1120, 2009

K. Personal research: BJS > 3000 PXF surgical cases with multiple publications related to:
   1. IOP
   2. Phacoemulsification techniques and intraocular complications associated with zonule weakness
   3. Postoperative IOL displacement/dislocation and capsule contraction issues

II. PSEUDOEXFOLIATION and IOP ISSUES

A. PXF and glaucoma
1. Ubiquitous – worldwide distribution
2. Most common cause of secondary open-angle glaucoma – 20%
3. Glaucoma presents earlier and with higher IOP than primary open-angle glaucoma
4. Higher frequency/severity of disc damage/visual field loss at time of diagnosis
5. Progresses more rapidly
6. Greater IOP fluctuation
7. Increased incidence of narrow angles/ACG

B. Medical therapy: all four major classes of glaucoma medications effective in medical therapy (prostaglandin agonist, beta blocker, alpha agonist, carbonic anhydrase inhibitor)
1. Prostaglandins may reduce TGF-B1 and matrix metalloproteinases, which theoretically may improve therapy
2. Pilocarpine
   a. Potentially reduces pigment and pseudoexfoliation material release
b. Can increase cataract formation
c. Can lead to forward movement of lens with AC shallowing if weak zonules present

3. PXF open-angle glaucoma more recalcitrant to medical therapy with higher rate of progression than primary open-angle glaucoma

C. Laser therapy (LT)
1. Selective laser trabeculoplasty (SLT); Argon laser trabeculoplasty (ALT); MicroPulse laser trabeculoplasty (MLT)
   a. Do gonioscopy first to rule out angle closure and compare angles between fellow eyes
   b. Beware of post-laser IOP spike
   c. Results
      1) 35% mean decrease IOP in PXF eyes versus 25% mean decrease IOP in POAG eyes at one year (ALT)
      2) Success rate decreases over time similar to results in POAG
         a) 80% success at one year
         b) 50% success at five years
         c) 20% success at ten years
      3) Higher incidence of abrupt, high elevation in IOP than in POAG eyes when failure occurs
2. Pseudophakic eye – LT still successful with significant IOP reduction. IOP reduction slightly less than in phakic eye
3. SLT MEEI – Tufts study 2013: 50-60% positive response to initial treatment with subsequent 50% positive response to re-treatment of those eyes that fail initially

D. Surgical therapy
1. All types of glaucoma surgery possible: MIGS -> MAGS (macro-incisional glaucoma surgery)
2. Greater need for glaucoma surgery than primary open-angle glaucoma
3. Success rates for trabeculectomy, combined procedures and glaucoma drainage devices similar to primary open-angle glaucoma
4. Pseudoexfoliation is often associated with altered blood aqueous barrier
   a. Increased inflammation postoperatively – may need more intensive anti-inflammatory therapy
   b. Particularly important for combined cataract and glaucoma surgery

E. Phaco effect on IOP in Pseudoexfoliation eyes
1. Single surgeon series, 1122 PXF eyes (JCRS, 2008, BJS)
   a. Uncomplicated phaco/PC IOL
   b. Mean follow up approximately three years; Range 1-18 years
   c. 882 PXF eyes (no glaucoma)
   d. 240 PXG eyes (glaucoma)
   e. Assess postop vision, IOP, GMR (glaucoma medication requirement)
2. Results – all 1122 eyes
   a. Significant decrease mean IOP through seven years
   b. Significant decrease mean GMR through five years
   c. Significant mean increase in vision through seven years
   d. >200 eyes followed for at least five years
3. Results – 882 PXF eyes
   a. Decreased IOP in all time intervals – 1-2 mmHg mean reduction
4. Results – 240 PXG eyes
   a. Decreased IOP through one year – not statistically significant thereafter
   b. Decreased GMR through five years – gradual rise to pre-surgery medication requirement
c. IOP reduction greater in PXF eyes than PXG eyes

5. Postoperative IOP spike to > 30 mmHg on first postoperative day
   a. All eyes: 76/1122 (6.8%); PXF eyes: 38/882 (4%); PXG eyes: 41/240 (17%)
   b. Treatment including pilocarpine, alpha agonists and aqueous suppressants, does not eliminate first postoperative day IOP spikes

6. Modifying factors for IOP reduction
   a. Increased preoperative IOP associated with greater postoperative IOP reduction (Figures 1 and 2)
   b. Age, gender, axial length not significant modifying factors

Figure 1

![Impact of Preoperative IOP on IOP Reduction in PXF Eyes after Phacoemulsification](image)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Pre-Op IOP &lt; 20mmHg (%Δ)</th>
<th>Pre-Op IOP 21-25mmHg (%Δ)</th>
<th>Pre-Op IOP &gt;25mmHg (%Δ)</th>
</tr>
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<tbody>
<tr>
<td>1 day</td>
<td>-0.2 (-1.3%)</td>
<td>-3.44 (-15.8%)</td>
<td>-5.42 (-19.2%)</td>
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<tr>
<td>1 month</td>
<td>-1.46 (-9.5%)</td>
<td>-6.44 (29.1%)</td>
<td>-11.0 (-40.2%)</td>
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<tr>
<td>1 year</td>
<td>-1.34 (-8.7%)</td>
<td>-5.8 (26.0%)</td>
<td>-12.0 (-42.9%)</td>
</tr>
<tr>
<td>3 years</td>
<td>-1.01 (-6.5%)</td>
<td>-5.93 (-18.4%)</td>
<td>-7.4 (-26.4%)</td>
</tr>
<tr>
<td>5 years</td>
<td>-0.61 (-4.0%)</td>
<td>-2.20 (-10.2%)</td>
<td>-8.0 (-30.5%)</td>
</tr>
<tr>
<td>7 years</td>
<td>-0.97 (-6.2%)</td>
<td>-4.6 (-20.5%)</td>
<td>No Data</td>
</tr>
<tr>
<td>10 years</td>
<td>-1.0 (-6.4%)</td>
<td>No Data</td>
<td>No Data</td>
</tr>
</tbody>
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Figure 2
7. Effect of pre-phaco laser or filter on IOP in pseudoexfoliation eyes undergoing cataract surgery
   a. 169 PXG eyes had no prior laser or filter surgery: significant decrease IOP and GMR at all-time intervals after phaco/IOL
   b. 51 PXG eyes with prior laser or filter surgery: slight increase IOP with stable GMR after phaco/IOL

8. Failure after cataract surgery
   a. PXF eyes (failure defined as need for medical therapy): 24/882 eyes (2.7%)
   b. PXG eyes (failure defined as need for laser and/or glaucoma surgery): 9/240 eyes (3.7%)

F. Phacotrabeculectomy effect on IOP in Pseudoexfoliation eyes

   1. 138 PXF eyes/uncomplicated phacotrab PC IOL (JCRS, 2011; BJS)
   2. Results for all 138 eyes
      a. Mean decrease in IOP 5-7 mmHg through ten years
      b. Mean decrease in GMR 75% at one year; 50% at ten years
      c. Sustained increased vision through mean follow up of five years
      d. Postoperative day #1 IOP spike greater than 30 mmHg (8% of phacotrab eyes)
      e. Higher preoperative IOP associated with greater postoperative IOP reduction
      f. No significant impact on success of phacotrabeculectomy by prior laser treatment, single versus separate site incision; fornix versus limbal-based conjunctival flap; use of intraoperative mitomycin, small pupil manipulation (23% of eyes)

   3. Adjunctive procedures required after phacotrabeculectomy
a. Bleb needling 12%
b. 5-FU 30%
c. Laser suturelysis 25%
d. Bandage contact lens for bleb leak 8%
e. Patients who required these adjunctive procedures had similar results in terms of visual acuity improvement, IOP reduction, bleb development and GMR reduction compared to those who did not require such manipulation

4. Complications
   a. Intraoperative (eyes not included in IOP analysis)
      1) Zonule weakness – 1
      2) Posterior capsule tear – 1
      3) Aqueous misdirection – 1
   b. Postoperative complications
      1) Early bleb leak – 11
      2) Choroidal/AC shallowing – 3; suprachoroidal hemorrhage – 0
      3) IOP less than 5 mmHg: 1 eye with true pathologic hypotony; 12 with good vision and no pathologic hypotony
      4) Late bleb leak – 0
      5) Bleb infection/endophthalmitis – 0

5. Failure after phacotrabeculectomy
   a. Failure defined as need for additional LT or surgery: 4 eyes required postoperative LT, 14 eyes required glaucoma surgery for elevated IOP and 1 eye required surgery with treatment for pathology hypotony. Of total 19 failed eyes: mean time to failure 5.6 years
      119/138 eyes (86%) successful; mean follow up of 11 years
   b. Failure defined as <20% IOP reduction at final postop visit: 39/119 eyes (32.8%)
   c. Failure defined as failing either or both criteria above: 58/138 eyes (42%)

G. Indications for surgery in Pseudoexfoliation eyes with glaucoma

1. Phaco IOL/alone -- Mild, moderate glaucoma; tolerate medications; higher preoperative IOP in setting of relatively healthy optic nerve; older age
2. Phaco IOL/MIGS -- Mild, moderate glaucoma; tolerate or not tolerate topical medications
3. Phaco trabeculectomy/canaloplasty/glaucoma drainage device – “MAGS” – macro-incisional glaucoma surgery. More advanced glaucoma, younger age, higher preoperative IOP and need for long-term, lower postop IOP
4. Glaucoma procedure first -- Advanced glaucoma requiring lowest postop IOP

III. PSEUDOEXFOLIATION – INTRAOPERATIVE PHACOEMULSIFICATION/INTRAOCULAR LENS ISSUES

A. Cataract formation
   1. Increased incidence of cataract development
   2. Nuclear and subcapsular changes predominate
   3. Etiology
      a. Ocular ischemia
      b. Defective antioxidant defense mechanisms

B. Multiple intraocular risks associated with cataract surgery in PXF
   1. Small pupil
   2. Shallow AC
   3. Positive pressure
   4. Hyper-deep AC
   5. Vitreous prolapse
6. Zonule dialysis
7. Capsule fragility
8. PC tear
9. Dropped nucleus

C. Multiple postoperative risks associated with cataract surgery in PXF
1. Increased IOP
2. Corneal edema
3. Increased aqueous flare
4. IOL deposits
5. Posterior synechiae
6. CME
7. Phimosis
8. Posterior capsule opacification
9. IOL subluxation
10. Glaucoma

D. Two key risk factors for cataract surgery
1. Small pupil
   a. Infiltration of iris by extracellular material
   b. Degeneration of sphincter muscle
   c. Involvement of stromal muscle fibers
   d. Intrastromal hemorrhage
   e. Alteration of blood aqueous barrier
   f. Small pupil can lead to small capsulorrhexis and increase tendency towards phimosis and capsule contraction forces extending to zonules postop
2. Zonule weakness – most important
   a. Infiltration by pseudoexfoliation material at origin and insertion of zonules leading to disinsertion
   b. Lysis and stromal enzyme degradation
   c. Fragmentation of zonules

E. Clinical signs of weak zonules
1. Anterior chamber depth asymmetry between eyes – shallow or hyper-deep; gonioscopy critical
2. AC depth asymmetry within a given eye: superior versus inferior
3. Iridodonesis – pre-dilation may manifest with iris flutter
4. Phacodonesis – post-dilation visible with gaze shift and physical tap on eye
5. Lens subluxation – anterior chamber depth asymmetry within the eye, decentration of central nucleus, typically inferior displacement
6. Age, nuclear density, axial length, reduced pupil size NOT associated with weak zonules in Shingleton study
7. No correlation of zonule weakness with amount of pseudoexfoliation material present

F. Incidence of weak zonules: single surgeon series of 1059 consecutive eyes (excluding combined procedures, previous surgery) – 60/1059 eyes (5.7%) had weak zonules confirmed preoperatively and/or intraoperatively (BJS, JCRS 2010)
1. Incidence of weak zonules without need for vitrectomy
   a. 1021/1059 eyes (96.4%) did not manifest weak zonules and did not require vitrectomy
   b. 22/1021 eyes (2.2%) had weak zonules confirmed intraoperatively – managed with or without capsular retractors/CTS/CTR and no vitrectomy
2. Incidence of weak zonules with need for vitrectomy: impact of risk factors
   a. 38/1059 eyes (3.6%) required vitrectomy – all with weak zonules confirmed intraoperatively
b. 937/1059 eyes (88.5%) -- no risk factors: 20/937 no risk factor eyes (2.1%) required vitrectomy

c. 122/1059 eyes (11.5%) -- risk factors present: 18/122 risk factor eyes (14.8%) required vitrectomy
   1) 2/90 eyes (2.2%) -- AC depth asymmetry
   2) 9/21 eyes (39%) -- phaco/iridodonesis/subluxation
   3) 7/11 eyes (64%) -- complicated fellow eye surgery

G. Cataract surgery in pseudoexfoliation --- Techniques

1. Preoperative assessment – compulsively look for signs of zonule weakness (see above)
2. Incision location
   a. Temporal location most common – consider more posterior entry and/or superotemporal shift in location if significant concern for zonule weakness and potential need for larger incision to accommodate AC IOL or larger sutured PC IOL
3. Ophthalmic viscoelastic devices (OVDs)
   a. Dispersive
      1) Protect endothelium
      2) Sequester zonule weakness and vitreal prolapse
   b. Cohesive
      1) Maintain AC
      2) Viscodilate small pupil
      3) Viscodissect cortex
      4) Expand capsular bag for device/IOL implantation
4. Pupil management
   a. Preop dilation, nonsteroidal anti-inflammatory drops
   b. Intraoperative pharmacology
   c. Release synechiae – mechanical and OVD
   d. Stretching/sphincterotomies
   e. Tectonic iris support, favored
      1) Iris retractors
      2) Ring expander
   f. IFIS issues
5. Capsulorrhexis
   a. Size – 5.0-5.5 mm
      1) Too small: complicate phaco, increase zonule stress
      2) Too large: compromise device use, IOL fixation
   b. Intact capsulorrhexis critical
   c. Enlargement after IOL implantation possible
   d. Potential role for Femto laser, Zepto, Fugo
   e. Signs of zonule instability when performing continuous curvilinear capsulorrhexis
      1) Trampolining with initiation of CCC
      2) Striae during CCC
      3) Movement of capsular bag during CCC
      4) Ovalization of capsule
      5) Use of second instrument or retractor for counter-traction may facilitate completion of capsulorrhexis
      6) Potential role for femto laser
6. Hydodissection
   a. Complete and free nucleus rotation critical!!!
   b. Helps to minimize transmission of aspiration forces to the capsule equator and zonules
   c. Facilitates cortex removal
7. Phacoemulsification
   a. Use advanced power/flow/aspiration systems
b. Chop/flip technique
c. Two instrument nucleus rotation
d. Work in central zone, avoid capsule periphery and reduce transmission of aspiration forces to capsule equator
e. Utilize OVD for dissection and manipulation
f. Phacoemulsification: signs of zonules instability
   1) Nucleus tilt
   2) Eccentric shift
   3) Difficult nucleus rotation
   4) Vitreous prolapse peripherally around capsule

8. Cortex removal
   a. Good hydrodissection facilitates cortex removal and viscodissection also possible
   b. Tangential stripping
c. Vacuum lens subcapsular epithelial cells to reduce postop anterior capsule phimosis
d. Signs of zonule instability during cortex removal
   1) Striae/posterior capsule laxity
   2) Collapse of capsular equator and visibility of equatorial capsule edge

9. Capsule support systems
   a. Capsule retractors
      1) Mackool/MST/Yahuchi-Kazawa
      2) Multiple
      3) After or concurrent with capsulorrhexis
      4) Support lens in A-P direction
      5) Rotational support
      6) Avoid stretching and lid/speculum contact
   b. Capsule tension ring (CTR)
      1) Improves IOL centration – reduces IOL tilt due to expanded and stabilized capsular bag
      2) Reduces intraoperative complications
      3) Timing: -- delay insertion until zonules instability noted
      4) Does not prevent late IOL displacement or anterior capsule phimosis
   c. Sutured modified CTR (Cionni)
      1) Single or double-eyelet
      2) Suture with 9-0 Prolene or 8-0 Gortex
   d. Capsule tension segments (CTS)
      1) Fixate with suture
      2) Fixate with iris hook

10. Intraocular lens – choice for implantation
    a. Intact posterior capsule with intact zonules: PC IOL in the capsular bag
    b. Intact posterior capsule with questionable zonules: PC IOL in the capsular bag with CTR or sulcus placement of haptics with optic capture within capsulorrhexis (with or without CTR)
    c. Intact posterior capsule with extensive zonule weakness: Sutured CTR: with PC IOL in capsular bag or with optic capture or as in 10d
    d. Lack capsule integrity
       1) Scleral suture/supported PC IOL
       2) Iris sutured PC IOL
       3) AC IOL
       4) Iris enclavation IOL

11. Posterior chamber intraocular lens material and design
    a. All new generation material is biocompatible
       1) Acrylic/silicone/hydrogel/PMMA
       2) Possibly greater phimosis with older generation silicone
    b. Favor three-piece, large optic, flexible haptic/posterior angulation, neutrally aspheric or spherical PC IOL
c. Avoid plate-haptic IOL without holes and all-acrylic IOLs if no CTR used
d. PXF is a relative contraindication to accommodative or multi-focal IOL

12. Anterior chamber IOL – new generation, highly acceptable
   a. Compressible, open loop haptics
   b. Multiple lengths
   c. Anterior angulation, round edges to optics and haptics
   d. Simple and safe
   e. Peripheral iridectomy reduces chance of pupillary block
   f. AC IOL should be available for every PXF case

H. Vision and IOP results
   1. Results of phacoemulsification in PXF eyes without zonular weakness: significant vision improvement, small statistically significant mean decrease in IOP; long term risk of IOL displacement – mean 8.5 years
   2. Results of phacoemulsification in PXF eyes with zonular weakness, but no vitrectomy; significant vision improvement, small statistically significant mean decrease in IOP; 20% of PXF eyes with intraoperative signs of zonular weakness and 12.4% of PXF eyes with preoperative signs of zonular weakness developed pseudophakodonesis, anterior capsule contraction (phimosis) and/or IOL subluxation. Non-sutured CTR placement associated with similar complications.
   3. Results of phacoemulsification with zonular weakness and concurrent vitrectomy
      a. Equal vision improvement, IOP reduction and GMR reduction in vitrectomy eyes compared to non-vitrectomy eyes. More intensive postoperative care for vitrectomy eyes
      b. AC IOL vs. PC IOL (sulcus/iris sutured): equal vision improvement, IOP reduction and GMR reduction but more complications with AC IOLs
      c. Anterior vitrectomy results equal to pars plana vitrectomy results for the same parameters

IV. PSEUDOEXFOLIATION and POSTOPERATIVE CAPSULE/IOL ISSUES

A. Capsule issues
   1. Posterior capsule opacification – increased in pseudoexfoliation eyes
   2. Anterior capsule contraction (phimosis) – increased in pseudoexfoliation eyes because of weak zonules
      a. Age
      b. Blood aqueous compromise
      c. Chronic flare
      d. Retained cortex
      e. Compromised zonules
      f. Originally described in 1993 by Davison
      g. IOL material and design – surface modification to decrease cellular proliferation and capsule contraction
   3. Identify early
   4. Treat early
      a. YAG laser anterior cruciate incisions to release centripetal capsule traction forces
      b. Surgical incisions with micro-forceps scissors
      c. Early treatment delays and reduces incidence of IOL subluxation
      d. Vacuum subcapsular lens epithelial cells

B. Intraocular lens issues
   1. Pseudophakodonesis
   2. Subluxation/dislocation: Capsule/Complex displacement characteristic
      a. Timing of subluxation: mean 8.5 years after cataract surgery
      b. Location: inferior quadrants, 8% present with complete dislocation into vitreous
      c. All PC IOL styles and materials
d. IOP at presentation of subluxation: 10% of eyes greater than 30 mmHg

C. Prevent/Reduce incidence of IOL subluxation
   1. AC IOL
   2. Sulcus placement of PC IOL +/- IOL capture
   3. Scleral supported/iris sutured PC IOL

D. Medical management of IOL subluxation
   1. Observation
   2. Miotic
   3. Contact lens if IOL dislocation outside of visual axis
   4. IOP issues

E. Surgical management of IOL problems – pseudophakodonesis
   1. Usually asymptomatic and may not progress to subluxation for years
   2. Suture if visually significant

F. Surgical management of IOL problems – subluxation/dislocation
   1. IOL exchange
      a. Indications
         1) Need for IOL power change
         2) Plate-haptic IOL (no holes) without CTR present
         3) Optic/haptic damage
         4) Complete dislocation
         5) Patient needs/surgeon preferences
      b. Techniques
         1) Incision location/size
         2) Instruments – forceps/scissors
         3) Vitrectomy
         4) IOL removal
         5) AC/sutured PC IOL
   2. IOL repositioning suturing
      a. Indications: possible in many situations
      b. Techniques
         1) Suture to iris
            a) Good for 3-piece IOLs free of capsule and Soemmering’s ring
            b) Avoid iris fixation of all-PMMA IOL/all acrylic IOL – iris chafe and pigment release
         2) Lasso sulcus suture – (9-0 Prolene, 8-0 GoreTex) -- favored and ideal for IOL/capsule complex subluxation characteristic of PXF eyes
         3) 
   G. Results of IOL exchange/repositioning surgery (JCRS, 2013, BJS) 150 PXF eyes
   1. Vision significantly improved
   2. IOP mean decrease of 4 mmHg
   3. GMR stable
   4. IOL exchange equals IOL repositioning in terms of final results, but:
      a. IOL exchange: 85% need for vitrectomy
         1) Higher rate of transient IOP less than 5mmHg or greater than 30 mmHg in early postop period
         2) Higher rate of CME, bleeding, pupillary block, chronic inflammation
         3) Longer recovery, longer incision, more inflammation
      b. IOL repositioning: 15% need for vitrectomy
1) Lower rate of transient IOP less than 5 mmHg or greater than 30 mmHg in early postop period
2) Lower rate of CME, bleeding, pupillary block, chronic inflammation and faster recovery