What’s New in Anterior Segment Laser Surgery

Aaron McNulty, OD, FAAO
Louisville Eye Center
Course Overview

- Review of recent literature, concepts, and techniques in anterior segment laser surgery for optometrists
  - SLT
  - YAG capsulotomy
  - Iridotomy
Common questions in optometric laser surgery

- When should I do SLT instead of adding drops?
- Does a patient with narrow angles need an iridotomy? How narrow is too narrow?
- What’s the maximum laser energy I can safely use without causing complications?
Selective Laser Trabeculoplasty (SLT)

- Indications
- Predicting SLT success
- SLT and prostaglandins
- Diurnal control
- Pigment dispersion
- Repeatability
- Learning curve
- Novel approaches to SLT
- New technologies
SLT Indications

● After maximum medications?
● When adding second/third drop?
● First line?
SLT/Med Study

- Published 2012
- Prospective randomized clinical trial
- 100 eyes followed for 1 year
- POAG and OHTN
- Randomized to SLT or prostaglandin
- If target IOP not met:
  - Repeated SLT in laser group
  - Added drops in medication group
SLT/Med Study

- Baseline IOP ~24.5mmHg in both groups
- IOP reduction
  - SLT: 6.3mmHg
  - Meds: 7.0 mmHg
- Need for additional treatment
  - SLT: 11%
  - Meds: 27%
- Conclusion: SLT is a viable first line treatment for POAG
SLT as first line?

- American Academy of Ophthalmology Preferred Practice Patterns
  - “Laser trabeculoplasty can be considered as initial therapy in selected patients.”
SLT as first line?

- UpToDate
  - “Once the decision has been made to treat a patient with open-angle glaucoma, we recommend pharmacologic or laser therapy as first line treatment.”
  - Grade 1B evidence
SLT as first line?

- 2015 Meta-Analysis (Oi Man Wong et. al)
  - "Robust evidence that SLT may be...offered as a primary treatment to patients with OAG."
SLT as first line?

Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHt): a multicentre randomised controlled trial

Gus Gazzard, Evgenia Konstantakopoulou, David Garway-Heath, Anurag Garg, Victoria Vickerstaff, Rachael Hunter, Gareth Ambler, Catey Bunce, Richard Wormald, Neil Nathwani, Keith Barton, Gary Rubin, Marta Buszewicz, on behalf of the LiGHt Trial Study Group*

● RCT with n=718
● Followed for 3 years
● Looked at QoL, efficacy, cost, and safety
Selective laser trabeculoplasty provides superior intraocular pressure stability to drops, at a lower cost and, importantly, it allows almost three quarters of patients (74%) to be successfully controlled without drops for at least 3 years after starting treatment.”
Trabeculoplasty efficacy

- Expected IOP reduction: 20-30%
- 80-90% effective at one year
- 30-50% effective at five years
Predicting SLT Success

- SLT is not 100% effective
  - Modest response in some
- What if we could predict nonresponders?
Predicting SLT Success

Development of a Prediction Rule to Estimate the Probability of Acceptable Intraocular Pressure Reduction After Selective Laser Trabeculoplasty in Open-angle Glaucoma and Ocular Hypertension

Alexander J. Mao, MD, OD, MPH,* Xiao-jing Pan, MD,† Ian McIlraith, MD,* Maurice Strasfeld, MD,* George Colev, MD,* and Cindy Hutnik, MD*

- Looked at:
  - Pre-treatment IOP, current medications, phakic status, level of pigmentation, steroid use, age, gender
Preoperative intraocular pressure as a predictor of selective laser trabecuoplasty efficacy

Karin R. Pillunat, Eberhard Spoerl, Greta Elfes and Lutz E. Pillunat

Department of Ophthalmology, Medical Faculty Carl Gustav Carus, Technische Universität, Dresden, Germany

<table>
<thead>
<tr>
<th>Mean diurnal IOP change</th>
<th>Baseline mean diurnal IOP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;14 mmHg (n = 56) min. 9.3 mmHg</td>
</tr>
<tr>
<td>Decrease (n = 15) &gt;20%</td>
<td>1.8% (−3.3 mmHg)</td>
</tr>
<tr>
<td>Decrease (n = 55) 10–20%</td>
<td>31.1% (−1.9 mmHg)</td>
</tr>
<tr>
<td>Decrease (n = 51) &lt;10%</td>
<td>31.1% (−0.6 mmHg)</td>
</tr>
<tr>
<td>No change (n = 3)</td>
<td>3.6%</td>
</tr>
<tr>
<td>Increase (n = 33)</td>
<td>32.4% (+1.0 mmHg)</td>
</tr>
</tbody>
</table>
SLT and prostaglandins (PGA)

● SLT may function similarly to PGA
  ○ Low-grade inflammation
● 2007 study: In patients on drops, SLT had the least impact in eyes already treated with PGA
SLT and prostaglandins (PGA)

- Alvarado et. al
- Two parts to study
  - In vitro
    - PGA and trabeculoplasty have competitive mechanism of action
  - Clinical arm
Alvarado et. al Clinical Arm

- 24 patients
- Withdrew PGA for washout period, then did SLT
- Measured SLT response after 90 days
Alvarado et. al Clinical Arm

- Average IOP reduction
  - PGA: 25%
  - SLT: 30%
- PGA responders tended to be SLT responders (at equivalent levels)
Alvarado et. al Proposed Protocol

- **If patient is on no glaucoma meds preoperatively**
  - Test response with PGA
  - If successful, proceed with SLT
  - SLT functions like starting PGA

- **If patient is already on PGA preoperatively**
  - Discontinue PGA for 1 month
  - If IOP increases, expect SLT to work
  - SLT basically replaces PGA
Alvarado et. al Proposed Protocol

- If patient needs further IOP reduction following SLT, consider using non-PGA medication
Trabeculoplasty Diurnal Control

- How effective is SLT at controlling nocturnal IOP spikes?
Trabeculoplasty Diurnal Control

- Prospective study: 18 patients on drops undergoing ALT
- Subjects stayed in sleep lab
- Checked IOP during day (sitting) and overnight (supine)
  - Repeated before and after ALT
Trabeculoplasty Diurnal Control

- Mean nocturnal IOP was 1.8mmHg lower after ALT
  - Some patients showed no improvement during day, but still had blunted nocturnal spike
SLT and normal tension glaucoma (NTG)

- How much IOP reduction can we expect?
- Does improved diurnal control still apply?
SLT and normal tension glaucoma (NTG)

- 14-16% IOP reduction
  - 2015 meta-analysis of SLT studies
- Diurnal control benefits
  - SLT decreases nocturnal spikes in NTG patients

![Graph showing IOP reduction before and after SLT.](image)
Expected SLT outcome:
- IOP 16 → 14
- Blunted nocturnal spikes
SLT and pigment dispersion

- Is it effective?
- Is it safe?
SLT and pigment dispersion

- SLT mechanism of action
- Thermal relaxation time
SLT and pigment dispersion

- SLT tends to be very effective, HOWEVER...

- 2005 paper reported four cases of PDG with severe IOP spike following SLT
  - Required urgent trabeculectomy

- Some doctors avoid SLT in PDG
SLT and pigment dispersion

- Consider “test dose”: 10 shots at 0.3mJ
- If no IOP spike, proceed with treating one quadrant at a time
  - Monitor IOP response after each quadrant
  - May not need to treat all four quadrants
SLT and Pseudoexfoliation

- Heavy pigmentation $\rightarrow$ Good response
- Wears off more quickly
- Higher risk (similar to PDG)
  - 2016 case series of 5 patients with persistent IOP spikes needing incisional surgery
- Recommended for mild/moderate cases
SLT for Steroid-Induced Glaucoma

- Effective in cases of intravitreal triamcinolone
- Sometimes advocated prophylactically before intravitreal injection, especially if OHTN
Repeat treatments

- Is SLT repeatable?
- Are repeat treatments as effective as the first?
Repeat treatments

● SLT is widely considered to be repeatable
  ○ No mechanical damage to TM
  ○ Largely based on anecdotal evidence and small studies
  ○ Repeat treatments may be less effective and may not last as long
Repeat treatments

- 2011 multicenter retrospective study
- 137 eyes
- 6 months to 8 years between first and second SLT
- First SLT
  - 20.3mmHg → 16.3mmHg
- Second SLT
  - 19.4mmHg → 16.3mmHg
Repeat treatments
## Repeat treatments

<table>
<thead>
<tr>
<th>Paper</th>
<th>Year</th>
<th>Diagnosis</th>
<th>Number of eyes (n)</th>
<th>Number of patients (n)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong et al. (11)</td>
<td>2009</td>
<td>POAG, PXG and PG</td>
<td>44</td>
<td>35</td>
<td>The repeat 360° SLT performed 6 months after the successful initial 360 SLT may be safe and effective</td>
</tr>
<tr>
<td>Avery et al. (12)</td>
<td>2013</td>
<td>POAG</td>
<td>42</td>
<td>42</td>
<td>Similar efficacy was found in primary SLT and repeat SLT in treatment of POAG. Repeat SLT produces a longer effective duration</td>
</tr>
<tr>
<td>Khouri et al. (13)</td>
<td>2014</td>
<td>POAG, PXG and PG</td>
<td>51</td>
<td>34</td>
<td>Equal proportion of eyes responds successfully to repeat SLT regardless of the initial SLT effect was successful or modest</td>
</tr>
<tr>
<td>Ayala et al. (14)</td>
<td>2014</td>
<td>POAG and PXG</td>
<td>80</td>
<td>80</td>
<td>Repeat SLT on the same trabecular meshwork area has same effect as on two different areas</td>
</tr>
<tr>
<td>Khouri et al. (15)</td>
<td>2014</td>
<td>POAG, PXG and PG</td>
<td>45</td>
<td>25</td>
<td>Repeat SLT is effective in controlling IOP up to 2 years</td>
</tr>
<tr>
<td>Polat et al. (16)</td>
<td>2016</td>
<td>POAG, PXG and PG</td>
<td>38</td>
<td>38</td>
<td>IOP in open-angle glaucoma can be controlled with repeat SLT which achieves comparable result as successful initial SLT</td>
</tr>
<tr>
<td>Francis et al. (17)</td>
<td>2016</td>
<td>POAG, PXG, PG, OHT and JOAG</td>
<td>137</td>
<td>137</td>
<td>Both initial SLT and repeat SLT with 360-degree treatment lowers IOP similarly</td>
</tr>
<tr>
<td>Durr et al. (18)</td>
<td>2016</td>
<td>POAG, PXG and NTG</td>
<td>38</td>
<td>38</td>
<td>The second SLT resulted in similar IOP lowering effect as previous 360° SLT with possibly more sustained response</td>
</tr>
</tbody>
</table>
SLT and MIGS

- MIGS: Minimally/micro-invasive glaucoma surgery
SLT and MIGS

- **SLT is likely safer**
  - “I see SLT as something to do before the patient has to go to the operating room. I think SLT is the safest thing I do in glaucoma care...Many patients should have SLT first...If the patient ends up needing to go to the OR, adding a MIGS procedure might be sufficient.”

- **MIGS may be stronger**
  - SLT enhances trabecular meshwork, MIGS bypass trabecular meshwork completely
SLT and MIGS

- MIGS procedures may be combined with cataract surgery
- 2013 study: SLT following failed Trabectome
  - All 14 SLTs failed
SLT Learning Curve

SLT vs ALT
SLT Learning Curve

- Gonioscopy is best practice
- 2014 study compared SLT performed by attending physicians to those performed by first year ophthalmology residents (doing their first SLT)
  - 110 procedures
  - Supervised by an attending surgeon
  - Comparable results between residents’ first SLT and attending surgeons
    - IOP reduction and safety profile
Evaluation of selective laser trabeculoplasty as an intraocular pressure lowering option
Residents vs “less experienced specialists” vs “senior specialists”

Resident = specialists

Resident & specialists < senior specialists

Senior specialists: More spots, more energy, more success

No mention of complications

Conclusion: “The data would suggest that experience is not the deciding factor in terms of outcome and IOP reduction.”
Conclusion: “The data would suggest that experience is not the deciding factor in terms of outcome and IOP reduction.”
Novel SLT approaches

- Annual low-power SLT for OHTN
  - 2014 ARVO paper
  - 0.4mJ; 40-50 spots over 360 degrees
  - Repeated yearly, regardless of IOP level
  - Followed 3-10 years
  - Mean treated IOP similar to traditional SLT
  - Fewer patients needed medications to control IOP vs traditional SLT
Novel SLT approaches

- Trans-scleral approach
  - 2014 ARVO paper
  - SLT applied to sclera overlying TM
  - IOP reduction equivalent to traditional SLT
Novel SLT approaches

- Direct SLT (DSLT)
  - Automated device being investigated
  - 100 spots simultaneously
  - 1 second treatment time
  - No gonio lens
Pattern SLT (PSLT)

- Computer-guided treatment algorithm
- Spots are precisely placed without overlap or gaps
- 100um spot size; 3 rows
Micropulse laser trabeculoplasty (MLT)

- Delivers small, repetitive micropulses rather than one continuous pulse
  - Cooling periods between micropulses reduces tissue damage
  - Does not destroy pigmented cells
  - Less pain during and after procedure
YAG Capsulotomy

- Avoiding complications
- Crystalens
- Standardizing techniques
YAG capsulotomy complications

- How do we minimize complications?
- What is the true risk of significant complications?
- Does higher energy per pulse cause more complications? What about cumulative energy?
YAG capsulotomy complications

- 2015 study
- 474 consecutive eyes
- Analyzed factors that led to complications
2015 YAG complication study

- Conclusion: Total laser energy is an important factor leading to complications
## 2015 YAG complication study

<table>
<thead>
<tr>
<th>Complication</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uveitis</td>
<td>9.9%</td>
</tr>
<tr>
<td>IOP spike</td>
<td>12.6%</td>
</tr>
<tr>
<td>IOL pitting</td>
<td>7.8%</td>
</tr>
<tr>
<td>Cystoid macular edema</td>
<td>2.9%</td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>2.3%</td>
</tr>
</tbody>
</table>
# 2015 YAG complication study

<table>
<thead>
<tr>
<th>Complication</th>
<th>Mean total energy with complication (mJ)</th>
<th>Mean total energy without complication (mJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uveitis</td>
<td>65</td>
<td>42</td>
</tr>
<tr>
<td>IOP spike</td>
<td>76</td>
<td>42</td>
</tr>
<tr>
<td>IOL pitting</td>
<td>62</td>
<td>43</td>
</tr>
<tr>
<td>Cystoid macular edema</td>
<td>71</td>
<td>42</td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>78</td>
<td>43</td>
</tr>
<tr>
<td><strong>Overall average</strong></td>
<td><strong>66</strong></td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>
2015 YAG complication study

- Retinal detachment: a closer look
- 11 RDs in 474 eyes (2.3%)
- Mean onset 11.7 months post YAG
  - Range 4-15 months
- Risk factors
  - Higher total laser energy
  - Higher axial length
- Recommendation: avoid large capsulotomy in patients with high axial length
2015 YAG complication study

- Mean energy level by PCO subtype

  Pearl: 1.8mJ starting energy; 22mJ total

  Fibrous: 2.8mJ starting energy; 65mJ total
Retinal Detachment Risk

Rate of retinal tear and detachment after neodymium:YAG capsulotomy

Jason D. Wesolosky, MD, Matthew Tennant, MD, FRCSC, Christopher J. Rudnisky, MD, MPH, FRCSC
Wesolosky et. al

• “The rate of RD after Nd:YAG capsulotomy reported in the literature and current ophthalmologic textbooks ranges from 0% to 3.6%. However, many of these studies were performed in the 1980s and 1990s when methods were considerably different than today.”
“The impetus for this study arose from regular discussions with patients about the risks and benefits of Nd:YAG capsulotomy and a sense that the actual rates of retinal tear and RD were lower than quoted.”
Wesolosky et. al

- 11 yr chart review
- Over 67,000 YAG caps
- RD risk was 0.6% at 90 days
  - Risk returned to baseline after 5 months
Retinal Tear and Detachment Rates Following Neodymium:YAG Capsulotomy

Journal of Cataract & Refractive Surgery

TAKE-HOME MESSAGE

- This retrospective assessment of a medical database explored the incidence of retinal tears or retinal detachment after neodymium:YAG capsulotomy via the appropriate billing codes.
- The authors found <1% incidence of retinal tears or detachments occurring within the first year, with the greatest risk occurring in the first 5 months. Additionally, risks were different depending on patient age, with the greatest risk in the 61- to 70-year-old group.

– Kathleen Freeman, OD, FAAO

This study indicates that the risk of RD is much lower than currently taught in textbooks and residency training programs. Based on the results, as part of informed consent to perform a YAG capsulotomy, I now counsel patients that the risk of RD from the procedure is 1 in 200.
Capsulotomy and Crystalens
Capsulotomy and Crystalens

- Capsulotomy may spontaneously enlarge with lens translation
  - Increases risk of IOL dislocation
- Recommendations
  - Maximum 4mm diameter
  - Avoid acute edges
    - Circular or octagonal approach
YAGs and Blebs

Bleb failure and intraocular pressure rise following Nd: Yag laser capsulotomy

Andreas Diagourantas, Petros Petrou, Ilias Georgalas, Kostantinos Oikonomakis, Panagiotis Giannakouras, Athanasios Vergados and Dimitrios Papaconstantinou

15 patient case series
YAGs and Blebs

- Patients were status post trabeculectomy
- IOP spiked, requiring Ahmed valve implantation
- Hypothesis: debris from capsule or anterior vitreous blocked outflow into the filtering bleb
Capsulotomy techniques

- Techniques are largely based on practitioner preference
- How to determine best practices?
Capsulotomy techniques

- 2011 survey of British ophthalmologists
  - 300 surveyed, 158 replied
- Use of dilating drops, capsulotomy shape/size, use of contact lens, steroid use, follow-up schedule
Capsulotomy techniques

- **Dilation**
  - 98.5% dilate before capsulotomy
- **Size**
  - 64% aim for size larger than undilated pupil
- **Shape**
  - 47% cruciate, 27% circular, 24% combination
- **Use of contact lens**
  - 88% use one
Capsulotomy techniques

- **Topical steroid use**
  - 42% use postoperative prophylactic steroids

- **Postoperative follow-up**
  - 39% see patients for routine postoperative visits
    - Mostly within one month
Laser peripheral iridotomy (LPI)

- When do we recommend LPI to prevent angle closure?
- How do we measure the angle?
- How do we classify angle measurements?
- Thresholds for prophylactic LPI
- Relative pupillary block
- Location of iridotomy
- Lens extraction for angle closure
- LPI and pigment dispersion
Laser peripheral iridotomy (LPI)

- How likely is this patient to develop glaucoma?
- How do we predict whether she will progress?
- How effective is LPI?
- What do we do if LPI fails?
Iridotomy indications

- Acute angle closure glaucoma
- Asymptomatic angle closure glaucoma
- Prophylaxis for primary angle closure suspect (“narrow angles”)
  - How narrow is too narrow?
  - How aggressive should we be?
How do we measure the angle?

● Gonioscopy vs newer technologies (i.e. anterior segment OCT)

● Gonioscopy
  ○ Advantages: view synechiae, angle recession, pigment levels, NVA
  ○ Disadvantages: subjective

● AS-OCT
  ○ Advantages: objective, noninvasive
  ○ Disadvantages: no view of pigment, synechiae, NVA
How do we measure the angle?

- Gonioscopy:
  - Underutilized, according to chart review studies and Medicare billing data
  - Remains gold standard for angle measurement
How do we classify the angle?

- **Based on chronicity**
  - Acute
  - Subacute
  - Chronic

- **Based on glaucomatous damage**
  - Primary angle closure suspect
  - Primary angle closure
  - Primary angle closure glaucoma

- **Additional concepts**: intermittent, latent, creeping angle closure
<table>
<thead>
<tr>
<th>Type of PAC</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACS</td>
<td>$\geq 180^\circ$ of ITC, normal IOP, no PAS, and no optic neuropathy</td>
</tr>
<tr>
<td>PAC</td>
<td>$\geq 180^\circ$ of ITC with PAS or elevated IOP, but no optic neuropathy</td>
</tr>
<tr>
<td>PACG</td>
<td>$\geq 180^\circ$ of ITC with PAS, elevated IOP, and optic neuropathy</td>
</tr>
<tr>
<td>APAC or AACC</td>
<td>Occluded angle with symptomatic high IOP</td>
</tr>
</tbody>
</table>

AACC = acute angle-closure crisis; APAC = acute primary-angle closure; IOP = intraocular pressure; ITC = iridotrabecular contact (defined as nonvisibility of posterior trabecular meshwork on static gonioscopy); PAC = primary angle closure; PACG = primary angle-closure glaucoma; PACS = primary angle-closure suspect; PAS = peripheral anterior synechiae.
A Helpful Classification Scheme

1. Anatomically narrow
   – Indentation gonioscopy opens angle
   – Normal IOP
   – Heightened suspicion

2. Anterior synechiae and/or elevated IOP
   – Minimal natural history data

3. Closed angles and glaucomatous damage
   (Fourth category: Acute symptomatic angle closure)
A Helpful Classification Scheme

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   (Fourth category: Acute symptomatic angle closure)
When to recommend prophylactic LPI

● Narrow angle (next slide), and presence of any:
  ○ Peripheral anterior synechiae
  ○ Elevated IOP
  ○ Optic nerve damage
  ○ Family history

● Narrow angle (next slide) without any of these: discuss risks, involve patient in decision
How narrow is too narrow?

- Gonioscopy: iridotrabecular contact in at least 180 degrees
  - Iridotrabecular contact = failure to see posterior meshwork
- AS-OCT: angle opening is less than 5-10 degrees
  - Visante: use lens vault measurement
A note on pupillary block
Important concept: *Relative* pupillary block

- No iridolenticular contact
- Relative resistance to aqueous flow
- Aqueous pressure is higher behind the iris (and at optic nerve)
  - One to eight mmHg
  - Equalized by iridotomy

- **Main known causative mechanism of ACG**
Does LPI work?

Ophthalmic Technology Assessment

Laser Peripheral Iridotomy in Primary Angle Closure

A Report by the American Academy of Ophthalmology
Does LPI work?

● PACS  
  ○ Up to 25% may not respond  
    ■ Suggests nonpupillary block  
  ○ Most require no additional treatment  
  ○ Very low risk of acute attack following LPI

● PAC and PACG  
  ○ Many require additional treatment
Does LPI work?

Original article

Longitudinal Changes of Angle Configuration in Primary Angle-Closure Suspects: The Zhongshan Angle-Closure Prevention Trial

Yuzhen Jiang MSc, MD 1, 2, Dolly S. Chang MD, PhD 2, 3, Haogang Zhu MSc, PhD 1, Anthony P. Khawaja MPhil, FRCOphth 4, Tin Aung PhD, FRCS(Ed) 5, Shengsong Huang MSc, MD 2, Qianyun Chen BA, MA 2, Beatriz Munoz MSc 3, Carlota M. Grossi BSc, PhD 1, Mingguang He MD, PhD 1, 2, *, F, David S. Friedman MD, PhD 2, 3, 6, *, Paul J. Foster PhD, FRCS(Ed) 1, 2, 7, *
Does LPI work?

- Six year prospective RCT
  - One eye per patient gets LPI
- 889 patients with PACS
- How many would develop PAC? (IOP greater than 24mmHg, PAS, or acute attack)
How many progressed to PAC?

- Untreated eyes: 36
- Treated eyes: 19

Limitations:
- Exclusion criteria
- Non-contact tonometry
- Limited to Chinese patients
Iridotomy learning curve

- 2017 comparison of LPIs performed by 1st/2nd/3rd year ophthalmology residents
- Compared total energy usage (approximates efficiency)
  - Decreasing energy with experience
- Compared complications
  - No difference
Iridotomy learning curve

- “Complications included elevated post-laser IOP at 30–45 minutes (≥8 mmHg), hyphema, aborted procedures, and lasering non-iris structures.”
Iridotomy placement location

- How can we minimize photopsia complications?
Iridotomy placement location

- Traditionally placed at 11:00 or 1:00
Iridotomy placement location

- 2014 prospective randomized trial
- 169 patients
  - Randomized to superior LPI in one eye and temporal LPI in other eye
- Looked for linear dysphotopsia as complication
Iridotomy placement location

- New-onset linear dysphotopsia
  - 10.7% (superior) vs 2.4% (temporal)
Iridotomy placement location

- **Superior placement**
  - 75% fully covered by lid
  - 17% partially exposed
  - 8% completely exposed

- **Temporal placement**
  - 98% completely exposed

- **Rate of linear dysphotopsia**
  - 2.8% fully exposed iridotomies
  - 11.3% partially or completely covered iridotomies
Iridotomy placement location

- Avoid exactly 3:00 or 9:00 (may damage long ciliary nerves)
  - Additional pain or pupil dysfunction
- Aim for a crypt just inferior to 3:00 or 9:00
- Beware of ciliary processes behind iris
  - Very far in the periphery
  - Whitish appearance
  - May be mistaken for iris stroma
Iridotomy placement location

- 2018 prospective RCT (n=559) found no difference in visual disturbances for superior vs nasal/temporal
Iridotomy size

- What is proper iridotomy size?
- No consensus
- One study revised “small” iridotomies (<100um) and angle deepened
- Aim for ≥200um
Lens extraction vs LPI

- Emanuel (2014): cataract extraction may be more effective at controlling IOP than iridotomy
Lens extraction vs LPI

- EAGLE trial (2016)
- Clear lens extraction vs LPI
- PAC with IOP > 30 or PACG
- Clear lens extraction had greater efficacy and was more cost-effective
A Helpful Classification Scheme

1. Anatomically narrow
   - Indentation gonioscopy opens angle
   - Normal IOP
   - Heightened suspicion

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   - Minimal natural history data

3. Closed angles and glaucomatous damage

(Fourth category: Acute symptomatic angle closure)
Pigment dispersion glaucoma & LPI

- Posterior bowing of iris may cause contact between iris and lens zonules
- Iridotomy equalizes pressure and flattens iris
Pigment dispersion glaucoma & LPI

- Scott et. al (2011)
  - Prospective randomized trial
  - 116 eyes with PDS and OHTN, no glaucoma
  - 3 years follow up
  - Randomized to LPI vs observation
  - No differences in glaucoma development or use of glaucoma medications
A note on vitreous prolapse

- Prolapse of vitreous humor into anterior chamber is possible if capsulotomy done improperly
Questions?

Thank you!

mcnulty.aaron@gmail.com
IOL optic

Capsulotomy

Capsulorrhexis
A note on acute angle closure

- How can dilation cause acute angle closure?
  - Pupillary block
    - Iris contacts anterior lens surface
    - Aqueous pressure builds up behind iris
    - Iris bows forward (bombe)
    - Angle closes
    - Most likely to occur when pupil is recovering from dilation (mid-dilated)
A note on acute angle closure

- How can dilation cause acute angle closure?
  - Iris volume
    - Iris normally loses volume with pupillary dilation (physiologic or pharmacologic)
A note on acute angle closure

- How can dilation cause acute angle closure?
  - Iris volume
A note on acute angle closure

- How can dilation cause acute angle closure?
  - Iris volume
Implementing lasers in your practice

- Co-ownership between offices
- Laser rentals
- Explore ophthalmology ambulatory surgical centers