Argon Laser Peripheral Iridoplasty

All you need to know

AAO 2015 Las Vegas
Instruction Course 288
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Financial Disclosures
Clement CY Tham, FCOphthHK

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Financial Interest Disclosure
Robert Ritch, MD

- No financial interests or relationships relevant to this course to disclose.
Course Title:
Argon Laser Peripheral Iridoplasty – All You Need to Know
Date and Time:
Location:
Marco Polo 805 (Level 1). Sand Expo/Venetian
Target:
Comprehensive Ophthalmologists & Glaucoma Sub-Specialists
Level:
Intermediate
Introduction

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Introduction

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Synopsis of Instruction Course

This course covers all you need to know about Argon Laser Peripheral Iridoplasty (ALPI), from indications, contraindications, techniques and pearls, results, to complications and their management. Slit lamp photographs and videos are extensively used in the course, the handout, and the course DVD-ROM to illustrate the critical techniques.
Objective of Instruction Course

At the conclusion of this course, the attendee will be able to safely, effectively, and confidently, perform ALPI in the appropriate patients.
ALPI Instruction Course Webpage
http://www.cuhk.edu.hk/medint/ovs/dovs/alpi.html
Laser Peripheral Iridoplasty

- Laser contraction burns in extreme iris periphery
- Contracting iris stroma, and thereby mechanically pulling open an appositionally closed angle
Mechanical Opening of Appositionally Closed Angles
Laser Peripheral Iridoplasty

Characteristics of ‘Contraction Burns’:
1. Long duration
2. Low power
3. Large spot size

*Argon laser widely used – ‘ALPI’*
*Diode laser also effective*
Argon Laser Peripheral Iridoplasty

Indications & Contraindications
ALPI – INDICATIONS AND OUTCOMES

Robert Ritch, MD, FACS, FARVO, FRCOphth, DSc (Hon)
Shelley and Steven Einhorn Distinguished Chair
New York Eye and Ear Infirmary, New York, NY
Angle-Closure - Mechanisms

• PUSH - Forces originate posterior to the iris and cause the iris to become apposed to the trabecular meshwork, closing the angle
Anatomic basis of angle-closure

• The forces causing angle closure can have a primary origin at 4 anatomic levels
  – Posterior chamber (pupillary block)
  – Ciliary body (plateau iris)
  – Lens (phacomorphic glaucoma)
  – Posterior to the lens (malignant glaucoma)

• Essential: totally dark room and small beam of light focused on the superior angle and wait
Anatomic basis of angle-closure

• Accurate diagnosis and treatment require indentation (dynamic) gonioscopy

• Successful treatment for angle-closure at any particular anatomic level from anterior to posterior may require performing the preferred treatment procedure for angle-closure originating at each of the more anterior levels
Angle-Closure: Terminology

- Pupillary block = impedance to flow of aqueous from the posterior chamber to the anterior chamber
  - Relative
  - Absolute
Angle-Closure Glaucoma

( Before L.I. )

( After L.I. )
Anatomic basis of angle-closure

• PIC can convert to PIS and seal angle

• Classic PIC was “rare” because iris level was at Schwalbe’s line

• Incomplete plateau iris – 97%
Peripheral Iridoplasty

• Simple and effective means of opening an appositionally closed angle in acute angle-closure or for persistent appositional closure after iridotomy has eliminated a pupillary block component

• Argon or diode
Peripheral Iridoplasty

• Acute angle-closure
  – Medically unbreakable attack
  – Primary treatment

• Persistent appositional closure
  – Plateau iris syndrome
  – Lens-related angle-closure
  – Malignant glaucoma

Adjunct to ALT/SLT

• ALPI will not break PAS
ALPI TECHNIQUE

- Contraction burns
- 500 microns
- 0.5-0.7 second
- 240-320 mW

- ABRAHAM LENS

- MUST GO AS PERIPHERALLY AS POSSIBLE
Malignant Glaucoma

- Primary -
  - Anterior lens movement
  - Vitreous expansion

- Secondary - origin posterior to vitreous
  - Usually anatomically predisposed - fellow eye
ALPI - Retreatment

- Directly into angle beyond first burns or can use for focal treatment
- Ritch lens
- 200 microns
- 0.7 second
- 200-400 mW
CONTRAINDICATIONS

• PULL MECHANISMS
  – ICE
  – NVG
  – UVEITIS

• RELATIVE
  – CORNEAL EDEMA OR OPAQUIFICATION
  – ARCUS SENILIS
  – FLAT ANTERIOR CHAMBER
  – SYNECHIAL ANGLE CLOSURE
Complications

- Pop and Pigment – turn down power
- Inflammation – routine postop Pred brand name qid x 4, bid x 2, qd x 7
- Post-steroid discomfort – reinstitute steroids
- Corneal decompensation – have seen one
Urrets-Zavalia syndrome
Iridoplasty - Indications

1. Emergency measure when PI cannot be immediately performed
   - APAC
   - Lens-related mechanism

2. Elective measure in appositional angle closure despite patent LI
   - Plateau iris syndrome
   - Secondary & malignant glaucomas
   - As adjunct to ALT / SLT / GSL
### Management of Acute Primary Angle Closure

<table>
<thead>
<tr>
<th>Treatment Stages</th>
<th>Traditional Approach</th>
<th>Possible Alternative Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong>&lt;br&gt;IOP Reduction &amp; Alleviation of Symptoms</td>
<td>Drugs – topical + systemic</td>
<td>1. Argon laser peripheral iridoplasty (ALPI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. <em>AC Paracentesis</em></td>
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<td>3. <em>Corneal indentation</em></td>
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<tr>
<td><strong>Stage 2</strong>&lt;br&gt;Prevention of:</td>
<td>Laser peripheral iridotomy</td>
<td>Early lens extraction</td>
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<tr>
<td>• APAC recurrence</td>
<td></td>
<td></td>
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<tr>
<td>• Progression to PACG</td>
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</table>
Iridoplasty - Indications

Very useful in APAC:

1. As Primary Procedure
   • Superior efficacy over systemic drugs confirmed by RCT

2. When drugs fail to control IOP
   • Conventional approach
Iridoplasty - Contraindications

1. When AC flat
2. When cornea clear enough for immediate laser iridotomy
APAC RCT
ALPI vs. Systemic IOP-lowering Drugs

<table>
<thead>
<tr>
<th>Immediate ALPI</th>
<th>Systemic Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>~1/2 hour to normalize IOP</td>
<td>&gt;2 hours to normalize IOP</td>
</tr>
<tr>
<td>No systemic adverse effects. No serious local adverse effects.</td>
<td>Potentially serious systemic adverse effects. No serious local adverse effects</td>
</tr>
<tr>
<td>17.6% progressing to CACG (mean FU 14.6 ± 5.2 months)</td>
<td>38.2% progressing to CACG (mean FU 16.9 ± 5.5 months)</td>
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</tbody>
</table>

Immediate ALPI in AAC


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ALPI in APAC

- Advantages of immediate ALPI
  - IOP more rapidly reduced
    - More rapid relief of severe symptoms
    - Possibly less nerve & ocular tissue damage
  - Avoids systemic adverse effects of drugs
  - Reduce long-term risk of progression to CACG
Iridoplasty - Indications

1. Emergency measure when PI cannot be immediately performed
   • APAC
   • Lens-related mechanism

2. Elective measure in appositional angle closure closure despite patent LI
   • Plateau iris syndrome
   • Secondary & malignant glaucomas
   • As adjunct to ALT / SLT / GSL
Acute Phacomorphic Angle Closure

- Acute swelling of mature cataract leading to acute angle closure
- Symptoms resemble APAC
Conventional Management Strategy

- Medically control IOP
- +/- PI
- Early cataract extraction
- +/- Filtration
Conventional Medical Therapy not ideal, because

1. Failed to control IOP in 37.5% (Angra et al, 1991)
2. May take hours to days to reduce IOP
3. Potentially serious systemic adverse effects
Acute Phacomorphic Angle Closure – Analogous to Acute Primary Angle Closure??
Potential Advantages of ALPI

• Prompt IOP reduction
• Prompt symptomatic relief
• No systemic adverse effects
Post-ALPI IOP Profile

Post-ALPI IOP

- At 2 hours, 5 of 10 eyes had IOP $\leq 25$ mmHg
- At 2 hours, 8 of 10 eyes became asymptomatic
- At 4 hours, all 10 eyes had IOP $< 25$ mmHg + asymptomatic

Systemic Drugs

- 1 patient received acetazolamide according to protocol
- 0 patient given mannitol

Day 1

• Mean IOP ± SD = 13.6 ± 4.2 mmHg (range, 7 to 20 mmHg)
• All corneas cleared

Cataract Extraction

- All performed within 4 days with primary IOL
- 6 ECCE + 4 Phaco
- No complications

At Final Follow Up

- Mean FU ± SD = 8.1 ± 8.6 months (range, 1 to 23 months)
- Mean BCVA ± SD = 0.28 ± 0.22 (range, 0.05 to 0.7)
- Diminished BCVA due largely to GON in 7 eyes, and ARMD in 3 eyes

At Final Follow Up

• Mean IOP ± SD = 12.3 ± 3.4 mmHg
• Range, 9 to 19 mmHg
• Only 1 eye on timolol eye drop
• All 10 corneas clear
• Mean CD ± SD = 0.52 ± 0.17
• Range, 0.3 to 0.9

Complications - Nil

- No irreversible peripheral corneal opacity or oedema
- No irido-corneal adhesion
- No significant iris atrophy

Conclusion

Immediate ALPI may be a safe & effective alternative in the initial treatment of acute phacomorphic angle-closure, before the definitive treatment of cataract extraction.

Iridoplasty - Indications

1. Emergency measure when PI cannot be immediately performed
   • APAC
   • Lens-related mechanism

2. Elective measure in appositional angle closure despite patent LI
   • Plateau iris syndrome
   • Secondary & malignant glaucomas
   • As adjunct to ALT / SLT / GSL
ALPI as Adjunct

Laser Trabeculoplasty ALT / SLT

• Widens angle in eyes with narrow access to TM prior to ALT / SLT
• ALPI allows easier & safe access to TM
ALPI as Adjunct

Goniosynechialysis GSL

- Maintain wide-open angle after PAS stripped
- More effective when combined with lens extraction

Iridoplasty - Contraindications

1. Peripheral anterior synechiae (PAS)
2. Extensive peripheral corneal opacity – relative
3. Patient unable to co-operate at slit lamp - relative
Argon Laser Peripheral Iridoplasty Techniques
ALPI - Techniques

Pre-treatment Measures

- Topical anesthesia – eye drop or gel
- Abraham / Wise lens, or other iridotomy lens
ALPI - Techniques

- Mark segments with appositional closure BEFORE pilocarpine
- Pretreat with 2% pilocarpine x 2
- Brimonidine perilaser to prevent IOP spike
ALPI - Techniques

Laser Parameters

- 500 – 1000 microns spot size (brown irides)
  - 200 microns (lighter irides)
- 0.5 s duration
- Start from 150 mW (brown irides)
  - 200-300 mW (lighter irides)
ALPI - Techniques

Do NOT use semi-punch burn settings published elsewhere:

• 200 microns
• 0.2 second
• 200-800 mW power
ALPI - Techniques

- Laser aimed at *most peripheral* portion of iris possible
- Allow aiming beam to slightly overlap the sclera at the limbus
ALPI – Titration of Laser Power

Increase laser power if:
1. No contraction

Decrease laser power if:
1. Bubble formation
2. Iris charred
3. Pigment released into AC
4. ‘Pop’ sound
ALPI – Titration of Laser Power

Visible Endpoint:

• Iris stromal contraction
• Slight deepening of AC at point of application
ALPI – Treatment Parameters

- 20 to 24 spots over 360°
- Avoid large visible radial vessels if possible
- Iris necrosis / atrophy may occur if too many spots placed too closely together
ALPI Procedure

- Topical anesthesia
- Using Abraham contact lens

Video - courtesy of Prof. Robert Ritch
ALPI – Post-op Measures

- Monitor IOP for spike
- Topical steroid – stat, then qid for 1 week
ALPI – Variations in Techniques

Acute setting - APAC:

• **180° ALPI** effective in lowering IOP

Asymptomatic setting:

• ALPI to be applied to areas of documented appositional closure only
• ALPI – not effective on PAS
ALPI – Variations in Techniques

Diode laser also useful for iridoplasty

Advantages:

• No bright light – allowing better visualization of iris contraction
• Possibly better penetration through edematous cornea

ALPI – Tips & Pearls

In lighter irides:

- More power needed than in darker irides
- Try smaller spot size (200 micron) and more burns
ALPI – Tips & Pearls

• **Arcus senilis** should be ignored
• An **extremely shallow AC and corneal edema**, which are relative contraindications to laser iridotomy, do not preclude peripheral iridoplasty
ALPI – Tips & Pearls

• If AC is very shallow, laser applications should be timed enough apart so that heat generated can dissipate
• Alternatively, ALPI can be applied less peripherally first, and then further spots applied more peripherally after AC has deepened
• If necessary, glycerine may help clear the cornea to facilitate ALPI
ALPI – Tips & Pearls
Argon Laser Peripheral Iridoplasty

Special Situations
Retreatment
New developments
Complications & management
Acute Phacomorphic Angle Closure

• Acute swelling of mature cataract leading to acute angle closure
• Symptoms resemble APAC
Malignant Glaucoma

- **Primary** -
  - Anterior lens movement
  - Vitreous expansion

- **Secondary** - origin posterior to vitreous
  - Usually anatomically predisposed - fellow eye
Malignant glaucoma
Ciliary block
Aqueous misdirection
Peripheral Iridoplasty

- Do NOT use semi-punch burn settings, published elsewhere
- 200 microns
- 0.2 second
- 200-800 mW power
ALPI - Alternative Methods

• No pilocarpine
• Consensual light reflex
• No light reflex - directly into angle
• Can assess effect immediately
ALPI – Potential Complications

- Pop and Pigment – turn down power
- Inflammation – routine postop Pred brand name qid x 4, bid x 2, qd x 7
- Postlaser discomfort – reinstitute steroids
- Corneal decompensation – have seen one
ALPI – Potential Complications

- Mild iritis – Self-limiting
- Corneal endothelial burn
  - Mostly self-limiting
  - Minimized by placing an initial contraction burn more centrally before placing the peripheral burn
ALPI – Potential Complications

- Transient IOP spike
- Pigmented burn marks on iris
ALPI – Potential Complications

- Iris atrophy - can be avoided by:
  - using the lowest laser power to achieve iris contraction
  - leaving untreated spaces between 2 laser application sites
Argon Laser Peripheral Iridoplasty

Conclusions
Conclusions

Argon peripheral laser iridoplasty (ALPI)

- Simple and safe
- Effectively opens up appositionally closed angles
- Does not replace iridotomy
- Useful in:
  - APAC
  - Lens-related angle closure
  - Plateau iris syndrome
  - Secondary angle closure
  - Adjunct to ALT / SLT / GSL
Further Reading on ALPI

Recent Review Papers

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Further Reading on ALPI

Recent Book Chapters

Ritch R, Tham CC.
Chapter 45: Laser peripheral iridotomy / iridoplasty
Ophthalmic Surgery – Fourth edition
Lead editors: George Spaeth, Helen Danesh-Meyer, Anselm Kampil
Section editors: Helen Danesh-Meyer, Ivan Goldberg
Publisher: Elsevier, London UK, 2010

Correspondence: clemtham@cuhk.edu.hk
Further Reading on ALPI

Recent Book Chapters

Tham CC, Lam DS, Ritch R.
Chapter: Argon laser peripheral iridoplasty (ALPI)
Essentials of Glaucoma Surgery – First edition
Book editor: Malik Kahook
Publisher: SLACK, New Jersey, USA, 2011

Tham CC, Lai JS, Lam DS.
Chapter 23: Argon laser peripheral iridoplasty (ALPI)
Angle Closure Glaucoma
Editors: Chul Hong, Tetsuya Yamamoto.

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Save the date
February 5-9, 2016

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- XXXII Pan-American Congress of Ophthalmology
Thank You!!

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