Management of Angle Closure Glaucoma

Hospital Authority Convention
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Jimmy Lai
Clinical Professor
Department of Ophthalmology
The University of Hong Kong
Primary Angle Closure Glaucoma (PACG)

- Optic neuropathy 2º to increased IOP caused by angle closure

- Result of apposition/adhesion (PAS) of peripheral iris to trabeculum
Gonioscopy
Drainage angle

- Sclera
- Trabecular meshwork
- Cornea
- Iris
- Lens
- Schwalbe’s Line
- TM (non pigmented)
- TM (pigmented)
- SS
- CB
Gonioscopy

Open angle

Narrow angle
Ophthalmic ultrasound imaging

Schwalbe’s Line
Trabecular Meshwork
Scleral Spur
Ciliary Body Band
Ophthalmic ultrasound imaging
Terminology

1. Primary angle closure suspect (PACS)
   – 180 degree TM not visualized

2. Primary angle closure (PAC)
   – PACS + IOP>21mmHg

3. Primary angle closure glaucoma (PACG)
   – PAC + optic neuropathy
Natural course of PACG

Primary angle closure suspect

10% to 40% in 10 years

Primary angle closure

25% to 30% in 5 years

Primary angle closure glaucoma
The Singapore Chinese Eye Study

• 2009-2011
• 3353 Chinese > 40 years
• Prevalence:
  – Glaucoma - 3.2%
  – POAG - 1.4%
  – PACG - 1.2% (*PACG only, PACS and PAC not included)
  – Secondary glaucoma

• Prevalence of blindness:
  – Secondary glaucoma 14.3%
  – PACG 10.2%
  – POAG 8.8%
Mechanisms of angle closure

1. Plateau iris
2. Pupillary block
3. Phacomorphic
4. Aqueous misdirection
5. Mixed
Primary Angle Closure Glaucoma

• Angle closure risk factors:
  – Short axial length
  – Shallow AC
  – Thick lens
Relative lens vault

Relative LV = LV/AV
Angle closure mechanisms
PACG

• Acute and chronic subtypes

• Acute primary angle closure
  – Symptomatic
  – Results from sudden appositional angle closure leading to a very high IOP

• Chronic angle-closure glaucoma
  – More insidious
  – May follow acute PAC or arise de novo

Corneal edema,
Fixed pupil
Ciliary flush
IOP > 40 mmHg
↓vision
Treatment of PACG

– Decrease IOP

– Reduce risk of further ON damage

– Stop progressive angle closure

– Abolish risk of acute angle closure

– Open up closed angle
Treatment of PACG

Two-step approach

• 1) IOP reduction to relieve symptoms & to prevent irreversible optic nerve damage
  – By systemic & topical IOP-lowering medications or ALPI

• 2) Relieve angle closure mechanism(s) to prevent recurrence
  – By LPI

Anterior segment/drainage angle reconstruction
Phacoemulsification in Angle Closure Glaucoma

- Angle closure mechanisms - racial difference
- Mixed type more common in Asian, pure pupillary block more common in Western population
- LPI not as effective as expected in Asian than in Caucasian
- A significant proportion of patients progressed to chronic type of PACG after LPI
Treatment of PACG

• 2-step approach effective in majority of PACG

• Phacoemulsification becoming more popular in the 2\textsuperscript{nd} step
  – It is claimed that by removing the lens or cataract, angle closure factors other than the pupillary block are also eliminated
Phacoemulsification + intraocular lens implant
Effect of cataract extraction on angle structure

- Angle widen
- AC deepen
## Effect of cataract extraction on IOP

<table>
<thead>
<tr>
<th></th>
<th>Before phacoemulsification</th>
<th>At final FU (Mean FU = 18.0 ± 2.9 months)</th>
<th>P value (paired t test) (Preoperative values vs values at final FU)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IOP</strong></td>
<td>19.7 ± 6.1 mm Hg</td>
<td>15.5 ± 3.9 mm Hg</td>
<td>0.022</td>
</tr>
<tr>
<td><strong>Number of topical glaucoma drugs</strong></td>
<td>1.91 ± 0.77</td>
<td>0.52 ± 0.87</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

*J Glaucoma 2006*
# Non-visually significant cataract extraction in PACG

<table>
<thead>
<tr>
<th>Against</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of a normal ocular structure</td>
<td>May be normal functionally but not anatomically</td>
</tr>
<tr>
<td>Effectiveness not proven</td>
<td>Extrapolate results from cataract extraction/PACG</td>
</tr>
<tr>
<td></td>
<td>Case reports, non-RCT case series</td>
</tr>
<tr>
<td>Surgical risks</td>
<td>Minimal</td>
</tr>
<tr>
<td>Lack of outcome predictor</td>
<td>?phaco/PACG, GSL/PACG</td>
</tr>
<tr>
<td>Limited choices of IOL</td>
<td>May correct pre-existing refractive errors</td>
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</table>
EAGLE study
Effectiveness, in Angle-closure Glaucoma, of Lens Extraction

• Multi-center RCT
• Around 400 subjects
• Evaluate whether early lens extraction improves clinical outcomes & cost-effectiveness compared with LPI
Angle Closure Glaucoma
Consider phacoemulsification

- Visually significant cataract
- Shallow AC after LPI
- Uncontrolled IOP/progressive angle closure after LPI
- Clinically bulging lens (increased relative lens vault)
- Hypermetropia >+2D & both eyes indicated for lens extraction
- Loose zonules
- Age>50
Management of PACG

Medical therapy

LPI

IOP controlled

IOP uncontrolled

Phaco

Early cataract/Lens extraction

Newly diagnosed PACG
Acute, chronic
Cataract, no cataract
What if phacoemulsification fails to control IOP

• Goniosynechyliaasis (GSL)

• Glaucoma filtration surgery
  – Trabeculectomy
  – Glaucoma shunt
Cost-effectiveness of phacoemulsification in the treatment of PACG

Local data from 3 HA hospitals from March 2002 to October 2007

• 53 PACG eyes with phacoemulsification:
  • Before surgery
    – Mean IOP 19.8 +/- 6.1 mmHg
    – Mean number of glaucoma drugs 2.7 +/- 1.0
  • At 6 years
    – Mean IOP 14.7 +/- 2.5 mmHg
    – Mean number of glaucoma drugs 1.6 +/- 1.2
• 10 patients (18.9%) required trabeculectomy at a mean time of 2.53 +/- 1.38 years
Summary

• Primary angle closure is an anatomical disorder (occludable angle)
• Can progress from PACS to PAC & to PACG
• Anatomical disorder may be reversed but not the optic nerve damage
• 2-step treatment approach to PACG relatively clear cut
• Treatment of PACS and PAC controversial
**Summary**

- PACG can be acute or chronic (majority)
- Treatment is by 2-step approach

<table>
<thead>
<tr>
<th></th>
<th>Acute</th>
<th>Chronic</th>
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<tr>
<td><strong>1st step</strong></td>
<td></td>
<td></td>
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<tr>
<td>IOP reduction</td>
<td>In hours</td>
<td>In weeks</td>
</tr>
<tr>
<td><strong>2nd step</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior segment</td>
<td>LPI in hours to days</td>
<td>Cataract extraction when indicated</td>
</tr>
<tr>
<td>reconstruction</td>
<td>Cataract extraction when indicated</td>
<td></td>
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<tr>
<td><strong>3rd step</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glaucoma surgery</td>
<td>When 2-step approach fails</td>
<td>When 2-step approach fails</td>
</tr>
<tr>
<td><strong>Loss of vision</strong></td>
<td>Immediate</td>
<td>Gradual</td>
</tr>
<tr>
<td>if untreated</td>
<td></td>
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<tr>
<td><strong>Follow-up</strong></td>
<td>Life long</td>
<td>Life long</td>
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Management of Angle Closure Glaucoma

Thanks to the human lens which after removal, leaves more space inside the eye which is desperately needed in PACG.
Thank you