Managing & Avoiding Post-Op Complications in Tube Surgeries

K. Sheng Lim
St. Thomas’ Hospital, London

shenglim@gmail.com
Current GDD

Molteno 1969

Baerveldt 1990

Ahmed 1993
<table>
<thead>
<tr>
<th>GDD</th>
<th>Plate Material</th>
<th>Plate Size</th>
<th>Resistance Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molteno (1969)</td>
<td>Polypropylene &amp; Silicone</td>
<td>135 mm²</td>
<td>No</td>
</tr>
<tr>
<td>Baerveldt (1990)</td>
<td>Silicone</td>
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</tr>
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<td>185 mm²</td>
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Post operative Mx – main issues

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<th>Early Hypotony</th>
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Post operative Mx – main issues

Early Hypotony
Tube Related
Corneal decompensation
Tube/Plate Erosion
Bleb Encapsulation
Post-op IOP

- IOP
- Hypotony
- Week 6
- Bleb resistance
Treatment Outcomes in the Ahmed Baerveldt Comparison Study after 1 Year of Follow-up

Donald L. Budenz, MD, MPH,1 Keith Barton, MD,2 William J. Feuer, MS,1 Joyce Schiffman, MS,1 Vital P. Costa, MD,3 David G. Godfrey, MD,4 Yvonne M. Buys, MD,5 for the Ahmed Baerveldt Comparison Study Group

<table>
<thead>
<tr>
<th>Complication</th>
<th>Ahmed Glaucoma Valve Group</th>
<th>Baerveldt Glaucoma Implant Group</th>
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<tbody>
<tr>
<td>Tube occlusion</td>
<td>3 (2%)</td>
<td>12 (9%)</td>
</tr>
<tr>
<td>Choroidal effusion</td>
<td>21 (15%)</td>
<td>13 (10%)</td>
</tr>
<tr>
<td>Suprachoroidal hemorrhage</td>
<td>0</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Endophthalmitis</td>
<td>0</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Cystoid macular edema</td>
<td>8 (6%)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Shallow anterior chamber</td>
<td>27 (19%)</td>
<td>26 (20%)</td>
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<tr>
<td>Hypotony maculopathy</td>
<td>5 (3%)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Diplopia</td>
<td>9 (6%)</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Corneal edema</td>
<td>17 (12%)</td>
<td>29 (22%)</td>
</tr>
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<td>Tube–corneal touch</td>
<td>7 (5%)</td>
<td>8 (6%)</td>
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Strategies to prevent hypotony

Ahmed valve

Molteno & Baerveldt – Vicryl tube tie

Molteno & Baerveldt - Supramid stenting
Does flow control mechanism in Ahmed work?

  No
- Porter et al. *Ophthalmology*. 1997; 104(10): 1701
  Yes
  Yes
  30(8): 662
  Yes

Ahmed valve has consistent flow control mechanism
Does flow control mechanism in Ahmed work?

Evaluation of Closing Pressure in Ahmed Glaucoma Valve

**Purpose:** Ahmed Glaucoma Valve closing pressure using a gravity-driven flow system

**Methods:** 6 FP7, primed with BSS then assessed in flow rig

**Results:** All 6 AGV exhibited valve closure, with mean closing pressure was 8.2 ± 5.0 mmHg with a range of 2.5 to 14.6 mmHg.

**Conclusions:** Ahmed FP7 is prone to variations in closing pressure

**FP7 can have inconsistent closing pressure**
In vivo Flow Testing of Ahmed Valve

- From July 2008
- Single surgeon
- St Thomas’ Hospital
- Uveitic, previous cyclodioide & neovascular
  - i.e. low aqueous production rate

Goyal, Jones, Alaghband, Beltran-Agullo, Lim ARVO 2010
Constant Pressure Flow Test

13.6 cm H$_2$O = 10 mmHg

- BSS bottle
- Giving set
- 26 gauge cannula
- Primed Ahmed Valve before testing
Constant Pressure Flow Test

13.6 cm H$_2$O = 10 mmHg

- BSS bottle
- Giving set
- 26 gauge cannula
- Primed Ahmed Valve before testing
Ahmed Valve
constant pressure flow test
Gravity-driven Flow Test

13.6 cm H₂O = 10 mmHg
13.6 cm H₂O = 10 mmHg
Ahmed Glaucoma Valve - Rejection

- Free flow of fluid at 7 mmHg
- No flow of fluid at 15 mmHg
- 24 AGV since July 2008
- 4 rejections; 3 hypotony, 1 high opening pressure

Goyal, Jones, Alaghband, Beltran-Agullo, Lim ARVO 2010
In vivo flow testing Ahmed Valve

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<tr>
<td>Age mean (range)</td>
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<tr>
<td>Mean pre-op IOP (range)</td>
<td>29 (10-57)</td>
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<td>15 (3-52)</td>
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Goyal, Jones, Alaghband, Beltran-Agullo, Lim ARVO 2010
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Molteno & Baerveldt – Vicryl tube tie

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Post-op IOP – Tube Vicryl Tie

IOP

Hypotony

Hypertensive

Time

Combine resistance
Post-op IOP – Tube Vicryl Tie & Perforation

Hypertensive

Combine resistance

Hypotony

IOP

Time

- Unpredictable results
- May still have risk of hypotony
Strategies to prevent hypotony

Ahmed valve

Molteno & Baerveldt – Vicryl tube tie

Molteno & Baerveldt - Supramid stenting
The Baerveldt Glaucoma Implant: A new technique for more consistent IOP control.
Heatley C, Lim KS, Barton K.
October 2005. AAO video
Post-op IOP – Supramid stent

Hypertensive

Supramid removal

Hypotony

Time

IOP
Post Op Hypotony

AC

- Formed
  - No other complication
    - 1 week review
  - Maculopathy or Effusion
    - 1 week review/Healon in AC
- Shallow
  - No other complication
    - 1 week review
  - Maculopathy or Effusion
    - Healon in AC
- Flat
Post Op Hypotony

AC

Formed
- No other complication
  - 1 week review

- Maculopathy or Effusion
  - 1 week review/Healon in AC

Shallow
- No other complication
  - 1 week review

- Maculopathy or Effusion
  - Healon in AC

Flat
- Tube Tie
Tube Tie – 8.0 Prolene
Post operative Mx – main issues

- Early Hypotony
- Tube Related
- Corneal decompensation
- Tube/Plate Erosion
- Bleb Encapsulation
Tube Blockage

K. Barton
Post operative Mx – main issues

- Early Hypotony
- Tube Related
- Corneal decompensation
- Tube/Plate Erosion
- Bleb Encapsulation
44 year-old lady
Congenital glaucoma
Multiple trabeculectomies
Bilateral Molteno 1990

RVA PL

RVA 6/60
Corneal Endothelial Loss following Tube Surgery


Topouzis et al. Am J Ophthalmol. 1999 Aug;128(2):198-204. Follow up of the original cohort with the Ahmed glaucoma valve implant 30% corneal complication rate at 4 years

Corneal Endothelial Loss following Tube Surgery


- GDD is an independent risk factor for graft failure


endothelial cell progressively decreased after AGV
What causes corneal decompensation?

- Prior corneal endothelial damage
- IOP related
- Physical attrition by the tube
What causes corneal decompensation?

- Prior corneal endothelial damage
- IOP related
- Physical attrition by the tube
Video from K. Barton
Tips to avoid corneal complications

Careful gonioscopy pre-op

Do not over inflate anterior chamber

Place tube as close as possible to the iris

Revised tube position if touching cornea
Tips to avoid corneal complications

- Careful gonioscopy pre-op
- Do not over inflate anterior chamber
- Place tube as close as possible to the iris
- Revised tube position if touching cornea
Tips to avoid corneal complications

Careful gonioscopy pre-op

Do not over inflate anterior chamber
- Avoid combine surgery if possible

Place tube as close as possible to the iris

Revised tube position if touching cornea
Tips to avoid corneal complications

- Careful gonioscopy pre-op
- Do not over inflate anterior chamber
- Place tube as close as possible to the iris
- Revised tube position if touching cornea
Corneal Decompensation
Post operative Mx – main issues

- Early Hypotony
- Tube Related
- Corneal decompensation
- Tube/Plate Erosion
- Bleb Encapsulation
## Tube Erosion

<table>
<thead>
<tr>
<th>Technique</th>
<th>Risk of Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>No covering</td>
<td>20%</td>
</tr>
<tr>
<td>Trabeculectomy flap</td>
<td>10%</td>
</tr>
<tr>
<td>Long needle track</td>
<td>2.5%</td>
</tr>
<tr>
<td>Graft – Scleral/Cornea/Tutoplast</td>
<td>2%</td>
</tr>
</tbody>
</table>
Long Needle Track

Oscar Albis Donado, MD
Corneal Patch Graft
Tutoplast Patch Graft

Tutoplast® Pericardium
Bioimplantat aus humanem Perikard, 
γ-strahlensterilisiert
Bioimplant of human pericardium, sterilized by gamma irradiation

Inhalt / Content: 1 Stück / Piece
Größe / Size: 15 mm x 15 mm
Art.-Nr. / Order No.: 58250

Verarbeitet / Processed:
06.2009
Verwendbar bis / Expiry date:
06.2014
<table>
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<tr>
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<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Scleral Patch</td>
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<td>Expensive (£400)</td>
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<tr>
<td></td>
<td></td>
<td>Short shelf life (1 day)</td>
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<tr>
<td>Tutoplast</td>
<td>Cheap (£90)</td>
<td>Cosmesis</td>
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<td></td>
<td>Long shelf life (4 years)</td>
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Tube Erosion
Tube Erosion
Post operative Mx – main issues

- Early Hypotony
- Tube Related
- Corneal decompensation
- Tube/Plate Erosion
- Bleb Encapsulation
Bleb Encapsulation

Needling

Bleb excision

Another shunt or Cyclodiode
Bleb Encapsulation

- Needling
- Bleb excision
- Another shunt or Cyclodiode