New Times. Old Problem

- Convergence excess ET
  - ET 25  ET’ 35
  - [nearly] everyone BMR 5mm
  - ET 35  ET’ 50.......6mm
  - ET 15  ET’ 50

What surgical dosage BMR?
Scleral Posterior Fixation Suture

- Cüppers 1976
- Became known as “Faden” suture
- Attaches rectus muscle to globe 12-14mm behind insertion
  - Medial rectus – convergence excess
  - Superior rectus – DVD

- Limits effect of muscle in its field of action
  - Minimal effect on primary position
Scleral Posterior Fixation Suture

- Preventing arc of muscle contact from unravelling decreases moment arm and thus torque acting on muscle
Scleral Posterior Fixation Suture

- Forced duction test post-Faden
  - Sutured muscle is tight
- Change of lever arm is not the only effect
- Clark, Demer
- Posterior fixation sutures: a revised mechanical explanation for the fadenoperation
- Am J Ophth 1999
Faden Suture

- Restriction thus explained

A, B: ant & post extent of pulley sleeve
Medial Rectus Pulley Suture

- Clark, Ariyasu and Demer
  - American Journal Ophthalmology, June 2004
Medial Rectus Pulley Suture

Original MR insertion

Medial orbital wall

Medial Rectus (MR)
Medial Rectus Pulley Suture

- 22 pts: acquired ET with high AC/A ratio
  - 9 scleral fixation
    - Mean F/U 22 months
    - Mean near excess decreased from 16.2^ to 4.4^  
    - 1 under-correction (didn’t have BMR)
  - 13 “pulley posterior fixation”
    - Mean F/U 9.7 months
    - Mean near excess decreased from 16.8^ to 2.5^  
    - 1 over-, 1 under-correction (didn’t have BMR)

- No significant differences between groups apart from F/U
Recurrent ET
- Near excess decreased from 12.1^ to 1.3^.

Sensory ET
- 2 over-corrections
  - Poor measurements
  - Enhanced effect of LR resect combined with pulley suture
    - Recommend decrease MR dose in this setting
Melbourne Experience

- Lionel Kowal performing MR pulley fixation suture surgery from late 2006
  - Invaluable guidance/advice from Joe Demer

- 44 cases thus far
  EW: n=2
3 key slides

- 1. forced duction test to show that there is no restriction of MR
- 2. measure distance from lateral limbus to caruncle
- 3. repeat measurement after MR pulley placed
Melbourne Experience: Surgical technique

Forced duction test to show that there is no restriction of MR
Melbourne Experience: Surgical technique

Measure distance from lateral limbus to caruncle.
Melbourne Experience: Surgical technique

Repeat measurement after MR pulley placed
Melbourne Experience:
Checking restriction produced

- 26/44 with restriction check
- Average (when measured) 3.2mm
  - increase in distance from temporal limbus to caruncle on adduction
Melbourne Experience: Surgical technique

- Pulley final copy 2 wmv
Melbourne Experience: Patient characteristics

<table>
<thead>
<tr>
<th>Convergence excess</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aim:</strong> spectacle independence</td>
<td>16</td>
</tr>
<tr>
<td>Low hyperopia</td>
<td>9</td>
</tr>
<tr>
<td>D=N with bifocals</td>
<td>4</td>
</tr>
<tr>
<td>Spectacle intolerance</td>
<td>3</td>
</tr>
<tr>
<td>Variable ET</td>
<td>4</td>
</tr>
<tr>
<td>Infantile ET</td>
<td>3</td>
</tr>
<tr>
<td>Sensory ET</td>
<td>2</td>
</tr>
<tr>
<td>Recurrent ET</td>
<td>3</td>
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</tbody>
</table>

- NB some overlap between groups
Melbourne Experience: Pre-operative details

- For n=44

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at surgery (yrs)</td>
<td>6.0</td>
<td>(0.6 – 23.7)</td>
</tr>
<tr>
<td>Follow-up (months)</td>
<td>8.6</td>
<td>(0 - 28.1)</td>
</tr>
<tr>
<td>N&gt;D disparity (Δ)</td>
<td>20.9</td>
<td>(-5 – 65)</td>
</tr>
</tbody>
</table>
Melbourne Experience: Follow-up

- For $n=44$

![Bar chart showing follow-up percentages across different time periods: 90.91% for 1-3 months, 38.64% for 3-6 months, 34.09% for 7-12 months, and 27.27% for 12+ months.](Image)
Melbourne Experience: Outcome measures

- For n=44

<table>
<thead>
<tr>
<th>Δ</th>
<th>CT D (with best available correction)</th>
<th>N-D</th>
<th>ΔN-D</th>
</tr>
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<tbody>
<tr>
<td>1-3 months</td>
<td>1.3</td>
<td>6.6</td>
<td>-13.8</td>
</tr>
<tr>
<td>4-6 months</td>
<td>4.1</td>
<td>4.1</td>
<td>-13.4</td>
</tr>
<tr>
<td>12+ months</td>
<td>3.8</td>
<td>0.7</td>
<td>-22.3</td>
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</table>
Melbourne Experience: Outcome measures

- For n=44
  - Over-corrections
    - At 1-3 months: 4 (10%)
    - At 4-6 months: 2 (11.8%)
    - At 7+ months: 0
    - At final follow-up: 3 (6.8%), 1 > 10^XT
  - Technical failures
    - 4 pulley sutures unable to be placed (4 eyes, 4 pts)
      - Used Faden in 2 cases, (unplanned) unilateral pulley sutures in 1 case, and no fixation suture in 1 case
    - 2 patients required further surgery
      - At one month and seven months
Melbourne Experience: Pre-operative details

- For convergence excess cases (n=25)

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<tr>
<td><strong>Age at surgery (yrs)</strong></td>
<td>5.4</td>
<td>(1.8 - 11.0)</td>
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<td><strong>Follow-up (months)</strong></td>
<td>8.9</td>
<td>(0.1 - 28.1)</td>
</tr>
<tr>
<td><strong>N&gt;D disparity (Δ)</strong></td>
<td>23</td>
<td>(6 – 47)</td>
</tr>
</tbody>
</table>
Melbourne Experience: Surgical details

- For convergence excess cases (n=25)
  - All underwent BMR recessions
    - Mean 4.85 mm
    - General dose = for average of near and distance deviations
  - All underwent bilateral pulley sutures
    - Except one technical failure
      - Scleral Faden placed left eye, pulley suture right eye
      - Straight at near and distance at 3 months
Melbourne Experience: Outcome measures

- For convergence excess cases (n=25)

<table>
<thead>
<tr>
<th>Units = Prism dioptres</th>
<th>CT D (with best available correction)</th>
<th>N-D</th>
<th>ΔN-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 months</td>
<td>-0.2</td>
<td>7.4</td>
<td>-14.7</td>
</tr>
<tr>
<td>4-6 months</td>
<td>4.6</td>
<td>3.6</td>
<td>-17.4</td>
</tr>
<tr>
<td>12+ months</td>
<td>4.0</td>
<td>0.8</td>
<td>-19.7</td>
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Melbourne Experience: Outcome measures

- For convergence excess cases (n=25)
  - 7 (28%) had bifocals pre-operatively
    - 3 (43%) were able to discontinue bifocal wear during follow-up period
  - 1 (5.6%) required bifocals post-operatively, when not required pre-operatively
Melbourne Experience: Outcome measures

- For convergence excess cases (n=25)
  - Over-corrections
    - At 1-3 months: 3 (12.5%)
    - At 4-6 months: 2 (25%)
    - At 7+ months: 0
    - At final follow-up: 2 (8%), 1 > 10^XT
Melbourne Experience:

- For variable esotropia patients (n=4)
  - 3 infantile esotropia
  - Variability or difficulty assessing deviation reliably = common feature
Pulley Posterior Fixation Suture

- Logical application of current understanding of orbital anatomy
- Safe
- Effective at decreasing near excess
  - $\Delta 12-17^\wedge$
- Low risk significant over-correction ($\leq 3\%$)
- Technically difficult
- Probably not effective as isolated procedure
The Future

- Long-term follow-up?
- Is titratability possible?
- Role of intraoperative restriction?