A Cohort of High Hypermetropes with Esotropia
How well do they do?

Lionel Kowal
Jo-Anne Pon
Chris Chen

Royal Victorian Eye and Ear Hospital

Squint Club Meeting April 2008
Method

- 86 consecutive cases from private practice of strabismologist
- Retrospective audit
- High hypermetropia ≥6DS
- With esotropia
- Progressive hypermetropia (change in refraction ≥1.5DS)
Data

- Age of presentation
- Follow-up
- Visual acuities
- Best Stereopsis
- Refractive error (cycloplegic)
- Ocular deviation – esotropia & cyclovertical
- Surgery and response
Data

• N=86

• Follow-up
  Mean 20.2 months (0-216)
High Hypermetropia in Literature

• Parks 1958
  – 143/897 = 16% (>5.25D & ET)

• Abrahamsson 1992 (>5D & strabismus)
  – 2/49 = 4%
  – Progressive Hypermetropia
    • 5/41 (Δ by 2-3D), 3/41 (Δ by 1-<2D)
    • 41 with ET

1. Abnormal Accommodative Convergence in Squint, Parks, Archives in Ophthalmology, 1958;59 March
2. Refraction changes in childhood developing convergent or divergent strabismus, Abrahamsson, BJO 1992;76:723-727
Progressive Hypermetropia in Literature

• Abrahamsson 1992
  – Progressive Hypermetropia
    • 5/41 (Δ by 2-3D), 3/41 (Δ by 1-<2D)
    • 41 with ET (Range of Refractive Error?)

• Progressive hypermetropia in this study
  – 25/70 (36%)

Refraction changes in childhood developing convergent or divergent strabismus, Abrahamsson, BJO 1992;76:723-727
Average Age of Presentation

- 2.6yrs – this study
- Parks 1958 2.5yrs
- Abrahamsson 1992 2-3yrs

1. Abnormal Accommodative Convergence in Squint, Parks, Archives in Ophthalmology, 1958;59 March
2. Refraction changes in childhood developing convergent or divergent strabismus, Abrahamsson, BJO 1992;76:723-727
Age of Presentation (%)

- **Progressive Hyperopia**
- **Non-progressive Hyperopia**

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>&lt;1</th>
<th>≥1&lt;2</th>
<th>≥2&lt;3</th>
<th>≥3&lt;4</th>
<th>≥4&lt;5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Presentation (%)</td>
<td>5%</td>
<td>25%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Isoametropic Hyperopes

Age of Presentation

- Progressive Hyperopia
- Non-progressive Hyperopia
- Isoametropic Hyperopes

The chart shows the age of presentation categorized into different ranges:
- <1
- ≥1<2
- ≥2<3
- ≥3<4
- ≥4<5
- ≥5<6

The data is represented using bars with different colors for each category.
Isoametropic Hyperopes
Age of Presentation

- Isoametropic Hyperopes present later
- Klimek – 5yrs 1mo vs 3yrs 5 mo (all hyperopes)
- Ziylan – 5.5 yrs vs 4.1 yrs (all hyperopes)

- Not in this study
  – Majority before age 3
High Hyperopes & Amblyopia

• Bilateral amblyopia ($\leq 6/12$)
  – 18% this study
  – 9% - Klimek ($\geq 4.5\text{D}$, no anisometropia $\geq 1.5\text{D}$)

• Responded well to Rx – glasses & patching

• After Amblyopia Rx – achieved $> 6/12$
  – 86% - Klimek ($\geq 6/12$)
  – 83.9% - Ziylan
  – 83% - this study

Isoametropic Amblyopia Due to High Hyperopia in Children, Klimek et al, JAAPOS, 2004;8:310-313
BCVA in better eye

- VA ≥ 6/7.5
  - 23/60 (38%) – this study (higher hypermetropia, ≤1.5D anisometropia)
  - 58% Klimek (≥5D, ≤1.5D anisometropia)

- Overall do high hypermetropes do worse?
Progressive Hypermetropia & BCVA in worse eye
BCVA better eye

Progressive hyperopia
Non-progressive hyperopia

14  | 6   | 2    | 5    | 1    | 1    | 1
Stereopsis

• No difference between progressive hyperopes and non-progressive hyperopes
Age of Presentation & Best Sensory Fusion

- No Stereopsis
- 4dot
- FLY
- 200”-25”

Age buckets:
- <1
- ≥1<2
- ≥2<3
- ≥3<4
- ≥4<5
- ≥5<6
- ≥6<7
Stereopsis

• Higher levels of stereopsis found in those who presented later
• (rather than early detection and Rx)

% with stereopsis
  – 89.3% - Mulvihill (range of hyperopia uncertain)
  – 33% - this study

Outcome in refractive accommodative esotropia, Mulvihill et al, BJO 2000; 84:746-749
Progressive Hyperopes & Esotropia

Size of deviation
- Large
- Medium
- Small
- Orthotropia

Progressive hyperopia
Non-progressive hyperopia
Surgery & Size of Deviation

- Large D & N > 20Δ
- Medium e.g. D=0 N=30 or both 15 Δ
- Small D & N ≤ 10Δ

- Fully accommodative: 1
- Partially accommodative: 3 + 4 = 7
- Non accommodative: 14

Large
Medium
Surgery in fully accommodative ET

• Decompensation of fully accommodative ET
  – 2.4% requires surgery (Mulvihill)
  – 1/40 = 2.5% (this study)

Outcome in refractive accommodative esotropia, Mulvihill et al, BJO 2000; 84:746-749
Progressive Hyperopes & Surgery

- Progressive hyperopia
- Non-progressive hyperopia

<table>
<thead>
<tr>
<th></th>
<th>Surgery</th>
<th>No Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Non-progressive</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>
Surgery

• Rate 30/85 (35%)
  – 1 Operation: 24
  – 2 Operations: 5
  – 3 Operations: 1
  – Reoperation rate 6/24 (25%)

• Reoperation rate of surgeon
  – BMR 10%
  – <2yrs old 15%,
  – Difficult group (consecutive XT) 16%
Surgery results

Results for 6 patients unknown

- Good ≤ 10Δ: 3 (Progressive hyperopia), 13 (Non-progressive hyperopia)
- Acceptable (>10Δ): 3 (Progressive hyperopia), 1 (Non-progressive hyperopia)
- 2nd surgery: 4
Cyclovertical Anomaly

- N=86
- Present 32 (37%)
- None 54 (63%)
Cyclovertical anomaly

Progressive hyperopia
Non-progressive hyperopia

Vertical deviation absent
Vertical deviation present
Differences between \( \geq 6\text{DS} \& \text{ET} \) vs \(<6\text{DS} \pm \text{ET}\)

- 36% Progressive hypermetropia
  - More common with high plus
- Bilateral amblyopia – higher risk
- Sensory fusion seen if presenting age \( \geq 2\text{yrs}\)
- Reoperation rate 25%
Progressive vs Non-progressive hypermetropia

Progressive hypermetropes more likely to

• Have amblyopia - But responds well to Rx
• More likely to have larger angle ET
• More likely to require surgery
• Less likely to have good results
  • Progressive hyperopes – not well reported in literature