PINK AND PULSELESS HAND IN CHILD’S GARTLAND III SUPRACONDYLAR HUMERAL FRACTURE

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SpR Training Day - The Ark, Basingstoke
9th April 2010
CASE EXAMPLE

- 7 yr old boy
- Attended minor injuries unit
  - Supracondylar # diagnosed
- Blue lighted to local DGH (no vascular surgeons)
  - Pulseless, pink hand
- Referred to tertiary hospital
- MUA + K wires $\rightarrow$ pulse returned
CLASSIFICATION

- I  Undisplaced fracture
- IIA  Posterior angulation, intact posterior cortex, no rotation
- IIB  Posterior angulation, intact posterior cortex, malrotation
- III  Complete displacement, no cortical contact

Gartland JJ. (Surg Gynecol Obstet, 1959) \(^1\)
Wilkins KE. (Fractures in Children, Vol. 3, 1984) \(^2\)
GARTLAND III FRACTURE
INCIDENCE

- NV injury more common with posterolateral displacement of distal fragment

- Absent radial pulse: 10 – 20% \(^{4-7}\)

- Vascular complications presenting as an absent pulse: 3.2 – 14.3\% \(^{8}\)

- Associated neurological injury: 60\% \(^{9,10}\)
  - Median nerve
  - Anterior interosseus nerve
THE PROBLEM

- Initial management
  - Attempt reduction
  - Seek vascular opinion
  - Explore

- Subsequent management (following satisfactory reduction and stabilisation):
  - Pulse, well perfused
  - No pulse, well perfused
  - No pulse, poorly perfused
MALVIYA et al. (J Pediatr Orthop B, 2006)\textsuperscript{10}

- British Society for Children’s Orthopaedic Surgery

- Following stabilisation:
  - Observe - 60%
  - Urgent exploration - 16%
  - Vascular opinion - 24%
## EVIDENCE FOR OBSERVATION

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Total pts</th>
<th>Pink pulseless</th>
<th>Time taken for pulse to return</th>
<th>Mean f/u</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garbuz et al. ⁹ (J Paediatr Orthop)</td>
<td>1996</td>
<td>326</td>
<td>16 (3)</td>
<td>48 hrs</td>
<td>4.5 yrs</td>
</tr>
<tr>
<td>Pirone et al. ⁴ (JBJS Am)</td>
<td>1988</td>
<td>230</td>
<td>21 (4)</td>
<td>1-4 days</td>
<td>4.6 yrs</td>
</tr>
<tr>
<td>Louahem et al. ¹¹ (J Paediatr Orthop B)</td>
<td>2006</td>
<td>210</td>
<td>26 (2)</td>
<td>4-6 days</td>
<td>n/a</td>
</tr>
<tr>
<td>Gosens and Bongers ¹² (Injury)</td>
<td>2003</td>
<td>n/a</td>
<td>n/a (4)</td>
<td>Prior to d/c</td>
<td>3-6 mths</td>
</tr>
<tr>
<td>Lally et al. ¹³ (Ann Surg)</td>
<td>1990</td>
<td>11</td>
<td>n/a</td>
<td>n/a</td>
<td>15.8 yrs</td>
</tr>
<tr>
<td>Lipscomb and Burleson ¹⁴ (JBJS Am)</td>
<td>1955</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
## EVIDENCE FOR EXPLORATION

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Absent or diminished pulse</th>
<th>Absent pulse after initial mx</th>
<th>Time to surgery</th>
<th>Findings on exploration</th>
<th>Mean f/u</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copley et al. (^{15}) (J Paediatr Orthop)</td>
<td>1996</td>
<td>17 (128)</td>
<td>5</td>
<td>&lt;30 mins</td>
<td>Entrapment (1)</td>
<td>28 mths</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Injury requiring vascular repair or graft (4)</td>
<td></td>
</tr>
<tr>
<td>Rabee et al. (^{16}) (Saudi Med J)</td>
<td>2001</td>
<td>n/a</td>
<td>5 (pink)</td>
<td>n/a</td>
<td>Entrapment (5)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 (white)</td>
<td></td>
<td>Comp syndrome (1)</td>
<td></td>
</tr>
<tr>
<td>Noaman (^{17}) (Microsurgery)</td>
<td>2006</td>
<td>120 (840)</td>
<td>31</td>
<td>n/a</td>
<td>Aneurysm (17)</td>
<td>26 mths</td>
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<td></td>
<td></td>
<td>Transection (8)</td>
<td></td>
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<td>Thrombosis (3)</td>
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<td>Partial tear (2)</td>
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<td></td>
<td></td>
<td></td>
<td>Entrapment (1)</td>
<td></td>
</tr>
<tr>
<td>Blakey et al. (^{18}) (JBJS Br)</td>
<td>2009</td>
<td>26 (pink)</td>
<td>26</td>
<td>3 mths</td>
<td>Entrapment (9)</td>
<td>15.5 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23 isch cont.</td>
<td>21 explored</td>
<td>Constricted by scar tissue (11)</td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Nerve entrapment (M9,R3,U1)</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Nerve compression (M14,R15,U12)</td>
<td></td>
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<td></td>
<td></td>
<td>Nerve transection (M1,R1,U0)</td>
<td></td>
</tr>
</tbody>
</table>
MANGAT et al. (JBJS Br, 2009)

- **Observation - 11**
  - pulse returned (7)
    - <24hrs (2)
    - 1-3 wks (3)
    - 1-3 mths (2)
  - pulse absent (4)
    - Entrapment (2)
    - Injury requiring repair (1)
    - Spasm (1)

- **Exploration – 8**
  - Entrapment (6)
  - Spasm (2)

<table>
<thead>
<tr>
<th></th>
<th>Vascular entrapment</th>
<th>No vascular entrapment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op nerve palsy</td>
<td>7 (p=0.01)</td>
<td>0</td>
</tr>
<tr>
<td>Normal pre-op neurology</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
A ROLE FOR IMAGING

- Sabharwal et al. (J Paediatr Orthop, 1997)\textsuperscript{20}
  - 12/410 pink pulseless hand
  - 8-12 hrs obs → angiography +/- thrombolysis/exploration

- Luria et al. (J Paediatr Orthop B, 2007)\textsuperscript{21}
  - Aid planning for vascular repair

- Non invasive procedures
  - Doppler USS
  - Colour flow duplex
  - Segmental pressure monitoring
  - Magnetic resonance angiography
CONCLUSIONS

- Literature unclear
- Observation
  - Good long term outcome
  - Collateral circulation
- Exploration
  - If additional clinical signs of critical ischaemia
  - If associated nerve injury
- Imaging
  - May have a role
  - Not without its risks
CASE EXAMPLE

- 7 yr old boy
- Attended minor injuries unit
  - Supracondylar # diagnosed
  - Pulseless, pink hand
- Blue lighted to local DGH (no vascular surgeons)
- Referred to tertiary hospital
- Closed reduction → pulse returned
‘it is interesting to observe the trepidation with which men, otherwise versed in trauma, approach a fresh supracondylar fracture’

Gartland, 1959
REFERENCES

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