Parent reliability detecting neurovascular complications in children with plasters

Di Crellin ¹⁻³, Akshay Bapat ², Franz Babl ¹⁻³

Royal Children’s Hospital
The University of Melbourne
Murdoch Children’s Research Institute
Research background

- Limb fractures common in the emergency department (ED) (Hart 2006)
- Immobilisation often with encircling plaster (Hutson 2004)
- Complications can occur secondary to plaster (Turner 2010)
- Plaster checks widely recommended (RCH Factsheet 2010, Kelly 1996)
Research background

- 2009 RCH audit of families of children plastered in ED showed
  - Patients often not referred for a plaster check
  - Families don’t always remember the details of plaster instructions  (Crellin et al, 2009)
- No studies examining parents’ ability to detect abnormal neurovascular findings or complications
Aims of the study

Primary objective:

- To determine the reliability of parents in detecting abnormal neurovascular findings following application of an encircling plaster for “complex” limb fractures
Study design

- Prospective inter-rater reliability study
- Eligible patients recruited for plaster check approx 24h following plaster application
  - Inpatients seen on the ward
  - Outpatients asked to return to ED
- Parent and treating clinician assessed neurovascular parameters
- Older patients (>12 years) also completed the assessment
Data collection

- Demographic data
- Assessment data - ‘plaster check’
  - Swelling
  - Colour change
  - Temperature change
  - Movement
  - Findings of concern
Participant selection

- **Inclusion criteria:**
  - 0-18 years old
  - “Complex” limb fractures
  - Encircling plaster applied

- **Exclusion criteria:**
  - Parents requiring an interpreter
“Complex” fractures

- A fracture where there is an increased risk of swelling and therefore complications such as compartment syndrome
- Therefore defined as a:
  - Fracture requiring manipulation
  - Fracture to the lower limb
  - Fracture resulting from a crush injury
Results - Recruitment

Eligible n=178

- Refused n=25

Approached n=71

- Did not return n=4
- Consented n=46
  - Plaster check completed n=38
- Discharged n=4
Results - Demographics

- **Age**
  - Mean age 8.9 years
  - Median 9.7 years
  - Range 1.9 to 15.1 years

- **Gender**
  - 29 males (76%)
## Results - Fracture details

### Bones fractured

<table>
<thead>
<tr>
<th>Fracture Location</th>
<th>N (n= 38)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius only</td>
<td>9</td>
<td>23.7</td>
</tr>
<tr>
<td>Ulna only</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Radius &amp; ulna</td>
<td>23</td>
<td>60.5</td>
</tr>
<tr>
<td>Tibia only</td>
<td>2</td>
<td>5.3</td>
</tr>
<tr>
<td>Fibula only</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Tibia and fibula</td>
<td>2</td>
<td>5.3</td>
</tr>
</tbody>
</table>

### Sedation during manipulation

<table>
<thead>
<tr>
<th>Sedation Method</th>
<th>n (n= 35)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biers block</td>
<td>18</td>
<td>51.4</td>
</tr>
<tr>
<td>N2O</td>
<td>10</td>
<td>28.5</td>
</tr>
<tr>
<td>GAMP</td>
<td>4</td>
<td>11.4</td>
</tr>
<tr>
<td>IV ketamine</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>1</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Note: manipulation not required in 3 cases - All in lower limb
## Results - outcome

Outcome of plaster check:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N (n = 38)</th>
<th>Freq (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharged with no intervention</td>
<td>29</td>
<td>76.3</td>
</tr>
<tr>
<td>Plaster trimmed</td>
<td>3</td>
<td>7.9</td>
</tr>
<tr>
<td>Plaster removed</td>
<td>2</td>
<td>5.3</td>
</tr>
<tr>
<td>Additional surgery</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>Admitted for elevation</td>
<td>3</td>
<td>7.9</td>
</tr>
</tbody>
</table>
## Results – parent assessment

### Inter-rater reliability – parents v’s treating clinician

<table>
<thead>
<tr>
<th></th>
<th>% agreement</th>
<th>Kappa value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swelling</td>
<td>75.4</td>
<td>0.011</td>
</tr>
<tr>
<td>Colour change</td>
<td>86.8</td>
<td>0.347</td>
</tr>
<tr>
<td>Temp change</td>
<td>84.2</td>
<td>0.182</td>
</tr>
<tr>
<td>Change in sensation</td>
<td>73.7</td>
<td>0.030</td>
</tr>
<tr>
<td>Loss of movement</td>
<td>81.6</td>
<td>0.059</td>
</tr>
<tr>
<td>Findings of concern</td>
<td>73.7</td>
<td>0.030</td>
</tr>
</tbody>
</table>

Kappa

- < 0.4 = poor
- 0.4 – 0.75 = fair to good
- >0.75 = excellent
## Findings of concern

<table>
<thead>
<tr>
<th>Doctor</th>
<th>Parent</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>1 (3%)</td>
<td>8 (21%)</td>
<td>9 (24%)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>3 (8%)</td>
<td>27 (68%)</td>
<td>30 (76%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4 (11%)</td>
<td>34 (89%)</td>
<td>38 (100%)</td>
</tr>
</tbody>
</table>
Limitations

- Single centre study
- Convenience sample
- Small sample size (n=38)
  - Small numbers of abnormal findings
**Discussion - Parent reliability**

- Poor agreement between parents and clinicians
  - Kappa values range from 0.01 to 0.35
- Parents
  - more likely to report positive findings
  - less likely to report that findings were concerning
- Audit data
  - poor recall of signs and symptoms
  - very confident (96%) in deciding if medical help is needed
Discussion - Parent reliability

- Implications
  - Parents may not understand the importance of findings
  - May not seek help as confident with their decision
  - Discharge education may not be adequately preparing parents
Further work/questions

- Larger scale study
  - Multicentre
  - Larger number of positives

- Review discharge education
  - Highlight the importance of findings
Conclusion

- Plaster checks performed by a clinician still an important part of fracture management
Acknowledgements

- Akshay Bapat
- A/Prof Franz Babl
- The staff in the Emergency Department
- All patients and their families
- The Clinical Biostatistics and Epidemiology Unit (CEBU)
- Royal Children’s Hospital Human Research Ethics Committee (RCH HREC)
References


