Proximal Junctional Kyphosis Measurement Variability in Patients with Growing Rods

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Disclosures

Kody K. Barrett, BA-None
Lindsay Andras, MD-None
Vernon Tolo, MD

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a. Grants/Research Support
b. Consultant
c. Stock/Shareholder
d. Speakers’ Bureau
e. Other Financial Support
Background - PJK in AIS

• PJK is a known risk after spinal fusion
• Incidence of 9.2-46%
• Rare cause for re-operation
Background - PJK in Growing Rods

- Incidence of 56% in one study
- Limited number of studies
- No data on need for reoperation or complications
Criteria For PJK in Past Studies

• Lee et al.
  – >5° greater than normally expected

• Denis et al.
  – >10°
  – And >10° from pre-op

• Kim et al.
  – >10°
Study Question

What is the variability in measuring PJK in patients with distraction based growing rods?
Methods

• 10 patients with growing rod Instrumentation were selected at random
• The most recent lateral view radiograph was used
• Four pediatric orthopaedic spine surgeons made measurements using two different methods
• These measurements were repeated on the same radiographs one week later
Measurement Methods

As Described by Lee et al.

Method 1

Superior Endplate

Inferior Endplate

UV

Method 2

Superior Endplate

Inferior Endplate

UV

As Described by Lee et al.
## Example Measurements

<table>
<thead>
<tr>
<th>Doctor</th>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor 1</td>
<td>3°</td>
<td>37°</td>
</tr>
<tr>
<td>Doctor 2</td>
<td>3°</td>
<td>32°</td>
</tr>
<tr>
<td>Doctor 3</td>
<td>15°</td>
<td>22°</td>
</tr>
<tr>
<td>Doctor 4</td>
<td>14°</td>
<td>27°</td>
</tr>
</tbody>
</table>
Analysis

• Variability: Limits of Agreement
  – Likely range for the difference between two successive measurements

• Intraclass Correlation Coefficient
  – Scale from 0-1
  – Approximates strength of correlation
  – Unlike R, accounts for inherent correlation due to measuring same target
  – 0.4-0.75 is “good” and >0.75 is “excellent”
## Results

<table>
<thead>
<tr>
<th></th>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intraobserver Variability</strong></td>
<td>±13.2°</td>
<td>±18.3°</td>
</tr>
<tr>
<td><strong>Interobserver Variability</strong></td>
<td>±21.6°</td>
<td>±20.7°</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th></th>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intraobserver ICC</strong></td>
<td>0.728</td>
<td>0.840</td>
</tr>
<tr>
<td><strong>Interobserver ICC</strong></td>
<td>0.311</td>
<td>0.822</td>
</tr>
</tbody>
</table>

Scale 0-1, 0.4-0.75 is “good” and >0.75 is “excellent”
Conclusions

- Both interobserver and intraobserver variability was high, with $\pm 15^\circ$ of error to be expected in each.
- It is difficult to accurately evaluate PJK in the setting of growing rods.
- These results call into question prior studies.
Discussion

- Rely on clinical signs and symptoms
- Look to different imaging modalities
References


