Pull-out of the upper thoracic pedicle screws can cause spinal canal encroachment in Growing Rods treatment

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Proximal foundation failure of GR

- Very common complication
- Pedicle screw pull-out is a frequent cause of revision surgery
- Enchroachment of the spinal canal after screw pull-out has been anectodally reported
Aim

• To report the prevalence and describe the risk factors of this potentially devastating complication in growing rods treatment for EOS
Methods

• Inclusion criteria
  – GR
  – Pedicle screw in at least one level at the proximal foundation
  – Pull-out of an upper thoracic pedicle screw
• Pedicle screw pull-out was initially detected in the plain X-ray
• Presence of medial migration into the spinal canal was later confirmed by CT
Methods

• Analysis
  – Demographic and clinical information
  – Etiology
  – Radiology
  – Neurological status
  – Revision procedures and the final status of the patient
  – Intra-operative surgical details of the procedure
Results

• Twenty-one patients (out of 96) (21.8%)
  – Age @ index surgery
    • 5.5 (3 to 8)
  – FU time
    • 50.4 months (64 to 85)
  – # lengthenings
    • 8.1 (range, 4 -13)
• Spinal canal enchroachment by CT
  – 11 patients (52%)
7 YO, M
5 YO, M
# Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preop</th>
<th>Follow-up</th>
<th>Pull-out</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
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<td>Follow-up (months)</td>
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<td>Lengthening procedure</td>
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<tr>
<td>Major deformity magnitude</td>
<td></td>
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<tr>
<td>Postop</td>
<td>35.2</td>
<td>30.3</td>
<td>0.260</td>
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<tr>
<td>At screw pull-out</td>
<td>45.7</td>
<td>35.6</td>
<td>0.002*</td>
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<tr>
<td>T2-12 kyphosis (°)</td>
<td>45</td>
<td>50.8</td>
<td>0.528</td>
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<tr>
<td>Preop</td>
<td>33.5</td>
<td>31.4</td>
<td>0.389</td>
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<tr>
<td>Postop</td>
<td>44.2</td>
<td>46.7</td>
<td>0.551</td>
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<td>At pull-out</td>
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<tr>
<td>Kyphosis correction (%)</td>
<td>23.9</td>
<td>32.2</td>
<td>0.287</td>
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<td>PJA (°)</td>
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<td>4.9</td>
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<tr>
<td>Postop</td>
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<td>7</td>
<td>0.189</td>
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<td>Last f/u before pull-out</td>
<td>14.5</td>
<td>12.3</td>
<td>0.449</td>
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<tr>
<td>At screw pull-out</td>
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</table>
Results

• There was no abnormal signal during intraoperative neurological monitoring

• No postoperative neurological deficit in the index surgery or following revision of pulled out screws
Conclusion

• Pedicle screws may constitute a risk for spinal cord injury during follow-up in GR even though insertion is safe.
• A well-placed pedicle screw can migrate medially in case of pull-out.
Conclusion

• If pullout is associated with significant deformity increase
  – Be careful!
  – Extra attention!
• Preoperative CT scanning is recommended
  – Plain X-rays are not reliable!
• Neuromonitorization during the revision procedure for GR patients with proximal pedicle screw pullout
  – Mandatory!