The role of Halo Gravity Traction prior to MCGR, when does correction occur?

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Disclosures:

Michelle Welborn: Depuy Synthes- Consultant; K2M advisory panel; POSNA research grant recipient; editor JPO, Spine deformity

Dan Bouton: nothing to disclose

Ivan Krajbich: K2M- Consultant
Background

Over 6,000 MCGR cases have been performed worldwide.

Thacker et al reviewed 15 MCGR papers:

- Preop Cobb 64.8
- Postop Cobb 36.4
- Average percent correction of 44%
What are the outcomes in severe EOS treated with HGT prior to MCGR?

Treatment of severe scoliosis with HGT prior to MCGR has not been previously reported.

Would they achieve appropriate initial correction?
- What was the impact of HGT?
- Was it even necessary?

Would they maintain that correction?
Methods

- IRB approved retrospective cohort study of a prospectively collected database
- 42 MCGR patients from 2014-2017 treated at a single institution
  - All patients failed conservative management
    - All genders, ethnicities, and underlying diagnosis were included.

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42 MCGR
  12 revision patients excluded
  30 enrolled
  18 no traction
  12 traction
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Traction protocol

- 6+ pins
- Weight increased BID
- Traction for 4-8 weeks total based on:
  - Severity of curvature, preop nutrition status, and response to traction.
  - Average of 48 days range (30-76)
- Max activity encouraged:
  - School, traction walkers, wheelchairs, bikes, accessible playground
Would they achieve appropriate initial correction?
## Results

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>Flexibility film Cobb</th>
<th>Absolute correction flexibility film</th>
<th>Percent correction flexibility film</th>
<th>Postop Cobb</th>
<th>Ave Correction</th>
<th>Percent Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=12</td>
<td>90° (69-114°)</td>
<td>78° (60-100°)</td>
<td>13° (3-59°)</td>
<td><strong>14%</strong> (3-29)</td>
<td>46° (31-57°)</td>
<td>45° (37-59°)</td>
<td>49% (34-68)</td>
</tr>
<tr>
<td><strong>Non traction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=18</td>
<td>77° (56-113°)</td>
<td>46° (19-66°)</td>
<td>32° (5-70°)</td>
<td><strong>40%</strong> (7-66)</td>
<td>34° (18-50°)</td>
<td>44° (19-74°)</td>
<td>54% (26-74)</td>
</tr>
<tr>
<td><strong>P-value</strong></td>
<td>0.027</td>
<td>0.000</td>
<td>0.002</td>
<td>0.000</td>
<td>0.421</td>
<td>.743</td>
<td>.244</td>
</tr>
</tbody>
</table>
At what point is the correction occurring? What was the impact of HGT?

- Preop Flexibility
- Traction
- Intraop
At what point is the correction occurring?

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>Preop Flexibility</th>
<th>Post traction Cobb</th>
<th>Postop Cobb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traction</strong></td>
<td>90°</td>
<td>78°</td>
<td>59°</td>
<td>46°</td>
</tr>
<tr>
<td>n=12</td>
<td>27%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non traction</strong></td>
<td>77°</td>
<td>46°</td>
<td>NA</td>
<td>34°</td>
</tr>
<tr>
<td>n=18</td>
<td>72%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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# Equivalent correction post HGT to Flexibility Film in nonHGT group

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>Preop Flexibility</th>
<th>Last in traction Cobb</th>
<th>Postop Cobb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traction n=12</strong></td>
<td>90°</td>
<td>78°</td>
<td>59°</td>
<td>46°</td>
</tr>
<tr>
<td></td>
<td>70%</td>
<td>12°</td>
<td>19°</td>
<td></td>
</tr>
<tr>
<td><strong>Non traction n=18</strong></td>
<td>77° 72%</td>
<td>46°</td>
<td>NA</td>
<td>34°</td>
</tr>
</tbody>
</table>
same correction achieved between Post traction Cobb and Postop Cobb as the Flexibility Cobb and Postop Cobb in the non traction group

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>Preop Flexibility</th>
<th>Post traction Cobb</th>
<th>Postop Cobb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traction n=12</td>
<td>90° 27%</td>
<td>78° 43%</td>
<td>59° 30%</td>
<td>46°</td>
</tr>
<tr>
<td>Non traction n=18</td>
<td>77° 72%</td>
<td>46°</td>
<td>NA 28%</td>
<td>34°</td>
</tr>
<tr>
<td>P-value</td>
<td>0.027</td>
<td>0.000</td>
<td>NA</td>
<td>0.421</td>
</tr>
</tbody>
</table>
Would they maintain that correction?
Lengthening protocol

Maximum correction sought in OR

First lengthening 8 weeks postop

Frequency:
- q6-8 weeks

Lengthen: 2-3mm

Radiographs:
- EOS microdose PA/Lateral full spine q3 lengthenings

Clinical exam:
- Palpate anchors at each visit to evaluate for increasing pain, prominence or bursa

Preop

PA
Lateral

Final in traction

PA
Lateral

Postop

PA

3 years later

PA
Lateral
## Results – most recent follow-up

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>Postop Cobb</th>
<th>Most recent Cobb</th>
<th>Change in Cobb postop vs most recent</th>
<th>Average Follow-up (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traction n=12</strong></td>
<td>90° (69-114°)</td>
<td>46° (31-57°)</td>
<td>44° (28-65°)</td>
<td>-2° (-13-9)</td>
<td>878</td>
</tr>
<tr>
<td><strong>Non traction n=18</strong></td>
<td>77° (56-113°)</td>
<td>34° (18-50°)</td>
<td>40° (17-63°)</td>
<td>6° (-5-17)</td>
<td>804</td>
</tr>
<tr>
<td><strong>P-value</strong></td>
<td>0.027</td>
<td>0.421</td>
<td>.838</td>
<td>0.019</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion:

Equivalent correction to flexible curves can be achieved in more rigid curves through the use of traction.

43% of the total correction achieved occurred in traction.

Equivalent correction occurred intraoperatively in both groups.

Postoperatively we did not see diminishing returns:
- Neither group lost correction over time, p=0.019.
- HGT gained correction at final follow-up, indicating HGT continues to effect the patient positively long past the initial implantation.
Thank you