Preop Halo Gravity Traction (HGT) Associated with Decreased Implant Complications in MCGR

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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
MCGR background

- Implant related complications in MCGR range from 0-100% with an average complication rate of 44% and UPROR of >30% [1-9]
  - Earlier generations had increased failure rates due to o-ring and pin fractures
  - 10% rate of rod fracture, 10% rate of rod failure
  - Rod fracture and failure has been attributed in part to increased curve rigidity.
How can we decrease complications in patients with severe EOS treated with MCGR:

**Goal: decrease stress on implants**

- **Preop:**
  - Patients with large, rigid curves undergo preop HGT
  - Preop HGT theoretically makes the curve is less rigid.
  - Decreasing curve rigidity may potentially decreasing implant related complications

- **Postop small magnitude high frequency lengthenings**
  - Small magnitude lengthenings would decrease the strain exerted on the implants
  - High frequency lengthenings would allow us to keep up with growth
Concerns- can HGT have a negative impact?

- HGT impacts the soft tissues of the whole spine
- So would patients that undergo HGT have a higher or a lower complication rate?
Methods

- IRB approved retrospective cohort study of a prospectively collected database
- 51 MCGR patients from 2014-2018 treated at a single institution
  - All patients failed conservative management
    - All genders, ethnicities, and underlying diagnosis were included
    - <2 yr follow-up and revision patients excluded

Excluded: 26 revision patients
Excluded: 3 f/u at OSH
No traction: 33
>2 yr f/u: 13
traction: 16
<2 yr f/u: 10
## MCGR >2 yr followup

<table>
<thead>
<tr>
<th></th>
<th>Preop Cobb</th>
<th>% correction on flexibility film</th>
<th>Postop Cobb</th>
<th>% correction</th>
<th>Complication Rate</th>
<th>UPROR</th>
<th>Ave follow-up days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traction</strong></td>
<td>89°</td>
<td>17%</td>
<td>44°</td>
<td>51%</td>
<td>10%</td>
<td>0%</td>
<td>1020</td>
</tr>
<tr>
<td>N=10</td>
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<tr>
<td><strong>No-Traction</strong></td>
<td>77°</td>
<td>39%</td>
<td>35°</td>
<td>55%</td>
<td>31%</td>
<td>15.4%</td>
<td>1067</td>
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<tr>
<td>N=13</td>
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<tr>
<td><strong>P-value</strong></td>
<td>0.027</td>
<td><strong>0.000</strong></td>
<td><strong>0.421</strong></td>
<td>0.244</td>
<td>.123</td>
<td>.397</td>
<td>.3409</td>
</tr>
</tbody>
</table>
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
Postop 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 q3-4 lengthenings

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

Preop PA Lateral
Final in traction PA
Most Recent Follow-up PA Lateral
Most recent follow-up Rod status-
>2 yr follow-up

Traction: no rod failures
- 7/10 achieved maximal length of rod
- 3/10 continuing to lengthen

Non-traction:
- 3/13 still lengthening primary mcgr
- 2/13 skeletally mature, lengthening stopped
- 2/13 proximal anchor failures
- 2/13 rod failures – both patients Preop Cobb >80 and generation 1.2 rods,
- 5/13 revised due to max length of rod
Complications

- **Traction group: 10%**
  - Ave follow-up 1020 days
  - Intraop dural tear
  - 0% UPROR

- **Non-traction group: 30.8%**
  - Ave follow-up 1067 days
  - 2 patients with rods that failed to lengthen
    - both patients at or near skeletal maturity
  - 1 patient with v mild PJK,
    - Associated with proximal hook failure
  - 1 anchor migration requiring revision
  - 15.4% UPROR
Junctional Kyphosis

Conclusion:
PJA is a direct result of intraop sagittal contour

- PJA did not change between initial postop and most recent follow-up

No INCREASED RISK OF PJK with HGT

- Patients with 11° PJA had proximal anchor failure -> revised anchor
Complications: all patients including <2 yr follow-up

- 81 MCGR procedures
- 51 primary MCGR

- **18 traction**
  - 2 Dural Tears
  - 1 Proximal anchor failure
  - **6% UPROR**
  - **19% complication rate**
  - **Ave follow-up 757 days**

- **33 no traction**
  - 2 rod failures
  - 2 v mild pjk, 1 observed, 1 revised due to implant failure
  - 1 anchor migration
  - 2 wound infection (both high risk neuromuscular patients)
  - 1 symptomatic screw
  - **15% UPROR**
  - **24% complication rate**
  - **Ave follow-up 674 days**

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Conclusion

- Large curves can be effectively and safely treated with MCGR
  - Rigid curves achieved equivalent correction to flexible curves with preop HGT
  - HGT does not result in a higher complication rate
  - PJA is a direct result of intraoperative rod contouring and did not increase with HGT