Consensus-Based Best Practice Guidelines (BPG) for Use of Preoperative Halo Gravity Traction (HGT) for Pediatric Spinal Deformity

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-Disclosures-

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Royalties: Biomet, ECOP
Consultant: Stryker, Biomet; Wellinks; Nuvasive
Grant/Research Support: SRS, POSNA, CSSG
BOD: POSNA (PL); CSSG, SP3
Introduction

- **HALO GRAVITY TRACTION (HGT)** was introduced in 2001 by Sink et al.

- Modeled after Sielke and Stagnara’s techniques.

- Initially intended for **6+ weeks** and recommended for children with severe trunk decompensation or shift, failed previous spinal fusion surgery, or risky pulmonary status.
• **Limitations to the evidence base:**
  
  • No RCTs or prospective studies
  • Lack of consensus on patient population, indications, intended outcomes, etc.
  • Variable methodologies employed during treatment
In order to establish a better quality evidence base for the use of HGT, we must first explore:

- Current practices among experts
- Ideal best practices

Once consensus has been reached on best practices, guidelines can be used to promote research on unanswered questions.

The purpose of this study was to establish consensus on best practices for use of HGT.
Consensus Based HGT Guidelines: Methodology

• Conduct **literature review** to identify extent of current evidence

• **Survey** surgeons who utilize peri-/pre-op HGT to understand current practices and assess variability

• Facilitate **Delphi process** to generate consensus opinion on best practices by iterative rounds of online surveys

• Host face to face **Nominal process** to discuss non-consensus items to establish agreed-upon guidelines

• ≥80% agreement is considered consensus
In 2015, Dr. Pahys conducted a study with CSSG to understand current practices of surgeons using HGT.

- 63-question survey
- 35 SRS-member surgeons invited to respond
- 30 responded
- Majority have experience with 1-10 HGT cases / year (73%)

Present study extends that effort
Weight application and management

• Starting weight: 5lbs (58%) or 10lbs (42%)
• Goal weight: 50%TBW (37.5%) or 33%TBW (33.4%)
• Weight increased daily (45%), every 48 hours (31%), or twice a day (23%)
• Same weight day and night (72%)
• No traction-free periods (59%)
• **3 rounds** of online surveys to evaluate expert opinion of best practices - **42 surgeons** invited to respond
  
  • 1<sup>st</sup>: February, 58 Q  
    • 32 responses  
  • 2<sup>nd</sup>: March, 50 Q  
    • 40 responses  
  • 3<sup>rd</sup>: April, 34 Q  
    • 31 responses  
  
  • **41 consensus items** established from surveys  
  • **14+ surgeons met face at Spine Safety Summit**
**Final Guidelines - Indications**

**INDICATIONS**

- Major curve > 90° (coronal or sagittal) or 60°-90° with need for respiratory/nutritional optimization
- *Thoracic > lumbar major curve*
- Curves with *high DAR*
- No open fontanelles
- Skeletal dysplasia and osteogenesis imperfecta are okay
## Final Guidelines - Preop Evaluation

### PRE-OPERATIVE EVALUATION

- Plain Radiographs
  - Erect scoliosis series
  - Cervical spine films
  - Manipulative film to assess flexibility – bending, traction, bolster
- Screening MRI if patient is ambulatory
- Evaluate questionable skull morphology
- No open fontanelles
Final Guidelines – Technique

SURGICAL TECHNIQUE

- If skeletally immature, > 6 years old: 6+ pins
- ≤ 6 years old: 8+ pins
- 4-8 in-lbs of torque
  - Older, better bone quality, less pins = higher torque
- If indicated, spinal release should occur 2-4 weeks prior to definitive posterior instrumentation
**Final Guidelines – Management in Traction**

<table>
<thead>
<tr>
<th>BEDSIDE MANAGEMENT</th>
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<tbody>
<tr>
<td>• Starting weight: small, tolerable, %BW</td>
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<tr>
<td>• Increase weight daily (approx.)</td>
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<tr>
<td>• Weekly spine XR during weight increase</td>
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<tr>
<td>• <em>Reach 50% TBW in about 2 weeks</em></td>
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<tr>
<td>• <em>Remain in goal weight 2-4 weeks</em></td>
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<tr>
<td>• Spine XR every 2 weeks during maintenance</td>
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<tr>
<td>• Active pin care</td>
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<tr>
<td>• Regular physical and respiratory therapy</td>
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<tr>
<td>• <em>Overnight traction is ok, elevate head of bed</em></td>
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<tr>
<td>• <em>Full neuro exam daily by MD</em></td>
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<tr>
<td>• Standard spine XR weekly</td>
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</tbody>
</table>
### Final Guidelines – Complications

#### COMPLICATIONS

**Pin site infection?**
- 1<sup>st</sup>: antibiotics
- 2<sup>nd</sup> (persistent): pin exchange or removal

**Neurologic Change?**
- 1<sup>st</sup>: remove weight
  - Motor: all traction weight
  - Cranial nerve: recently added weight
- AND cervical spine XR
- If symptoms persist after weight removal, get spine MRI ASAP
# HALO GRAVITY TRACTION CHECKLIST

## HGT Indications:
- Major curve > 90° (coronal or sagittal) or 60°-90° with need for respiratory/nutritional optimization
- Thoracic > lumbar major curve
- Curves with high DAR
- No open fontanelles
- Skeletal dysplasia and osteogenesis imperfecta are okay

## Pre-Operative Evaluation for HGT:
- Plain radiographs
  - Erect scoliosis series
  - Cervical spine films
  - Manipulative film to assess flexibility – bending, traction, bolster
- Screening MRI if patient is ambulatory
- Evaluate any questionable skull morphology
- No open fontanelles

## HGT Surgical Technique
- If skeletally immature, > 6 years old: 6+ pins
- ≤6 years old: 8+ pins
- 4-8 in-lbs of torque
  - Older, better bone quality, less pins = higher torque
- Spinal release should occur 2-4 weeks prior to definitive posterior instrumentation

## HGT Bedside Management
- Starting weight: small, tolerable, %BW
- Increase weight daily (approx.)
  - Weekly spine XR during weight increase
- Reach 50% TBW in about 2 weeks
- Remain in goal weight 2-4 weeks
  - Spine XR every 2 weeks during maintenance
- Active pin care
- Regular physical and respiratory therapy
- Overnight traction is ok, elevate head of bed
- Full neuro exam daily by MD

## Managing HGT Complications
- Pin site infection?
  - 1st: antibiotics
  - 2nd (persistent): pin exchange or removal
- Neurologic change?
  - 1st: Remove weight
    - Motor: all traction weight
    - Cranial nerve: recently added weight
  - AND Cervical spine XR
  - If symptoms persist after weight removal, get Spine MRI ASAP

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**FOR ANY CONCERNS OR NEURO CHANGES REMOVE TRACTION WEIGHTS and STAT Page Ortho Team at _______ and contact the following people: ________________________________**
Discussion and Conclusions

• HGT is an effective tool for complex spinal deformity in children
• There is currently variability in how it is used
• Some consensus emerges among experienced users

• We have also identified areas of true equipoise for further research
  • What about lumbar and cervical spine?
  • How should beginning traction weight be determined?
  • Is there a role for HGT for 2 weeks or less?
  • Nighttime management?
Thank You!

NewYork-Presbyterian
Morgan Stanley Children’s Hospital

Columbia University
Department of Orthopedic Surgery
College of Physicians & Surgeons

AMAZING THINGS ARE HAPPENING HERE

FOR KIDS