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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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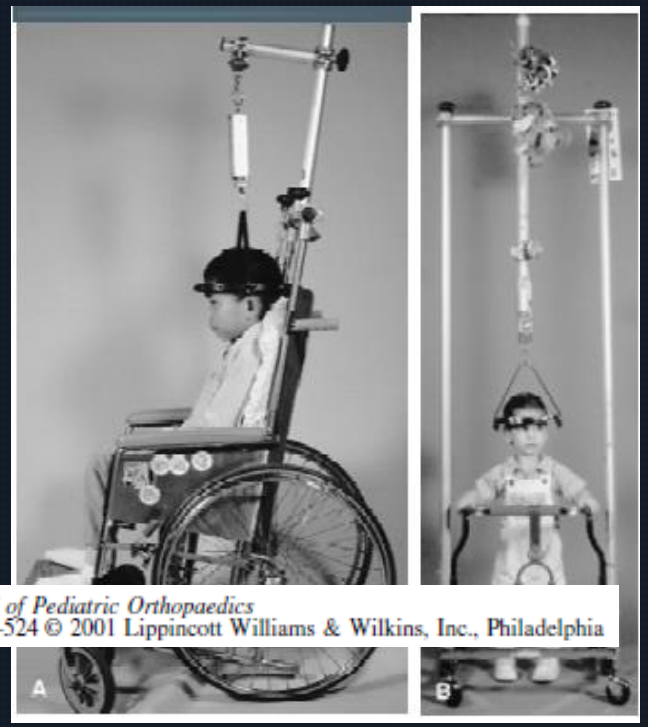
Introduction

- **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*



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Introduction

- ***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

Purpose

- **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***

Previous Work

- **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**

Unexplained Variability Implies Some are Getting Suboptimal Care

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%)

Delphi and Nominal Processes

- ***3 rounds* of online surveys to evaluate expert opinion of best practices - *42 surgeons* invited to respond**
  - 1st: February, 58 Q
    - 32 responses
  - 2nd: March, 50 Q
    - 40 responses
  - 3rd: 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 asses 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

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***
- Standard spine XR weekly

Final Guidelines – Complications

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

HALO GRAVITY TRACTION CHECKLIST

PRE-OPERATIVE → **OPERATIVE** → **POST-OPERATIVE**

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***

<u>FOR ANY CONCERNS OR NEURO CHANGES REMOVE TRACTION WEIGHTS</u> and STAT Page Ortho Team at _____ and contact the following people: _____

NewYork-Presbyterian
Morgan Stanley Children's Hospital
Columbia University Medical Center

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!

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