

# Best Practice Guidelines

## Use of Halo Gravity Traction (HGT) for Pediatric Spinal Deformity

### Goals

#### Deformity-based:

- Avoid or minimize 3 column osteotomies (e.g. vertebrectomy)
- Improve major coronal and sagittal curves
- Improve coronal and sagittal balance

#### Patient-based:

- Improve nutritional status and/or pulmonary function

### Indications

#### Radiographic Criteria:

- Fusion procedures
  - Generally consider HGT when major coronal or sagittal curves are over 90°
  - When major coronal or sagittal curves are between 60°- 90°, HGT is rarely indicated unless patient has medical co-morbidities
  - HGT is not indicated in curves under 60°
- Growth friendly procedures
  - HGT is an option in this population
  - There is a role for HGT for curves in the 60-90° range
- HGT is more effective for curves in the thoracic spine compared to the lumbar spine
- Given similar curve magnitudes, curves with a higher deformity angular ratio (DAR) should be more strongly considered for HGT

#### Clinical Criteria

- HGT can be indicated for any etiology of scoliosis (i.e. congenital, neuromuscular, syndrome, idiopathic...) and for any ambulatory status (i.e. community ambulator, non-ambulator...)
- Skeletal dysplasia and osteogenesis imperfecta (OI) are NOT contraindications to HGT with appropriate precautions (e.g. using more pins with lower torque)
- Open fontanelles are a contraindication to HGT

### Pre-Operative Evaluation

- Standard spine radiographs should be obtained prior to HGT including erect scoliosis series and cervical spine radiographs
- Curve flexibility should be evaluated with a manipulative film (such as a bending, traction, or bolster film)
- Ambulatory patients should have a screening MRI of the spine
- If there is a reason to suspect abnormal skull morphology, there is a role for formal evaluation (such as skull films or DEXA scan)

## Protocols

- If performing concurrent spinal releases prior to placement of HGT, this should occur 2-4 weeks prior to definitive posterior instrumentation

### Pins

- At least 6 pins should be used in skeletally immature children and consider using 8 or more pins for children 6 and under
- Active pin care should be employed during HGT (i.e. a protocol for keeping pin sites clean beyond normal hygiene)

### Torque

- Age, bone density, and total number of pins all help determine goal torque
- For most children, insertion torque should be 4-8 in-lbs
- If unable to safely use 4 in-lbs of torque, more pins should be added

### Weight

- Starting weights should be small, tolerable to the patient, and reflect the patient's body weight
- Daily weight increases are appropriate during the weight increase phase, although other intervals may be used
- Goal weight should be approximately 50% of patient's total body weight, but there is a role for >50% in some patients
- Goal weight should be achieved in about 2 weeks

### Duration of HGT

- Curve magnitude and flexibility are important factors when considering duration of HGT
- HGT should generally last from 4-6 weeks, but curve magnitude, flexibility, and patient response to HGT should help define the duration of treatment
- If you feel a patient would benefit from additional time in traction, you should delay the scheduled surgery

### Maintenance

- Keeping the patient in traction overnight as tolerated is acceptable and should be done with the head of the bed elevated
- Physical therapy should be prescribed for patients in HGT as should respiratory therapy, at least for patients with pre-existing respiratory conditions

### Films

- Obtaining standard radiographic spine films once a week during weight increase phase and at least once every 2 weeks during weight maintenance phase is appropriate and adequate
- C-spine films should be obtained at some point during HGT

### Neuro Exams

- Motor, sensory, and cranial nerve exams should be conducted during HGT treatment. At least one exam a day should be performed by an MD.

## Complications

### Pin site infection

- The initial response to a suspected pin site infection should be antibiotics followed by pin removal or exchange

### Neurologic Changes

- New neurologic changes require removal of some or all of the traction weight
  - Motor changes in the trunk or extremities require removal of all traction weight
  - Cranial nerve changes require removal of most recently added weight
- In addition to weight removal, c-spine radiographs should be obtained
- If problems persist, an MRI should be obtained ASAP

# Best Practice Guidelines

## Sample Checklists for Clinical Application of Halo Gravity Traction (HGT) Best Practices

### 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

- Plan radiographs
  - Erect scoliosis series
  - Cervical spine films
  - Manipulative film to assess flex traction, bolster
- Screening MRI if patient is ambulatory
- Evaluate any questionable skull morphology
- No open fontanelles

### HGT Surgical Technique

- If skeletally immature and > 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

### HGT Bedside Management

- Starting weight: small, tolerable, % of body weight (BW)
- Increase weight daily (approx.)
  - Weekly spine x-ray during weight increase
- Reach 50% TBW in about 2 weeks
- Remain in goal weight 2-4 weeks
  - Spine x-ray 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
- C-spine films should be obtained

### 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 x-ray
  - If symptoms persist after weight removal, get spine MRI ASAP

#### Reference:

Roye BD, Campbell ML, Matsumoto H, et al. Establishing consensus on the best practice guidelines for use of halo gravity traction for pediatric spinal deformity. *J Pediatr Orthop.* 2020; 40(1):e42-e48. <https://doi.org/10.1097/BPO.0000000000001379>