Magnetically Controlled Growing Rods: Sagittal Plane Analysis and the Risk of Proximal Junctional Kyphosis

Purnendu Gupta, Felix Brassard, Jennifer Schottler, Alicia January, Ron El-Hawary, Ben Roye, Jeff Sawyer, Kim Hammerberg, CSSG

Purnendu Gupta, M.D.
Chief of Staff
Shriners Hospitals for Children: Chicago
Clinical Professor of Orthopaedic Surgery
University of Illinois, Chicago

Shriners Hospitals for Children™

Disclosures

- Purnendu Gupta
  - Nothing to disclose
- Felix Brassard
  - Nothing to disclose
- Jennifer Schottler
  - Nothing to disclose
- Alicia January
  - Nothing to disclose
- Ron El-Hawary
  - Apifix Ltd.: Paid consultant
    Children's Spine Study Group: Board or committee member
    DePuy, A Johnson & Johnson Company: Paid consultant; Research support
    Medtronic: Paid consultant; Research support
    Pediatric Orthopaedic Society of North America: Board or committee member
- Ben Roye
  - SRS, OMeGA, POSNA: Research support
- Jeff Sawyer
  - Children's Spine Foundation: Board or committee member
    DePuy, A Johnson & Johnson Company: Paid presenter or speaker
    Mosby: Publishing royalties, financial or material support
    Nuvasive: Paid presenter or speaker
    Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
- Kim Hammerberg
  - Nothing to disclose
- CSSG
  - DePuy Synthes, Nuvasive

Introduction/Methods

- Hypothesis:
  - MCGR insertion may have increased risk of PJK due to actuator geometry
- Methods:
  - Multi-center registry data
  - Radiographic analysis pre-op, immediate post-op and 24 month follow up
- Inclusion/Exclusion:
  - MCGR insertion with 12 and 24 month follow up

Results

Preliminary data:

- N=28
- Idiopathic (n=11)
- Neuromuscular (n=11)
- Congenital (n=3)
- Syndromic (n=3)

Results

Preliminary data

- 2-12 years of age
- Pre-op curves: (M= 69.8±14.4 degrees)
- 194 lengthenings (M = 6.93/patient)

- 16 (57%) male, 12 (43%) female patients
- M = 7.8 (±2.7) years at initial implant

Results

Preliminary data:

- Scoliosis improved from
  - 69.8±14.4 degrees pre-op to
    - 40.2±15.2 immediate post-op ($p<.001$)
    - 42.6±14.5 at 24-month follow-up ($p<.001$)
- Increase in T1–T12 length from
  - 16.9cm±3.3 pre-op to
    - 19.2cm±3.0 post-op ($p<.001$)
    - 20.1cm±3.6 at 24-month follow-up ($p<.001$)

Results

- Preliminary data:
  - 12 complications occurred in 7 (25%) of patients
    - 4 implant failures
    - 2 device migrations
    - 2 infections
    - 2 neurogenic pain
    - 1 rod fracture
    - 1 wound dehiscence

Results

Preliminary data

- No significant changes in thoracic kyphosis (TK)
  - Pre-op to Post-op (25.4 vs. 26.2, p=.799)
  - Pre-op to 24 months (23.7 vs. 28.6, p=.072)
- No significant changes in lumbar lordosis (LL)
  - Pre-op to Post-op (-51.8 vs. -45.2, p=.118)
  - Pre-op to 24 months (-48.4 vs. -58.5, p=.268)

Results

Preliminary data:

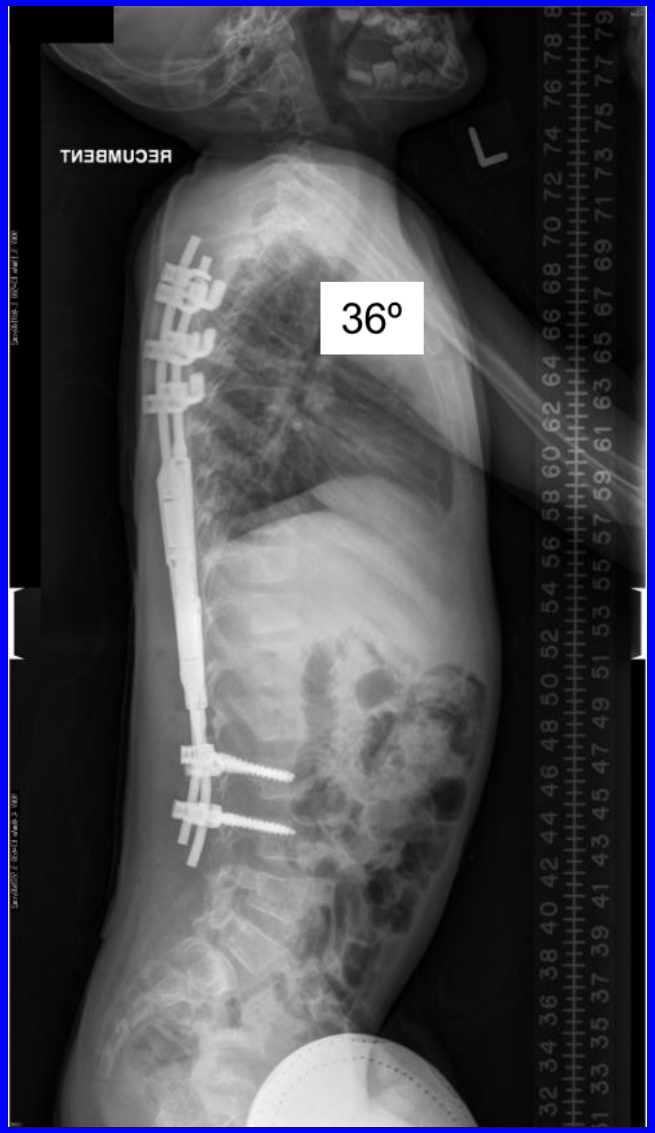
- T1 slope changed
  - Pre-op to post-op (16.9 vs. 21.2; p=.044)
  - Pre-op to 24-month follow-up (15.9 vs. 21.2; p =.039)

- At 24-month evaluation, PJK developed in 2 of 22 (9%) patients

Case A: PJK with revision

January 2014

April 2014



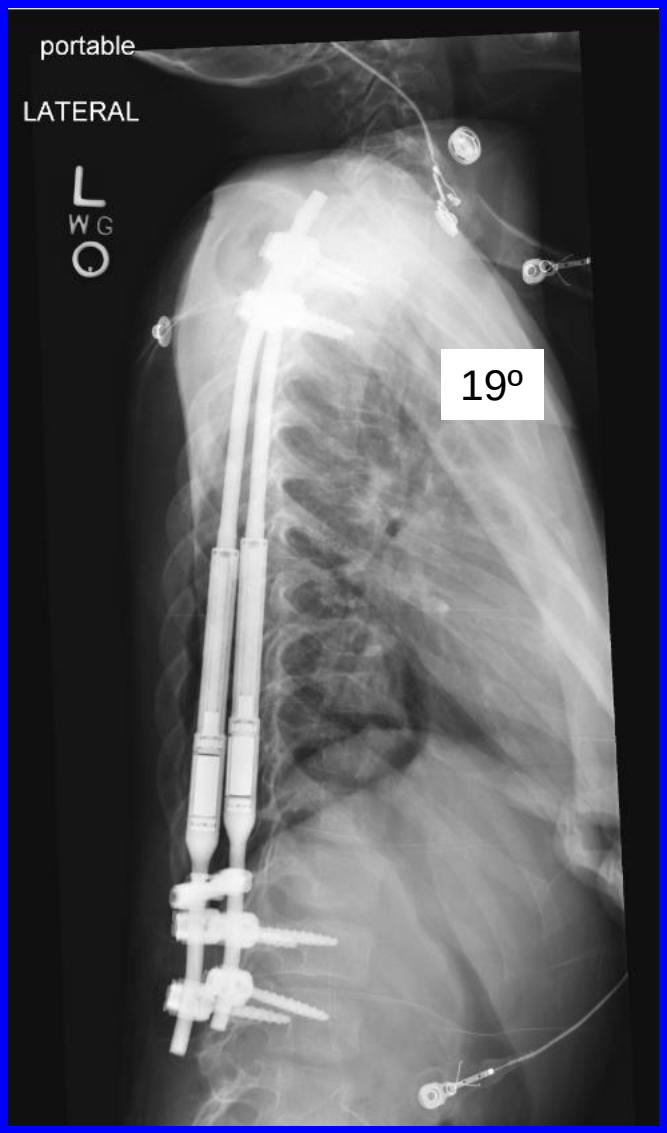
May 2016

Shriners Hospitals for Children™

Case B: PJK with revision

August 2014

October 2014



December 2016

Shriners Hospitals for Children™

Conclusions

- Significant increase in T1 tilt
- No significant change in thoracic kyphosis or lumbar lordosis
- Rate of PJK 9% (n=2)
  - Unable to differentiate between 70mm and 90mm actuator with respect to PJK due to sample size
- Larger data set and longer study time needed