MCGR debate

Drive growth vs Match growth

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- AOSpine (speaker)

- *This talk is given in the spirit of a debate*…..
Definition

- Drive growth
  - Lengthening of rod(s) until “clunking occurs” at an interval of more than 4 months.

- Match growth
  - Lengthening by a pre-determined amount
    - Dimeglio growth charts
    - Tail-gating principle
Content

- **Why match growth?**
  - It makes sense
    - Physiological
  - It works!
    - Longest follow-up
  - Law of reducing length gains

- **Why NOT drive growth?**
  - Length gain never as much as expected
  - Damage leads to fusion?
  - Clunking and metallosis
  - Unpredictable
Content

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Growing rods!
Why follow old ways when you can more closely mimic physiology?
Why match growth?

- It makes sense
  - Physiological
- It works!
  - Longest follow-up
- Law of reducing length gains
First surgery in 2009 at Age 7
Age 16 with 9 years of follow-up…
Mean 6-Year Follow-up of Magnetically Controlled Growing Rod Patients With Early Onset Scoliosis: A Glimpse of What Happens to Graduates

BACKGROUND: There is no agreement on frequency of distractions of magnetically controlled growing rods (MCGRs) but more frequent and smaller amounts of distractions mimic physiological spine growth. The mid- to long-term follow-up and management at skeletal maturity is unknown.

OBJECTIVE: To analyze patients with mean 6 yr of follow-up and describe the fate of MCGR graduates.

METHODS: Early onset scoliosis (EOS) patients treated with MCGRs with minimum 4 yr of follow-up and/or at graduation were studied. Parameters under study included Cobb angle, spine and instrumented lengths, and rod distraction gains. Relationship between timing of rod exchanges with changes in rate of lengthening was studied.

RESULTS: Ten EOS patients with mean 6.1 yr of follow-up were studied. The greatest Cobb angle correction occurred at the initial implantation surgery and was stable thereafter. Consistent gains in T1-12, T1-S1, and instrumented segment were observed. Rate of rod distraction at the proximal end was less than that of the distal end.

CONCLUSION: This study provides an outlook of the end of MCGR treatment. Although this is a fusionless procedure, instrumented segments do experience stiffness limiting further correction and length gain during final surgery whether fusion or rod removal is performed.

KEY WORDS:Magnetically controlled growing rod, MCGR, early onset scoliosis, EOS, graduate

Ten EOS patients with mean 6.1 yr of follow-up
FIGURE 2. Change in T1-12, T1-S1, instrumented length, and body height from preoperative to 4-yr postoperative. Persistent gains were observed throughout follow-up especially for T1-S1 and instrumented length.
FIGURE 1. Change in coronal and sagittal Cobb angle from preoperative to 4-yr postoperative. The main correction occurs with the first implantation and is maintained throughout follow-up.
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We should not be doing so many lengthenings?
Diminished rate of lengthening over time due to rod factors and not patient factors

Cheung et al. Neurosurgery 2018
Maximal Force Generated by Magnetically Controlled Growing Rods Decreases With Rod Lengthening

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Observed Length Increases of Magnetically Controlled Growing Rods are Lower Than Programmed

Sarah E. Gilday, MS, PA-C,* Mark S. Schwartz, DO,† Donita I. Bylski-Austrow, PhD,* David L. Glos, BSE,* Lindsay Schultz, BS, CCRP,* Sara O’Hara, MD,* Viral V. Jain, MD,* and Peter F. Sturm, MD, MBA*

Monitoring of lengthenings is important
Non-invasive monitoring of lengthenings

Personal experience: I can generally not get more than 4mm of lengthening at any one time before clunking occurs.

Potential for insufficient gain in spine length.
Content

- Why NOT drive growth?
  - Length gain never as much as expected
  - Damage leads to fusion?
  - Clunking and metallosis?
  - Unpredictable
  - No law of diminishing return
Biomechanics

Analysis of Explanted Magnetically Controlled Growing Rods From Seven UK Spinal Centers

- failure of the O-ring seal
- eccentric loading
- leading to wear

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Take home messages

• For matching growth:
  – Makes physiological sense
  – Supported by long term follow-up
  – *Law of reducing length gains* related to rod factors
  – Does driving growth get sufficient length gain?
  – Could driving till clunk be related to metallosis?
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