



JOHNS HOPKINS
M E D I C I N E

Masters Technique: Strategies at the End of Growth

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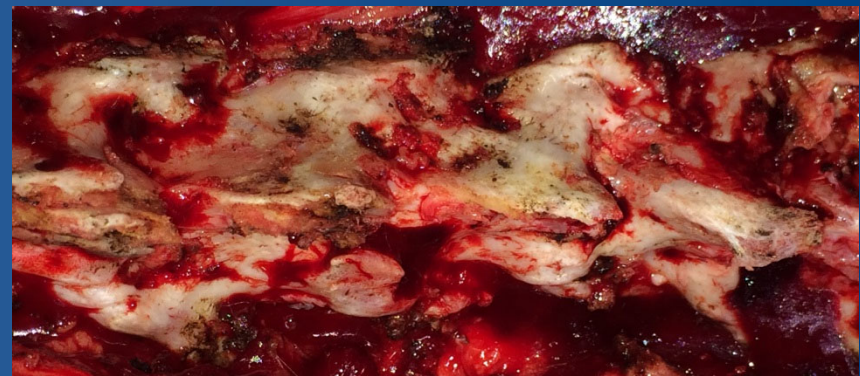
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ICEOS 2015



Background

- “Final fusion” is a common endpoint to growing rod treatment (GR) for early onset scoliosis
- Recent literature suggests that autofusion with growing rods is common, which can limit further correction at definitive fusion (Cahill 2010)



Implications for End of Growth

If final fusion performed, there may be:

- new scars

- Stiff spine

- Obscured landmarks

- Implants needing removal

- drifted anchors

- Focal deformities due to iatrogenic biomechanical changes

Surgery at “graduation”

- -Many required osteotomies
- Most gained <50% correction

Growing-Rod Graduates: Lessons Learned from Ninety-nine Patients Who Completed Lengthening

John M. Flynn, MD, Lauren A. Tomlinson, BS, Jeff Pawelek, BS, George H. Thompson, MD, Richard McCarthy, MD, Behrooz A. Akbarnia, MD, and the Growing Spine Study Group

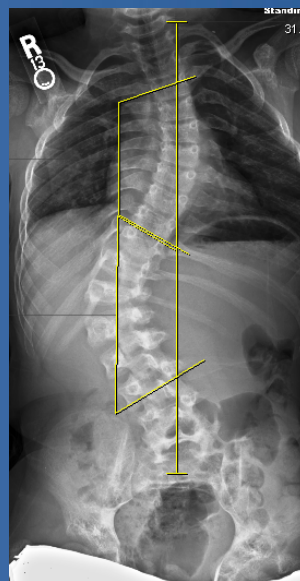
Investigation performed at The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, and the San Diego Center for Spinal Disorders, La Jolla, California

3 scenarios/ strategies at maturity

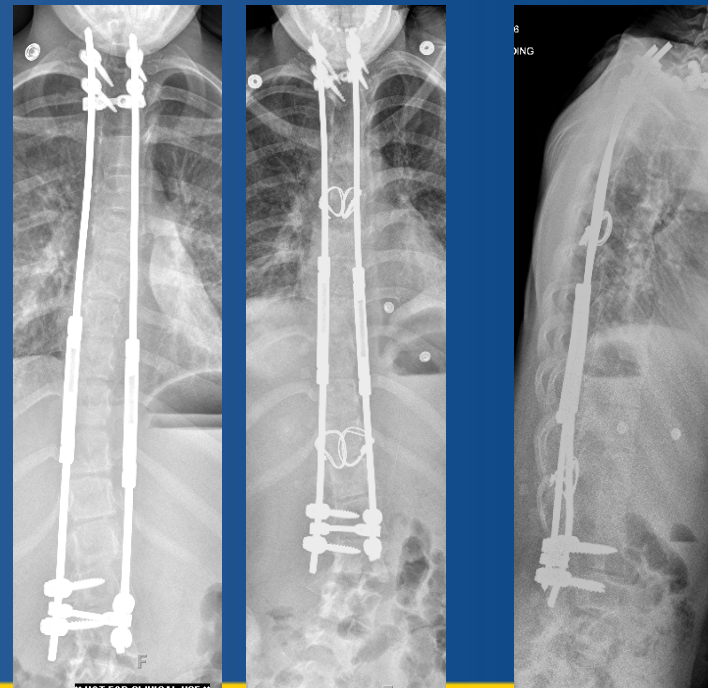
- 1. Straight, not stiff
- 2. Not Straight (unacceptable/unbalanced)
- 3. Straight and stiff

1. Straight but not Stiff

- Recent rod breakage
- Laxity at last distraction
- Connective tissue disorder
- Added anchors + graft



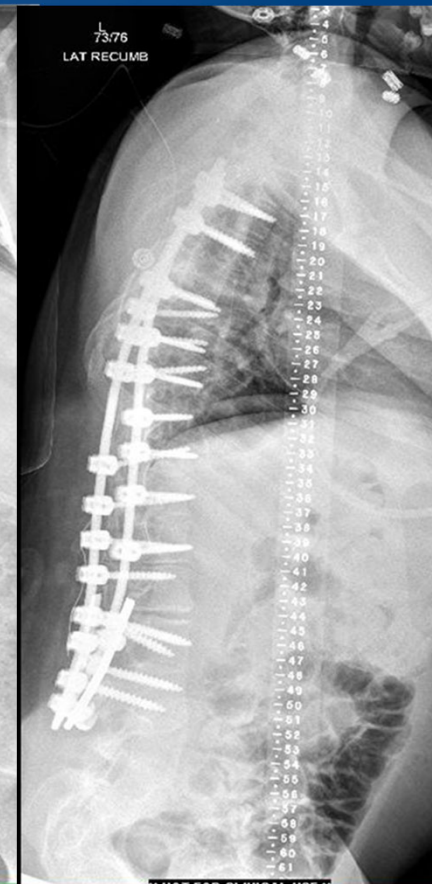
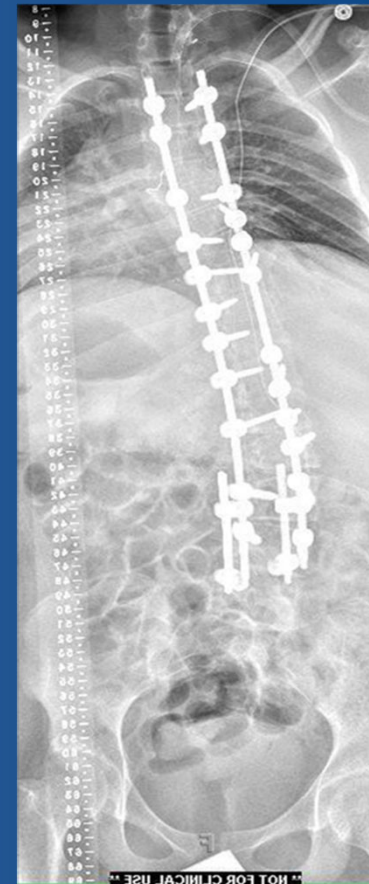
→
7 yrs



2. Not Straight (Unacceptable)

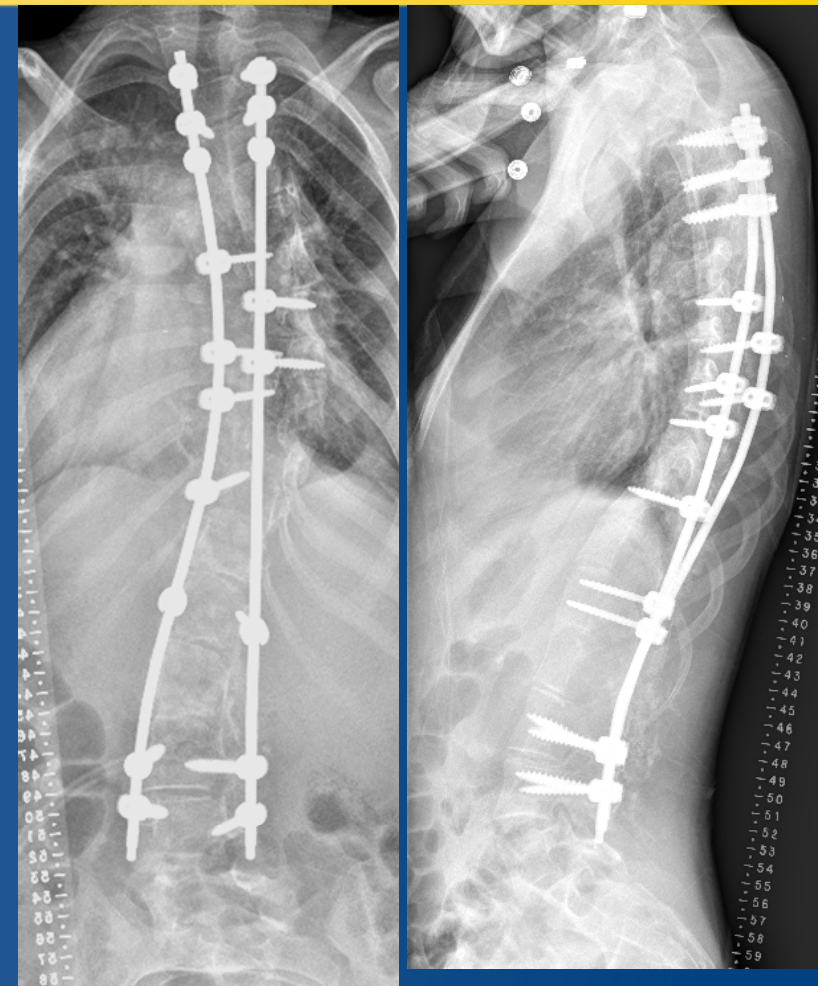
- Osteotomies or VCR needed
- Increased EBL
- RE-check anchors; don't assume screws are safe

15 y.o. IIS



Temporary neuro deficit

15 y.o. LDS



3. Straight and Stiff

- -No final fusion is an option

No Final Fusion

- Final fusion may not be necessary for a subset of EOS patients who have reached skeletal maturity with good alignment
 - Risser 3-4
 - No rod fractures in prior 2 years
 - “Diminishing returns”; <1 cm at last distraction

GSSG study

- Database patients who reached skeletal maturity.
- 137 patients had final fusion (FF)
- 30 patients did not have a final fusion surgery (NF)
- Ages and diagnoses comparable

Results:

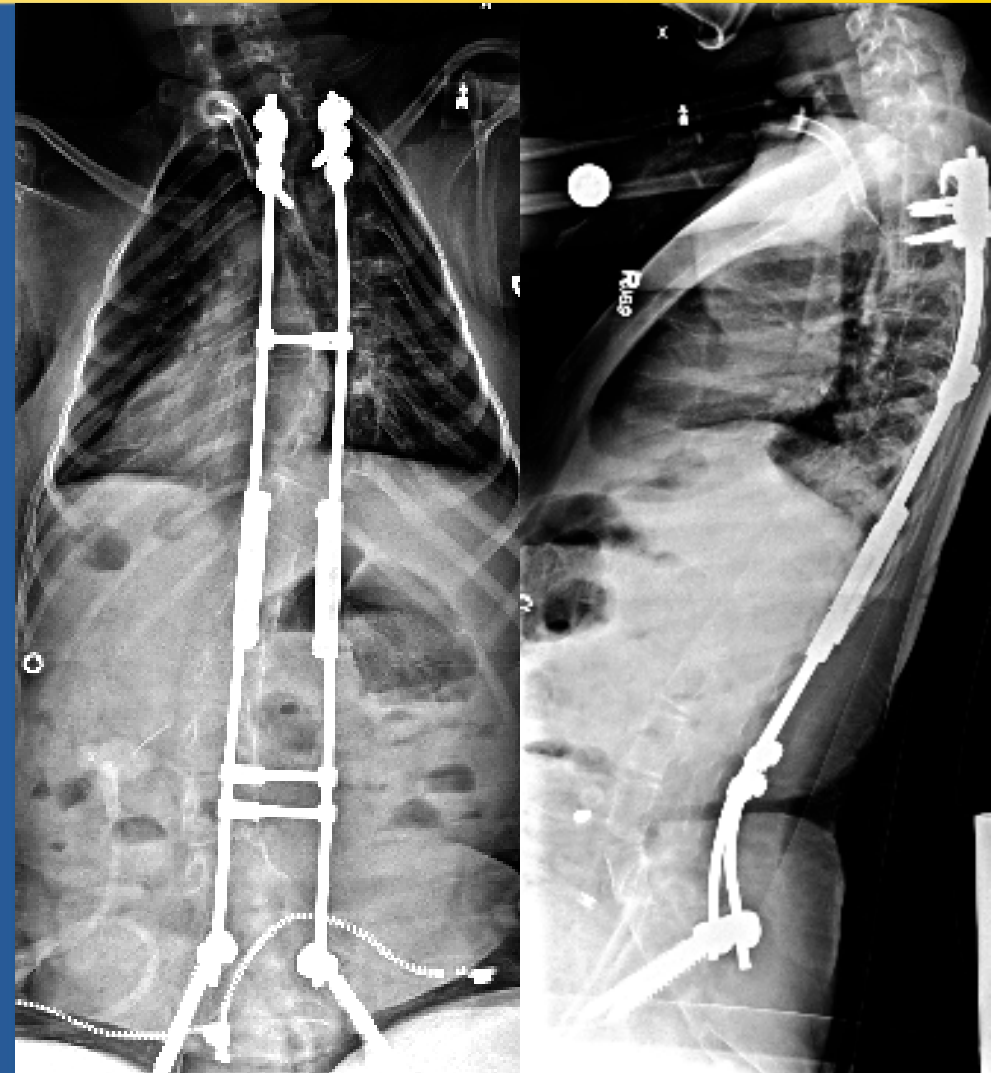
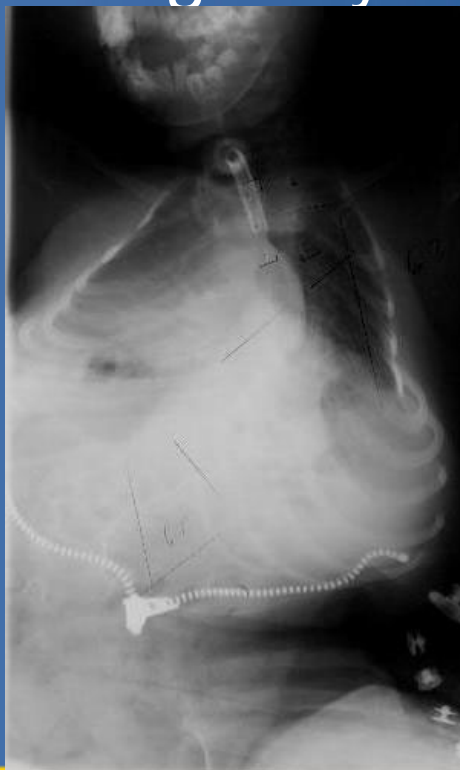
Radiographic Outcomes

- **Correction of major curve**
 - ❑ NF group: 48% correction (from 79 to 41)
 - ❑ FF group: 38% correction (from 74 to 46)
 - ❑ **No significant difference (P=0.31)**

- **Increase in trunk height (T1-S1 length)**
 - ❑ NF group: 31% (29.2 cm to 38.1 cm)
 - ❑ FF group, 35% (26.8 cm to 36.1 cm)
 - ❑ **No significant difference (P=0.64)**

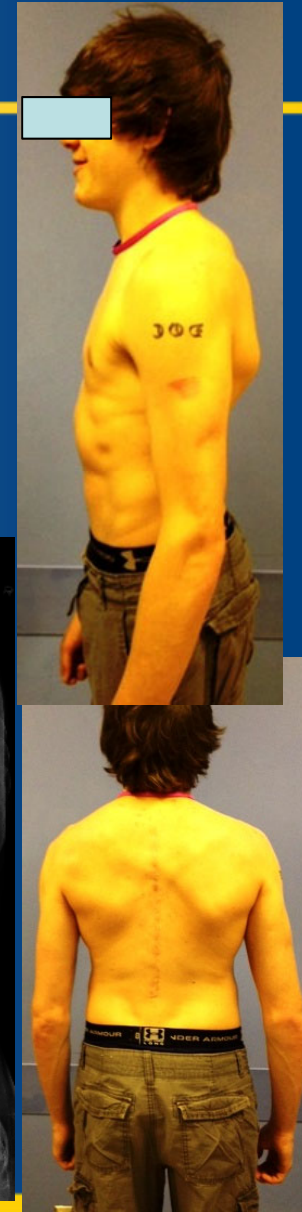
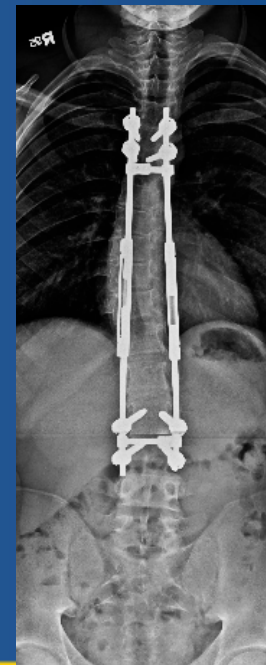
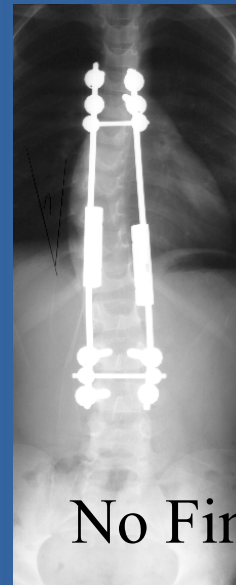
End of the Saga

- SMA
- Now age 17
 - No surg x 4 yrs



NF Follow up

- 26 /30 patients had rods retained
 - 4 rods removed due to infection.
- In NF group, **no rod fractures** and no clinical evidence of **pseudarthrosis**



Growth-Friendly surgery

- Can be an incremental process
- Preventing and managing deformities in safe steps
- Avoiding need for higher-risk surgery

Implications

- Need to focus not only on minimizing procedures, but:
- Not allowing deformity to progress to need for riskier surgery
 - Progressive 2-plane deformity
 - Uncontrolled junctional deformity

Conclusion

- Consider the End-Game as growth progresses
- Intervene with progressive deformity
- “No final fusion” at maturity is a viable option for patients with GR who have satisfactory final alignment
- Further followup of non-fusion patients required to better understand long term implications
- Implications for shilla, MAGEC to be seen

Thank you

