

# How I Decide What to Do at the End of Growth Friendly Treatment

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# Disclosure

- Consulting – Depuy Synthes, Nuvasive, Globus, K2M, Ethicon,
- Speakers Bureau – Depuy Synthes, Nuvasive, Globus, Stryker, Medtronic (baclofen pump)
- Royalties – K2M, Globus, Orthopediatrics



# Most Important Disclosure

My preference for growth friendly  
treatment is final fusion

Special Thanks to Paul Sponseller



# Two Questions

- What to do at the end?
  - Fusion vs No final fusion vs instrumentation removal
- When is the end? → stop lengthening
  - Final fusion → scheduling surgery
  - No final fusion → waiting to schedule surgery
  - Instrumentation removal → waiting to schedule revision surgery



# Introduction

- Historically final fusion anticipated
- Cahill et al. (2010) → autofusion common
  - Poor correction at final fusion

## 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*



# Final Fusion Concerns

- **Stiff spine → osteotomies**
- **Obscured landmarks → difficult implant placement**
- **Weak bone → stress shielding**
- **Longer fusion**
- **Drifted anchors**
- **Potential increased neurological risks**



# It may not be over?

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## Final Fusion After Growing-Rod Treatment for Early Onset Scoliosis

Is It Really Final?

Connie Poe-Kochert, RN, CNP, Claire Shannon, MD, Jeff B. Pawelek, BS, George H. Thompson, MD, Christina K. Hardesty, MD,  
David S. Marks, FRCS, Behrooz A. Akbarnia, MD, Richard E. McCarthy, MD, and John B. Emans, MD

- 20% reoperation risk following final fusion



# Instrumentation Removal

- Hope for a straight spine with some flexibility
- Yazici (ICEOS 2016) → bad idea
  - High rate of decompensation
- Too many “my next worst cases” started with “they then removed the instrumentation”





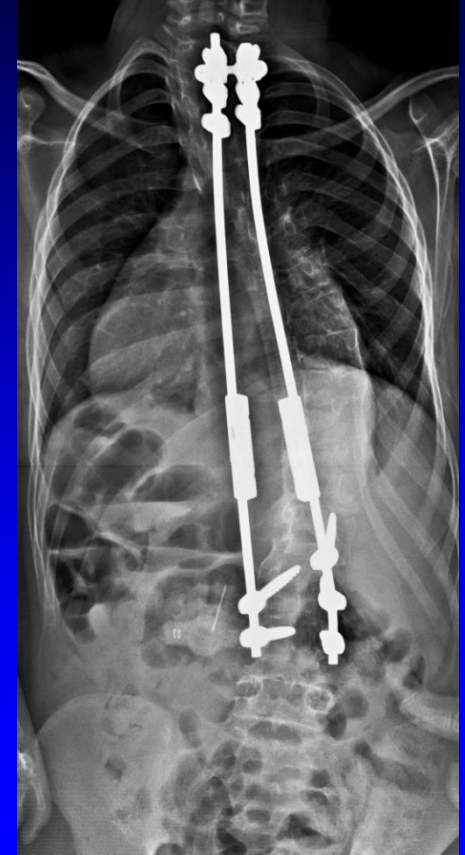
# Magnetic Implants

- No long term safety profile
- Discuss need for removal at implantation



# 3 Scenarios at “Graduation”

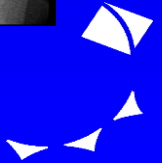
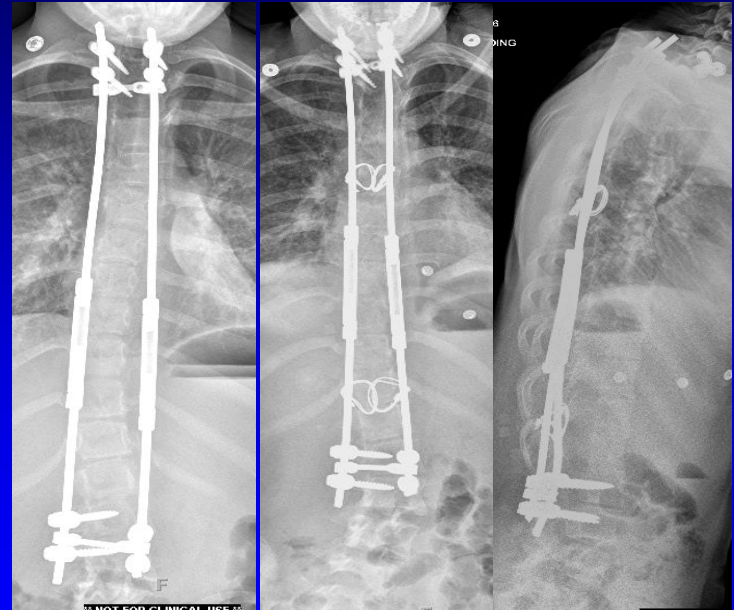
- **1. Straight, not stiff**
- **2. Not Straight  
(unacceptable/unbalanced)**
- **3. Straight (acceptable) and stiff**



# Straight but Not Stiff

– Sponseller –

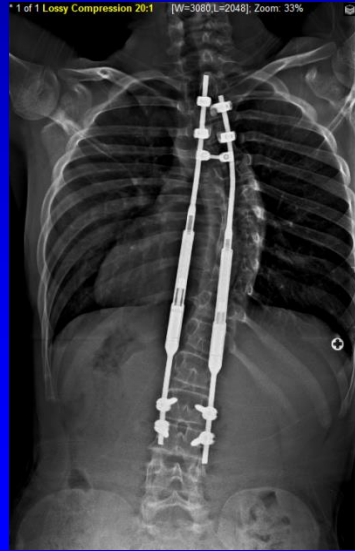
- Recent rod breakage
- Laxity at last distraction
- Add anchors + graft



# Straight but Not Stiff

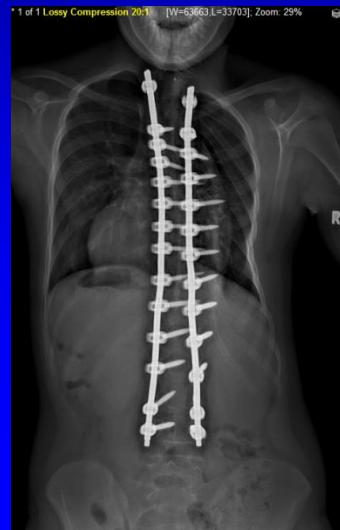
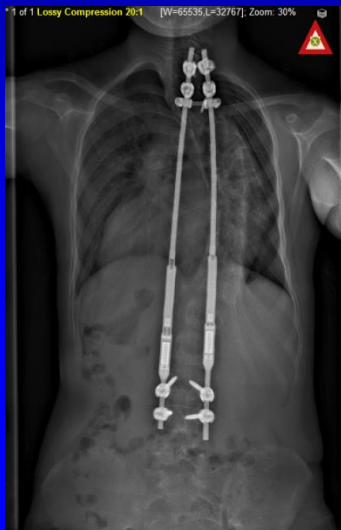
– Personal preference

- Revising instrumentation
- Improving correction – all planes



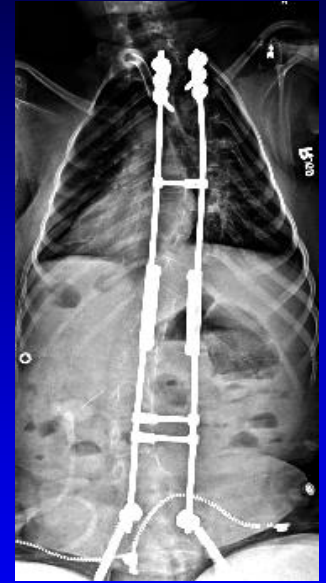
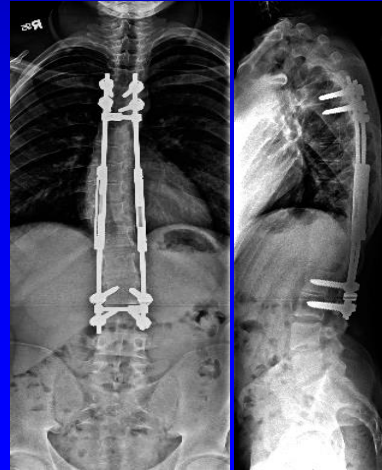
# Not Straight

- Personal preference
  - Final fusion → Revision surgery
  - Aggressive correction → Osteotomies

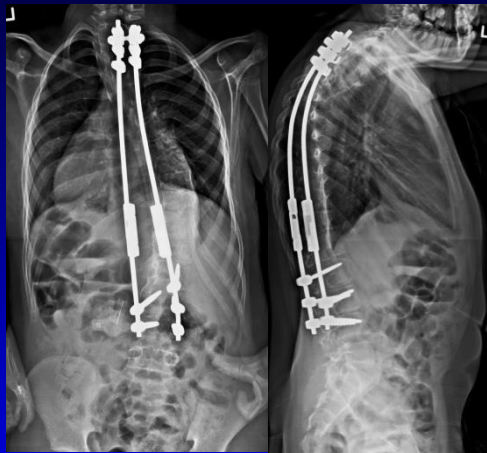


# Acceptably Straight and Stiff

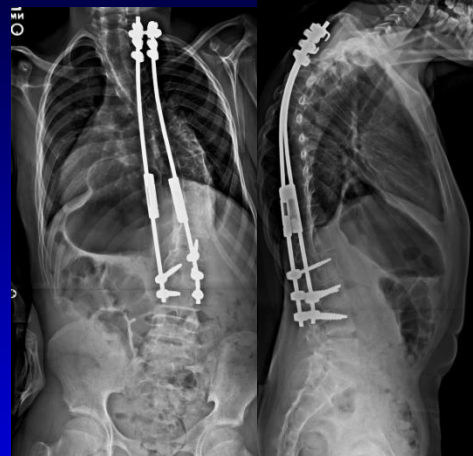
- No final fusion
  - Skeletally Mature
  - No rod fractures
  - Stiff → diminishing returns



# Acceptably Straight and Stiff

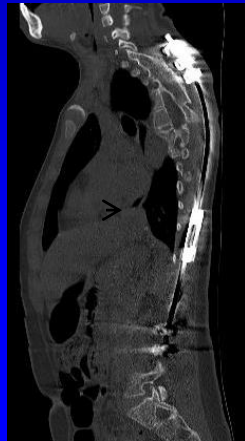


CT → fused



Final Fusion

- No further surgeries
- 12 surgeries later → no more
- Done growing



2 years later pop in upper back



# While my preference is to final fuse, there are options

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## Avoidance of “Final” Surgical Fusion After Growing-Rod Treatment for Early-Onset Scoliosis

Amit Jain, MD, Paul D. Sponseller, MD, John M. Flynn, MD, Suken A. Shah, MD, George H. Thompson, MD, John B. Emans, MD,  
Jeff B. Pawelek, BS, and Behrooz A. Akbarnia, MD, on behalf of the Growing Spine Study Group

- Compared 137 Final fusion (FF) with 30 non fusion (NF)
- Skeletally mature
- Similar ages and diagnoses





# Radiographic Outcomes

- Correction of major curve
  - NF → 48% correction
  - FF → 38% correction
  - Not statistically significant (P=0.31)
- Increase in trunk height (T1-S1 length)
  - NF → 31%
  - FF → 35%
  - Not statistically significant (P=0.64)



# Conclusion

- Personal default is final fusion
  - Prepared for difficult surgery
  - 20% risk of additional surgery
- No final fusion → viable option with caution
  - Continue to follow
- Don't remove instrumentation

