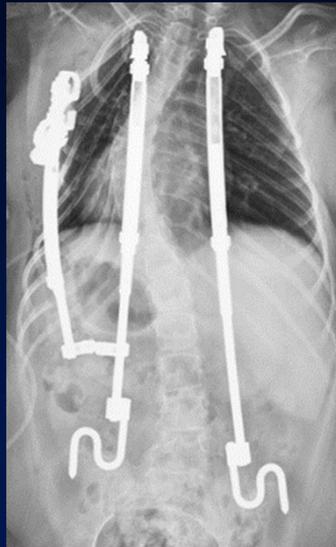


# The Graduates



John (Jack) M. Flynn, MD  
Professor of Orthopaedics  
University of Pennsylvania  
Chief of Orthopaedics  
Children's Hospital of Philadelphia



# EOS Surgery Grads



- Increased attention to this part of the journey as early cohorts mature
- Topic lends itself to Top 10 countdown, but by stage of journey, not importance
- Some data, lots of personal experience

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## 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*

# 10

## EOS Surgery Grads Graduation depends....



### Different graduations for different conditions

- Jeune Syndrome
- Congenital
- Neuromuscular like CP, SB
- SMA—chest collapse
- Idiopathic-like

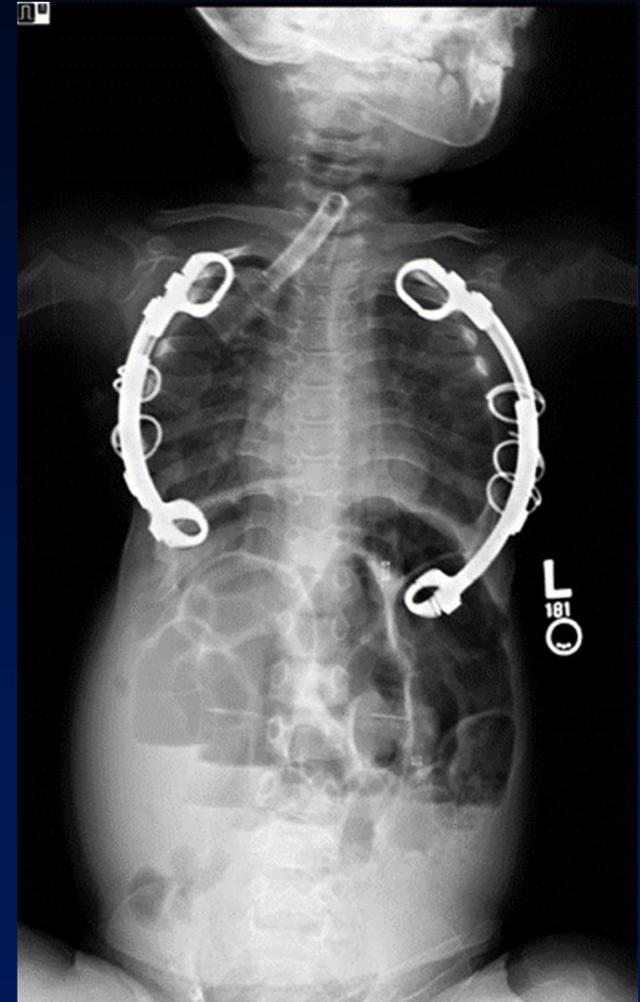
# 10

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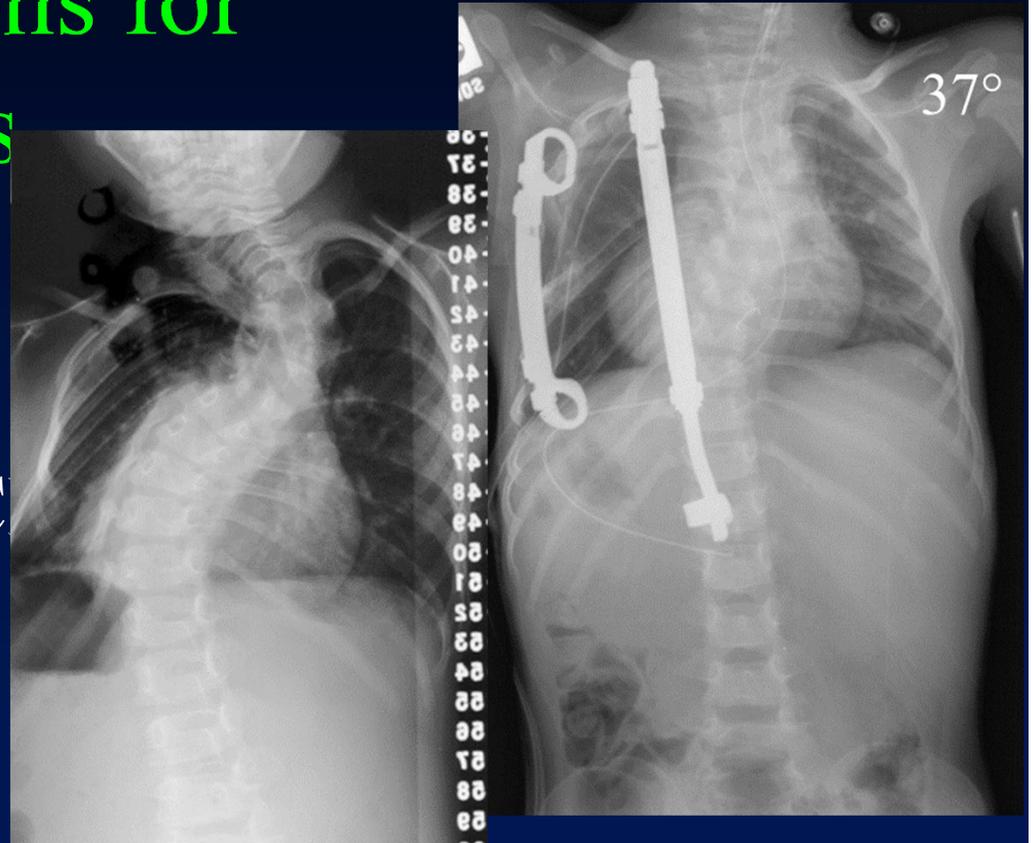
# 10

## EOS Surgery Grads Graduation depends....



### Different graduations for different conditions

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# 10

## EOS Surgery Grads Graduation depends....



### Different graduations for different conditions

- Jeune Syndrome
- Congenital
- **Neuromuscular like CP, SB**
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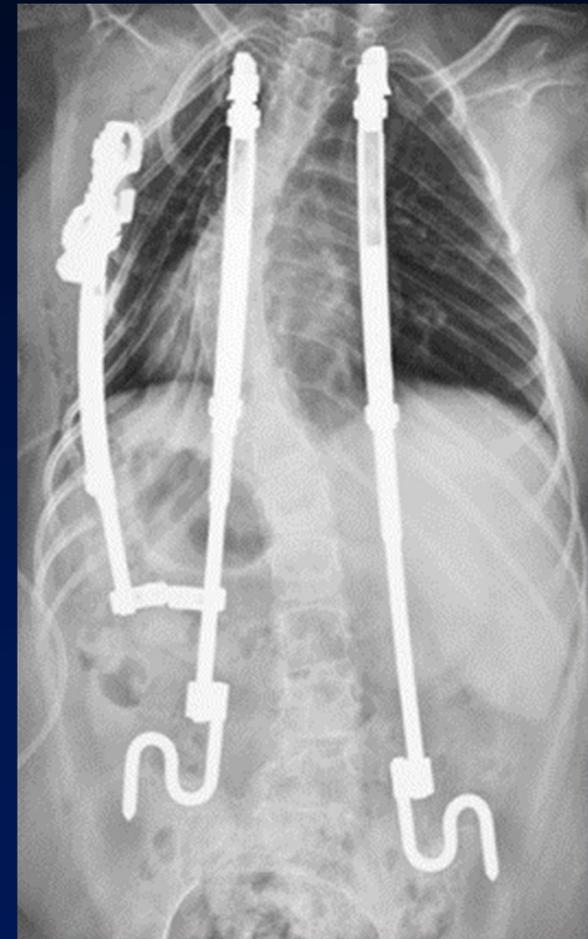
# 10

## EOS Surgery Grads Graduation depends....



### Different graduations for different conditions

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# 10

## EOS Surgery Grads Graduation depends....



### Different graduations for different conditions

- Jeune Syndrome
- Congenital
- Neuromuscular like CP
- SMA—chest collapse
- Idiopathic-like



# 9

## EOS Surgery Grads

# Set proper expectations



## Before the initial implant

- Make sure they know the natural history
- Include “graduation” in the discussion
- Make sure they know graduation is not “final redemption”—solving of all left-over problems

# 9

## EOS Surgery Grads Set proper expectations

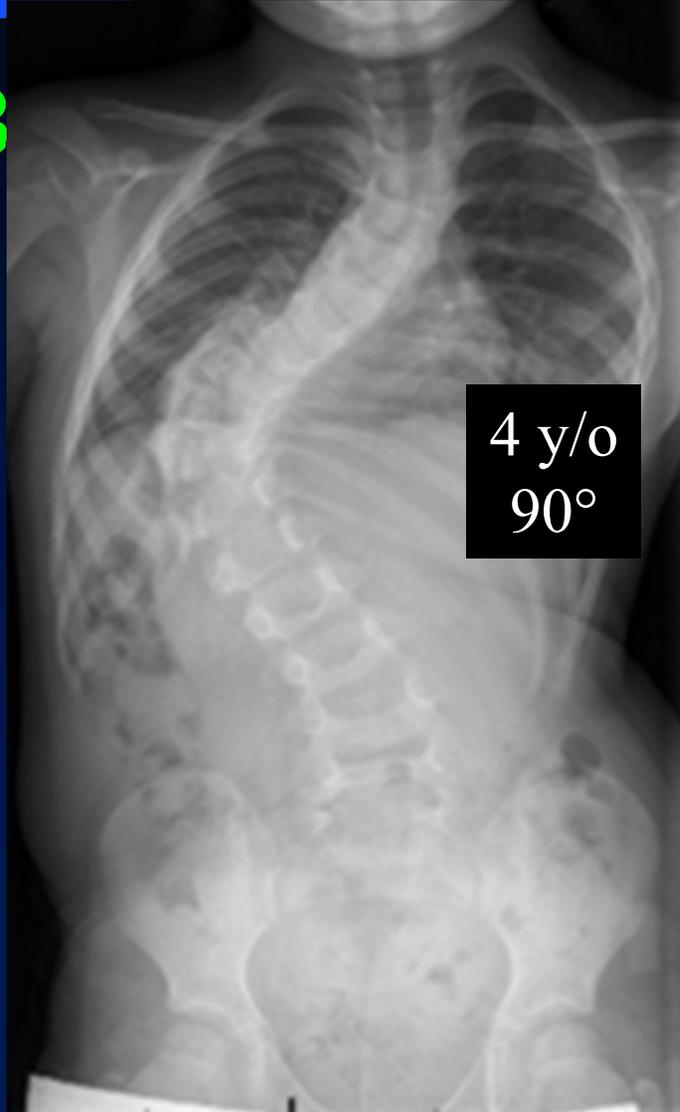


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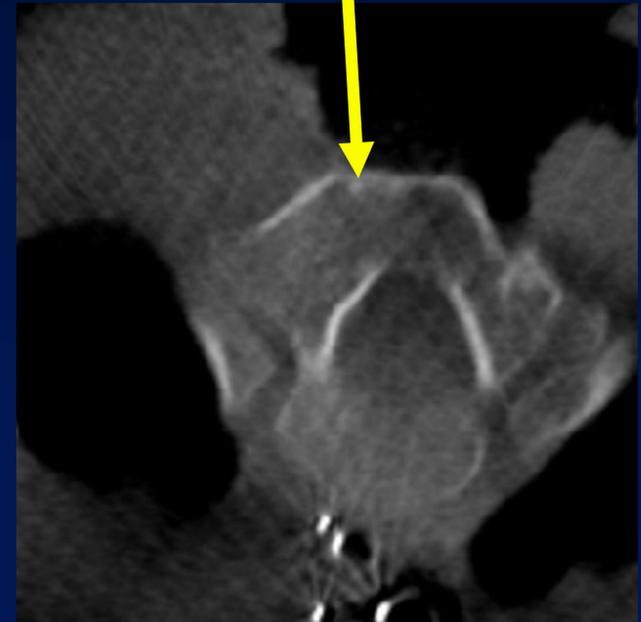
# 8

## EOS Surgery Grads ~3-4 years, it's mostly fused



- The law of diminishing returns is real, but varies
- 3-4 yrs in, most of the spine is fused in most kids
- Then...it's limping to graduation

Try lengthening this



# 7

## EOS Surgery Grads “We’re done with this”



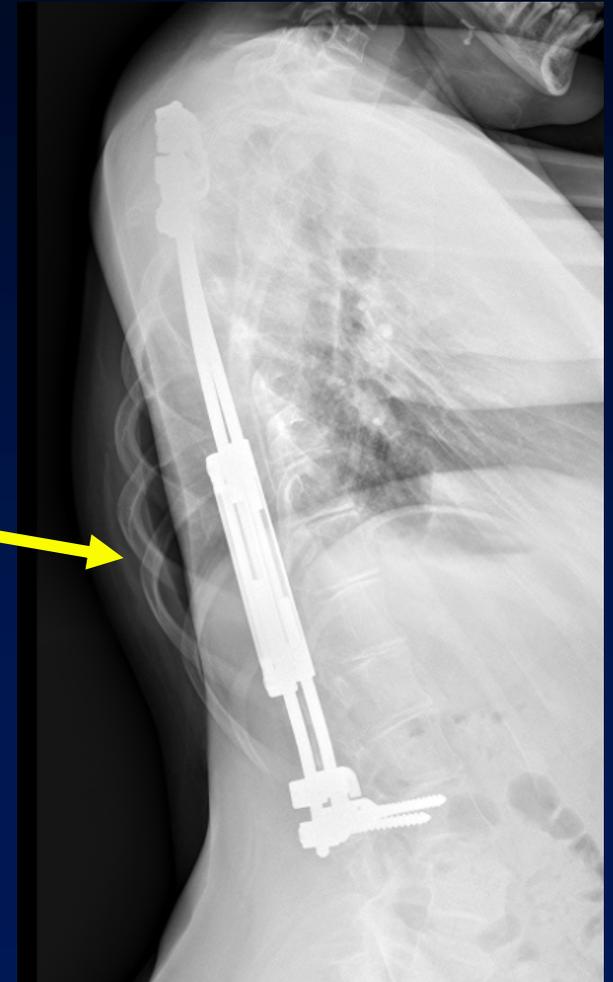
The earlier you  
instrument the earlier you  
are going to want  
graduation...but not true  
for parents

# 6

## EOS Surgery Grads The hump and short trunk



- Kids crankshaft at peak growth velocity
- The rib hump can be spectacular
- The trunk is short
- Kid's hate the short trunk and rib hump
- Both are hard to correct

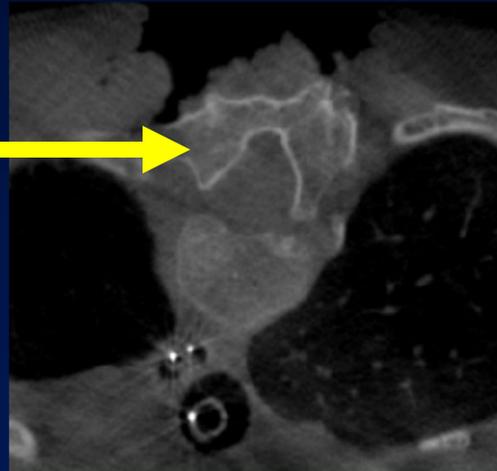


# 5

## EOS Surgery Grads PJK



- Ubiquitous in graduates
- Compensation for sagittal balance
- Thick fusion mass →
- Extremely hard to fix



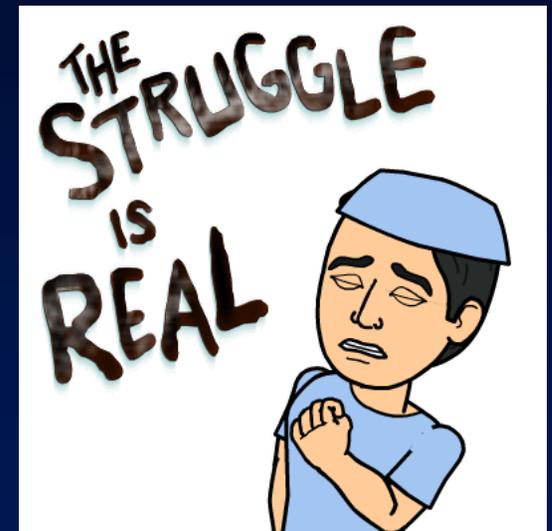
# 4

## EOS Surgery Grads Final fusion: the worst



Final fusion is the least satisfying operation ever invented

- Spine is mostly fused
- The spine is very deformed
- Stress-shielded bone is mush
- Anyplace that anything (rod or connector) touches the bone will fuse—roman aqueduct



# 3

## EOS Surgery Grads Final is not final



### Thompson et al. SRS 2014

- 22% of pts had surgery “after the final fusion”
- Most: infection 9%
- Painful or failed implants
- Mostly the NM & syndromic
- Less common: idiopathic, congenital

# 2

## EOS Surgery Grads Maybe skip graduation?



- Maybe they don't have to “walk with their class”
- The spine is fused or mostly fused
- Implants are strong
- Surveillance after peak growth may be the answer
- One strike and you're out



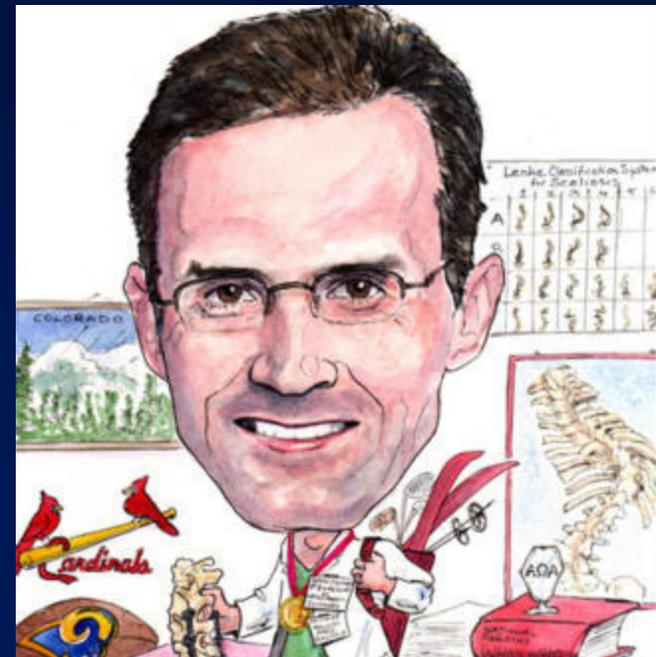
How does this 14y/o benefit from a final fusion?

# 1

## EOS Surgery Grads What happens longterm



- We don't know what happens 40 years after GR/VEPTR treatment
- Larry Lenke is here to shed light on some possibilities





Thank You