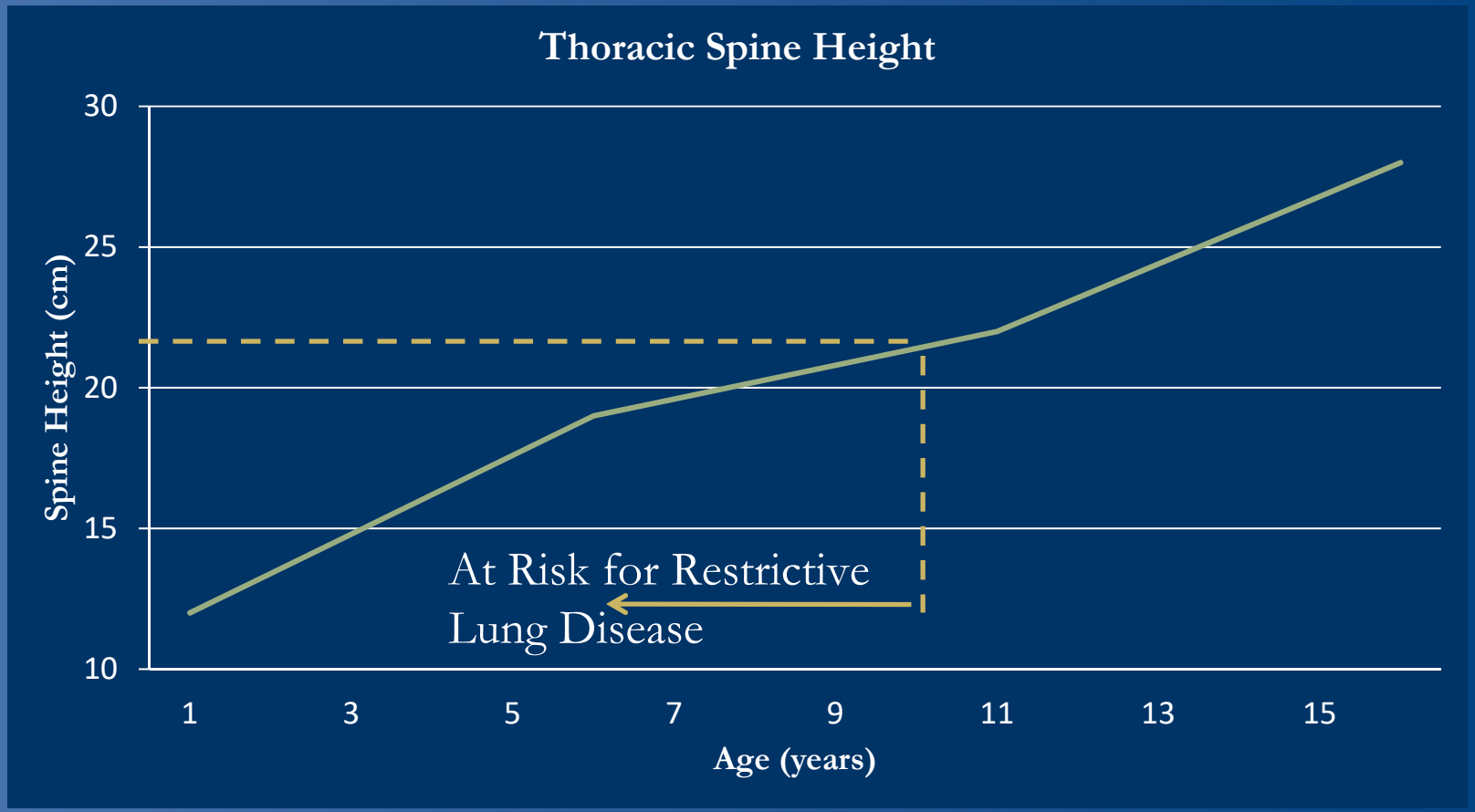
JOHNS HOPKINS
MEDICINE

When to Stop Lengthening -and What's Next?

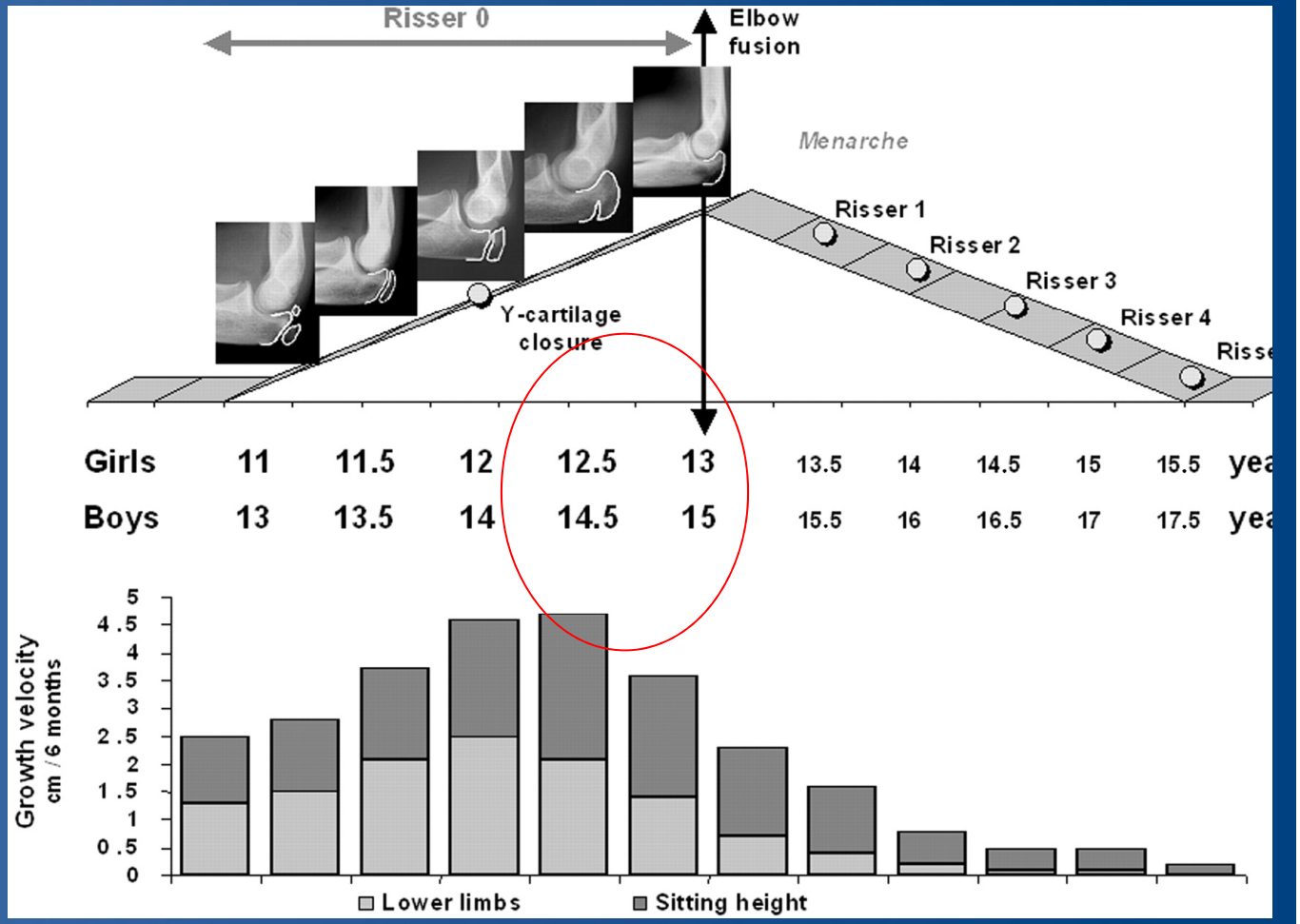
Paul Sponseller

When to stop lengthening:
1. Goal- Thoracic Spine Height

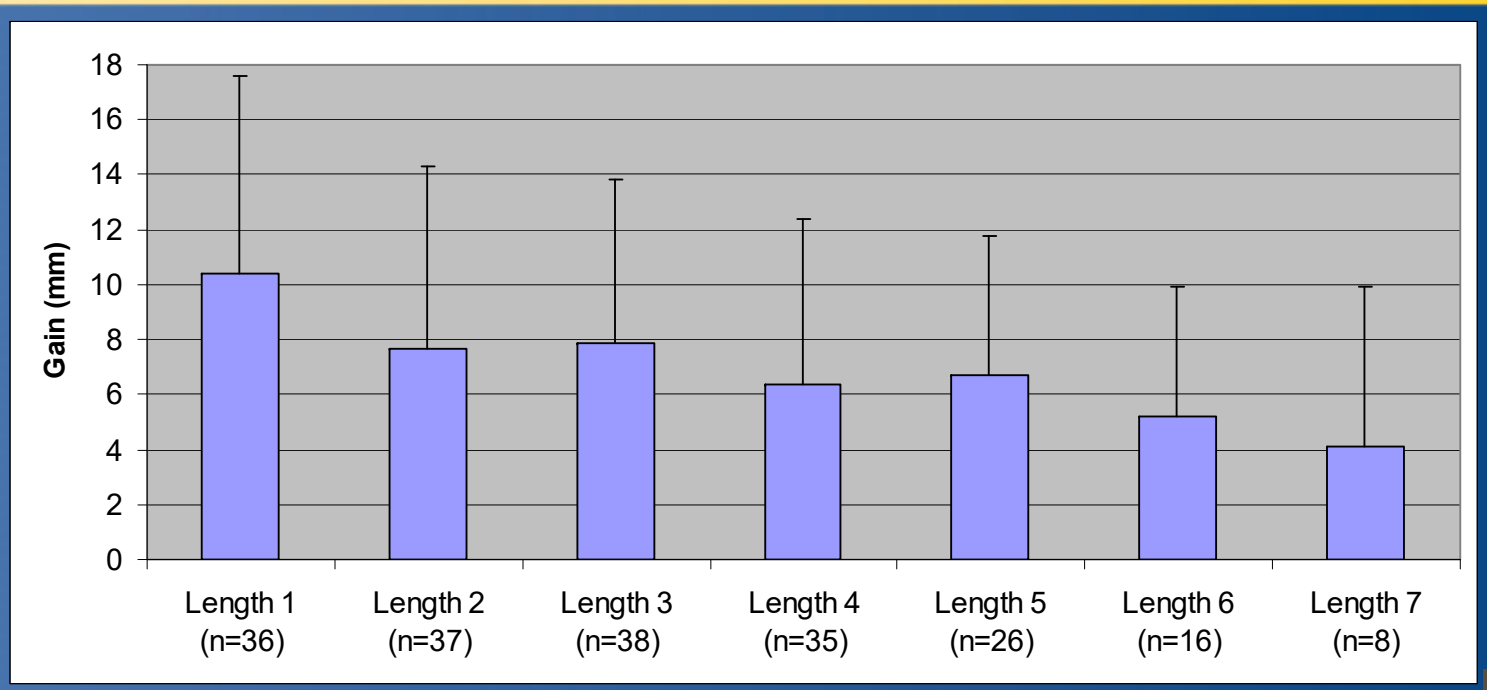


When to stop Lengthening: 2. Growth of Whole Spine

- 13/15y
- Dimeglio



When to stop Lengthening: 3. “Law of Diminishing Returns”



Spine stiffens with time

P<0.05

Sankar and Skaggs

What's Next?
The Growing Spine "Pathway"

- Patients are told they will have
  - Growing Phase
  - Final Fusion
- Many surgeons and patients follow this as a matter of protocol

Final Treatment Survey vs. Growing Rod Database

	Survey (17 Surgeons)	GSSG Database (265 Patients)
Final Treatment	(12/17) Replace everything, add more anchors (1/17) Leave rods add more anchors (0/17) Bone graft with existing implants,(Including connectors) (4/17) Don't fuse if pt having no problem	(65/71) Definitive Fusion (4/71) Implants removed, no fusion (2/71) Rods left in place, no fusion

GSSG Survey: Indication for Final Fusion

JOHNS HOPKINS MEDICINE

(13/17) Skeletal maturity (6/11 surgeons use Risser 4)

(14/17) Complications: infection or implant failure

(8/17) Curve progressing > 90°

(7/17) Failure to distract

Final Fusion- what is it?

Flynn JBJS 2013

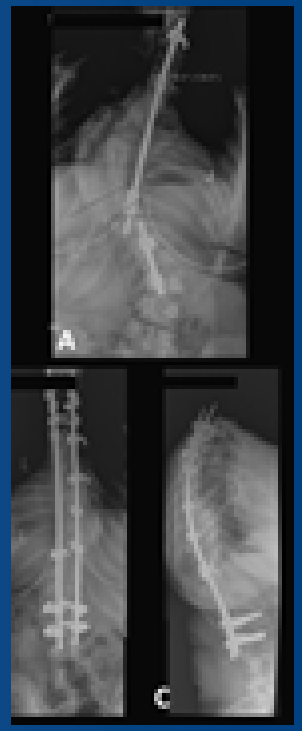
- 99 patients at maturity or fusion
  - 92 had fusion
- Mean of 5 years in GR

- 34% of patients
  - indication for fusion not given

Findings at Fusion

- Mean age of 12.5 yrs
- 62% completely stiff
- 50% got only moderate correction
- 25% required osteotomies

- 19% had worsening post-fusion



Assessing Spontaneous Stability:

When can we avoid final fusion procedures in Growing Rod patients who have reached skeletal maturity?

- How can patients not needing final fusion be identified?
  - Clinical and radiographic predictors
- Is CT needed?

Hypothesis

Final fusion may not be necessary for adequate correction in a subset of patients who:

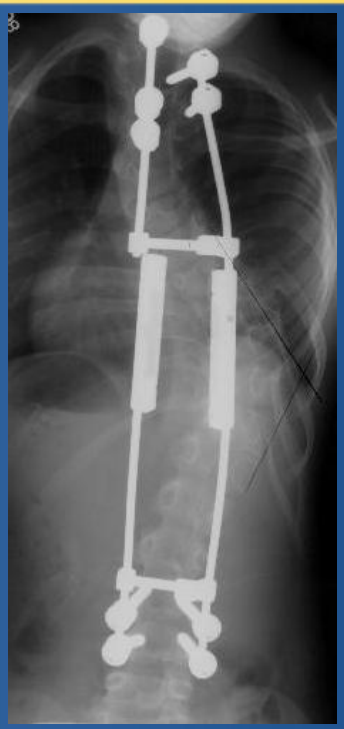
- Have been treated with growing rods for over 3 years
- Are skeletally mature (Risser >1-2) and have adequate correction/balance
- Have no implant problems (no infections, no rod breakage within past 2 years)
- Have had diminishing returns at distraction

A Growing Rod Saga

JOHNS HOPKINS MEDICINE

Age 6

Age 8



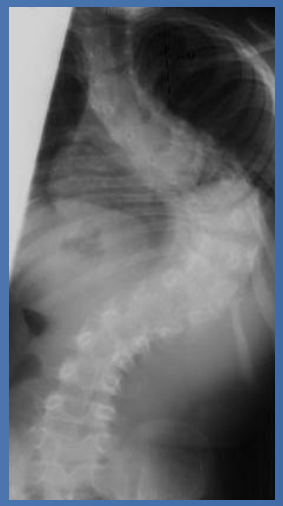
Age 9

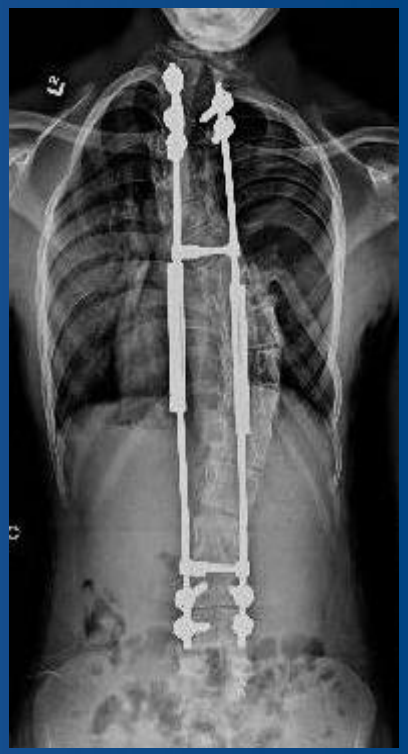
Patient with idiopathic early onset 95 degree curve at age 6. Rods fractured multiple times; each time repaired with distractions.

End of the saga

JOHNS HOPKINS MEDICINE

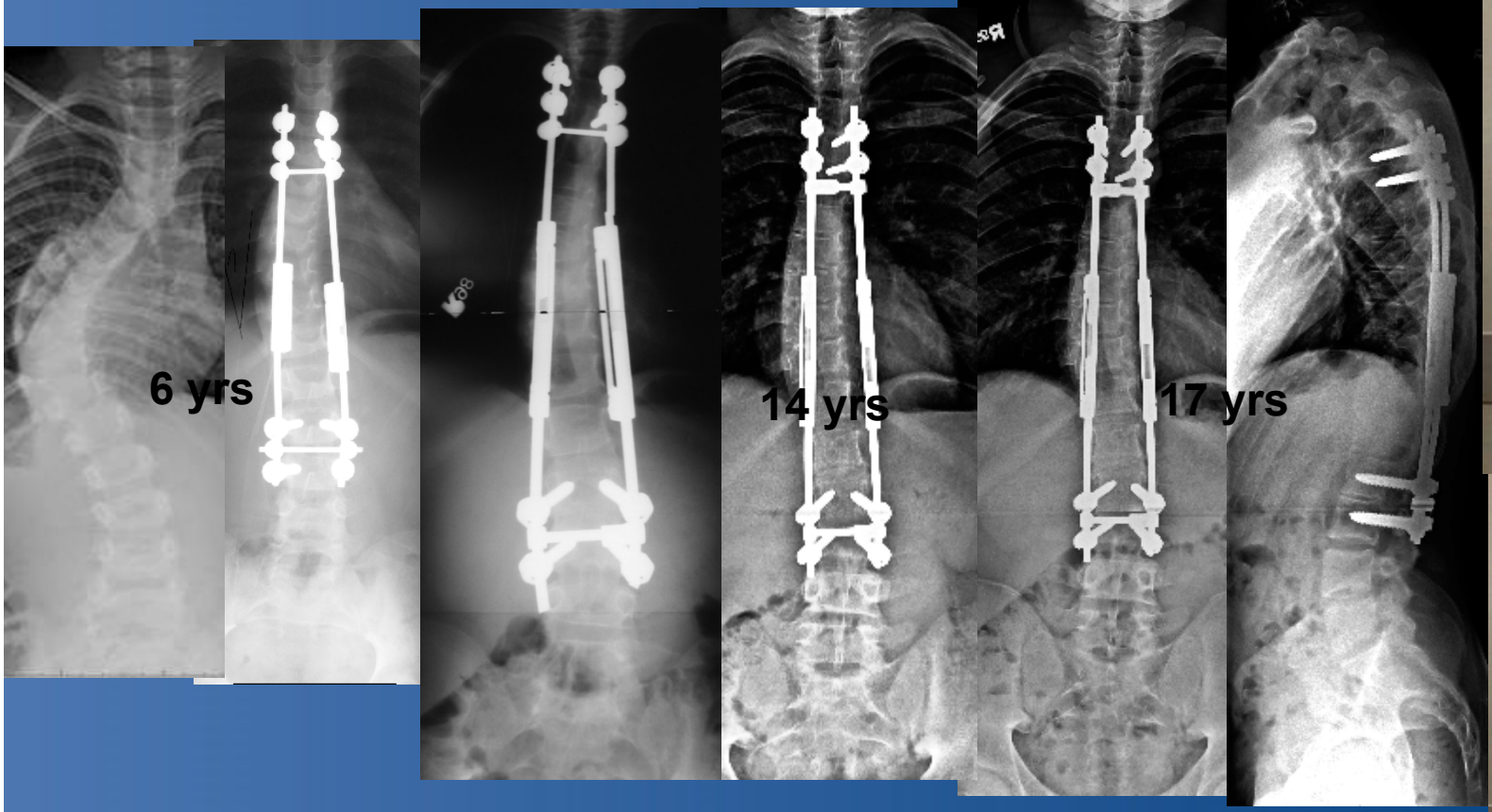
Age 6 Age 14 Age 15 Age 16

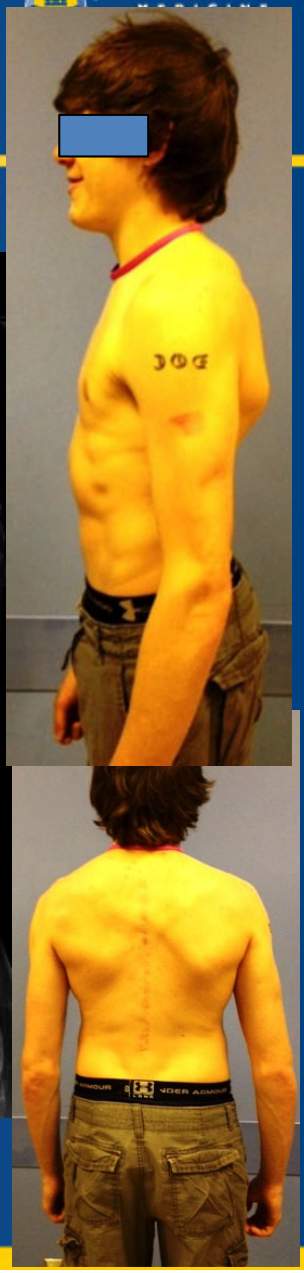




Construct has been stable for 3 yrs at skeletal maturity.
No final fusion is planned

Another story -IIS

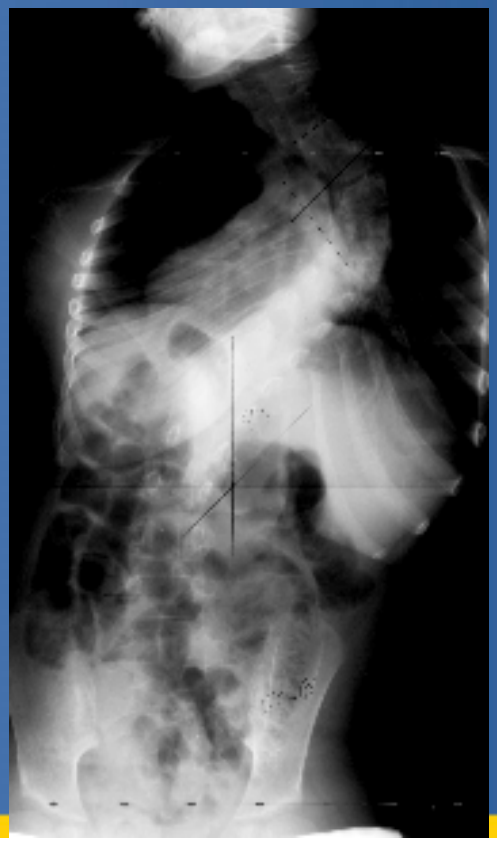


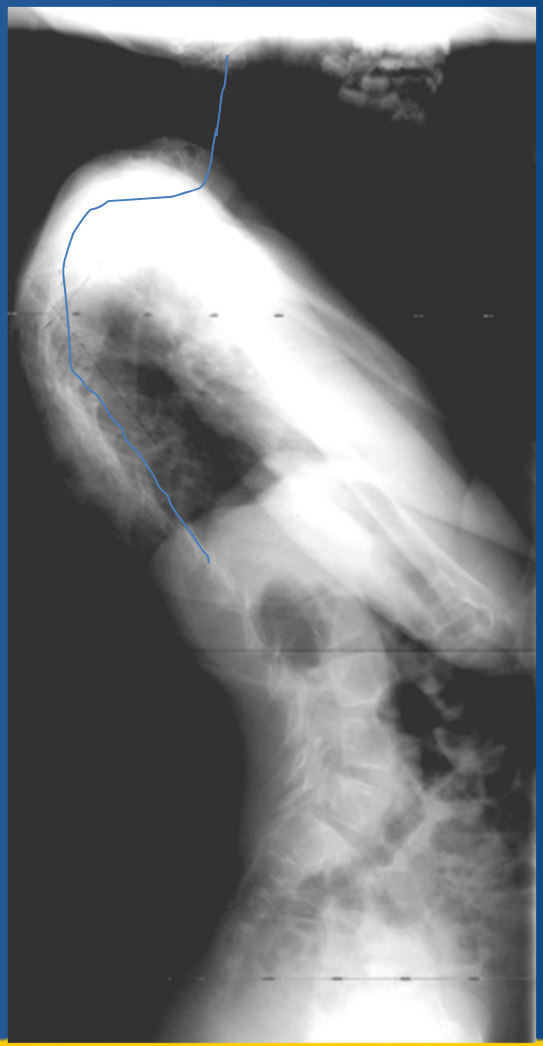


No Final Fusion planned

Example: 8 yo congenital myopathy

- 85° kyphosis C5-T5
- 87° scoliosis T1-T10



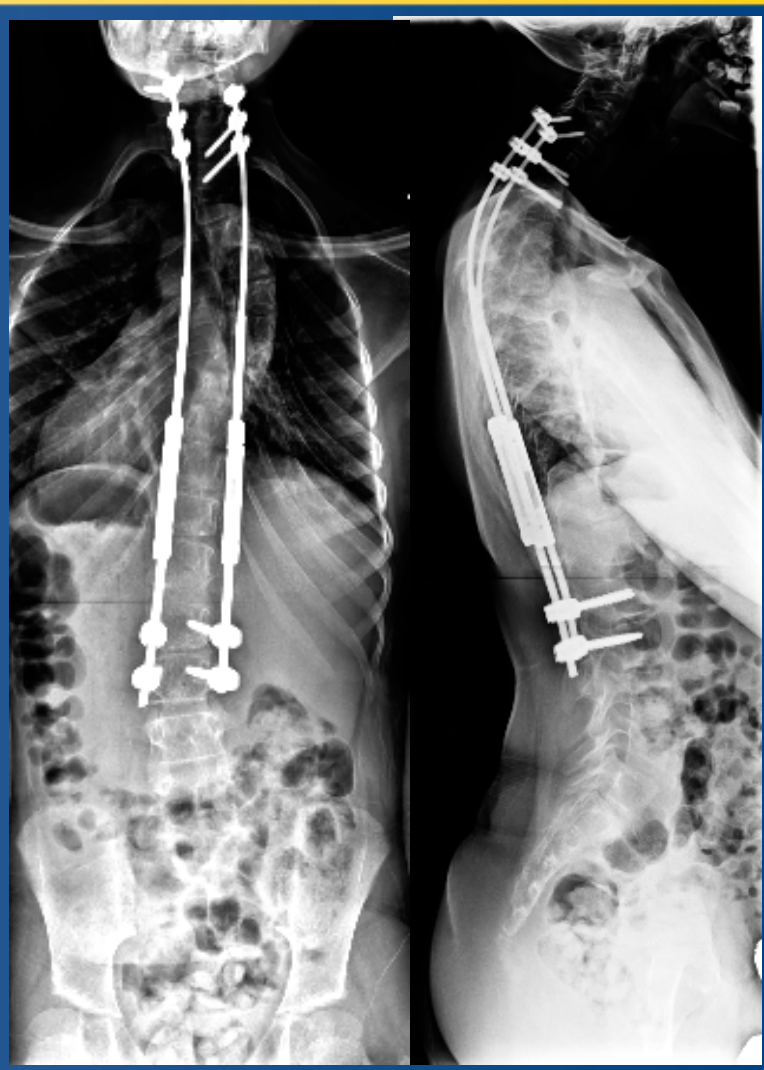


In Tx

Follow up: Myopathy -age 12

JOHNS HOPKINS MEDICINE

No fusion performed
3 yr follow up

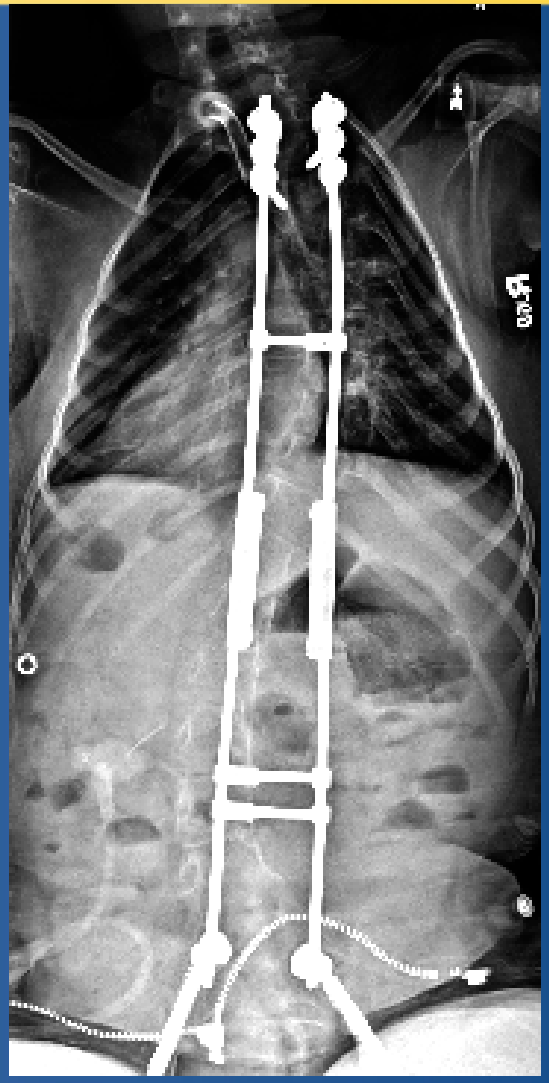


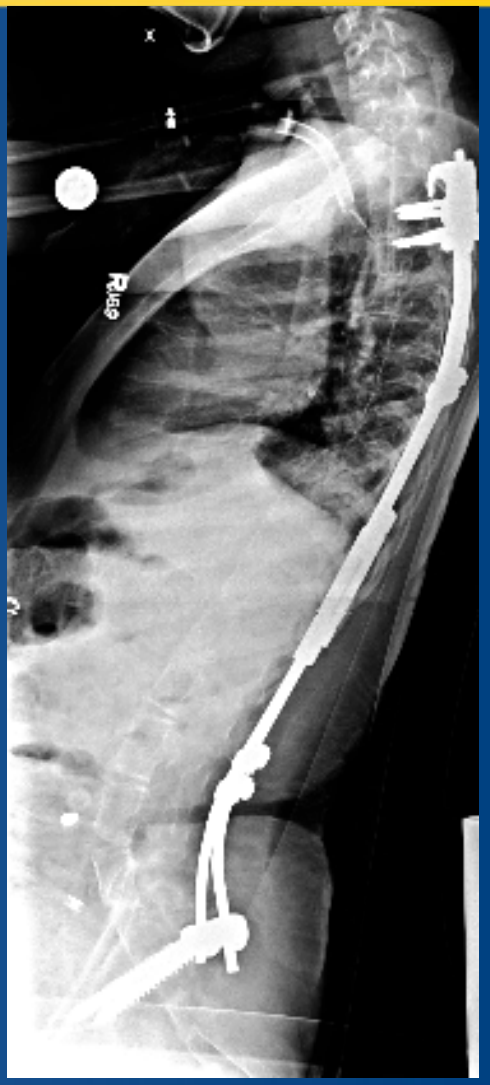
SMA 7 yrs old

- preop

SMA 4 yrs post-op

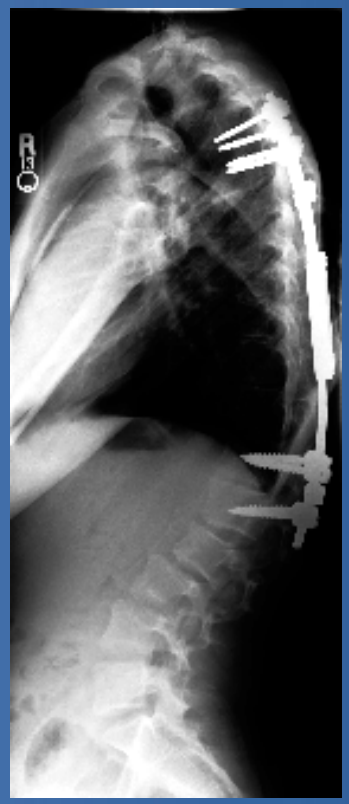
- 5 distractions
- Now age 16
- Risser 4
- End game?
  - No surg x 3 yrs





Final fusion

- If deformity correction not satisfactory



Summary: What's Next

- Final Fusion if
  - Inadequate alignment
  - Symptomatic pseudarthrosis
    - But Large procedure, blood loss
- Implant removal if
  - Infection
- Observation if
  - Good balance, no problems
  - Needs validation over time

Thank you