Decisions, Decisions…Choose Wisely

Peter O. Newton MD

Rady Children’s Hospital & University of California, San Diego

San Diego – Orthopaedics
Disclosures as Listed

Royalties from K2M, DePuy Synthes.
Licensed IP on tethering to DePuy Synthes and Spinologics
The EOS Challenge

• Easy Problems, Hard Problems
• Simple Treatment, Complex Surgery
• Good Decisions, Bad Decisions
• Good Outcomes, Bad Outcomes
Why Intervene in EOS?

- Prevent deformity
- Promote pulmonary development
- Assumes intervention better than natural history
Two Causes of Severe EOS

1. Patient with big deformity early in life (them)
2. Surgeon with big dreams of helping a patient with “growth friendly” surgery (us)
Patient Disease

- 11 mo old
- Neuroblastoma
- Extensive resection
Patient + Surgeon Disease

- JIS
- Shilla
- Loose
- Infection
- Removal
- Progression
There’s no going back…

- Wear debris
- Autofusion
- Junctional issues
Wait, Wait, Wait... Fuse.

One & Done!
Do Everything **NOT** to Operate Before Age 8, better yet Age 12

- Observation
- Casting
- Bracing
- Halo Traction
- All of the above
Justification to Intervene?

Age 3.0

No correction brace
“Growth Modulation” w/ Cast
Casting Strategies

- Cotrel
- Risser
- Mehta
- Bending
Serial Casting Works

1st Cast

2nd Cast

Age 9
Growing rod, Shilla, Tether?

Age 8

2014

2015

2016

2017

NO
and/or get a better brace

• BRAIST trial proved it works
• In brace correction matters
• Time in brace matters
• The brace maker matters
Casting/Bracing Complications

• Failure to control scoliosis
• Chest wall deformity due to cast pressure
• Skin breakdown
• Negligible compared to “Growth (un)Friendly Surgery”
Too Proximal for a cast...

Age 3  Neuroblastoma
Progression over 4 years (age 7)

2013 73º

2016 76º

2017 94º
Progression over 4 years

2013 83°
2016 85°
2017 114°
If it doesn’t work...

First Stage of Treatment

Second Stage of Treatment
HGT - Rarely Disappoints
Few hours/day Holter Txn
• Surgery (beginning of the end)
• Keep delaying (devastating for lungs)
• Choose wisely & based on deformity
Age 8

Ready for Surgery...??
How?

- Growing rods?
- Growth guidance?
- What levels?

Age 8
How?

- Growing rods?
- Growth guidance?
- What levels?

After HGT

Age 8
First Principle

Delay surgical intervention!

• Cast
• Brace
• Traction
• Resist the temptation of Easy!
Second Principle...

Know when to break the First Principle!

- Only for a Short Fusion
- Define “Short”...
- Depends on age, diagnosis
Shortest curve – 1 level fusion
3 y/o paraplegia
"Short" Thoracolumbar Fusion

Neuroblastoma

2001
2006
2016

21cm
NF1 - Short Curve
Early, Short Fusion

Age 3
Age 5
Too much fusion too early vs. Too little too late

**Goal**

- T1-12
- 20-22cm
Decisions Matter More in EOS

- Resist the urge to do easy surgery too early
- Resist the urge to instrument more than the “bad” spine/chest
- The younger the patient, the greater the importance of getting it right
Large Curve, “Virgin” Spine
Always easier than one previously treated with growth sparing instrumentation
Anterior Spinal Growth Tethering

- Maintains motion
- Modulate growth
- Heuter-Volkmann
- Reshape vertebrae
- Requires real growth (2-3 years)
Apical Vertebra Shape Change

2 year of growth modulation
Clinical Anterior Tethering
“Physician Directed Use” w/ 510k Cleared Device

• Posterior Adult Lumbar system
• Cord and Screws used anteriorly
Thoracoscopic Approach

- Single lung ventilation
- 4 incisions (15mm)
- Divide segmental vessels
- Vertebral pronged staple & screw
- Tension the tether
Results at/after Maturity

Immed PO 1 yr Post Op 2 yr Post Op Maturity
- 12 y/o F, Risser 0, closing TRC, 53° curve
- Modest loss of correction, starting at 2 yrs
- Broken tether near completion of growth
Segmental Angulation Changes

>6° = Broken tether

![Graph showing segmental angulation changes for different spine segments.](image)
Average Thoracic Cobb Angle

- **ASGT**: 4.3 Yrs
- **PSF**: 4.0 Yrs
10 y/o male, very immature, Small curve
Proximal overcorrection
Distal adding on, broken tether (2 levels)
Revised with partial removal and extended
Not a “One & Done” for All

- Risser 0, Open TRC cohort
- Early outcomes excellent
- 4-6 yrs outcomes mixed
- 53% required 2\textsuperscript{nd} Surgery
- 71% have avoided Fusion
- Tether failures common (not obvious)
Some Outstanding...
Decision, Decisions

- EOS is tough
- Often no perfect solution
- Buy time, even if it’s hard
- Choose wisely with an eye on the final solution
Make the first procedure count!
There is only one first time!
(especially from the back)