Criteria for avoiding Final Fusion

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Thursday November 20, 2014
2:40-2:50
Disclosures

- Medical Education Reviews
- JBJS
- DePuy Synthes Spine: Research, royalties
- Globus: Royalties
Goal- Thoracic growth

Thoracic Spine Height

At Risk for Restrictive Lung Disease

Age (years)

Spine Height (cm)
When to stop Lengthening: Growth of Whole Spine

- PHV < 13/15y
- Dimeglio
Implications of “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, *then*
  – Final Fusion

• Many patients follow this as a matter of protocol
## Final Treatment Survey

<table>
<thead>
<tr>
<th>Final Treatment</th>
<th>GSSG Survey  (17 Surgeons)</th>
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</thead>
<tbody>
<tr>
<td>(12/17) Replace everything, add more anchors</td>
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<tr>
<td>(1/17) Leave rods add more anchors</td>
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<tr>
<td>(4/17) Don’t fuse if pt having no problem</td>
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GSSG Survey: Indication for Final Fusion

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

(14/17) Complications: infection or implant failure

(8/17) Curve progression

(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 with 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
Final Fusion is not always Final

- Thompson et al
- > 20% require additional surgery
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?
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 maturing (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
Patient with idiopathic early onset 95 degree curve at age 6. Rods fractured multiple times; each time repaired with distractions.
End of the saga

Construct has been stable for 5 yrs at skeletal maturity.
No final fusion has been performed
Another example - IIS

No Final Fusion planned
Example: 8 yo congenital myopathy

- $85^\circ$ kyphosis C5-T5
- $87^\circ$ scoliosis T1-T10
Follow up: Myopathy -age 12

No fusion performed
4 yr follow up
SMA 7 yrs old

- preop
SMA 5 yrs post-op

- 5 distractions
- Now age 17
- Risser 5
- End game:
  - No surg x 4 yrs
Implications -
“begin with end in mind”

- Plan each lengthening to maintain balance
- Consider coronal and sagittal planes
- Check pelvic obliquity with T-square
  - If indicated
Challenges to the plan

- Infection
- Unacceptable deformity
Implant and ankylosis work together

- Implant removal – increase in coronal and sagittal plane
  - Shah 2010
  - Alpert 2014
Final fusion

- If deformity correction not satisfactory
Other types of implants

- Luque-Trolley
- VEPTR
- MCGR

- Do different mechanics and lengthening patterns have same implications?
Summary:

• **Final Fusion if:**
  – Inadequate alignment
  – Symptomatic pseudarthrosis
    • But Large procedure, blood loss

• **Implant removal if:**
  – Infection
    • May need another procedure later

• **Observation if**
  – Good balance, no problems
  – Needs validation over time
Thank you