When to Stop Lengthening -and What’s Next?

Paul Sponseller
When to stop lengthening:

1. Goal- Thoracic Spine Height

Thoracic Spine Height

At Risk for Restrictive Lung Disease
When to stop Lengthening:
2. Growth of Whole Spine

- 13/15y
- Dimeglio
When to stop Lengthening:

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

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

- Survey includes responses from 17 surgeons, with data provided for each treatment option.
- GSSG Database includes data from 265 patients, with specific outcomes noted for definitive fusion, implant removal, rod retention, and non-fusion cases.
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 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

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

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
Follow up: Myopathy
-age 12

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