Disclosures

- Medical Education Reviews
- JBJS
- Depuy Synthes Spine: Research, royalties
- Globus: Royalties
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Michael G Vitale MD
celebrity look-alikes?
The Benefits of Screws:

• 3-D control
• Durability
  – Stay where you put them!
• Minimal invasiveness
  – Easy in, easy out
The questions

- Will they affect Growth?
- Will they impair ambulation
Limitations of S-hooks

- Not rigid fixation
- Limited sagittal control
- Can only distract
  - differentially
- Drift
- Difficult removal
S hooks in ambulatory patient

- Forward lean progresses
Infantile Marfan Syndrome

- 2.5 yr old
- 3 heart valves
Advantages of Screws in Pelvis

- Strongest distal anchors
- Foundation for rotational control
- Better sagittal control
- Better coronal control
- Better growth control
Indications for Pelvic Fixation

• Mostly Neuromuscular
  – CP
  – SMA

• Syndromic
  – Marfan
  – LDS
Parameters of pelvic Growth
# Results: Growth Disturbances

<table>
<thead>
<tr>
<th></th>
<th>Iliac Fixation (n=4)</th>
<th>SAI Fixation (n=15)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean growth ratio of sacral width*</td>
<td>0.96 +/- 0.04</td>
<td>0.98 +/- 0.09</td>
<td>0.538</td>
</tr>
<tr>
<td>Mean growth ratio of iliac width*</td>
<td>0.96 +/- 0.08</td>
<td>0.99 +/- 0.08</td>
<td>0.844</td>
</tr>
<tr>
<td>Mean growth ratio of pelvic inlet*</td>
<td>0.99 +/- 0.06</td>
<td>0.96 +/- 0.05</td>
<td>0.744</td>
</tr>
<tr>
<td>Mean, summative percent change in fixation angulation**</td>
<td>90 +/- 30</td>
<td>90 +/- 40</td>
<td>0.467</td>
</tr>
</tbody>
</table>

*normalized to femoral head diameter; ratio of post-operative to pre-operative growth.
**normalized to pelvic inlet; summative of left and right pelvic fixation.
SRS 2017:
Don’t You Wish You Had **Fused** Fixed to the Pelvis the First Time?

**Paper 94 Nielsen, VItale…. Skaggs**

**Take Home Message:**

- Advise Families if a second operation to the pelvis is needed
  - it will be as “big” as the first surgery
    - OR time
    - EBL
  - likely end up with less correction
• Iliac Fixation
  – Starting on sacral ala
  – Deeper, within muscle envelope
  – In line with other spinal anchors
  – Ideal for pelvic obliquity correction mechanics
  – Good platform for de-rotation
Neuromuscular EOS

- 7 yrs old
- Now 17
- No Final Fusion
5 yr Durability: Pelvic Implant Complications

- **SAI Group**
  - 0% pelvic implant-related complications

- **Iliac Screws Group (14%)**
  - 6 Cases:
    2 Prominent Screws (not needing reop)
    3 disconnections (1 not reop, 2 reop)
    1 loose iliac screw that needed removal
Technique

• 6 cm incision
• S1 screws first
• Works for other anchors
  – In midline

Baclofen pump intact
Standard Correction

• Lock rods in SAI screws distally
  – Leave long ~2-3 cm against sacrum
  – For compression/distraction

• S1 and L4/5
  – Minimizes stress on Screws and caps
Goals

- To correct pelvic obliquity
  - SAI screws
  - compress and distract pelvis
Summary

- S-hooks have limited sagittal control
  - Mainly differentially distract
- Drift because of limited transverse profile
- Difficult extraction
- Problems better addressed with screws
Thank you
Transverse-plane pelvic asymmetry
Baltimore Heroes – sports
Baltimore Heroes (??)
Thank you
As soon as the anesthesiologist gets here, we'll get started.
Russell A. Hibbs

Dr. Russell A. Hibbs
Pioneer of Spinal Fusion

Daniel J. Miller, MD, and Michael G. Vitale, MD, MPH

S
Spinal deformity was a source of significant morbidity during the industrial revolution, particularly in urban areas where tuberculosis (TB) and poliomyelitis were endemic. Although surgical procedures to stabilize the spine date back to Berthold Hafter in 1891, management of spinal deformity at the turn of the 20th century consisted primarily of long-term manipulation and immobilization via casting or bracing. The purpose of this publication is to review the contributions of Dr. Russell Hibbs toward the development of an operative technique of spinal fusion and to emphasize how this technique helped change the paradigm for the treatment of spinal deformity.

BIOGRAPHY
Dr. Russell Hibbs (Figure 1) was born in Birdsville, Kentucky, in 1869.7 The youngest of 10 children, Dr. Hibbs attended college at Vanderbilt University and graduated from the University of Louisville School of Medicine in 1890. After practicing...
Advantages of Fixation *Short of Pelvis*

- Increased mobility (if it works)
- Lower infection rate?
- Fewer CSF risks
  - Sacrum often thin or bifid
  - Dural ectasia occurs distally in syndromes
Retrospective Comparison of Unit Rods vs Screws

- 157 CP patients
- Unit Rod pts required more blood
  - 1010 vs 650cc
- Final major Cobb correction similar
- Pelvic obliquity correction
  - 74% U vs 22% C (p=0.002)
Early Onset Scoliosis

• Requiring surgery before age 9
• Fusion arrests trunk growth
• Solution: Growing rods
Technique- Finishing

- Pelvic anchors can be manipulated like other spinal anchors
- Allows compression and distraction
  - improves pelvic obliquity correction
  - and derotation of TL spine
- “T-square of Tolo”
  - JPO 2013
Technique - Passage

- Aim for A.I.I.S.
- Resistance increases at SI joint
- I like using awl; others like drill
- Continue to PSIS or lateral cortex
Starting Point

- ~25 mm below S1 endplate
- ~25 mm lateral to midline
Results: SAI Fixation

Pre-Operative: 9.7 yo
Major Curvature: 129°
Pelvic Obliquity: 46°

3 Days Post-Operative
Major Curvature: 29°
Pelvic Obliquity: 9°

2 Year Follow-up
Major Curvature: 23°
Pelvic Obliquity: 5°
Screws in SMA patient

- SS
Technique

- Check “teardrop”
- (obturator oblique)
  - Start more laterally if “vertical” hemipelvis
  - Seat screw heads at same depth as & in-line with S1
- Drive partly into bone
Many means of Pelvic Fixation

Ideal Implant Qualities:

• Low profile
• Long/thick enough for strength
• In line with spine
Indications for fusing short of pelvis

• Apex above L1
• End vertebra L4 or higher
• Upright balance
• Stander or independent sitter
  – With level pelvis
  – Pelvic Obliquity < 15°
Pitfalls

- Difficult CP
  - Use teardrop view to line up
  - Start more laterally
  - Ko JPO 2009