Vertebral Body Stapling

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History of Vertebral Body Stapling

- Convex growth arrest
- Nachlas & Borden, 1951
- Smith, 1954

Dr Crawford’s Adult Patient
10 yo girl with IS, onset at age 8.5 years, progressing despite bracing
Natural history suggests she would go onto a fusion
Progression Risk of Idiopathic Juvenile Scoliosis During Pubertal Growth
YP Charles, A Dimeglio et al Spine 2006;31:1933–42

- Patients with JIS and curves > 30° treated with bracing
  - 100% risk for curve progression needing fusion
- Curves ranging from 21 to 30°
  - 75% risk
8 yo girl

1st erect

4 year post-op
Case Example: 10 yo female, R=0, S=3
Growth Modulation

Reversing of the wedging

2002

2005

- 63 patients met our inclusion criteria
  - Diagnosis of idiopathic scoliosis
  - Preoperative curve
    - 20-35° for thoracic curves
    - 20-45° for lumbar curves
  - Preoperative Risser sign of 0 - 1
  - Total of 81 stapled curves
    - 43 thoracic, 38 lumbar
  - Mean preoperative Cobb angle
    - Thoracic curves: 29.1° (range 25-35)
    - Lumbar curves: 30.5° (range 25-45)
  - Mean length of follow-up was 3.4 yrs
Follow-up to Skeletal Maturity
Defined by Having a Risser Score $\geq$ 4

- The success rate for mature thoracic curves was 71% (12/17)
- The success rate for mature TL / lumbar curves at most recent follow-up was 89% (17/19)
Inclusion criteria
- Idiopathic scoliosis
- Coronal curve magnitude of 25 to 44°
- Risser 0 or 1
- Minimum two-year follow up
- Matched for age at initiation of treatment

VBS database (2002-2007)
- 43 patients, 55 curves

- 53 patients, 70 curves
Subanalysis of Groups When Matched for Age, avg. 10.5yrs
VBS: 55 curves, Bracing: 70 curves

<table>
<thead>
<tr>
<th></th>
<th>No change/improvement (%)</th>
<th>Progression (%)</th>
<th>P value (Fisher’s exact test)</th>
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</thead>
<tbody>
<tr>
<td><strong>Thoracic curves 25-34°</strong></td>
<td></td>
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<tr>
<td>VBS (N=25)</td>
<td>80</td>
<td>20</td>
<td>0.09</td>
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<td>Bracing (N=36)</td>
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<td><strong>Thoracic curves 35-44°</strong></td>
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<td>VBS (N=11)</td>
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<td>Bracing (N=13)</td>
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<td><strong>Lumbar curves 25-34°</strong></td>
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<td>VBS (N=13)</td>
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<td>Bracing (N=18)</td>
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<td><strong>Lumbar curves 35-44°</strong></td>
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<td>VBS (N=6)</td>
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<td>Bracing (N=3)</td>
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Bad Results of Stapling in the Current VBS Literature

  - 11 patients (myelodysplasia, congenital scoliosis, juvenile scoliosis, infantile scoliosis, Marfan's, paralytic scoliosis, and neuromuscular scoliosis) showed > 50% failure. Average pre-op curves were 68°.
    - This is a patient population with extreme curves, different from our cohort.
- Ohlin et al, SRS 2012
  - 9 immature patients with moderate thoracic AIS with mean pre-op Cobb 38° (2 pts <35°, 7 pts ≥ 35°) underwent endoscopic vertebral stapling. 7/9 pts with curves ≥ 35° progressed to fusion.
    - The 1st erect curve averaged 34° in this cohort of patients

VBS is for flexible, moderate scoliosis, not for severe scoliosis or large curves that failed bracing
Fusion After Failed Stapling

No spontaneous fusion
Failure and Success in Vertebral Body Stapling

Joshua Pahys, Amer Samdani, Michael Auriemma, Elias Dakwar, Randal Betz, Patrick Cahill

21st International Meeting on Advanced Spine Techniques, Valencia Spain, July 2014
Growth Modulation with Staples: Consider for Tether?

- Some patients with bone overgrowth on staples
  - Not common
- Some patients with hyperkyphosis
For lumbar:
small open incision
or XLIF transpsoas approach