Adult Degenerative Scoliosis

Kai-Ming Fu, M.D., Ph.D.

Assistant Professor
Department of Neurosurgery
Weill Cornell Medical Center

May 5th, 2012
Disclosures

- Synthes-Medical Education
Demographics Portend an Increasingly Elderly Population

- Over the next 25 years, the number of people >65 yrs/old will increase by 125% (70 million)
- Those aged ≥85 yrs will double

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>1990</th>
<th>2000</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-44</td>
<td>99.73</td>
<td>104.00</td>
<td>110.45</td>
</tr>
<tr>
<td>≥65</td>
<td>31.2</td>
<td>34.99</td>
<td>70.3</td>
</tr>
<tr>
<td>≥85</td>
<td>3.1</td>
<td>4.2</td>
<td>8.9</td>
</tr>
</tbody>
</table>

Back Pain is a Significant Factor affecting the Elderly Population

- A survey of >100K Medicare beneficiaries >65 found heart and lung disease and back pain were the most important factors impacting the physical health status of older Americans.
- Disabling back pain is common in old age-affecting ~20% of men and ~30% of women.

High Prevalence of Scoliosis in the Adult Population

- Robin evaluated 554 subjects aged between 50 and 84 years and found some scoliosis was found in 70% of the subjects.

- Schwab a scoliosis rate of 68% in an asymptomatic adult population with an average age of 70.5 years.

Spine. 2005 May 1;30(9):1082-5.
Types of Adult Scoliosis

- Adults with History of Adolescent Scoliosis
- Iatrogenic Deformity
  - Mild or no deformity prior to destabilizing surgical intervention(s)
- Older Adults with Degenerative “de novo” Scoliosis
  - No Deformity Before 40 Years Old
  - Consequence of disc degeneration
Degenerative Scoliosis: Pathoanatomy

- Disc degeneration/collapse
- Facet arthrosis/hypertrophy
- Ligamentum hypertrophy
- Segmental instability:
  - Spondylolisthesis in 55%
  - Rotatory olisthesis in 13-34%
Development of *De Novo* Scoliosis

- A 12-year prospective study of *de novo* scoliosis in a community based cohort was performed.
- 60 subjects aged 50–84 years without scoliosis at baseline were selected and followed.
- *De novo* scoliosis $>10^\circ$ developed in 22 subjects.
- $>20\%$ decrease in unilateral disc height or $>5$ mm osteophyte on one side led to an increased incidence of *de novo* scoliosis.

Kobayashi T. Spine 2006
Natural History of Adult Scoliosis

- Untreated AIS (>45°) progresses 0.5 to 0.75° per year
- Greater magnitude curves are more likely to become symptomatic
- Degenerative adult curves progress 3.3° per year
- Rapid decompensation may follow decompression for spinal stenosis
Mean age 63 y/o

Adult scoliosis patients had significantly lower SF-36 scores when compared to the age matched norms.

<table>
<thead>
<tr>
<th>SF-36 Variable</th>
<th>Mean Maimonides Score</th>
<th>General U.S. Score</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF</td>
<td>49.56</td>
<td>66.32</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>RP</td>
<td>31.40</td>
<td>46.71</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>BP</td>
<td>34.29</td>
<td>59.34</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>GH</td>
<td>58.14</td>
<td>58.45</td>
<td>NS</td>
</tr>
<tr>
<td>VT</td>
<td>41.82</td>
<td>52.29</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>SF</td>
<td>52.06</td>
<td>81.48</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>RE</td>
<td>51.76</td>
<td>70.90</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>MH</td>
<td>64.14</td>
<td>74.93</td>
<td>P &lt; 0.001</td>
</tr>
</tbody>
</table>

PF = Physical Functioning scale; RP = Role Physical scale; BP = Bodily Pain scale; GH = General Health scale; VT = Vitality scale; SF = Social Functioning scale; RE = Role Emotional scale; MH = Mental Health scale; NS = not significant.

N = 49, age >55 = 32; age <55 = 17.
Incidence of Neurological Compression

- Adult degenerative scoliosis has been associated with radiographic evidence neurological compression

Grubb SA; Spine 1988; 13:241
Incidence of Neurological Compression

- 36 patients presenting for operative management of elderly degenerative scoliosis
- Mean age: 68.9 years; range: 51-85
- The mean leg pain NRS was 6.5
- Mean ODI was 53.2
- At least one level of severe foraminal stenosis was identified in 97% of patients
- All but one patient reported significant radicular pain
Incidence of Neurological Compression
Importance of Identifying Scoliosis

- Outcomes of nonoperative treatment of lumbar spinal stenosis are poorer with scoliosis.
- Surgical decompression alone for spinal stenosis has a high failure rate with progression of symptoms and deformity.
- Results of limited posterolateral lumbar spinal fusion with pedicle screws is poorer.
  - Degenerative scoliosis has a lower (70%) fusion rate compared with degenerative disc disease alone (91%).

How to identify patients whom should be further evaluated for Scoliosis

- Patients who report previous diagnosis of scoliosis
- Reports of scoliosis on imaging
- Increasing difficulty with ADL’s
- Progressive kyphosis (bent forward posture)
What to do next

- Evaluation by spine surgeon/ deformity
- Standing x rays (preferably long cassette)
Treatment Options

- Nonoperative
  - Pain Medications
  - Injections (facet, epidural, selective nerve root)
  - Physical therapy, reconditioning (aquatics)
Treatment Options

- Operative
  - Focal Decompression
  - Focal Fusion
  - Reconstruction
Next Steps
ISSG
Multi-center study proposal

Evaluation of patient factors in non-operative deformity patients transitioning to operative care

K Fu/C Shaffrey/ J Smith
7/13/2011
Clinical Question

- A subgroup of patients initially treated with nonoperative care for significant symptomatic adult scoliosis will transition to “needing” operative intervention.
- Determining if there are apparent attributes at presentation can provide prognostic information or potentially justify earlier intervention.
- Understanding the factors (radiographic, hrql) that influence patients to transition can again help with prognosis and provide a potential basis for proceeding forth with surgical intervention.
Clinical Question

What similar projects have been done and by whom and how they affected this study design…

- Chris, Justin, I looked at elderly degenerative patients (retrospective analysis of prospective database) over age 60
- High rate of patients transitioning (25%) mean time 1.7 years
- No statistically significant differences at presentation
- At last followup or transition only significant differences in pain/hrql
- No significant differences in SVA, Cobb angle
- Need for more patients/multicenter and prospective transition data collecting
Data collection

- Adult Scoliosis patients
- HRQL (enrollment, followup, transition)
- Nonoperative interventions (chiro/inj/etc.)
- Radiographic parameters (e,f,t)
  - Cobb angles, thoracic kyphosis, lumbar lordosis, sagittal balance, pelvic tilt, pelvic incidence
- Follow up minimum 2 years or until transition
Study Implementation

- Piggy back on the prospective study, IRB
- Ideally minimal extra costs, would be happy to do data analysis.