MULTILEVEL SPINAL FUSION & FUNCTIONAL OUTCOME

Jessica Hart
Clinical Problem Solving I
Purpose

- Present patient s/p multilevel spinal fusion
- Evaluate the evidence for return to function s/p multilevel spinal fusion
57 yo female
Dispatcher
Married
Sole caregiver for her niece & husband
Upon discharge returning to son’s house
  Won’t have 24 hour supervision
  Inpatient rehab?
Health Condition

- Multi-level degenerative lumbar scoliosis with lumbar spondylosis
  - Occurs after age 50
  - Complication rates range from 56%-75%
- Failed conservative treatment
- Post-op following a T10-S1 spinal fusion
  - T10-S1 posterior lumbar interbody fusion (PLIF)
  - L1-L4 direct lateral fusion (DLIF)
  - T10-ileum decompression
Patient History

- **PMH:**
  - Asthma
  - Fibromyalgia

- **Comorbidities:**
  - BMI of 31 = obese

- **Medications:**
  - Albuterol
  - Heparin
  - Oxycodone
  - Hydromorphone

- **Post-op complications:**
  - Hypoxia/respiratory distress
  - Ileus
  - Anemia
  - Pulmonary edema
PT Examination

- **Pain (NPRS):**
  - 7-9/10

- **Bed mobility**
  - R rolling: Mod A
  - Supine to sit: Min A

- **Transfers**
  - Sit to stand: Min A x2
  - Bed to chair: Min A

- **Balance**
  - EOB: fair
  - Static/dynamic standing: fair

- **Tests/Measures:**
  - None

- **Assistance terms defined:**
  - Contact guard assist (CGA): direct contact with pt for safety but no physical assistance
  - Min A: pt able to do ≥75%
  - Mod A: pt able to do ≥50%
  - Max A: pt able to do ≥ 25%

- **Balance terms defined:**
  - Fair: pt able to maintain balance with handheld support. May require occasional minimal assistance. Accepts minimal challenge; able to maintain balance while truing head/trunk.
Evaluation

- **Impairments:**
  - Pain
  - Decreased strength
  - Decreased bed mobility, transfers & balance
  - Decreased functional endurance
  - Abnormal gait pattern

- **Activity limitation(s):**
  - Unable to complete ADL’s independently

- **Participation restriction(s):**
  - Unable to work
  - Unable to care for husband & niece
Prognosis = Fair/Poor

- **Unfavorable**
  - Post surgical complications
  - Low baseline function
  - Limited family support
  - Obese
  - Pain
    - Drowsiness & lethargy

- **Favorable**
  - Young
  - Agreeable
Physical Therapy Goals

- By post-op day 10...
  - Patient will go from supine → sit with Min A
  - Patient will go from sit → stand with CGA
  - Patient will go from bed to chair with CGA
  - Patient will ambulate 75 ft. with LRAD with CGA in order to complete ADL’s
Interventions & Outcome

Interventions:
- Donned Thoracic Lumbar Sacral Orthosis (TLSO)
- Transferred bed \(\rightarrow\) chair

Outcome:
- Goals achieved??
- Post op day 11:

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>7/10</td>
</tr>
<tr>
<td>Rolling R/L</td>
<td>Min A x2</td>
</tr>
<tr>
<td>Sidelying (\rightarrow) EOB</td>
<td>Mod A</td>
</tr>
<tr>
<td>Sit (\rightarrow) Stand (3x)</td>
<td>Mod A</td>
</tr>
</tbody>
</table>
Clinical Question

For my 57 yo patient with a T10-S1 spinal fusion, is the number of segments fused a prognostic indicator of functional outcome?
Retrospective study; 2011

Purpose: evaluate clinical outcomes of pts with degenerative lumbar scoliosis after posterior lumbar interbody fusion (PLIF)

Inclusion criteria:
- Diagnosis of degenerative lumbar scoliosis—Cobb angle > 10°
- > 50 yo when diagnosed
- Refractory to medical treatment for 6m
- Corrected with PLIF
- Follow up > 24 months

Exclusion criteria:
- Prior spinal trauma or fx
- Spinal malignancy or infection
- Adult idiopathic scoliosis
Materials & methods
- 58 pts s/p PLIF
- Average age 68.9 ± 8.5 years
- Oswestry Disability Index (ODI), visual analogue scale (VAS) & patient satisfaction were evaluated before surgery and last follow up period
- Average follow up was 38.7 +/- 11.0 months
- Statistical results were significant if p<0.05
Results

Within outcome measure, means without a common superscript differ ($P < 0.001$).
Results continued...

<table>
<thead>
<tr>
<th>Variable</th>
<th>Simple linear regression analysis</th>
<th>Multiple linear regression analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta \pm \text{SD}$</td>
<td>$p$ value</td>
</tr>
<tr>
<td>Gender</td>
<td>$8.40 \pm 3.09$</td>
<td>0.009</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>$0.68 \pm 2.79$</td>
<td>0.808</td>
</tr>
<tr>
<td>No. of levels fused</td>
<td>$-1.55 \pm 2.70$</td>
<td>0.570</td>
</tr>
<tr>
<td>No. of levels fixed</td>
<td>$-7.71 \pm 2.37$</td>
<td>0.002</td>
</tr>
<tr>
<td>No. of levels decompressed</td>
<td>$-0.45 \pm 2.79$</td>
<td>0.873</td>
</tr>
<tr>
<td>Op time(min)</td>
<td>$-4.10 \pm 2.58$</td>
<td>0.117</td>
</tr>
<tr>
<td>Blood loss (mL)</td>
<td>$-2.13 \pm 2.57$</td>
<td>0.412</td>
</tr>
</tbody>
</table>
Limitations

- Retrospective study
- Small sample size
- Failure to define terms such as number of levels fused compared to number of levels fixed
- No data representation showing the significance between number of levels fused & decreased ODI scores
- Short follow-up period
Prospective; February 2008

Purpose: compare the results of short fusion vs long fusion for degenerative lumbar scoliosis

Inclusion:
- Pts with Cobb angle $> 10^\circ$
- Spinal decompression & posterolateral fusion
Materials & Methods

- 50 pts
  - 8 men; 42 women
  - 28 pts short fusion
  - 22 pts long fusion
- Average age was 65.5 ± 5.1 years
- Average follow up period 4.3 ± 1.9 years
- Clinical outcomes assessed by ODI
- Statistical significance defined as P<0.05

Table 1: Clinical parameters between short fusion and long fusion

<table>
<thead>
<tr>
<th>No. of levels fused (n)</th>
<th>Short fusion (n = 28)</th>
<th>Long fusion (n = 22)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.1 ± 0.9</td>
<td>6.5 ± 1.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age (year)</td>
<td>64.4 ± 8.1</td>
<td>66.9 ± 6.4</td>
<td>0.23</td>
</tr>
<tr>
<td>No. of co-morbidities</td>
<td>1.7 ± 0.7</td>
<td>1.8 ± 0.7</td>
<td>0.66</td>
</tr>
<tr>
<td>Blood loss (ml)</td>
<td>1,671 ± 604</td>
<td>2,819 ± 1,097</td>
<td>0.001</td>
</tr>
<tr>
<td>Operative time (min)</td>
<td>179 ± 56.9</td>
<td>242 ± 58</td>
<td>0.001</td>
</tr>
<tr>
<td>Hospital stay (day)</td>
<td>18.4 ± 8.3</td>
<td>23.3 ± 11.2</td>
<td>0.1</td>
</tr>
<tr>
<td>No. of decompressions</td>
<td>2.6 ± 0.9</td>
<td>2.8 ± 1.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Results

Differences in ODI between short and long fusions

- Preop: Short fusion - 70, Long fusion - 72, P = 0.12
- Final: Short fusion - 50, Long fusion - 52, P = 0.08
- Change: Short fusion - 10, Long fusion - 12, P = 0.14

Short fusion
Long fusion
Results

ODI minimal detectable change ($MDC_{95}$) = 11.75 pts

<table>
<thead>
<tr>
<th></th>
<th>Short fusion (n = 28)</th>
<th>Long fusion (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>65.3 ± 20.4</td>
<td>71.0 ± 12.4</td>
</tr>
<tr>
<td>Final</td>
<td>48.6 ± 27.6</td>
<td>47.8 ± 17.1</td>
</tr>
<tr>
<td>Change</td>
<td>17.8 ±12.5</td>
<td>24.3 ± 11.3</td>
</tr>
</tbody>
</table>
Limitations

- Small sample size
- Short follow-up period
- Difference in scoliotic curve magnitude and sagittal imbalance between groups
Summary

- Limited evidence regarding multi-level spinal fusions & outcomes
- **Short term:**
  - Similar statistically significant improvements in outcome as represented by ODI (both studies) & VAS regardless of number of levels fused
  - Number of levels fixed was significantly related to differences in ODI scores pre and post surgery. So, the number of levels fixed has a slightly negative affect on pt outcomes & satisfaction even though everyone gets better.
    - Pts with long fusions were limited in their improvement compared to pts with short fusions
- **Long term:** ???

For my 57 yo patient with a T10-S1 spinal fusion, is the number of segments fused a prognostic indicator of functional outcome?
Questions...

