Spinal Fusion in Patients With Duchenne’s Muscular Dystrophy and a Low Predicted Forced Vital Capacity

Alastair Marsh, Christos Yiannakopoulos, Geraldine Edge, Jan Lehovsky

Royal National Orthopaedic Hospital,
Brockley Hill, Stanmore, England
Introduction

- Forced vital capacity (FVC) often used as a marker or indicator for spinal fusion in DMD scoliosis

- Most authors suggest an FVC > 30-40% of predicted values as being the minimum acceptable for surgery

- We plan to show that spinal fusion surgery can be performed safely in patients with an FVC <30%
Patients and Methods

- Patients with scoliosis secondary to DMD who had undergone spinal fusions between January 1990 and December 1999
- Retrospective data collection
A comparison of key mean data from the two sub-groups and the whole group

<table>
<thead>
<tr>
<th>GROUP</th>
<th>NUMBER</th>
<th>AGE AT SURGERY (years.months)</th>
<th>AGE OF NONAMBULANCE</th>
<th>PFVC CURVE CORRECTION (degrees)</th>
<th>OP TIME (minutes)</th>
<th>BLOOD LOSS (litres)</th>
<th>TIME ON TUBE (hours)</th>
<th>TIME ON RESPIRATORY SUPPORT (hours)</th>
<th>TIME ON IN-PATIENT STAY</th>
<th>IN-PATIENT STAY EXCLUDING PATIENT WITH TRACHEOTOMY</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30%</td>
<td>13</td>
<td>14.3</td>
<td>10.2</td>
<td>24%</td>
<td>38.5</td>
<td>209</td>
<td>3.8</td>
<td>19</td>
<td>81</td>
<td>45</td>
</tr>
<tr>
<td>&gt;30%</td>
<td>17</td>
<td>15.1</td>
<td>12.2</td>
<td>40%</td>
<td>34.8</td>
<td>215</td>
<td>5.8</td>
<td>28</td>
<td>74</td>
<td>44</td>
</tr>
<tr>
<td>WHOLE</td>
<td>30</td>
<td>14.8</td>
<td>11.3</td>
<td>33%</td>
<td>36.4</td>
<td>212</td>
<td>4.9</td>
<td>24</td>
<td>77</td>
<td>45</td>
</tr>
</tbody>
</table>
Results

- 30 patients, mean age 14 yr 8/12 at surgery (11 years 2/12-19 years)
- Mean age non ambulance 11 years 4/12 (7-17 years)
- Posterior only fusion, all fused to pelvis
- Mean levels 15 (T3 to sacrum)
- Mean FVC 33% of predicted values (18%-60%)
- 13 patients with FVC<30%, 17>30%
Results

- Mean time intubated 24 hours
  (5 hours – 3 days 16 hours)
  - 4 patients required reintubation
  - 2 required temporary tracheotomies
- Mean ventilatory support time (all patients)
  77 hours (5 hours – 23 days)
- Mean ventilatory support time (non trachy patients)
  42 hours (5 hours – 6 days 3 hours)
Results

- Mean pre operative curve 61° (30°-90°)
- Mean correction 36° (16°-61°)
- Mean operation time 212 minutes (120-345 minutes)
- Mean blood loss 4.9 litres (1.4-10 litres)
Complications

- 2 wound infections, 1 requiring surgical debridement and re-suture
- 8 other major complications
  - Poor respiratory effort (25% FVC) 128 hours ventilatory support
  - Pleural effusion (40% FVC) drained under USS
  - 1 chest infection settled on BIPAP/antibiotics (30%)
  - 2 reintubated for exhaustion due to infection (21%/55%)
  - 1 cardiac arrest (55%) secondary to hyperkalaemia
2 Temporary Tracheotomies

- FVC 34%, fusion T2 to pelvis
- 552 hours (23 days) ventilatory support time due to pneumonia
  - Tracheotomy removed after 39 days
  - Discharged home 62 days post operatively
- 20% FVC, fusion T3 to pelvis
- Respiratory arrest due to tension pneumothorax day 3 postop
  - Developed pneumonia and required 510 hours (21 days) of respiratory support
  - Tracheotomy removed after 27 days
- Discharged home 50 days post operatively
Discussion

- Fusion to the pelvis removes the risk of curve progression if the fusion is stopped at L5.
- Operation time in this series similar to other published studies.
- Blood loss in this series is higher than in other series.
  - Blood loss was higher in the >30% FVC group.
Discussion

- Complications following surgery were seen in both the >30% and <30% groups
- Overall rate of major complications was 30% (9/30) and is similar to reported series
- Mean ventilatory support times and post operative stays were similar in the two groups
Discussion

- Largest reported series of patients with a FVC of <30%
- 1 patient with cardiomyopathy
  - Twice mean intubation time
  - Twice mean ventilatory support time
  - Twice mean post operative stay
  - Represents more advanced stage of disease, even though FVC >30%
Conclusions

This series shows that patients with an FVC <30% can be offered spinal fusion surgery provided that the surgery is performed in a facility with appropriately experienced surgeons, anaesthetists, nurses and ancillary staff.
Thank You