Is there a global consensus on optimal surgical care of adolescent idiopathic scoliosis? A Delphi study

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Within the last 2 decades, there has been several new operative strategies for AIS patients which has led to variability in treatment.
There is no international consensus on what constitutes optimal surgical management for AIS patients.

**Purpose**
To survey an international group of surgeons treating patients between 12-20 years with AIS to determine optimal operative care for scoliotic curves ranging from 40-90° Cobb angle.

**Methods**

<table>
<thead>
<tr>
<th>Round</th>
<th>Method</th>
<th>Purpose</th>
<th># of Ques.</th>
<th>Schedule</th>
<th>Consensus Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Online</td>
<td>Routine use</td>
<td>36</td>
<td>Jul - Nov 2012</td>
<td>From No consensus to consensus</td>
</tr>
<tr>
<td>2</td>
<td>Online</td>
<td>Optimal care</td>
<td>47 + 17</td>
<td>Apr 2013</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Online</td>
<td>Optimal care</td>
<td>6</td>
<td>Apr 2013</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Face-to-face</td>
<td>Optimal care</td>
<td>23</td>
<td>Apr 2013</td>
<td></td>
</tr>
</tbody>
</table>
Summary statistics

- 29 countries
- Male
- 50-59 years of age
- 80% have been practicing for ≥ 10 years
Results

- Excellent response rate

<table>
<thead>
<tr>
<th>Round</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96 %</td>
</tr>
<tr>
<td>2, 3</td>
<td>100 %</td>
</tr>
<tr>
<td>4</td>
<td>88 %</td>
</tr>
</tbody>
</table>

- ≥ 70% agreement = Consensus *(Defined a-priori)*
- Consensus was reached on > 60 aspects of what is considered optimal care

- Primary aims of surgery
  - To achieve a balanced spine
  - To prevent curve progression through solid fusion

- Identified a subgroup of patients with large, rigid curves
Results (Preoperative care)

Areas where consensus was reached:

Preoperative imaging
- Radiographs
  - standing full spine P-A + full spine lateral
  - standing full spine A-P + full spine lateral
- Hand/arm position on clavicle or head for lateral radiographs is optimal
- Hips should be visible in full spine lateral radiographs
- Dynamic radiographs are optimal
- Non-radiographic measurements should be performed

Surgical preparation
- Head position: in mask
- Skin preparation: betadine or chlorhexidine

Mean rank = 1.7
Mean rank = 2.1
Results (Intraoperative care)

Areas where consensus was reached:

Intraoperative monitoring
- Intraoperative monitoring (MEP or SSEP) is optimal, and if unavailable, the Wake-up Test

Surgical techniques
- Posterior as opposed to anterior (endoscopic) approach is optimal

Implants
- Pedicle screws are optimal
  - in the thoracic spine
  - in the lumbar spine
- Titanium anchor points (screws, hooks) are optimal
- Implant density of < 80% for 40-70° curves is optimal

Supplementary biological materials
- Autologous local bone graft should be used as opposed to autologous ICBG
- Supplemental BMPs are not optimal
Results (Postoperative care)

Areas where consensus was reached:

Infection control and pain management
• Reinfusion drainage systems are \textit{not} used
• Use of drains is optimal
• Oral antibiotics are \textit{not} used

Postoperative imaging
• Routine post-op CT scans are \textit{not} optimal
• Routine measurement of outcomes other than radiographs is optimal

Aftercare
• Returning to unrestricted activity at 7-12 months postoperative is optimal

Registries
• Logging data into a registry is optimal
Results (Preoperative care)

Areas where consensus was not reached and which require further study:

Preoperative health assessment tests
- Use of pulmonary function tests
- Use of nutritional status through blood testing

Preoperative imaging
- Type of dynamic radiograph for 40-70° curves
- Type of dynamic radiograph for 70-90° curves
- Performing full spine MRI

Surgical preparation
- Type of positioning table
Results (Intraoperative care)

Areas where consensus was not reached and which require further study:

Intraoperative monitoring
- Use of intraoperative navigation systems

Surgical techniques
- Spinous process preservation
- Interspinous ligament (at the apex) preservation

Implants
- Indication for hooks (e.g., in the proximal area of thoracic spine)
- Rod material for 70-90° curves
- Implant density for 70-90° curves

Blood conservation
- Use of antifibrinolytics
Results (Postoperative care)

Areas where consensus was not reached and which require further study:

Infection control and pain management
- Use of drains (High/low vacuum)
- Factors influencing drain removal
- Use of epidural pain catheters
- Time period for initial IV antibiotic administration

Aftercare
- Returning to unrestricted activity ≤ 6-months postoperative
Conclusions

With these findings we:
• Identified areas of no consensus which require further research, including the optimal treatment for large, rigid curves.
• Formulated the bases for current optimal surgical management recommendations, and when implemented should increase the quality of provided care.
• Encourage health care providers to define appropriate care in their region.

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