Adolescent Idiopathic Scoliosis

Surgical Management: Present and Future

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Adolescent Idiopathic Scoliosis

- Remains “idiopathic”
- Still many theories about its cause
  - Muscular
  - Neurologic
  - Hormonal
  - Genetic
- Most plausible theory:
  - Genetic basis, influencing the neurologic mechanism governing growth and motor control
Genetic Discoveries

Publications:

Axial Biotech

- ScoliScore Prognostic Test® developed
- Useful in deciding whether to treat young children with very small curves
- May also be useful in other ways….
  - Genetic counseling
  - Choosing fusion vs. fusionless techniques
**ScoliScore™ AIS Prognostic Test**

2749 East Parleys Way, Suite 200, Salt Lake City, UT 84106-9921
Toll Free: (877) 294-2598  |  Tel: (801) 984-9098  |  Fax: (801) 984-9099
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**INDICATIONS FOR USE**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Adolescent Idiopathic Scoliosis</th>
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</thead>
<tbody>
<tr>
<td>Age Range</td>
<td>9 – 13 years of age</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td>Ethnicities</td>
<td>Caucasian (North American, South American, European, Eastern European, Middle Eastern)</td>
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<tr>
<td>Curve Type</td>
<td>Mild Curve (10 – 25° Cobb Angle)</td>
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In collaboration with DePuySpine

Johnson & Johnson Company
Curve Surveillance

- Goal: following curve progression while avoiding exposure to ionizing radiation
- Long-term result of serial radiographs
Curve Surveillance

- MRI as a surveillance imaging modality
  - Problem: supine position
  - Solution: reproduce gravity by axially loading the spine
Scoliosis seen in MRI
Challenges

- Length of Scan
- Getting 3D image onto 2D picture for measurement
- Positioning, Holding Still
- Cost / Insurance Coverage
- Disruption of office flow
Surface Topography
Raster Stereography
Formetric 3D/4D®
Bracing

Used to slow curve progression

Effective in 50% of patients

Brace types:
- TLSO worn 18+ hours per day (eg. Lyon, Boston)
- Flexible brace (eg. Spinecor®)
- Night Time Bending Brace (eg. Charleston)
Brace Types
Surgical Correction

Criteria:
- Thoracic curves >50°, esp. if kyphotic
- Lumbar curves >40°, imbalanced, or with loss of lordosis
- Evidence of progression
- Back Pain
- Age
- Genetic predisposition
- Aesthetics
Methods

- Combined Anterior/Posterior Approach
  - Advantages & Drawbacks

- Anterior Approach (selective anterior)
  - Advantages & Drawbacks

- Posterior Approach
  - Advantages & Drawbacks
Severe Curves
Staged Procedure

- Application of Halo
- Skeletal traction, 2-3 days
- Anterior release
  - Thoracotomy
  - Laparotomy
- Back into traction, 1-2 weeks
- Posterior instrumentation and correction
Younger Children

- Fusion will stop curve progression, but also growth
- Need internal skeletal correction, but also need to keep the ability to lengthen the trunk with growth
Operative Technique

- Open wedge thoracostomy
- From transverse process to sternum
- At apex of the deformity
- Distraction osteotomy with laminar spreaders
- Expandable prosthetic titanium rib (Vepr®)
- Repeat rib expansions
Opening wedge thoracoplasty with distraction
Expansion
Repeat lengthening every 4-6 mo.
Thoracic Insufficiency Syndrome
Improved After Right Expansion Thoracoplasty
Space available for the Lung

Before thoracostomy

After
Growing Rods

- Pedicle Screws with connecting rods that expand when twisted
- Expanded every 3-4 months through minimal incision
Growing Rods
Anterior Vertebral Stapling

- Tilt the disc spaces in the opposite direction
- Allow growth
- Can be placed thorascopically
Idiopathic Scoliosis: Anterior Fusion

- **CASE EXAMPLE:** A. R. (15 yo)
- Physical exam – presented with a double major curve
- X-ray evaluation
  - R Thoracic curve = 65°, demonstrated significant structural changes
  - L Lumbar curve = 58°, demonstrated significant flexibility on side bending
Idiopathic Scoliosis:
Anterior Fusion

- Procedure – Anterior thoracotomy, rib excision, disc excisions, auto rib graft, stabilization with titanium cages, rods, screws, chest tube
- Special considerations – Custom TLSO for 4 months wear when out of bed
Idiopathic Scoliosis: Anterior Fusion

- Spontaneous correction of the lumbar curve achieved with Selective Anterior Thoracic procedure (pre-op = 58°, post-op = 24°)
- Lumbar spine remains UNFUSED
  - Greater mobility
  - Decrease of accelerated spinal degeneration adjacent to instrumentation
Idiopathic Scoliosis:
Anterior Double-Rod Construct
Idiopathic Scoliosis: Posterior Fusion

- CASE EXAMPLE: M. M. (15yo)
- Physical exam –
  - Neurologically normal
  - Rib prominence
- X-ray evaluation
  - Curve correction needed below diaphragm
  - Stronger, more active patient
  - Loss of lumbar lordosis
Idiopathic Scoliosis: Posterior Fusion

- Procedure – Posterior fusion, stabilization with rods, hooks, screws, iliac crest bone graft

- Benefits-
  - Better overall correction
  - More reliable fixation with pedicle screws
  - Ability to provide de-rotation in addition to coronal and sagittal correction
  - Restoration of lumbar lordosis
Complications

- Early:
  - Paralysis/Neural injury
  - Infection - Early
  - Pseudarthrosis
  - Coronal/Sagittal Imbalance
  - Instrument-related problems

- Late:
  - Degeneration of Adjacent Spinal Segments
  - Infection - Late
S/P ASF with Residual Curve
Thank you!

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