Comorbidity Profiles in Adolescent Idiopathic Scoliosis Patients with and without Syringomyelia

Katherine E Pierce BS, Avery Brown BS, Haddy Alas BS, Cole Bortz BA, Jordan Manning BA, Dennis Vasquez-Montes MS, Bassel G. Diebo MD, Carl B. Paulino MD, Frank A. Segreto BS, Nicholas Stekas MS, M. Burhan Janjua MD, Aaron J. Buckland MBBS, FRACS, Michael C. Gerling MD, Peter G Passias MD
Disclosures

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Adolescent Idiopathic Scoliosis (AIS)

• **AIS** is defined as the lateral curvature of the spine for which no cause can be determined
  – AIS currently affects 0.42-5.2% of patients between 10 and 20 years of age

• Patients who have AIS also have been demonstrated to have associated concomitant neuroaxial diseases, most commonly syringomyelia and Chiari malformation

• There are various purported comorbidities associated with neuroaxial diseases, which may result in higher peri- and post-operative morbidity and mortality.

• It is estimated that up to 12% of patients who have AIS have some neuroaxial disease
Study Objective

- There is currently a paucity of studies evaluating associated comorbidities once neuroaxial disease, specifically syringomyelia, has been identified in the patient.
- This is of particular importance as many of these can result in even higher complications in AIS patients undergoing operative intervention who have neuroaxial diseases.

OBJECTIVE:
The goal of this study was to assess clusters of diagnoses and comorbidities in a population of AIS patients with concordant syringomyelia.
Methods: Criteria

- **Used Kids Inpatient Database (KID) from 2003-2012**

- **Study Inclusion criteria**
  - ICD-9 diagnosis codes for AIS (737.1-3, 737.39, 737.8, 737.85, 756.1)
  - ICD-9 codes for a Syringomyelia diagnosis (336.0)
  - Patients aged 10-20 years
Methods: Data Collection and Statistical Analyses

• **Data Collection**  (Isolated with ICD-9 diagnosis and procedure codes)
  – Demographic details were collected (Age, Sex, etc.)
  – Comorbidity types based on organ system
  – Other diagnoses
  – Surgical details
  – Perioperative inpatient complications
  – Mortality

• **Statistical Analyses**
  – **Descriptive analyses:** Prevalence of demographic and comorbidities were found
  – **K-means cluster analysis:** Co-occurring comorbidities and diagnoses through cross-tabulations
  – **Contingency tables** to describe clustering profiles
Results: Demographics and Additional Spine Diagnoses of AIS patients

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Prevalence (%) or Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size (n)</td>
<td>77,183</td>
</tr>
<tr>
<td>Age</td>
<td>15.2yrs</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>64%</td>
</tr>
<tr>
<td>Diagnoses</td>
<td></td>
</tr>
<tr>
<td>Herniated disk</td>
<td>0.16%</td>
</tr>
<tr>
<td>Spondylosis</td>
<td>0.32%</td>
</tr>
<tr>
<td>Disc Degeneration</td>
<td>0.23%</td>
</tr>
<tr>
<td>Stenosis</td>
<td>0.21%</td>
</tr>
</tbody>
</table>

821 (1.2%) of AIS patients had concurrent SM
Age of presentation and Comorbidity Quantification in Patients with AIS and Syringomyelia

• Age of syringomyelia presentation
  – 10-13 years old - 40.5%
  – 14-17 years old - 42.4%
  – 18-20 years old - 17.1%

AIS-SM patients were significantly younger than other AIS patients (13.7±2.3 years, p<0.001)

• Comorbidity Prevalence Stratified by Organ System
  – 74.1% Pulmonary
  – 5.4% Cardiovascular
  – 5.0% Musculoskeletal
  – 2.1% Renal
### Strongest Diagnoses Clusters For AIS-SM Patients

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Clusters with AIS-SM</th>
<th>Clusters with AIS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold Chiari Malformation</td>
<td>52.2%</td>
<td>0.7%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asthma</td>
<td>11.9%</td>
<td>15.8%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tethered cord</td>
<td>9.2%</td>
<td>1.1%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hydrocephaly</td>
<td>6.2%</td>
<td>2.6%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>2.5%</td>
<td>0.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>2.2%</td>
<td>0.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>1.9%</td>
<td>9.9%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pulmonary Failure</td>
<td>1.9%</td>
<td>5.4%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Malignancy</td>
<td>1.7%</td>
<td>1.1%</td>
<td>0.125</td>
</tr>
<tr>
<td>Restrictive Lung Disease</td>
<td>1.7%</td>
<td>4.4%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Spina Bifida</td>
<td>1.5%</td>
<td>1.5%</td>
<td>0.992</td>
</tr>
<tr>
<td>Cerebral Palsy</td>
<td>1.3%</td>
<td>10.5%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Respiratory and Neurologic diagnoses had the strongest clusters with AIS-SM:
1) Arnold Chiari Malformation
2) Asthma
3) Tethered Cord
4) Hydrocephaly
5) Epilepsy
6) Hemiplegia
7) Quadriplegia
8) Pulmonary Failure
9) Restrictive Lung Disease
10) Cerebral Palsy
Conclusion

• The metrics in our study have yet to be evaluated and therefore represents a unique assessment of **AIS patients with and without syringomyelia**.

• Identifying the associated diagnoses and factors are important as they may allow for **preoperative optimization** and education to prevent complications, thereby decreasing patient morbidity and mortality.

• Furthermore, in a climate of medicine which is reliant on postoperative readmission and complication rates for reimbursements, it is increasingly important to circumvent these negative effects.

• Further prospective randomized studies are needed to evaluate for the associations in our study and furthermore to demonstrate if any true clinical significance can be determined.