Anatomic factors predict urinary continence in patients with anorectal malformation

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Background

• Anorectal malformation a complex spectrum diagnosis characterized by anal mislocation

• Associated with spinal cord and sacral anomalies
Background

ARM INDEX

- ARM Subtype
- Sacral Ratio
- Spine abnormalities

- Distal rectal anatomy
- Lateral radiograph
  Degree of sacral development
- Tethered cord or
  myelomeningocele
Background

• ARM index has been shown to predict fecal continence

• No tool exists to predict urinary continence
Purpose

• To identify if the anatomic factors that make up the ARM index are associated with urinary continence in ARM
Methods

• Review of large ARM database

• Inclusion criteria
  – Age > 4 yrs
  – Complete data
  – Patient reported continence
Methods

• Definition of continence
  – Volitional voiding per urethra
  – Dry between daytime voids
  – $\leq 1$ accident per week
Methods

- ARM INDEX
  - ARM Subtype
  - Sacral Ratio
  - Spine abnormalities

Simple
- Perineal, bulbar, vestibular, imperforate anus, anal stenosis, rectal atresia, H type fistula

Moderate
- Cloacal < 3cm, Rectoprostatic, Rectovaginal

Complex
- Cloaca > 3cm, Cloacal exstrophy, Rectobladder neck
Methods

**ARM INDEX**

- **ARM Subtype**: ≥ 0.7
- **Sacral Ratio**: 0.4 – 0.6
- **Spine abnormalities**: < 0.4

![Diagram showing spine and sacral ratio with normal ratios BC/AB = 0.77]
Methods

ARM INDEX

ARM Subtype

Sacral Ratio

Spine abnormalities

Normal

Tethered cord

Low conus

MMC
Results

• n = 434
• 57.5% male (n = 251)
• Median age 8.4 yrs (IQR 6 – 12.3)
Results

ARM Severity
- Simple: n = 245 (57%)
- Moderate: n = 101 (23%)
- Complex: n = 88 (20%)

Lateral Sacral Ratio
- ≥ 0.7: n = 229 (53%)
- 0.4 – 0.6: n = 157 (36%)
- < 0.4: n = 48 (11%)

Spinal Cord Findings
- Normal: n = 264 (61%)
- Tethered Cord: n = 151 (35%)
- MMC: n = 19 (4%)
Results
Continence Rates ARM Severity

<table>
<thead>
<tr>
<th>Complexity</th>
<th>Continence Rate</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>75.5% (n = 245)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Moderate</td>
<td>57.4% (n = 101)</td>
<td>0.004</td>
</tr>
<tr>
<td>Complex</td>
<td>31.8% (n = 88)</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Results

Continence Rate By Sacral Ratio

- ≥ 0.7: 72.9% (n = 229)
- 0.4 - 0.6: 56.1% (n = 157), p = 0.001
- < 0.4: 31.2% (n = 48), p = 0.000
Results

Continence Rate By Spinal Cord Findings

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continence Rate</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference (n = 264)</td>
<td>73.5%</td>
<td></td>
</tr>
<tr>
<td>Tethered Cord (n = 151)</td>
<td>47.0%</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Myelomeningocele (n = 19)</td>
<td>26.3%</td>
<td>0.008</td>
</tr>
</tbody>
</table>
Summary of findings

Summary of Results

- ARM subtype
- Sacral Ratio
- Spinal Cord Findings

Findings:
- Mild: 75.4, 73.5, 72.9
- Moderate: 57.4, 56.1, 47
- Severe: 31.8, 31.2, 26.5
Future Directions

• Further analysis
  – Weighted influence of each anatomic factors
  – Determine which anatomic factor over rides the others

• Continence calculator based on ARM index
Conclusion

• Anatomic factors are independently predictive of achieving urinary continence in ARM
  – ARM subtype
  – Lateral sacral ratio
  – Spinal abnormalities