Meatal Mismatch and GMS Scoring in Hypospadias Repair

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Division of Urology
Disclosures

• No authors have any disclosures to report
Background

- Glans-Meatus-Shaft (GMS) score = pre-operative phenotypic scoring system

<table>
<thead>
<tr>
<th>Glans (G) Score:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Glans above average in size; Urethral plate distinct, deeply grooved</td>
<td></td>
</tr>
<tr>
<td>2. Glans average in size; Urethral plate mostly distinct, grooved</td>
<td></td>
</tr>
<tr>
<td>3. Glans small; Urethral plate narrow, somewhat indistinct, flat</td>
<td></td>
</tr>
<tr>
<td>4. Glans very small; Urethral plate indistinct, narrow and flat</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Meatus (M) Score:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Glenular</td>
<td></td>
</tr>
<tr>
<td>2. Coronal</td>
<td></td>
</tr>
<tr>
<td>3. Mid or Distal shaft</td>
<td></td>
</tr>
<tr>
<td>4. Proximal shaft, penoscrotal, perineal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shaft (S) Score:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No chordee</td>
<td></td>
</tr>
<tr>
<td>2. Mild (&lt;30°) chordee</td>
<td></td>
</tr>
<tr>
<td>3. Moderate (30-60°) chordee</td>
<td></td>
</tr>
<tr>
<td>4. Severe (&gt;60°) chordee</td>
<td></td>
</tr>
</tbody>
</table>

(Huang, 2018)
Background

- **Glans-Meatus-Shaft (GMS) score = pre-operative phenotypic scoring system**

- Higher GMS scores have been associated with higher rates of post-operative complications

(Huang, 2018)
Background

- **Meatus** component of **GMS** score is assessed *prior* to degloving
  - M0: glanular
  - M1: coronal
  - M2: distal/midshaft
  - M3: proximal

- Meatus location often changes intra-operatively after penile degloving and urethral cutback
  - Causes "**mismatch**" between pre- and post-degloving meatus location
Meatal Mismatch Definitions

- Meatal **upstaging**: meatus moves **proximally** after degloving

Adapted from Elumalai, 2017
Meatal Mismatch Definitions

- Meatal **upstaging**: meatus moves proximally after degloving

- Meatal **downstaging**: meatus moves distally after degloving

Adapted from Elumalai, 2017
Aims

• To identify the association of meatal mismatch with post-operative urethrocutaneous fistula development
Hypothesis

- Meatal **upstaging** would be associated with higher risk of urethrococutaneous fistula development
Methods

• Retrospective cohort study
  • Meatal upstaging vs. meatal downstaging vs. no meatal mismatch
  • Meatus locations (per GMS score): glanular, coronal, distal/midshaft, proximal
• Single-center
• Primary repair: 07/2011-03/2018
Methods

• Retrospective cohort study
  • Meatal **upstaging** vs. meatal **downstaging** vs. no meatal mismatch
  • Meatus locations (per GMS score): glanular, coronal, distal/midshaft, proximal
• Single-center
• Primary repair: 07/2011-03/2018
• Inclusion:
  – Included within prospectively managed database of intraoperative data
• Exclusion:
  – No follow-up
  – No penile degloving
  – Incomplete medical record
• Primary Outcome: development of urethrocutaneous fistula
Cohort

Hypospadias Patients Identified
N=535

Excluded
No follow-up (35)
No degloving (9)
Incomplete records (6)
N=50

Hypospadias Patients Included
N=485 (91%)
## Mismatch Table

<table>
<thead>
<tr>
<th>Pre-degloving GMS meatal location, %</th>
<th>Post-degloving GMS meatal location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Glanular (M0)</td>
</tr>
<tr>
<td></td>
<td>Coronal (M1)</td>
</tr>
<tr>
<td></td>
<td>Distal/Midshaft (M2)</td>
</tr>
<tr>
<td></td>
<td>Proximal (M3)</td>
</tr>
<tr>
<td>Glanular (M0)</td>
<td></td>
</tr>
<tr>
<td>Coronal (M1)</td>
<td></td>
</tr>
<tr>
<td>Distal/Midshaft (M2)</td>
<td></td>
</tr>
<tr>
<td>Proximal (M3)</td>
<td></td>
</tr>
</tbody>
</table>
No Meatal Mismatch

- $N = 386/485 (80\%)$

<table>
<thead>
<tr>
<th>Pre-degloving GMS meatal location, %</th>
<th>Glanular (M0)</th>
<th>Coronal (M1)</th>
<th>Distal/Midshaft (M2)</th>
<th>Proximal (M3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glanular (M0)</td>
<td></td>
<td>68%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronal (M1)</td>
<td>68%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal/Midshaft (M2)</td>
<td></td>
<td></td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>Proximal (M3)</td>
<td></td>
<td></td>
<td></td>
<td>82%</td>
</tr>
</tbody>
</table>
Meatal Mismatch - **Upstaging**

- N=75/485 (15%)

<table>
<thead>
<tr>
<th>Pre-degloving GMS meatal location, %</th>
<th>Glanular (M0)</th>
<th>Coronal (M1)</th>
<th>Distal/Midshaft (M2)</th>
<th>Proximal (M3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glanular (M0)</td>
<td>68%</td>
<td>10%</td>
<td>15%</td>
<td>7%</td>
</tr>
<tr>
<td>Coronal (M1)</td>
<td>68%</td>
<td>68%</td>
<td>27%</td>
<td>3%</td>
</tr>
<tr>
<td>Distal/Midshaft (M2)</td>
<td>86%</td>
<td>86%</td>
<td>86%</td>
<td>12%</td>
</tr>
<tr>
<td>Proximal (M3)</td>
<td>82%</td>
<td>82%</td>
<td>82%</td>
<td>82%</td>
</tr>
</tbody>
</table>
# Meatal Mismatch – Downstaging

- **N=24/485 (5%)**

<table>
<thead>
<tr>
<th>Pre-degloving GMS meatal location, %</th>
<th>Glanular (M0)</th>
<th>Coronal (M1)</th>
<th>Distal/Midshaft (M2)</th>
<th>Proximal (M3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glanular (M0)</td>
<td>68%</td>
<td>10%</td>
<td>15%</td>
<td>7%</td>
</tr>
<tr>
<td>Coronal (M1)</td>
<td>2%</td>
<td>68%</td>
<td>27%</td>
<td>3%</td>
</tr>
<tr>
<td>Distal/Midshaft (M2)</td>
<td>2%</td>
<td>0%</td>
<td>86%</td>
<td>12%</td>
</tr>
<tr>
<td>Proximal (M3)</td>
<td>0%</td>
<td>0%</td>
<td>18%</td>
<td>82%</td>
</tr>
</tbody>
</table>
Outcomes

- Median follow-up: 9.7 months (IQR: 8.1-13.0 months) after final planned stage
- Fistula Development: 56/485 (12%)
  - At a median 6.8 months of follow-up (IQR: 1.8-14.6 months)
Risk of Fistula Development

Base Model

Full Model
Risk of Fistula Development

Base Model

Full Model

Meatus Location

CDC

Meatus Location

CDC
Risk of Fistula Development

Base Model

Full Model

Chordee Severity

Meatus Location

CDC

Chordee Severity

Meatus Location

CDC
Risk of Fistula Development

**Base Model**

- Chordee Severity

**Full Model**

- Chordee Severity

**Planned Stages for Repair**

- 1 vs 2+

*Source: CDC, Northwestern Medicine, Children's Hospital of Chicago*
Risk of Fistula Development

**Base Model**
- Meatus Location
- Chordee Severity
- Planned Stages for Repair

**Full Model**
- Meatus Location
- Chordee Severity
- Planned Stages for Repair

**Meatal Mismatch**
Risk of Fistula Development

**Base Model**

- Meatus Location
- Chordee Severity

**Full Model**

- Meatus Location
- Chordee Severity

1 vs 2+ Planned Stages for Repair

Meatal Mismatch

- Upstaging
- Downstaging

Planned Stages for Repair

CDC
Risk of Fistula Development

**Base Model**
- Chordee Severity
- Planned Stages for Repair

**Full Model**
- Chordee Severity
- Planned Stages for Repair

Meatal Mismatch
Risk of Fistula Development

Base Model

Full Model

Planned Stages for Repair

Chordee Severity

1 vs 2+

Meatal Mismatch

Planned Stages for Repair

1 vs 2+

CDC

CDC

Meatal Mismatch

Northwestern Medicine

Feinberg School of Medicine
Risk of Fistula Development

**Base Model**
- Meatus Location
- Chordee Severity
- Planned Stages for Repair

**Full Model**
- Meatus Location
- Chordee Severity
- Planned Stages for Repair
- Meatal Mismatch

1 vs 2+ Planned Stages for Repair

X
Conclusions

• Meatal **upstaging** is associated with increased risk of short-term post-operative urethrocutaneous fistula development

• GMS scoring should consider adding **modifier term** for meatal upstaging to enhance **post-operative** counseling/expectations
Thank you!
<table>
<thead>
<tr>
<th>Variable</th>
<th>Base model</th>
<th>Full model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR (95% CI), p-value</td>
<td>HR (95% CI), p-value</td>
</tr>
<tr>
<td>GMS pre-degloving meatal location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glans</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>Corona</td>
<td>0.54 (0.09-3.24), p=0.50</td>
<td>0.60 (0.10-3.57), p=0.57</td>
</tr>
<tr>
<td>Distal/midshaft</td>
<td>2.46 (0.59-10.30), p=0.22</td>
<td>3.92 (0.91-16.92), p=0.07</td>
</tr>
<tr>
<td>Proximal locations</td>
<td>3.20 (0.66-15.47), p=0.15</td>
<td>8.08 (1.42-46.00), p=0.02</td>
</tr>
<tr>
<td>Chordee severity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>1-29 degrees</td>
<td>5.22 (0.70-39.15), p=0.11</td>
<td>5.37 (0.72-40.31), p=0.10</td>
</tr>
<tr>
<td>30-60 degrees</td>
<td>7.37 (0.96-56.67), p=0.06</td>
<td>6.12 (0.79-47.25), p=0.08</td>
</tr>
<tr>
<td>&gt;60 degrees</td>
<td>6.90 (0.88-54.31), p=0.07</td>
<td>5.88 (0.74-46.44), p=0.09</td>
</tr>
<tr>
<td>Staged repair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-stage</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>Multi-stage</td>
<td>0.30 (0.11-0.83), p=0.02</td>
<td>0.25 (0.09-0.68), p=0.01</td>
</tr>
<tr>
<td>Meatal mismatch</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>No mismatch</td>
<td>-</td>
<td>Referent</td>
</tr>
<tr>
<td>Meatal downstaging</td>
<td>-</td>
<td>1.00 (0.30-3.36), p=1.00</td>
</tr>
<tr>
<td>Meatal upstaging</td>
<td>-</td>
<td>3.82 (1.87-7.83), p&lt;0.001</td>
</tr>
</tbody>
</table>