Magnetic Resonance Imaging of Female Pelvic Floor

Daniel R. Karolyi, MD, PhD
Background

- Pelvic Floor Weakness: Caused by injury or impairment of pelvic floor ligaments, fasciae, and muscles that results in functional disorders including fecal incontinence, obstructed defecation, and pelvic organ prolapse.
- In the United States, ~ 23 % of women are affected.
- One of the most common indications for gynecological surgery.
- Greatest risk factors are
  - Age
  - Female Sex.
Technique

- 1.5 Tesla or 3 Tesla Systems
- Horizontal versus Open Vertical Systems
- Patient Instructions
  - Empty Bladder: Full bladder can diminish straining and can impair prolapse.
  - Fill rectum with 150 cc warm ultrasound gel.
  - Practice before entering the magnet room
    - Straining / Valsalva
    - Squeezing / Kegel
    - Defecation

- Sequences

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Plane</th>
<th>Maneuver</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2 FSE Pelvis</td>
<td>Axial, Coronal, Sagittal</td>
<td>Rest</td>
</tr>
<tr>
<td>Tru-Fisp/FIESTA/SSFP</td>
<td>Midsagittal</td>
<td>Straining</td>
</tr>
<tr>
<td>Tru-Fisp/FIESTA/SSFP</td>
<td>Midsagittal</td>
<td>Squeezing</td>
</tr>
<tr>
<td>Tru-Fisp/FIESTA/SSFP</td>
<td>Midsagittal</td>
<td>Defecation</td>
</tr>
</tbody>
</table>
Measurements
Organ Prolapse

• Pubococcygeal Line (PCL) – From inferior public ramus to the last coccygeal joint.

• Anterior Compartment: Posteroinferior bladder base to the PCL

• Middle Compartment: Anteroinferior cervix (vaginal cuff) to PCL

• Posterior Compartment: Anterior aspect of anorectal junction to PCL.
Measurements
Organ Prolapse
Measurements
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Measurements
Organ Prolapse
Measurements
Organ Prolapse

Grading Cystocele and Uterine Prolapse

“Rule of 3s”

<table>
<thead>
<tr>
<th>Grade</th>
<th>Distance Below PCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>1 - 3 cm Below</td>
</tr>
<tr>
<td>Moderate</td>
<td>4 – 6 cm Below</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;6 cm Below</td>
</tr>
</tbody>
</table>
Measurements
Organ Prolapse
Measurements
Rectocele

Measure of depth of protrusion beyond the normal expected location of the anterior anorectal wall.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Depth of Anterior Rectal Wall Protrusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>&lt; 2 cm</td>
</tr>
<tr>
<td>Medium</td>
<td>2 – 4 cm</td>
</tr>
<tr>
<td>Large</td>
<td>&gt;4 cm</td>
</tr>
</tbody>
</table>
Measurements
Rectocele
Measurements
Rectocele
Measurements
Pelvic Floor Relaxation

HMO Grading of Pelvic Floor Relaxation

- **H = H Line**: Drawn from inferior pubic symphysis to the posterior wall of the rectum at the rectoanal junction (focal angulation between the inferior levator plate and the superior aspect of the puborectalis).
- Represents the anterioposterior width of the levator hiatus.
Measurements
Pelvic Floor Relaxation
HMO Grading of Pelvic Floor Relaxation

• M = M Line: Drawn perpendicular from the H Line to the posterior aspect of the H-Line.
• Represents distance of descent.
Measurements
Pelvic Floor Relaxation
Measurements
Pelvic Floor Relaxation

HMO Grading of Pelvic Floor Relaxation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Hiatal Enlargement (H Line)</th>
<th>Pelvic Floor Descent (M Line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 6 cm</td>
<td>&lt; 2 cm</td>
</tr>
<tr>
<td>Mild</td>
<td>6 – 8 cm</td>
<td>2 – 4 cm</td>
</tr>
<tr>
<td>Moderate</td>
<td>8 – 10 cm</td>
<td>4 – 6 cm</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt; 10 cm</td>
<td>&gt; 6 cm</td>
</tr>
</tbody>
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Measurements
Other Signs of Pelvic Floor Relaxation

• Levator Plate – Normally parallel to PCL, even at strain. Caudal inclination of the levator plate by > 10° is an indicator of pelvic floor relaxation.
Measurements

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Other Signs of Pelvic Floor Relaxation

- Levator Plate – Normally parallel to PCL, even at strain. Caudal inclination of the levator plate by > 10° is an indicator of pelvic floor relaxation.
Measurements
Other Signs of Pelvic Floor Relaxation

- Urethra – Normally vertically oriented even during strain. Anterior angulation > 30° from resting axis represents urethral hypermobility.