Role of Manometry Assessment for the Investigation of Pelvic Floor Dysfunction

Louis W.C. Liu MD, PhD, FRCP(C)
Head of Gastroenterology, UHN & SHS
Director of Motility Unit, University Health Network
VP of Administrative Affair, CAG
Disclosure: Louis Liu

Relationships with commercial entities over the last 48 months

<table>
<thead>
<tr>
<th>Commercial Entities</th>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knight, Pendopharm, Takeda</td>
<td>Speaker</td>
</tr>
<tr>
<td>AbbVie, Medtronic, Lupin</td>
<td>Speaker, consultant</td>
</tr>
<tr>
<td>Allergan</td>
<td>Speaker, consultant, research</td>
</tr>
</tbody>
</table>
## CanMEDS Roles Covered

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>√ Medical Expert</strong></td>
<td>(as <em>Medical Experts</em>, physicians integrate all of the CanMEDS Roles, applying medical knowledge, clinical skills, and professional values in their provision of high-quality and safe patient-centered care. <em>Medical Expert</em> is the central physician Role in the CanMEDS Framework and defines the physician’s clinical scope of practice.)</td>
</tr>
<tr>
<td><strong>√ Communicator</strong></td>
<td>(as Communicators, physicians form relationships with patients and their families that facilitate the gathering and sharing of essential information for effective health care.)</td>
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<tr>
<td><strong>√ Collaborator</strong></td>
<td>(as <em>Collaborators</em>, physicians work effectively with other health care professionals to provide safe, high-quality, patient-centred care.)</td>
</tr>
<tr>
<td><strong>Leader</strong></td>
<td>(as <em>Leaders</em>, physicians engage with others to contribute to a vision of a high-quality health care system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers.)</td>
</tr>
<tr>
<td><strong>Health Advocate</strong></td>
<td>(as <em>Health Advocates</em>, physicians contribute their expertise and influence as they work with communities or patient populations to improve health. They work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilization of resources to effect change.)</td>
</tr>
<tr>
<td><strong>√ Scholar</strong></td>
<td>(as <em>Scholars</em>, physicians demonstrate a lifelong commitment to excellence in practice through continuous learning and by teaching others, evaluating evidence, and contributing to scholarship.)</td>
</tr>
<tr>
<td><strong>Professional</strong></td>
<td>(as <em>Professionals</em>, physicians are committed to the health and well-being of individual patients and society through ethical practice, high personal standards of behaviour, accountability to the profession and society, physician-led regulation, and maintenance of personal health.)</td>
</tr>
</tbody>
</table>
Objectives

At the end of this session, participants will be able to:

• Describe the indications and information that can be obtained from an ARM study
• Identify the role of ARM in the assessment of patients with pelvic floor dysfunction - FI and DD
• Apply the ARM study in the management of patients with FI and DD
Epidemiology: Constipation is very common

Pooled prevalence = 14% (recent meta-analysis including 45 published studies of 261,040 CIC subjects, Suárez and Ford, 2011)

• 39%–67% reported a history of > 3 years
• 30%–71% experienced symptoms ≥ 1x/week
• Women more affected than men
• Prevalence increased with age
• Prevalence increased with lower socioeconomic status

Results from a survey of 13,879 adults, approximately 2,000 adults each from: United States (US), United Kingdom (UK), France (FR), Germany (GE), Italy (IT), Brazil (BR), South Korea (SK)

*Individuals with self-defined constipation

Epidemiology of FI

• 2-7 % of general population
  – Significant incontinence of liquid and solid: 0.7-2.2%
  – Increase with advancing age
  – Up to 50% of NH residents
    • 2\textsuperscript{nd} most common cause of placement in NH

• RF: female sex, advancing age, dementia, poor general health, obesity and physical limitations, pregnancy & obstetrical Trauma

• History of urinary incontinent: RR = 12

Only 1/3 of patients discussed with physicians
Poor Intake
“I pass very small amounts regularly…”

Slow Transit
“I never get the urge to go. I get progressively bloated & distended.”

Outlet Dysfunction
“I always get the urge to go, I strain and strain but very little happens.”

Adapted from Collins SM. 2011
Chronic Constipation Treatment Algorithm

**History & Physical Including Careful Perineal / Rectal Examination**
- **Assess Alarm Features**
  - Alarm Features Identified
  - No Alarm Features Identified
  - Specialist Assessment Recommended (Refer)
- **Optimize Management of Secondary Causes**
  - Constipation Persists

**Type of Constipation?**
- **Lifestyle Modifications (e.g., Dietary Fibre, Fluid, Exercise)**
  - Inadequate Fibre Intake
  - CIC/Slow Transit
  - Osmotic Laxatives
    - e.g. Milk of Magnesia, Lactulose or PEG titrate to efficacy and tolerability +/- fibre supplements
    - Eight-week trial at a reasonable dose prior to reassessment of maintenance or escalation to step-up therapies
  - Prosecretory or Prokinetic Agents
    - e.g. Linaclotide or Prucalopride
    - Eight to twelve-week trial prior to reassessment for maintenance or consideration of referral for specialist assessment
  - Rescue Therapy
    - 1. Glycerine suppository
    - 2. Stimulant laxatives (e.g. bisacodyl)
    - 3. Enema

**Additional Therapy**
- Pharmacological
  - e.g. TCA, SSRIs, SNRL antispasmodic
- Non-Pharmacological
  - e.g. Medication, Relaxation, Hypnosis

**Unsatisfactory Response or Intolerant to Side Effects**
- Specialist Assessment Recommended (Refer)
Utility of Digital Rectal Examination

**Table 2. Performance Characteristics of DRE in the Diagnosis of Dyssynergia in Patients With Chronic Constipation**

<table>
<thead>
<tr>
<th></th>
<th>Estimated value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower limit</td>
<td>Upper limit</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.75</td>
<td>0.68</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.87</td>
<td>0.68</td>
</tr>
</tbody>
</table>

1. Tantiphlachiva K et al. Clin Gastro Hep 2010

2. Soh, JS et al. The diagnostic value of a digital rectal examination compared with high-resolution anorectal manometry in patients with chronic constipation and fecal incontinence. AJG Aug 2015; 110:1197–1204

• In experience examiners, DRE has
  – high PPV to identify DD in patients with constipation\(^1,2\) and probably FI\(^2\)
  – poor in identifying abnormal sphincter tone\(^1,2\)

1. Tantiphlachiva K et al. Clin Gastro Hep 2010

Utility of history in determining DD

- The need of excessive straining with a sense of urge is predictive of DD.

- With appropriate history and a DRE that identifies DD, the patient is very likely to have DD. Thus, patient can be sent directly to BF without the need of BF.
Ano-rectal Manometry (ARM)

- Neuromuscular **sensory** of rectum (Rectal capacitance)
- **Motor** functions of anus and rectum
- **Coordination:** pelvic floor dyssynergy
ARM Procedure

• Digital examination, perianal sensation and ACWink reflex
• Insert manometry catheter
  – Resting pressure (measures IAS function)
  – Squeeze pressure (measures EAS function)
  – Strain
  – Sensations – min, urge, max
    • Rectal anal inhibitory reflex (RAIR)
  – Cough
• Balloon expulsion test
ARM – Resting pressure

Procedure:
- Let the patient rest quietly with no squeeze or straining for 20-30 secs to obtain the resting pressures.
ARM – Squeeze pressure

Procedure:
- Patient squeezes as hard as possible for 10-20 secs
- Repeat the squeeze 3X with more than 30 secs between squeezes
ARM – Strain

Procedure:
• Patient pushes as hard as possible for 10-20 s
• Repeat the push (bear down) 3x

Interpret along with Balloon expulsion test
Paradoxical contraction in dyssynergic defecation
Sensation

Procedure:
- Inflate rectal balloon with 10 ml of air
  - (fill empty w/out patient aware)
  - Possible sham
- Repeat and increase volume by 10 ml until min sensation is acknowledged
- Fill to constant urge
- Fill to max tolerable volume

- Minimum sensory volume
- Urge to defecate
- Max tolerable volume
RAIR: Rectal Anal Inhibitory Reflex

Procedure:
- Inflate rectal balloon with 10 ml of air. Repeat and increase volume by 10 ml until the RAIR is obtained (peds)
- Adults distend w/ 30-60 cc
- Testing sequence: 10, 20, 30, 40, 50 ml
Absence of RAIR in Hirschsprung’s Disease
Elderly with FI, with seepage incontinence & sense of incomplete emptying, unaware & nocturnal

<table>
<thead>
<tr>
<th>Resting</th>
<th></th>
<th>Squeeze</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Sphincter Pressure (rectal ref.):</td>
<td>20.8 mmHg</td>
<td>Max. Sphincter Pressure (rectal ref.):</td>
<td>113.5 mmHg</td>
</tr>
<tr>
<td>Mean Sphincter Pressure (rectal ref.):</td>
<td>19.0 mmHg</td>
<td>Max. Sphincter Pressure (abs. ref.):</td>
<td>138.8 mmHg</td>
</tr>
<tr>
<td>Max. Sphincter Pressure (abs. ref.):</td>
<td>21.3 mmHg</td>
<td>Duration of sustained squeeze:</td>
<td>2.5 s</td>
</tr>
<tr>
<td>Mean Sphincter Pressure (abs. ref.):</td>
<td>19.6 mmHg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of HPZ:</td>
<td>4.2 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length verge to center:</td>
<td>1.5 cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bear Down (attempted defecation)</th>
<th></th>
<th>Balloon Inflation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual Anal Pressure (abs. ref.):</td>
<td>52.2 mmHg</td>
<td>RAIR:</td>
<td>Present</td>
</tr>
<tr>
<td>Percent anal relaxation:</td>
<td>-126 %</td>
<td>First sensation:</td>
<td>20 cc</td>
</tr>
<tr>
<td>Intrarectal pressure:</td>
<td>35.8 mmHg</td>
<td>Urge to defecate:</td>
<td>70 cc</td>
</tr>
<tr>
<td>Rectoanal pressure differential:</td>
<td>-16.4 mmHg</td>
<td>Discomfort:</td>
<td>70 cc</td>
</tr>
</tbody>
</table>

Weaken internal anal sphincter
RAIR normal (20 cc).
Sensory: rectal hypersensitivity
Pelvic floor dyssynergy with failed BET (>4 min)
<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects and Randomization Intervention (n)</th>
<th>Duration and Number of Biofeedback Sessions</th>
<th>Primary Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rao et al. 11</td>
<td>77 (69 women)</td>
<td>3 months, biweekly</td>
<td>Presence of dyssynergia, Balloon expulsion time, Number of complete bowel movements</td>
</tr>
<tr>
<td>Rao et al. 12</td>
<td>52 (49 women)</td>
<td>One year, six active therapy sessions</td>
<td>Symptom improvement, Global Symptom relief, Global Improvement of symptoms</td>
</tr>
<tr>
<td>Chiaroni et al. 13</td>
<td>84 (71 women)</td>
<td>5 weeks, 30 min training sessions</td>
<td>None = 1, Mild = 2, Fair = 3, Major = 4</td>
</tr>
<tr>
<td>Heymen et al. 14</td>
<td>109 (104 women)</td>
<td>6 biweekly, 1 h sessions</td>
<td>Worse = 0, No improvement = 1, Mild = 2, Major = 3</td>
</tr>
<tr>
<td>Chiaroni et al. 15</td>
<td>54 biofeedback</td>
<td>3 months and 1 year, 5 weekly</td>
<td>Dyssynergia corrected or symptoms improved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 min training sessions</td>
<td>No of CSBM/week increased significantly in biofeedback (p &lt; 0.001)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Dyssynergia pattern normalized (p &lt; 0.0010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Balloon expulsion improved (p &lt; 0.001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Colonic transit normalized (p &lt; 0.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Biofeedback was superior to sham feedback and standard therapy</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Biofeedback was superior to standard therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Biofeedback was superior to placebo and diazepam</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Biofeedback was superior to laxatives</td>
</tr>
</tbody>
</table>

Studies on Biofeedback in Dyssynergic Defecation

Biofeedback therapy is recommended for the short-term and long-term treatment of constipation with dyssynergic defecation (DD). Level I, Grade A.
Correction of DD with BF

## Studies on Biofeedback in Fecal Incontinence

<table>
<thead>
<tr>
<th>References</th>
<th>Subjects [F/M]</th>
<th>Baseline FI/Week</th>
<th>Previous PFM training</th>
<th>Sphincter defects</th>
<th>Treatment</th>
<th>Control</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fynes 30</td>
<td>40/0</td>
<td>NA</td>
<td>NA</td>
<td>All included (obstetric trauma)</td>
<td>BFB Electrical stimulation (weekly, 12 weeks) Manometric biofeedback Rectal sensory training Coordination training (cross over, 4 weeks)</td>
<td>Vaginal manometric biofeedback</td>
<td>Augmented group improved symptoms more than control ( p &lt; 0.001 ) Biofeedback improved symptoms</td>
</tr>
<tr>
<td>Inycki 31</td>
<td>17/8</td>
<td>At least once a week</td>
<td>None</td>
<td>Major defect excluded</td>
<td>Vaginal manometric biofeedback Rectal sensory training Coordination training (cross over)</td>
<td>Sham training (cross over)</td>
<td>Improved symptoms</td>
</tr>
<tr>
<td>Heymen 32</td>
<td>83/25</td>
<td>Mean = 5.2</td>
<td>NA</td>
<td>Surgical candidate excluded</td>
<td>BFB PFMT sensory training (biweekly, 12 weeks)</td>
<td>PFMT</td>
<td>BFB improved symptoms more than PFMT ( 77% \text{ vs } 41%, p = 0.0011 ) 54% improved in all groups NSD in symptoms and QOL between groups</td>
</tr>
<tr>
<td>Norton 33</td>
<td>159/12</td>
<td>Median = 2</td>
<td>Excluded</td>
<td>Major defect excluded</td>
<td>Four groups: 1. Education + advice 2. As group 1 + PFMT 3. As group 2 + manometric biofeedback 4. As group 3 + home BFB (biweekly, 6 sessions and 3 months)</td>
<td>See 4 treatment groups</td>
<td>NSD in symptoms</td>
</tr>
<tr>
<td>Solomon 34</td>
<td>107/13</td>
<td>‘Mild to Moderate’</td>
<td>NA</td>
<td>All excluded</td>
<td>Three groups: 1. PFMT 2. PFMT + anal ultrasound biofeedback 3. PFMT + manometric biofeedback (monthly, 5 sessions)</td>
<td>See groups</td>
<td>NSD in symptoms and QOL and manometry changes between groups</td>
</tr>
<tr>
<td>Heymen 37</td>
<td>60/0</td>
<td>NA</td>
<td>All subjects NA</td>
<td>All included</td>
<td>BFB (weekly, 12 weeks)</td>
<td>BFB + electrical stimulation</td>
<td>NSD between groups</td>
</tr>
<tr>
<td>Naimy 38</td>
<td>49/0</td>
<td>NA</td>
<td>Major defect excluded</td>
<td>All included</td>
<td>BFB Electrode stimulation</td>
<td>Electrosimulation</td>
<td>Both groups improved NSD in symptoms and QOL between groups</td>
</tr>
<tr>
<td>Schwandner 39</td>
<td>138/20</td>
<td>NA</td>
<td>NA</td>
<td>All included</td>
<td>Electrical stimulation combined with EMG biofeedback twice at home for at least 3 months</td>
<td>EMG Biofeedback twice at home for at least 3 months</td>
<td>Combined Tx produced greater reduction in Cleveland Clinic FI Score (8 vs 5 Points) and more patients achieved continence (50% vs 26%)</td>
</tr>
</tbody>
</table>

Biofeedback therapy is recommended for the short-term and long-term treatment of Fecal Incontinence (FI). Level II, Grade B.

<table>
<thead>
<tr>
<th>References</th>
<th>Subjects [F/M]</th>
<th>Baseline FI/Week</th>
<th>Previous PFM training</th>
<th>Sphincter defects</th>
<th>Treatment</th>
<th>Control</th>
<th>Outcome</th>
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</thead>
</table>
| Fynes 30   | 40/0          | NA               | NA                    | All included (obstetric trauma) | BFB       | Vaginal manometric biofeedback | Augmented group improved symptoms more than control 
(p < 0.001) Biofeedback improved symptoms |
| Inycki 31  | 17/8          | At least once a week | None                  | Major defect excluded | Manometric biofeedback Rectal sensory training Coordination training (cross over - weekly, 4 weeks) | Sham training (cross over) |
| Heymen 32  | 83/25         | Mean = 5.2       | NA                    | Surgical candidate excluded | BFB     | PFMT     | BFB improved symptoms more than PFMT [77% vs 41%, p = 0.001] ~54% improved in all groups NSD in symptoms |
| Norton 33  | 159/12        | Median = 2       | Excluded              | Major defect excluded | Four groups: 1. Education + advice 2. As group 1 + | See 4 treatment groups |
| Schwandner 39 | 138/20       | NA               | NA                    | All included | Electrical stimulation combined with EMG biofeedback twice daily at least 3 months | EMG Biofeedback twice at home for at least 3 months |

Studies on Biofeedback in Fecal Incontinence
Summary

• ARM & balloon expulsion test
  – “Gold” standard to evaluate dyssynergic defecation
  – Provided information on sensory, motor, and coordination information of the ano-rectum for defecation

• Don’t forget DRE to detect pelvic floor dyssnergy
  – limited accessibility of ARM

• Consider ARM when it changes your management
  – concerns of DD, Hirschsprung’s, FI refractory to treatment (sphincter tone, DD), rectal hypersensitivity, pre-surgical re-anastomosis
  – help to guide biofeedback/pelvic floor rehabilitation
  – ERUS, defecography in refractory cases for surgical considerations