Bowel Dysfunction in Neurological Disease

*Best Practice in an Evolving Disorder*

Anton Emmanuel

*October 2016*
Regulation of colonic function

- Two-way interaction between ENS and CNS via sympathetic and parasympathetic nervous system
- So, a number of factors can influence colonic function:
  - Conscious: Behavioural factors
    - e.g. toilet avoidance
  - Unconscious: Emotional distress
  - Hormonal: Increased expression of progesterone receptors

References:
Motility: Healthy vs. constipated motor activity

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Scintigraphic study showing defaecation produces a complete emptying of the left colon in healthy subjects, but not in SCI.

Rasmussen MM et al. Spinal Cord 2013; 51: 683-7
Importance of synchronising defaecatory effort with colonic mass movements


Dinning et al  *Gastroenterology* 2004;127(1):49-56
Reflex bowel:
Loss of sensation of fullness
Rectal pressure **high**
Anal sphincter **high pressure** opens as a reflex when the rectum is full
Predisposes to inappropriate emptying

Flaccid bowel:
Loss of sensation of fullness
Rectal pressure **low**
Anal sphincter at **low pressure**
Predisposes to bowel soiling
Prevalence of neurogenic bowel symptoms

% patients with dysfunction

- Constipation (SCI: 70%, Gen Popn: 10%)
- Faecal Incontinence (SCI: 50%, Gen Popn: 5%)
- Megacolon (SCI: 20%, Gen Popn: 10%)
- Rectal prolapse (SCI: 5%, Gen Popn: 5%)
Bowel Dysfunction in MS

60-70% of MS patients
25% regular incontinence

Neurological:
- Cortical involvement (frontal lobe)
- Hypothalamic autonomic dysfunction
- Spinal Cord
- Conus Medullaris

Non-Neurological:
- Polypharmacy
- Reduced mobility
- Coeliac
- Others (cancer, IBD, IBS, pre-existing condition)
Constipation in Parkinson’s Disease

Pathophysiology

1. Slow transit due to disturbed parasympathetic tone
   - Commonest cause
   - Constipation predates treatment

2. Rectal outlet dysfunction: rare
   - Dyssynergic anal sph. contraction on attempted voiding
   - Probably related to loss of rectal sensation

3. Medication related: probably not dominant factor
   - No dose-relationship with gut transit rate
   - At best, drugs may potentiate pre-existing constipation
Insufficient treatment is reflected in the current disease burden on neurogenic patients

4 out of 10 have symptoms of constipation\(^1,2\)

5 out of 10 patients spend more than 30 minutes emptying their bowels

7 out of 10 suffer from faecal incontinence\(^2\)

39% report that colorectal dysfunction causes some or major restrictions on social activities / QoL\(^2\)

### Bowel dysfunction ruins quality of life

<table>
<thead>
<tr>
<th>Spinal Cord Injury</th>
<th>Multiple Sclerosis</th>
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<tbody>
<tr>
<td><strong>Limitation</strong></td>
<td><strong>Impact (0-6)</strong></td>
</tr>
<tr>
<td>Mobility</td>
<td>4.8</td>
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<tr>
<td>Bowel</td>
<td>4.3</td>
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<tr>
<td>Sexual</td>
<td>3.5</td>
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<tr>
<td>Bladder</td>
<td>3.4</td>
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<tr>
<td>Sensation</td>
<td>2.7</td>
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<td>4.4</td>
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<td>3.9</td>
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</table>

Glickman & Kamm, Lancet 1998

Preziosi et al, DDW 2011

Hospitalisations twice as frequent in SCI patients with bowel symptoms

Sonnenberg et al, Am J Gastro 2004
<table>
<thead>
<tr>
<th>Date (MM/DD/YYYY)</th>
<th>Time (HH:MM)</th>
<th>a.m.</th>
<th>p.m.</th>
<th>How immediate need was your need</th>
<th>Which best describes what your bowel movement looked like</th>
<th>Did you feel like you completely emptied your bowels?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Example) 01/31/2008</td>
<td>1:00</td>
<td>X</td>
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<td>1 2 3 4 5</td>
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<td>X</td>
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</table>
Assessment: Neurogenic Bowel Dysfunction Score

The number of points for each possible answer is given in parenthesis

(1) Frequency of defecation
   Daily □ (0)   2–6 times every week □ (1)   Less than once a week □ (6)
   Points

(2) Time used for each defecation
   0–30 min □ (0)   31–60 min □ (3)   More than one hour □ (7)
   Points

(3) Uneasiness, headache or perspiration during defecation
   No □ (0)   Yes □ (2)
   Points

(4) Regular use of tablets against constipation
   No □ (0)   Yes □ (2)
   Points

(5) Regular use of drops against constipation
   No □ (0)   Yes □ (2)
   Points

(6) Digital stimulation or evacuation of the anorectum
   Less than once every week □ (0)   Once or more every week □ (6)
   Points

(7) Frequency of faecal incontinence
   Less than once every month □ (0)   1–4 times every month □ (6)
   1–6 times every week □ (7)   Daily □ (13)
   Points

(8) Medication against faecal incontinence
   No □ (0)   Yes □ (4)
   Points

(9) Flatus incontinence
   No □ (0)   Yes □ (2)
   Points

(10) Perianal skin problems
    No □ (0)   Yes □ (3)
   Points

Krogh et al Spinal Cord 2002
## NBD Score and Quality of Life

<table>
<thead>
<tr>
<th>NBD score</th>
<th>Bowel dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very minor</td>
</tr>
<tr>
<td>0–6</td>
<td></td>
</tr>
<tr>
<td>7–9</td>
<td></td>
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<td>10–13</td>
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<tr>
<td>14 or more</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Very minor dysfunction (NBD 0–6)</th>
<th>Minor dysfunction (NBD 7–9)</th>
<th>Moderate dysfunction (NBD 10–13)</th>
<th>Severe dysfunction (NBD≥14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major impact on QOL</td>
<td>0% (n = 0)</td>
<td>13% (n = 7)</td>
<td>10% (n = 10)</td>
<td>38% (n = 40)</td>
</tr>
<tr>
<td>Some impact on QOL</td>
<td>8% (n = 8)</td>
<td>13% (n = 7)</td>
<td>30% (n = 30)</td>
<td>27% (n = 28)</td>
</tr>
<tr>
<td>Little impact on QOL</td>
<td>34% (n = 34)</td>
<td>46% (n = 24)</td>
<td>36% (n = 36)</td>
<td>29% (n = 30)</td>
</tr>
<tr>
<td>No impact on QOL</td>
<td>58% (n = 58)</td>
<td>27% (n = 14)</td>
<td>23% (n = 23)</td>
<td>6% (n = 6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 (28%)</strong></td>
<td><strong>52 (15%)</strong></td>
<td><strong>99 (28%)</strong></td>
<td><strong>104 (29%)</strong></td>
</tr>
</tbody>
</table>
Care algorithm in neurogenic bowel dysfunction

- Diet and fluid / lifestyle alteration / laxatives or constipating drugs
- Digital stimulation / suppositories / biofeedback
- Transanal irrigation
- Sacral nerve stimulation
- Antegrade colonic irrigation
- Sacral anterior root stimulation
- Stoma

Conservative options
Minimally invasive
More invasive
Management of neurogenic bowel dysfunction 2007

- Stoma: 9%
- SARS: 1%
- Antegrade irrigation: 2%
- Sacral nerve stimulation: 1%
- Transanal irrigation: 0%
- Digital stimulation & suppositories: 68%
- Diet & drugs: 19%
Management of neurogenic bowel dysfunction 2015

- Diet & drugs: 18%
- Transanal irrigation: 44%
- Digital stimulation & suppositories: 33%
- Sacral nerve stimulation: 0%
- Antegrade irrigation: 1%
- Stoma: 3%
- SARS: 1%
Bowel management after SCI in community settings

Interventions used for bowel care (multiple responses possible)

- Carbolax suppositories
- Enema
- Dulcolax suppositories
- Suppository - type not stated
- Perianal stimulation
- Gastro colic reflex
- Abdominal massage
- Glycarin suppositories
- Anorectal stimulation
- Oral laxative
- Regulate diet
- Manual evacuation

Management of Faecal Soiling

The Anal Plug

14 patients with spinal injury
All 14 incontinent weekly at least

13/14 stopped liquid leak
11/14 controlled gas incontinence

Well tolerated in 11
All had attenuated anal sensation

Are current laxative options effective for chronic constipation?

16–40% of those with constipation use laxatives

Symptoms persist despite laxative use

Approximately 2000 adults each from: United States, US; United Kingdom, UK; France, FR; Germany, GE; Italy, IT; Brazil, BR; South Korea, SK

Wald et al. Aliment Pharmacol Ther 2008;28:917
Summary: Tailoring laxatives to the patient, based on their symptoms and diagnosis

- **Episodic hard stool**: Bulk fibre
- **Episodic reduced frequency**: Stimulant
- **Slow transit constipation**: Osmotic
- **Difficulty evacuating**: Glycerine or stimulant suppository
- **Megarectum or megacolon**: Osmotic

If no improvement:
- Increase dose
- Rational combination e.g.
  - Stool softener and stimulant laxative or bulking agent

References:
Emerging treatments

Gut flora in colon lumen

Epithelial cell layer
Mucosa
Enteric nervous system
Muscularis mucosa
Submucosa
Circular muscle layer
Myenteric nerve plexus
Longitudinal muscle layer

Basolateral membrane
Tight junction
Apical membrane

Lumen

Chloride channel

Cl⁻

5-HT₄ receptor

Guanylate cyclase receptor

μ-opioid receptor

Prucalopride
Alvimopan
Methylnaltrexone
Linaclotide
Lubiprostone
PRESSURE CONSTANT

1. Screw top (including lid) to connect control unit to water bag
2. Bag for water
3. Pump for activating the balloon and pumping water
4. Control unit for regulation of air and water
5. Pre-coated rectal catheter with balloon

PRESSURE VARIABLE

Diagram showing different components for pressure management.
## Which patient?

<table>
<thead>
<tr>
<th>Neurogenic bowel dysfunction (NBD)</th>
<th>Functional disorders</th>
<th>Post-surgical situations</th>
</tr>
</thead>
</table>
| Spinal cord injury
  - supracaonal
  - cauda equina | Faecal incontinence
  - idiopathic
  - post-traumatic | Low anterior rectal resection syndrome |
| Spina bifida | Constipation
  - slow transit
  - rectal evacuation difficulties | Ileo-anal pouch dysfunction |

Multiple sclerosis

<table>
<thead>
<tr>
<th>congenital Anorectal Malformations (ARM)</th>
</tr>
</thead>
</table>

## Reasons for starting TAI

<table>
<thead>
<tr>
<th>Reason</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient relief with current regime</td>
<td>125</td>
<td>55%</td>
</tr>
<tr>
<td>Adverse effects with current regime</td>
<td>77</td>
<td>34%</td>
</tr>
<tr>
<td>Faecal incontinence</td>
<td>70</td>
<td>31%</td>
</tr>
<tr>
<td>Excess time taken</td>
<td>64</td>
<td>28%</td>
</tr>
<tr>
<td>Rectal bleeding/pain</td>
<td>30</td>
<td>13%</td>
</tr>
<tr>
<td>Dependence on carers</td>
<td>68</td>
<td>30%</td>
</tr>
<tr>
<td>Unpredictability / complexity</td>
<td>36</td>
<td>16%</td>
</tr>
<tr>
<td>Heard/read about TAI</td>
<td>16</td>
<td>7%</td>
</tr>
</tbody>
</table>

Transanal irrigation

Before irrigation

After irrigation

Anterior view of the 111In-labeled bowel content before washout (A) and after (B): the colon is empty up to the left colic flexure

Randomised controlled trial: transanal irrigation vs standard therapy

- Cleveland Clinic Constipation Scoring System: p=0.0002
- St. Mark's Fecal Incontinence Grading System: p=0.00016
- Neurogenic Bowel Dysfunction Score: p=0.034

Christensen et al Gastroenterol 2006
Randomised controlled trial: transanal irrigation vs standard therapy

- Time in toilet: TAI vs Standard, p=0.04
- Defaecation time: TAI vs Standard, p=0.094
- uti % of contacts: TAI vs Standard, p=0.0052
ORIGINAL ARTICLE

Long-term outcome and safety of transanal colonic irrigation for neurogenic bowel dysfunction

PM Faaborg¹,², P Christensen¹,², B Kvitsau¹, S Buntzen¹, S Laurberg¹ and K Krogh²

¹Surgical Research Unit, Department of Surgery p, Aarhus University Hospital, Aarhus, Denmark and ²Neurogastroenterology Unit, Department of Hepatology and Gastroenterology V and Department of Surgery p, Aarhus University Hospital, Aarhus, Denmark

**Figure 1** Treatment status. The 98 patients with a successful outcome are marked by a darker shading.

**Figure 2** Kaplan–Meier plot of the time course with transanal irrigation in all 211 neurogenic dysfunction patients. 95% CI are shown.
ORIGINAL ARTICLE

Transanal irrigation in myelomeningocele children: an alternative, safe and valid approach for neurogenic constipation

E Ausili¹, B Focarelli¹, F Tabacco¹, D Murolo¹, M Sigismondi², A Gasbarrini³ and C Rendeli¹

¹Department of Paediatric Science, Catholic University Medical School, Rome, Italy; ²Department of Medical Dentistry, Catholic University Medical School, Rome, Italy and ³Department of Internal Medicine, Catholic University Medical School, Rome, Italy
Transanal Irrigation for Bowel Symptoms in Patients with Multiple Sclerosis

Giuseppe Preziosi, M.R.C.S.\textsuperscript{1,2,3} • Jonathan Gosling, M.R.C.S.\textsuperscript{1,2} • Amanda Raeburn, Ph.D.\textsuperscript{1} • Julie Storrie, R.G.N.\textsuperscript{1} • Jalesh Panicker, M.D., D.M., M.R.C.P.(U.K.)\textsuperscript{3,4} • Anton Emmanuel, M.D., M.R.C.P.(U.K.)\textsuperscript{1,3}

\textbf{A}

Wexner Constipation score

\begin{center}
\begin{tabular}{c c c c c c c c c c}
\hline
25 & 20 & 15 & 10 & 5 & 5 & 10 & 15 & 20 & 25 \\
\hline
\end{tabular}
\end{center}

\begin{center}
\begin{tabular}{c c c c c c c c c c}
\hline
\textbf{Pretreatment} & \textbf{Posttreatment} \\
\hline
\end{tabular}
\end{center}

\textbf{B}

Wexner Incontinence score

\begin{center}
\begin{tabular}{c c c c c c c c c c}
\hline
25 & 20 & 15 & 10 & 5 & 5 & 10 & 15 & 20 & 25 \\
\hline
\end{tabular}
\end{center}

\begin{center}
\begin{tabular}{c c c c c c c c c c}
\hline
\textbf{Pretreatment} & \textbf{Posttreatment} \\
\hline
\end{tabular}
\end{center}
Tailoring treatment

Set realistic expectations:
- may take 4–12 weeks to achieve a reliable and effective routine
- process of trial-and-error to optimise individualised parameters
- 25% of patients have a poor initial response to TAI

Continue laxatives until TAI established, may need chronic use if very slow transit features

Adjunctive interventions may be needed
- relaxation techniques / abdominal massage / digital rectal stimulation

Many factors to manipulate to tailor treatment
TAI at UCH London

<table>
<thead>
<tr>
<th>Training</th>
</tr>
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<tbody>
<tr>
<td>Hospital nurse specialist (n=169)</td>
</tr>
<tr>
<td>Community nurse (n=58)</td>
</tr>
</tbody>
</table>

- Follow up phone call at 4 weeks
- Hospital nurse specialist (n=227)
- 2-weekly adjustments of treatment as needed (median 3)
- Hospital nurse specialist (n=155)
- Email or clinic follow up annually (n=223)

Median 4.5 years

The % of patients with severe NBD score (NBD ≥ 14) decreased by 55% after one year of introducing TAI

Carer dependence

% users

<table>
<thead>
<tr>
<th>Months after start</th>
<th>% Users</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>45</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
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<tr>
<td>12</td>
<td>15</td>
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<td>36</td>
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<tr>
<td>60</td>
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<tr>
<td>72</td>
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* p<0.01 vs baseline
Medical interventions related to NBD
At year 1 (with TAI) versus baseline (pre-TAI)

* Comparing before and after 2007, when TAI was introduced

- **88%**
  Hospital admissions

- **66%**
  G.P/Specialist visits

- **57%**
  Treated UTIs

- **61%**
  Need for stoma surgeries*

Managing neurogenic bowel dysfunction: what do patients prefer? A discrete choice experiment of patient preferences for transanal irrigation and standard bowel management

Beenish Nafees1
Andrew J Lloyd2
Rachel S Ballinger2
Anton Emmanuel3

1Health Outcomes Research, Nafees Consulting Limited, London, 2Patient-Reported Outcomes Research, ICON plc, Oxford, 3Department of Gastroenterology and Nutrition, University College Hospital, London, UK

Background: Most patients with bowel dysfunction secondary to neurological illness are managed by a range of nonsurgical methods, including dietary changes, laxatives, and suppository use to transanal irrigation (TAI). The aim of the present study was to explore individuals’ preferences regarding TAI devices and furthermore investigate willingness to pay (WTP) for attributes in devices in the UK.

Methods: A discrete choice experiment survey was conducted to evaluate the patients’ perceived value of TAI devices. Attributes were selected based upon a literature review and input from clinicians. Interviews were conducted with three clinicians and the survey was developed and finalized with the input from both patients and professionals. The final attributes were “risk of urinary tract infections” (UTIs), “risk of fecal incontinence” (FI), “frequency of use”, “time spent on toilet”, “ease of use”, “level of control/independence”, and “cost”. Participants were recruited by a patient panel of TAI device users in the UK. Data were analyzed using the conditional logit model whereby the coefficients obtained from the model provided an estimate of the (log) odds ratios (ORs) of preference for attributes. WTP was also estimated for each attribute.

Results: A total of 129 participants were included in the final analyses. Sixty two percent of the participants had suffered from three UTIs in the preceding year and 58% of patients reported currently experiencing FI using their current device. All attributes were significant predictors of choice. The most important attributes for participants were the “risk of FI”, “frequency of

Conclusion: Participants with bowel dysfunction regarded “risk of FI”, “frequency of use”, and “avoiding UTIs” as the most important features of a TAI device. These preferences are valuable in informing decision makers and clinicians regarding different bowel management solutions as well as for development of future devices.
REVIEW

Consensus review of best practice of transanal irrigation in adults

AV Emmanuel¹, K Krogh², G Bazzocchi³, A-M Leroi⁴, A Bremers⁵, D Leder⁶, D van Kuppevelt⁷, G Mosiello⁸, M Vogel⁹, B Perrouin-Verbe¹⁰, M Coggrave¹¹, P Christensen¹² and Members of the working group on Trans Anal Irrigation from UK, Denmark, Italy, Germany, France and the Netherlands

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Spinal Cord 2013: 51:732-738
Tailoring the treatment

Parameters that can be individualised

- Time with adjunctive measures (e.g., abdominal massage)
- Frequency of irrigation (daily, reduced to alternate days after ~10–14 days)
- Timing (undertake 20–30 minutes after a meal)
- Time of day (to fit with lifestyle of patient)
- Volume of irrigant (500 ml gradually increased to maximum of 1000 ml)
- Volume of rectal balloon (40–200 ml [one to five pumps]; use only as much as necessary)
- Other irritants (saline\(^1\), phosphate\(^2\) and other laxatives\(^{2,3}\) not formally investigated)

References:

Perforations per million irrigations (by weeks)

Overall risk: 2 per million

Early cases: avoidable

Late cases: NOT cumulative

Christensen & Emmanuel, Tech Coloproctol 2016
Adherence with transanal irrigation

Cumulative Use of Treatment

- Idiopathic Constipation
- Anal Insufficiency
- Sequelae to Anorectal Surgery
- Neurogenic Bowel Dysfunction
- Miscellaneous

Time Using Transanal Irrigation (Months)

0 12 24 36 48 60

0.2 0.4 0.6 0.8 1.0

Malone Antegrade Colonic Enema

- Water: 1000-1200 ml
- Mean 45 min. (30-60)
- Every every 3rd day
- Insert catheter every day
Antegrade colon irrigation

Before irrigation

After irrigation

30/32 would have it again
29/32 would recommend to friend

BUT 1 in 3 patients complications

Work done by Physiology Unit team