SNS and PTNS For Treatment of Faecal Incontinence

Paul Durdey
Bristol Royal Infirmary
Bristol UK
Anatomy

- IAS
- EAS
- Puborectalis
- Anorectal angle
- Pudendal nerve
Aetiology

- Obstetric trauma
- Instrumental delivery
- Prolonged 2\textsuperscript{nd} stage
- Multiparous
- Direct injury 3\textsuperscript{rd}/4\textsuperscript{th} degree tear
- Neuropathic – PN stretch/crush
- Combined
Sphincter Dysfunction

- Anatomical defect of EAS/IAS
- Pudendal Neuropathy
- Combination
Sphincter Disruption

- 3\textsuperscript{rd}/4\textsuperscript{th} degree tear
- Should be identified at delivery and repaired
- Good results >60% fully continent (\textit{Sultan 2008})
- IAS should be repaired
- Occult injuries
Pudendal Neuropathy

- Occurs with every vaginal delivery
- Stretch injury
- Mixed nerve - motor/sensory/muscle spindles
- EMG of pelvic floor shows denervation changes with prolonged 2nd stage/instrumental delivery/multip.
Symptoms

• EAS - urgency of defaecation

• IAS - passive incontinence
  - flatus
  - post defaecatory seepage
Evaluation

- Perineal descent
- Resting tone
- Voluntary squeeze
- Involuntary squeeze
- Paradoxical contraction
3. **Wexner Fecal Incontinence Score:** Please check the appropriate box in each row as honestly as possible regarding your bowel movement habits & your bowel control.

*Total Score (0-20): ________*

<table>
<thead>
<tr>
<th>How often do you have accidents to solid, well-formed stool?</th>
<th>Never (0)</th>
<th>Less than once per month (1)</th>
<th>Less than once/week &amp; greater than once/month (2)</th>
<th>Less than once/day &amp; greater than once/month (3)</th>
<th>Once a day or more than once a day (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you have accidents to liquid stool/diarrhea?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>How often does the gas escape without your knowledge or control?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>How often do you wear a pad/depends or change underwear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much do the above answers alter your lifestyle or activities?</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

4. **If you are NOT having full bowel accidents but you are having some leakage of stool or gas, please check the appropriate box in each row**

<table>
<thead>
<tr>
<th>Leakage of Gas</th>
<th>Never</th>
<th>1 to 3 times a month</th>
<th>Once a week</th>
<th>2 or more times a week</th>
<th>Once a day</th>
<th>2 or more times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage of Macus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage of Liquid Stool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage of Solid Stool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **In the past month, did you have any warning or feeling when you needed to have a bowel movement?**
   - Yes
   - No (If no, go to question 6)

   **If yes, did you have to rush/hurry to reach the toilet as soon as you felt the need to have a bowel movement?**
   - Yes
   - No

6. **In the past month, did you ever have bowel leakage shortly after emptying your bowels or passing a bowel movement?**
   - Yes
   - No
Anorectal Physiology

- Manometry
- Resting/squeeze pressure
- Fatigue
- Rectal function/capacity
- compliance
- EMG
Anal Ultrasound

- Defines anatomy
- EAS/IAS defect - both
- May overestimate damage
- Key investigation
- Operator dependent
- Occult injuries
Management of Incontinence

• Conservative- loperamide syrup, biofeedback
• Expanding role of continence advisor
• Suppositories/enemas
• Colonic irrigation
• Peristeen catheter
• ? Role of HRT
• Surgical procedures
Surgical Treatment

- Anterior sphincter repair
- Gracilis neosphincter
- Artificial bowel sphincter
- PTNS
- SNS

**only in patients who have significant impact on lifestyle!!**
Surgical Procedures

• Anterior repair of EAS
• Initial results good – 70-80% improve
• At 5 years – 40%
• Possible to re-do, 50% initial success
• IAS defects difficult
• Now very uncommon
Algorithm for Faecal Incontinence

History and physical examination

First line measures

Investigations if symptoms persist

Imaging and physiology informs the algorithm

Conservative treatment

Anterior sphincter repair

Minimally invasive therapies

Salvage procedures

Definitive treatment

Exclude luminal causes. If change in bowel habit, and investigate and treat reversible and organic causes and sinister symptoms. Specifically identify and manage rectal prolapse if present.

Low residue diet and practical advice, sphincter and pelvic floor exercises, titrated loperamide, psychological support

Assess sphincter structure with endoanal ultrasound and function with physiology. Assess pelvic floor trauma, atrophy and function with MRI (static/dynamic)

Isolated IAS defect, intact weak sphincters, levator atrophy

EAS defect (defect > 90° and < 180°) +/- IAS defect

EAS defect > 180° and/or severe structural injury

According to severity

Biofeedback, bowel retraining anal plug, retrograde rectal irrigation. Bowel program for special groups*

Primary overlap repair or redo repair with non atrophic muscle

Sacral neuromodulation, sphincter bulking agents

MACE, Artificial bowel sphincter, dynamic graciloplasty

Stoma

* For the elderly and neurogenic, consider Mx of impaction and incontinence together
SACRAL NEUROMODULATION (SNS)

• Initial use urinary incontinence
• Modulates function
• Widely used for faecal incontinence
SNS

- Stimulate S3/S4
- Trial stimulation
- Easy
- Low risk
- GA/LA
- Immediate result
SNS

• Initial indications - failed sphincter repair with intact EAS on US, preservation of PN function
• Approved by NICE
• Appears to work in presence of sphincter defect
SNS

• Initial trial stimulation – 2-3 weeks
• LA and sedation
• Symptom diary
• If > 50% improvement in symptoms – permanent SNS
SNS

- LA and sedation
- Permanent tined lead 4 electrodes
- Tunnelled to pocket in upper gluteal region
- IPG implanted
- External programmer
- Patient programmer
What do we know?

1. SNS is effective
SNS is effective for FI

- NICE approved 2007 (UK)
- Complete continence 41-80% (long term)
- ≥ 50% decrease in FI episodes 75-100%
- Inc QOL
- Safe
- Relatively cost effective

Jarrett et al., Br J Surg 2004
Hetzer et al., Arch Surg 2007
Dudding et al., Br J Surg 2008
Matzel et al., Lancet 2004
Vaizey et al., Br J Surg 2014
Coller et al., DCR 2014
SNS is an effective treatment for FI

Lifestyle & diet
Pharmacological
Bowel retraining & biofeedback
Neuropsychological
Neuromodulation
Surgical
SNS

• IPG may need reprogramming
• Appears to be effective long term
• 5 year success rates 40-80%
• Improved QOL
• No age limit
What don’t we know

How does SNS really work?
**Why is it important to know how SNS works (1)**

- SNS is good but it is not a panacea
- SNS is cash effective but it is not cheap
- National health organisations are poor
- Placebo-controlled data are lacking and will be very difficult to get
- Placebo responses are very high (30-80%) for GI disorders of function
Why is it important to know how SNS works (2)

- Objective biomarkers of response could:
  - Negate the placebo argument
  - Permit patient selection on the basis of pre-operative measurements
  - Lead to paradigm and therefore device modifications? battery life
  - “Raise the bar” for competitors e.g. PTNS and translumbar magnetic stimulation
What is in a sacral root?

Ventral roots

Aγ S1 only

Aγ

B

Nerve fibers in ventral roots from S1 to S5

Nerve fibers in dorsal roots from S1 to Coccyx

? C fibres
What is in a sacral root?


<table>
<thead>
<tr>
<th>Root</th>
<th>No. of Fascicles</th>
<th>No. of Nerve Fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ventral</td>
<td>Dorsal</td>
</tr>
<tr>
<td>S-1</td>
<td>47 ± 22</td>
<td>46 ± 12</td>
</tr>
<tr>
<td>S-2</td>
<td>27 ± 13</td>
<td>38 ± 15</td>
</tr>
<tr>
<td>S-3</td>
<td>11 ± 7</td>
<td>23 ± 11</td>
</tr>
<tr>
<td>S-4</td>
<td>7 ± 6</td>
<td>14 ± 11</td>
</tr>
<tr>
<td>S-5</td>
<td>2 ± 1</td>
<td>4 ± 3</td>
</tr>
<tr>
<td>coccygeal</td>
<td>1 ± 1</td>
<td></td>
</tr>
</tbody>
</table>
What nerves are stimulated

- Current drawn between a cathode and anode by a potential difference of 0.4 – 2V
- Pulsed DC current (14Hz, 210msec)
- Alters neuron membrane (generator) potential leading to (or blocking) action potentials
- Theoretically small thinly myelinated and unmyelinated fibres more affected
- Exponential drop off with distance from stimulus
- But...... S1 large motor fibres are stimulated
SNS: what does it stimulate

- Rami communicantes
- Pelvic nerve
Sacral nerve stimulation reduces corticoanal excitability in patients with faecal incontinence
R. Sheldon, E. S. Kiff, A. Clarke, M. L. Harris, S. Hamdy

No effect on resting or squeeze pressures
No effect on rectal sensory testing
Brain imaging: Acute vs Chronic SNM

Acute SNM

Chronic SNM

N = 12
Urgency incontinence
Detrusor overactivity

Blok et al. BJU Int 98:1238-1243, 2006
SNM & Brain Response in Fowler’s syndrome

Normal bladder function

Fowler syndrome SNM off

Fowler syndrome SNM on

Possible sites of action

- Peripheral
  - Preganglionic parasympathetic efferents
  - Preganglionic sympathetic efferents
  - Preganglionic spinal afferents
- Central
  - Spinal cord
  - Brain
What do we know?

3. SNS has some effects on measurable physiological variables
### Table 1  Rectal volumes (ml) on balloon testing.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12 months</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensation volume</td>
<td>50.4 (10–200)</td>
<td>32.2 (10–110)</td>
<td>0.28</td>
</tr>
<tr>
<td>Urge volume</td>
<td>107.2 (20–400)</td>
<td>75.0 (30–225)</td>
<td>0.39</td>
</tr>
<tr>
<td>Maximum tolerable volume</td>
<td>174.5 (35–400)</td>
<td>141.2 (60–300)</td>
<td>0.73</td>
</tr>
</tbody>
</table>
Volume thresholds for rectal filling sensations during isobaric phasic distension

Pressure thresholds for rectal filling sensations during isobaric phasic distension
### SUMMARY: Effect of SNS on colonic and anorectal physiology

<table>
<thead>
<tr>
<th>Site</th>
<th>Motor</th>
<th>Sensory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon</td>
<td>+</td>
<td>+ / -</td>
</tr>
<tr>
<td>Rectum</td>
<td>+ / -</td>
<td>++</td>
</tr>
<tr>
<td>Anus</td>
<td>+ / -</td>
<td>No data</td>
</tr>
</tbody>
</table>
PTNS
PTNS

- Treatment as OP
- Weekly treatments
- 30 minutes per session
- 3 month course of treatment
- 6 monthly top up
PTNS

- Alternative transcutaneous stimulation (GEKO)
- Possible to treat at home
- Recent trial shows some effect but ? as effective as PTNS
- Needs further evaluation
PTNS - Results

• Meta analysis of 13 studies
• > 50% improvement in symptoms
• 63-82%
• Max FU 30 months
• ? More frequent treatments more effective
• Need more studies

Dudding et al 2013
PTNS

- NICE suggesting PTNS as first treatment
- Lack of centres providing PTNS
- ? Cheaper in long term
- Labour intensive
How can we find out how SNS works

• Further careful prospective studies in patient subgroups with well defined pathophysiologies
  • Objective markers e.g. evoked potentials
  • Controlled (placebo or comparator)
• Device modification during temporary stimulation to trigger neurophysiological recording equipment
  • EMG
  • Evoked potentials
Other indications for SNM

- Spinal injury partial ?? Complete
- MS
- Urological
- Funding issues in current economic climate
SNS may be effective for constipation

Lifestyle & diet
Pharmacological
Bowel retraining & biofeedback
Neuropsychological
Neuromodulation
Surgical
Conclusions

• Sacral neuromodulation has become the primary interventional treatment for FI
• ? PTNS first option
• Direct SNS is effective in between 40-80% of patients in the long term
• Expensive
• Need specialist units/practitioners
• No real idea how it works but IT DOES!
Thank You