Funtional non-retentive fecal incontinence

Marc Benninga
Emma Children’s Hospital / AMC, Amsterdam
Case

- Boy > 9 years of age
- Fecal incontinence after 3 pm
- No other symptoms of constipation
- Urinary incontinence
- No abnormalities at physical exam

- Diagnostics: X-ray + markers???
- Treatment???
Non-retentive fecal incontinence

- Definition
- Epidemiology
- Symptoms
- Pathophysiology
- Diagnostic work up
- Treatment
- Long term follow up
Achievement of bowel control

N = 349

Definition problem

Encopresis = soiling = overflow incontinence
= fecal incontinence???
ENCOPRESIS / SOILING

FECAL INCONTINENCE
Non-retentive fecal incontinence definition

• Must include all of the following in a child with a developmental age at least 4 years:
  – Defecation into places inappropriate to the social context at least one per month
  – No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subjects symptoms
  – No evidence of fecal retention
  – Criteria fulfilled for at least 2 months prior to diagnosis

# Symptoms

<table>
<thead>
<tr>
<th>Boy's</th>
<th>Constipation</th>
<th>N = 111</th>
<th>NRFI</th>
<th>N = 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>68%</td>
<td>90%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowel movements/wk</td>
<td>2</td>
<td>7 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large amount of stools</td>
<td>61%</td>
<td>0%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fec incontinence/wk</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Painful defecation</td>
<td>50%</td>
<td>* P &lt; 0.05</td>
<td>20%*</td>
<td></td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>41%</td>
<td>22%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>25%</td>
<td>42%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpable abdominal mass</td>
<td>35%</td>
<td>0%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpable rectal mass</td>
<td>30%</td>
<td>0%*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Functional Defecation Disorders in Children with Lower Urinary Tract Symptoms

<table>
<thead>
<tr>
<th></th>
<th>Constipation</th>
<th>N = 53</th>
<th>NRFI</th>
<th>N = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysfunctional Voiding</td>
<td>55%</td>
<td></td>
<td>8.3%</td>
<td></td>
</tr>
<tr>
<td>Urge incontinence / OAB</td>
<td>30%</td>
<td></td>
<td>67%</td>
<td></td>
</tr>
</tbody>
</table>

Prevalence of fecal incontinence

- School children
  - 7 year old: 1-2%
  - 10-12 year old: 1.3%

- Male predominance: 6:1

Bellman A. Acta Pediatr 1966
Non-retentive fecal incontinence in Italy

- 128 patients referred to tertiary centre
  - 54 children 4-17 years
  - FC 84%
  - NRFI 16%

Fecal incontinence in Sri Lanka

- School based, island-wide, cross sectional study
  - 2686 children
  - 10-16 years

- Constipation related 81%
- NRFI 19%
  - Prevalence 0.4%

Rajindrajith S, et al. 2010 JPGN
Prevalence of fecal incontinence by age

Rajindrajith S. et al, JPGN 2010
Fecal incontinence in Sri Lanka

Fecal incontinence more common:

• Males
• Low socio-economic background
• Exposed to stressful life events
  – Being bullied at school
  – Being hospitalized

• No difference between children living in war affected and unaffected areas

Rajindrajith S, et al. 2010 JPGN
## Prevalence of fecal incontinence

<table>
<thead>
<tr>
<th>Amsterdam</th>
<th>Age</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>13,111 parents</td>
<td>5-6 year old</td>
<td>4.1%</td>
</tr>
<tr>
<td>9,780 parents</td>
<td>11-12 year old</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

Van der Wal M, et al. JPGN 2005
### Prevalence fecal incontinence

- **Boys:girls** 3.7%:2.4%

#### Ethnic origin

<table>
<thead>
<tr>
<th>Ethnic Origin</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch</td>
<td>3.5%</td>
</tr>
<tr>
<td>Surinam</td>
<td>3.7%</td>
</tr>
<tr>
<td>Moroccan</td>
<td>2.2%*</td>
</tr>
<tr>
<td>Turkish</td>
<td>2.2%*</td>
</tr>
</tbody>
</table>

*p<0.05

Van der Wal M, et al. JPGN 2005
Children taken to a doctor for evaluation

- 5-6 yr old 38%!
- 11-12 yr old 27%

Van der Wal M, et al. JPGN 2005
# Causes of fecal incontinence in children

<table>
<thead>
<tr>
<th>Functional causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional constipation associated faecal incontinence</td>
</tr>
<tr>
<td>Functional nonretentive faecal incontinence</td>
</tr>
<tr>
<td>Organic causes</td>
</tr>
<tr>
<td>Repaired anorectal malformations</td>
</tr>
<tr>
<td>Post surgical Hirschsprung disease</td>
</tr>
<tr>
<td>Spinal dysraphism</td>
</tr>
<tr>
<td>Spinal cord trauma</td>
</tr>
<tr>
<td>Spinal cord tumours</td>
</tr>
<tr>
<td>Cerebral palsy</td>
</tr>
<tr>
<td>Myopathies affecting the pelvic floor and external anal sphincter</td>
</tr>
</tbody>
</table>

Non-retentive fecal incontinence
Cause????

“fecal incontinence episodes are an impulsive act triggered by unconscious anger”

Biopsychosocial model of functional fecal incontinence

Social/Environmental
- Poor socioeconomic status
- Unhygienic toilet facilities
- Living area

Psychology
- Stress
- Anxiety
- Depression
- Behavioral problems
- Sexual/physical abuse

Biology/Physiology
- Genetics
- Abnormal
  - motility
  - sensation
  - sphincter function

Functional faecal incontinence

Pathogenesis of NRFI psychological factors

- 30% received special school education
- Behavior scores within the clinical range in 35% of patients

However

- Successful treatment resulted in significant improvement of the behavior scores

Prevalence of constipation and FI by ADHD status


* P < 0.001
## Autism Spectrum Disorders in Children with Functional defecation Disorders

<table>
<thead>
<tr>
<th></th>
<th>FDD + ASD sympt</th>
<th>FDD – ASD sympt</th>
<th>controls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>65</td>
<td>158</td>
<td>96</td>
<td>-</td>
</tr>
<tr>
<td>Male</td>
<td>40 (62%)</td>
<td>84 (53%)</td>
<td>42 (45%)</td>
<td>ns</td>
</tr>
<tr>
<td>Age</td>
<td>8.3*</td>
<td>7.7</td>
<td>7.2*</td>
<td>*0.01</td>
</tr>
<tr>
<td>FC</td>
<td>57 (88%)</td>
<td>145 (92%)</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>NRFI</td>
<td>8 (12%)</td>
<td>13 (8%)</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

The prevalence of ASD in children in the general population ranges from 0.6%-1%

## Symptoms

<table>
<thead>
<tr>
<th></th>
<th>Constipation (N = 111)</th>
<th>NRFI (N = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td>68%</td>
<td>90%*</td>
</tr>
<tr>
<td><strong>Bowel movements/wk</strong></td>
<td>2</td>
<td>7*</td>
</tr>
<tr>
<td><strong>Large amount of stools</strong></td>
<td>61%</td>
<td>0%*</td>
</tr>
<tr>
<td><strong>Fec incontinence/wk</strong></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Painful defecation</strong></td>
<td>50%</td>
<td>20%*</td>
</tr>
<tr>
<td></td>
<td>* P &lt; 0.05</td>
<td></td>
</tr>
<tr>
<td><strong>Abdominal pain</strong></td>
<td>41%</td>
<td>22%*</td>
</tr>
<tr>
<td><strong>Urinary incontinence</strong></td>
<td>25%</td>
<td>42%*</td>
</tr>
<tr>
<td><strong>Palpable abdominal mass</strong></td>
<td>35%</td>
<td>0%*</td>
</tr>
<tr>
<td><strong>Palpable rectal mass</strong></td>
<td>30%</td>
<td>0%*</td>
</tr>
</tbody>
</table>

Not always easy to recognize
Transit time measurement
## Pathogenesis of NRFI colonic transit times

<table>
<thead>
<tr>
<th>Condition</th>
<th>Control (C)</th>
<th>NRFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 129</td>
<td>n = 54</td>
<td></td>
</tr>
<tr>
<td>Normal transit time</td>
<td>52%</td>
<td>91%</td>
</tr>
<tr>
<td>Hindgut dysfunction</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td>Outlet obstruction</td>
<td>31%</td>
<td>9%</td>
</tr>
<tr>
<td>Slow transit constipation</td>
<td>10%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Benninga MA, et al. EJP 1995
<table>
<thead>
<tr>
<th>Pathogenesis of NRFI anorectal manometry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
</tr>
<tr>
<td>n = 111</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>C</th>
<th>NRFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting tone (mmHg)</td>
<td>56</td>
<td>63</td>
</tr>
<tr>
<td>Squeeze pressure (mmHg)</td>
<td>138</td>
<td>140</td>
</tr>
<tr>
<td>Defecation dynamics (normal)</td>
<td>41%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Pathogenesis of NRFI
anorectal manometry

Abnormal defecation dynamics → Hypothesis

• Sense the urge to defecate → lose their first stool → contract voluntary sphincter muscles → doing this daily → unconsciously development of abnormal defecation dynamics
Pathogenesis of NRFI
Rectal barostat

• Sensation:
  – Disturbed urge to defecate 5% (ns)
  – Disturbed threshold for pain 16% (ns)

• Compliance:
  – Normal

• Motility
  – Normal in response to a meal

Treatment options of NRFI

Limited randomized controlled trials

- Diary
- Education / demystification / toilet training
- Dietary advice
- Oral / rectal laxatives
- Biofeedback training
- Behavior therapy
- Loperamide
Biofeedback training in NRFI

Defecation dynamics
### Biofeedback training
#### Randomized controlled trials

<table>
<thead>
<tr>
<th>Authors</th>
<th>Journal</th>
<th>Year</th>
<th>Pts</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van der Plas et al</td>
<td>ADC</td>
<td>1996</td>
<td>71</td>
<td>-</td>
</tr>
<tr>
<td>BFT + Lax vs Lax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van Ginkel et al</td>
<td>J Pediatr</td>
<td>2000</td>
<td>48</td>
<td>-</td>
</tr>
<tr>
<td>Lax + BFT vs BFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Laxatives and NRFI Hypothesis

Normal sensation

- Deny or neglect normal and appropriate physiological stimuli

- Unnecessary softening of stools consequently results in more incontinence episodes
Observation
Rectal barostat

• Decreased rectal sensation

• Unnoticed rectal contractions accompanied by fecal loss

• Long-lasting repetitive contractions following rectal distension
Future treatment?
Loperamide

• Opioid-receptor agonist
• Inhibits peristaltic movement
• Treatment of fecal incontinence in adulthood.
• Increases anal sphincter pressure, possibly contributing to better sphincter function
• Decreases rectal contractions
Dys-coordination rectum & anal sphincter

“Hyperreactive” Rectum

Fecal Bolus

“Compensatory reflex” anal sphincter

Loperamide
Future treatment?
Loperamide

- Loperamide 10 mg 2 dd ➡️ constipation
- Loperamide 5 mg 2 dd ➡️ good clinical effect

Voskuil WP, et al. JPGN 2003
Hypothesis: “Used being dirty”

Intervention?

Behavioral therapy?

Effect of Additional Enemas?
Randomized Controlled Trial

12 week treatment program:

Conventional therapy:
• Strict toilet training regimen, rewarding

Intervention group:
• 1 rectal enema daily for the first 4 weeks
• Reduced by 1 enema per week

Clinical evaluation at week 4, 6 and 12
Methods

Inclusion criteria:

• 6 – 17 years
• Fecal incontinence > 1 per week
• No symptoms of constipation
• Colonic Transit Time < 62 hours
Endpoints

Primary outcome measures:

- Frequency of fecal incontinence
- Overall success rate

Success:

- < 1 episode of fecal incontinence per week
## Demographic and clinical characteristics at baseline

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of patients</strong></td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td><strong>Boys</strong></td>
<td>75 (n = 27)</td>
<td>77 (n = 27)</td>
</tr>
<tr>
<td><strong>Median age in y (range)</strong></td>
<td>9.0 (8.1-10.3)</td>
<td>9.3 (8.3-10.4)</td>
</tr>
<tr>
<td><strong>Median defecation frequency/wk</strong></td>
<td>7.0 (6.3-11.1)</td>
<td>7.0 (5.0-12.5)</td>
</tr>
<tr>
<td><strong>Median FI episodes/wk</strong></td>
<td>7.0 (4.0-11.5)</td>
<td>6.0 (4.0-10)</td>
</tr>
<tr>
<td><strong>Pain during defecation</strong></td>
<td>33 (n = 12)</td>
<td>29 (n = 10)</td>
</tr>
<tr>
<td><strong>Hard stools</strong></td>
<td>2.8 (n = 1)</td>
<td>8.6 (n = 3)</td>
</tr>
<tr>
<td><strong>Abdominal pain</strong></td>
<td>70 (n = 25)</td>
<td>60 (n = 21)</td>
</tr>
<tr>
<td><strong>Passage of large stools</strong></td>
<td>28 (n = 10)</td>
<td>23 (n = 8)</td>
</tr>
<tr>
<td><strong>Withholding behavior</strong></td>
<td>86 (n = 31)</td>
<td>74 (n = 26)</td>
</tr>
<tr>
<td><strong>Use of laxatives</strong></td>
<td>2.8 (n = 1)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Urinary incontinence (day)</strong></td>
<td>25 (n = 9)</td>
<td>37 (n = 13)</td>
</tr>
<tr>
<td><strong>Urinary incontinence (night)</strong></td>
<td>36 (n = 13)</td>
<td>34 (n = 12)</td>
</tr>
<tr>
<td><strong>CTT (h)</strong></td>
<td>31.2 (24.0-45.6)</td>
<td>28.8 (14.4-45.6)</td>
</tr>
</tbody>
</table>

Success rate

![Graph showing success rate over time with control and intervention groups.]

- p<0.01 at 4 weeks
- p=0.91 at 6 weeks
- p=0.86 at 12 weeks

Percentage vs. Time (weeks)
Outcome children with NRFI

>95% reached for follow-up!

Follow-up duration in years

% success

0 20 40 60 80 100

0 1 2 3 4-6 7 8 9-11 12

Outcome of Childhood NRFI

% success

>95% reached for follow-up!

Biological age in years

Effect of psychosocial comorbidities on outcome

- Attention deficit hyperactivity disorder
- Parent-child relational problems
- Mental retardation

Management algorithm of functional fecal incontinence

Faecal incontinence (FI)

Clinical history and physical examination

Functional FI

Organic FI
Management algorithm of functional fecal incontinence

Faecal incontinence (FI)

Clinical history and physical examination

Functional FI

Organic FI

Appropriate management

Management algorithm of functional fecal incontinence

Management algorithm of functional fecal incontinence

10% 90%

Faecal incontinence (FI)

Clinical history and physical examination

Functional FI

Doubtful diagnosis

Investigations

Non-retentive FI

Ano-rectal manometry
Colonic transit studies
Anal endosonography

Constipation associated FI

Disimpaction
PEG
Enema

Education/counselling
Toilet training
Positive reinforcement
Loperamide

Maintenance
Behavioural modification
Laxatives
Colonic lavage
Follow up

Appropriate management
Conclusions

- Fecal incontinence is a common symptom in children
- 10% fulfills criteria for NRFI
- Pathophysiological mechanisms still unknown
- Is difficult to treat
- Long term follow up is necessary