Defecation disorders and chronic abdominal pain in children. Pathophysiology and treatment
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Citation for published version (APA):

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Chapter 5

Rectal function in constipation and functional non-retentive fecal soiling

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submitted for publication
1. Abstract

1.1 Objective

The possible role of the rectum in the pathogenesis of childhood constipation and functional non-retentive fecal soiling is poorly understood. Therefore, the present study was designed to evaluate rectal sensation and motility in these patients.

1.2 Patients

Fourteen children with chronic constipation and 14 children with functional non-retentive fecal soiling were studied and compared with 9 healthy volunteers.

1.3 Interventions

Rectal sensation, compliance, and contractility were determined using an intermittent distention procedure by a barostat. The rectal contractile response to a meal was measured after ingestion of a 500 Kcal meal.

1.4 Main outcome measure

Rectal sensation, rectal compliance, rectal motility.

1.5 Results

In constipated children a subgroup showed disturbed rectal compliance (43%), but normal rectal sensation, whereas another subgroup (29%) showed decreased rectal sensation for urge, but normal rectal compliance. In a subgroup of children with functional non-retentive fecal soiling (21%), rectal sensation for urge is decreased, whereas rectal compliance is normal in all children with functional non-retentive fecal soiling. The rectal contractile response was comparable between healthy volunteers, constipated children and children with functional non-retentive fecal soiling.

1.6 Conclusions

In childhood constipation, impaired rectal sensation and increased rectal compliance are major abnormalities that are not related to each other. In contrast to earlier believes, we showed disturbed rectal sensation in children with functional non-retentive fecal soiling illustrating abnormal rectal function as a pathophysiological mechanism in this disorder.
2. Introduction

Constipation and functional non-retentive fecal soiling (FS) are common problems in children, accounting for respectively 3% and 1-2% of consultations in an average pediatric practice and as much as 25% in a pediatric gastroenterology clinic (1). Childhood constipation is diagnosed when at least two of the following four criteria are present: defecation frequency < 3 per week, two or more encopresis episodes per week, production of large amounts of stool every 7-30 days and a palpable abdominal or rectal mass (2). In contrast, functional non-retentive fecal soiling is defined as defecation into places and at times inappropriate to the social context, in the absence of structural or inflammatory disease and in the absence of fecal retention occurring in a child older than 4 years (3).

In general, handling of stool depends on normal anal sphincter and pelvic floor function and on colonic and rectal factors. Disturbances in rectal sensation, rectal compliance and rectal motility have been described (4), but their pathophysiological role in childhood constipation and FS is still largely unclear. At present, only a few manometric studies have evaluated rectal sensation in children with FS. As no abnormalities were observed, this clinical entity is currently mainly considered as psychogenic. In contrast, several studies using anorectal manometry have reported an increased volume threshold for rectal sensation in a substantial proportion (27% - 78%) of children with constipation and/or megarectum (5). It should be emphasized though that compliance of the rectum and the age of the children will significantly influence the threshold for sensation measured as volume. These shortcomings in measuring visceral sensation can be avoided by assessment of rectal sensation using pressure controlled distention. In addition to rectal sensation and compliance, rectal motility may play a significant role in childhood defecation disorders. Previous manometric studies (6-7) indeed showed decreased or disorganized colonic and decreased rectal motility in constipated children. However, comparable to rectal sensation, manometry is an insensitive technique to assess minor changes in contractility or rectal tone. Previously, we evaluated rectal motility in healthy children and children with IBS using a rectal barostat showing abnormal meal-induced rectal motility in IBS (8). Whether abnormalities in rectal motility also contribute to constipation and functional non-retentive fecal soiling has not been studied in detail. Therefore, the aim of the study was to elucidate the role of rectal sensation, compliance and motility in the pathophysiology of children with constipation and functional non-retentive fecal soiling.

3. Materials and methods

3.1 Subjects

Between August 1996 and April 1998, a group of otherwise healthy children, who were referred to the pediatric gastrointestinal motility lab with complaints of constipation or functional non-retentive fecal soiling (FS) were included in our study. All children were at least 5 years of age to understand the barostat procedure. The study encompassed 28 patients: 14 constipated...
children and 14 patients with FS. These data were compared with data from 9 healthy volunteers (HV's), siblings of the patients studied.

3.2 Constipation

As previously defined, children with constipation fulfilled at least two of the following four criteria: stool frequency less than three per week, two or more soiling and/or encopresis episodes per week, periodic passage of very large amounts of stool at least once every 7-30 days and a palpable abdominal or rectal mass on physical examination (2). Children with constipation were included in the study when conventional therapy (high fiber diet, high fluid intake, toilet training, motivation, oral laxatives and enemas) with or without biofeedback training was not successful.

3.2.1 Functional non-retentive fecal soiling

FS was defined as the occurrence of fecal incontinence without any other sign of constipation and without any organic cause (3). These patients were included in the study after failure of a strict toilet training regimen and/or biofeedback training.

4. Procedure and equipment

4.1 Equipment

A computer-driven barostat device (Synectics Visceral Stimulator; Synectics, Netherlands) was used for controlled inflation of the rectal balloon. The procedure was performed with a 10 cm long non-compliant (polyethylene) balloon with a maximum capacity of 375 ml. The balloon was fixed on a silicone catheter with an outside diameter of 4 mm and an inside diameter of 3 mm, allowing a flow of air of 38 ml/sec. Before and after each study, the balloon was checked for leakage.

4.2 Experimental protocol

Pain medication and all medication known to affect the gastrointestinal motility were discontinued 48 hours before the procedure. After a fasting period of at least 5 h, the children were invited to the laboratory. Only constipated children received bowel preparation consisting of at least three enemas (Klyx®: sodiumdioctylsulfosuccinate/ sorbitol; 120 ml) on three consecutive days before the day of the study and one on the morning of the day of the study. The last enema was given more than 2½ h before the start of the barostat procedure. Children with FS and HV's did not need any bowel preparation. If on rectal examination feces was present in the rectum, the subjects were asked to defecate. Emptiness of the rectum was checked once more by rectal examination. Subjects were placed in the left lateral position. The lubricated balloon was...
introduced into the rectum without the use of endoscopy. One week before the study the equipment was shown and the child and the parents were intensively informed about the barostat procedure.

The balloon was unfolded by a stepwise (30 ml steps) increase of the balloon until a maximum volume of 150 ml. When the balloon was still inflated, the catheter was pulled back against the pelvic floor. After deflation of the balloon and a 15 min period of equilibration, the minimal distention pressure (MDP) was determined by stepwise increasing the intraballoon pressure (1 mm Hg steps for 1 min). MDP was defined as the pressure resulting in an intraballoon volume of at least 30 ml and at which the influence of breathing on the volume could be identified. Determination of MDP was followed by an adaptation period of 15 min.

Rectal sensation to distention was evaluated using an intermittent distention procedure with steps of 3 mm Hg lasting 1 min and intervals of 1 min. At every pressure step the child was asked to score sensation immediately and after 30 s. A scale from 0-5 was used with 0=no sensation, 1=first sensation, 2=urge to defecate, 3=moderate urge to defecate, 4=severe urge to defecate, 5=pain. In case of pain, the balloon was immediately deflated.

After 15 min of adaptation, rectal volume was measured at a pressure of MDP + 2 mm Hg (9). After equilibration, a meal (pancake: 500 Kcal; fat 3.8%; carbohydrates 28.9%; protein 7.3%) was ingested within 5 min. Rectal volume was determined during the following 30 min, while the child was instructed not to move.

The study protocol was approved by the medical ethical committee of the Academic Medical Center. All subjects and/or parents gave informed consent.

5. Analysis

5.1 Rectal sensation

Thresholds for first sensation, urge to defecate and pain were determined from the intermittent distention protocol and expressed as pressure above MDP.

5.2 Rectal compliance

The compliance was calculated using a nonlinear mixed-effect model for fitting the pressure volume curves of each individual (10,11). The pressure volume curves were constructed by expressing the mean volume of the last 15 s (when equilibration of the volume was reached) of the consecutive pressure steps.

5.3 Rectal contractile response to a meal

The rectal contractile response to a meal (RCR) is described by two general patterns (8,9): (1) slow volume changes, defined as long lasting volume changes (>2 min), subdivided in an acute onset component and a long-lasting late component. The late component was defined as present when the rectal volume decreased by 20% or more. (2) rapid volume waves, defined as a
decrease in volume of at least 15 ml, lasting longer than one respiratory cycle, but shorter than 2 min. An artifact was defined as 1) any change in rectal volume secondary to coughing, laughing, talking, change in body position 2) a very rapid increase (>10 mm Hg) in rectal pressure or 3) a duration of change in volume shorter than 6 s. Rectal volume was measured as the mean of 3-min intervals and expressed as a percentage of the pre-prandial volume in order to eliminate the interindividual differences in rectal volume before starting the meal.

5.4 Statistical analysis

Data are expressed as mean (± SEM). The analysis of variance design (One-Way ANOVA) was used for comparing the mean sensation thresholds. The restricted maximum likelihood method was used to compare the compliance between the different groups. The Chi-square test was used to compare the number of patients of each group, who reached the threshold for sensation of urge and pain and in whom the rectal contractile response to a meal occurred. The Spearman's rho was used to calculate correlation coefficients. Differences were considered statistical significant when the p-value was less than 0.05.

6. Results

6.1 Subject characteristics

Nine HV (6 boys and 3 girls; mean age 10.2 years; range 7 – 15 years) were compared with 14 constipated patients (11 boys and 3 girls; mean age 10.2 years; range 7 – 13 years) and 14 children with FS (13 boys and 1 girl; mean age 9.3 years; range 6 – 13 years). There was no difference in age between the different groups (p=0.59). All children attended normal school. Other clinical characteristics are shown in Table 1.
### Table 1. Patient characteristics

<table>
<thead>
<tr>
<th></th>
<th>Constipation</th>
<th>FS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 14</td>
<td>N = 14</td>
</tr>
<tr>
<td>Defecation frequency</td>
<td>2.0 (0 – 8)</td>
<td>7.0 (3 – 23)</td>
</tr>
<tr>
<td>(number / week)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encopresis frequency</td>
<td>8.5 (0 – 50)</td>
<td>10.0 (4 – 25)</td>
</tr>
<tr>
<td>(number / week)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of subjects with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>large stool every 7-30 days</td>
<td>79%</td>
<td>0%</td>
</tr>
<tr>
<td>scybala at intake</td>
<td>36%</td>
<td>0%</td>
</tr>
<tr>
<td>Total period of symptoms</td>
<td>52 (28 - 150)</td>
<td>84 (36 - 144)</td>
</tr>
<tr>
<td>(months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total period of treatment</td>
<td>20 (2 - 52)</td>
<td>2 (1 – 67)</td>
</tr>
<tr>
<td>(months)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results are shown as median and range. One HV, with no gastrointestinal symptoms, reached an urge to defecate only at 21 mm Hg and did not reach the threshold for pain. She is a sibling of a severely constipated patient who did not reach an urge to defecate or threshold for pain. She is presented in the figures as an open symbol. She was considered as an outlier and her data have been excluded for statistical analysis.

### 6.2 Rectal sensation to distention

Minimal distention pressure (MDP) was 5 ± 1 mmHg in constipated children, 6 ± 1 mmHg in children with FS and 4 mmHg in HV (NS). The volume in the barostat balloon at MDP was 44 ± 8 ml, 46 ± 7 ml 32 ± 5 ml for the constipated children, children with FS and HVs, respectively (NS) (Table 2).
Table 2. Rectal sensation and compliance in healthy volunteers and children with constipation and functional non-retentive fecal soiling

<table>
<thead>
<tr>
<th></th>
<th>HVs (8)</th>
<th>constipation (14)</th>
<th>FS (14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>volume at MDP (ml)</td>
<td>32 ± 5</td>
<td>44 ± 8</td>
<td>46 ± 7</td>
</tr>
<tr>
<td>volume at MDP + 2 mmHg (ml)</td>
<td>91 ± 9</td>
<td>164 ± 13*</td>
<td>121 ± 14</td>
</tr>
<tr>
<td>first sensation (mm Hg)</td>
<td>3 ± 0</td>
<td>2 ± 1</td>
<td>3 ± 1</td>
</tr>
<tr>
<td>urge (mm Hg)</td>
<td>6 ± 1</td>
<td>5 ± 1</td>
<td>8 ± 2</td>
</tr>
<tr>
<td>pain (mm Hg)</td>
<td>22 ± 2</td>
<td>27 ± 3</td>
<td>24 ± 3</td>
</tr>
<tr>
<td>patients above cut-off for urge (%)</td>
<td>0</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td>compliance (ml/mm Hg)</td>
<td>9 ± 1</td>
<td>13 ± 1**</td>
<td>10 ± 1</td>
</tr>
<tr>
<td>patients above cut-off for compliance (%)</td>
<td>0</td>
<td>43</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are shown as mean ± SEM; *p < 0.01: constipation versus HVs and patients with FS, ANOVA; **p < 0.05: constipation versus HVs and patients with FS, restricted maximum likelihood method.

In HVs, the threshold for first sensation, sensation of urge and sensation of pain/discomfort was reached at 3 mmHg, 6 ± 1 mmHg and 22 ± 2 mmHg, respectively. The upper limit of the normal range (calculated as mean + 2SD) for first sensation, sensation of urge and pain was 3.0 mmHg, 10 mmHg and 35 mmHg, respectively.

The individual values for the different thresholds for sensation for the three study groups are shown in Figure 1.
Figure 1. Thresholds for visceral sensation in HVs, constipated children and children with FS

The thresholds for first sensation (A), sensation of urge (B) and pain (C) are plotted for the three different groups. Horizontal line indicates upper normal range. One HV with absolutely no gastrointestinal symptoms reached an urge to defecate at 21 mm Hg and did not reach the threshold for pain. She was considered as an outlier and therefore her data have been excluded for statistical analysis. She is presented in the figures as an open symbol. The open symbols for the constipated children and the children with FS indicate that these children did not reach the threshold for urge and/or pain at all before the end of the procedure. The pressure indicated by the open symbol is
The patient indicated by an arrow (←) in (B) did reach the threshold for pain (at 30 mm Hg) before he experienced the sensation of urge.

The threshold for first sensation was comparable among the three groups. In the constipated group 4 children had a threshold for urge above the upper limit of the normal range compared to 3 children with FS (NS). One HV (outlier), 6 constipated patients and 4 children with FS had an abnormal sensation for pain (>35 mm Hg). This was not significantly different between the groups (p=0.13; Kaplan-Meier; log rank test). All patients with an increased threshold for sensation of urge also showed an increased threshold for sensation of pain. There were no clinical differences such as defecation frequency, number of encopresis episodes, consistency of the feces between the FS children with a normal and an impaired visceral sensation.

6.2.1 Relationship between age, sensation and rectal volume in HVs

The volume measured at the threshold for first sensation, sensation of urge and sensation of pain/discomfort in HVs was 72 ± 8 ml, 102 ± 11 ml and 175 ± 15 ml, respectively. A correlation was observed between age and visceral sensation measured as volume (Figure 2): first sensation (r = 0.8; p = 0.031), sensation of urge (r = 0.7; p = 0.058) and pain (r = 0.8; p = 0.020). No correlation was observed between age and rectal compliance in HVs (r = 0.5; p = 0.183).
Figure 2. Linear regression curves for first sensation, urge and pain in HVs

Linear regression curves for different thresholds for visceral sensation expressed as volume against age. A. threshold for first sensation ($r = 0.8$) B. threshold for urge ($r = 0.7$) C. threshold for pain ($r = 0.8$). The HV presented as a non-filled symbol has not been used in curve estimation for reason as described in the text (outlier).
6.3 Rectal compliance

In HVs, rectal compliance was $9 \pm 1$ ml/mmHg with a normal upper range (mean $+ 2SD$) of 14 ml/mmHg. The compliance in constipated children ($13 \pm 1$ ml / mm Hg) (Table 2) was significantly higher compared to HVs ($9 \pm 1$ ml / mm Hg) and children with FS ($10 \pm 1$ ml / mm Hg) ($p<0.005$). Six constipated children (43%) had an abnormal rectal compliance, while the compliance of all children with FS was in the normal range.

As shown in Figure 3B no relationship was observed between compliance and sensation of urge in constipated children. All children with an abnormal sensation for urge had a normal compliance. On the other hand, 6 out of the 10 children with a normal sensation of urge had an abnormal compliance. No relation was observed between the existence of fecal scybala at intake and abnormal compliance ($p=0.9$).
Figure 3. Relation between sensation of urge and rectal compliance in HVs, constipated children and children with FS

Horizontal line represents upper normal range for rectal compliance (14 ml/mmHg). Vertical line represents upper normal range for sensation of urge (10 mmHg). A. healthy volunteers; B. constipated children; C. children with functional non-retentive fecal soiling. One HV with absolutely no gastrointestinal symptoms, the same as
described in figure 1, had an abnormal rectal sensation. She was considered as an outlier and therefore her data have been excluded for statistical analysis. She is presented in (A) as an open symbol.

The six constipated children with disturbed rectal compliance were significantly older compared to constipated children with normal compliance (12.2 ± 0.8 yrs and 9.2 ± 0.5 yrs; p < 0.05). Age of onset of constipation (3.3 ± 0.3 yrs and 2.3 ± 0.8 yrs) and the total period of constipation (8.9 ± 1.7 yrs and 7.0 ± 1.0 yrs) were comparable among these two groups.

As shown in Figure 3C, there was no relation between rectal compliance and sensation in FS patients. All children with FS had a normal compliance.

6.4 Rectal contractile response to a meal

6.4.1 Slow volume changes

After equilibration at MDP + 2 mmHg, the mean rectal volume in the constipation group was 164 ± 13 ml. This was significantly larger (p<0.01) compared to that in FS children (121 ± 14 ml) and in HVs (91 ± 9 ml).

Early phase

Only 3 out of 14 constipated children (21%) and 5 out of 14 FS children (36%) had an early phase. This was significantly less compared to 8 out of 9 (88%) HVs (p<0.01).

Late phase

A late phase was present in 7 patients with constipation (50%), 5 patients with FS (36%) and in 6 HVs (75%) (NS). In the constipated subjects with a late phase the time to the maximal decrease in rectal volume was not different (15 (6 – 27) minutes) compared to patients with FS (14 (6 – 21) minutes) and HVs (18 (6 – 24) minutes) and lasted until the end of the study. In those patients with a late phase, rectal volume decreased from 134 ± 10 ml to a minimum of 72 ± 17 ml and from 118 ± 17 ml to a minimum of 70 ± 18 ml in constipated children and children with FS, respectively. This residual volume was not significantly different among the 3 groups.

6.4.2 Rapid volume waves

During fasting, rapid volume waves were recorded in only 4 HV (Table 3).
Table 3. Rapid volume waves

<table>
<thead>
<tr>
<th></th>
<th>HVs n = 8</th>
<th>constipation n = 14</th>
<th>FS n = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>subjects with RVW (n)</td>
<td>4</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>frequency (per 10 min)</td>
<td>1.8 ± 0.5</td>
<td>2.1 ± 0.6</td>
<td>5.7 ± 1.4</td>
</tr>
<tr>
<td>amplitude (ml)</td>
<td>18 - 37</td>
<td>15 - 84</td>
<td>15 - 64</td>
</tr>
<tr>
<td>duration (s)</td>
<td>21 ± 6</td>
<td>19 ± 1</td>
<td>20 ± 1</td>
</tr>
</tbody>
</table>

Data are given as mean ± SEM or as range (amplitude).

After the meal rapid volume waves (RVW) were recorded in 8 subjects with comparable frequency, amplitude and duration. In constipated children, 9 out of 14 showed rapid volume waves during fasting. After the meal RVW were present in 13 constipated children. During the fasting period, also 9 out of 14 FS children showed RVW increasing to 13 subjects after the meal. The pre- and postprandial RVW had comparable characteristics. One child with FS showed an isolated RVW (amplitude 52 ml, duration 23 s) (Figure 4) resulting in the loss of feces, which was unnoticed by the child.

Figure 4. Isolated rectal contraction in child with FS

Isolated rectal contraction leading to the unconscious loss of feces in one of the children with FS.
6.5 Discussion

This study evaluated rectal function (sensation, compliance and motility) in children with constipation and functional non-retentive fecal soiling (FS). In contrast to earlier studies, we identified a subgroup of FS children with disturbed rectal sensation (20%), indicating that other than psychological factors may be responsible for fecal loss in this defecation disorder. On the other hand, impaired rectal sensation was demonstrated in 29% of constipated children, whereas increased rectal compliance was present in 43%. These two pathophysiological mechanisms occurred independent of each other and should therefore be considered as separate entities involved in constipation. The rectal contractile response to a meal was not different in FS and constipated children compared to healthy volunteers, suggesting that abnormalities in meal-induced rectal motility are not involved in the pathogenesis of these defecation disorders.

Children with defecation disorders are often difficult to treat, mainly because of a lack in pathophysiological insight. These children are classified into different classes, based on clinical presentation, findings at clinical investigation or results from functional studies. Children with FS, clinically characterized by encopresis as an isolated symptom, have no abnormalities on anorectal manometry or colonic transit time (40 - 57 hours in the current study) and therefore these children are believed to suffer from psychological disturbances. In contrast, in children with constipation, delayed transit time (69 - 134 hours in the current study) has been described previously, illustrating that abnormal colonic motility is one of the mechanisms leading to constipation. In addition, decreased rectal sensation to distention was previously shown in constipated children. Using anorectal manometry, an increased threshold for rectal sensation was shown in up to 70% of constipated children and was particularly described in children with a megarectum. The finding that the afferent pathway from the rectum is clearly abnormal in constipated children further underscores that impaired rectal sensation should be considered as an important pathophysiological mechanism in childhood constipation. In our study however, only 30% of the constipated children showed decreased rectal sensation. This percentage is lower compared to other studies, most likely due to methodological aspects. Rectal volume is age-dependent and moreover rectal volume at which sensation is perceived strongly depends on rectal compliance. Therefore, children with an increased rectal compliance will be incorrectly considered to have an increased threshold for sensation. Our observation that all constipated children with an abnormal rectal compliance had a normal pressure-controlled threshold for sensation indirectly supports this hypothesis.

In addition to decreased sensation, we showed that rectal compliance is abnormal in nearly half of the constipated children. It is often assumed that this abnormal compliance is the result of longstanding accumulation of feces in the rectum. However, we did not observe a relationship between abnormal compliance and the total period of constipation or the existence of large fecal scybala on physical examination at intake. Alternatively, abnormal compliance of the
rectum may be the primary cause of fecal impaction. Impaired excitatory input to the rectum may lead to a decrease of rectal tone and rectal contractility and consequently to an increase in rectal compliance with accumulation of feces in the rectum. Whether the observed changes in rectal sensation and compliance are primarily or secondary can not be determined from our data, but can only be investigated in longitudinal studies. Normal rectal compliance and sensation as observed in the remaining 29% of constipated children suggests that other mechanisms, such as impaired colonic motility or psychological factors, will also be involved.

So far, no abnormalities in rectal function have been reported in children with FS. The absence of indications for somatic pathophysiological mechanisms in these children, might have directed the Rome II criteria stating that 'the soiling episodes are an impulsive act triggered by unconscious anger', suggesting that this disorder is of psychological origin. However, all children in this study attended normal schools and showed no evident psychological abnormalities. Moreover, in the current study, 20% of children with FS showed decreased rectal sensation, indicating that - at least in this subgroup - abnormalities in visceral sensation may be involved. In addition to abnormal sensation to distension, we also observed in one FS patient rectal contractions accompanied by unnoticed fecal loss. Although this finding requires further study, aberrant rectal motility may contribute to the occurrence of fecal incontinence, especially in the presence of impaired visceral sensation. In adults, it has been suggested that in fecal incontinence the rectum is often hypersensitive to any pressure rise or distension. Under normal conditions, reflex contraction of the external anal sphincter in response to rectal distention, thus preventing fecal loss, will only occur when rectal sensation is perceived. As rectal distention will relax the internal anal sphincter, this reflex is of crucial importance to prevent fecal loss. Therefore, children with impaired rectal sensation, in the presence of a normal inhibition reflex and normal rectal contractility, may be at risk to suffer from fecal loss due to the absence of this compensatory anal contraction. Based on our findings, we conclude that impaired rectal sensation may be a pathophysiological mechanism in a subgroup of children with FS.

Interestingly, impaired rectal sensation was observed in FS and constipation. These two patient groups are considered as clinically different entities. Why this abnormality is accompanied by fecal loss in FS and fecal stasis in constipation remains a matter of speculation, but differences in rectal motility may play an important role. Impaired rectal motility may rather lead to fecal stasis, whereas enhanced rectal motility, as suggested in adults, will result in fecal incontinence. Clearly, more insight in the underlying pathophysiology is certainly warranted to better understand defecation disorders in children. The current classification of children with defecation disorders may be improved when the underlying pathophysiological mechanisms are also taken into account. Eventually, this may also lead to substantial changes in the current classification of these entities.

In adult constipated patients, a significant decreased rectal contractile response to a meal has been observed, suggesting a pathophysiological role in constipation. This meal-induced response is not clearly understood and data in children are limited. In contrast to adults, no differences were observed in RCR or in rapid volume waves among children with FS, constipated children and healthy volunteers, indicating that rectal motility in response to a meal does not play a significant role in children with defecation disorders. This difference between adults and children may be due to other pathophysiological mechanisms playing a role in
symptom development. On the other hand, one might assume that longstanding fecal impaction in the rectum from childhood into adulthood will result in blunting of the rectal contractile response to a meal.

More insight in the mechanisms underlying defecation disorders in children may be important to decide on the treatment of choice. Clearly, more studies are required to clarify the role of rectal motility. In addition it also important to unravel whether changes in rectal physiology are primary or secondary findings. In the latter case, early intervention with oral and rectal laxatives may be warranted to prevent irreversible damage. Otherwise, prokinetic agents may prove beneficial in case of impaired rectal compliance and/or motility. One might even speculate that drugs reducing rectal motility might be of use in preventing fecal loss in case of aberrant rectal motility. This is to some extent illustrated by our observation that rectal application of 5 mg loperamide twice a day normalized defecation in a child with FS, while fecal loss disappeared.

In conclusion, we showed that in contrast with previous studies a subset of children with functional non-retentive fecal soiling has decreased rectal sensation, suggesting that abnormal rectal function may also play a role in this disorder. In children with chronic constipation, decreased rectal sensation and increased rectal compliance are major pathophysiological mechanisms, occurring independent from each other. The normal rectal contractile response to a meal in constipated children and in children with functional non-retentive fecal soiling suggests that rectal motility induced by a meal plays no major role in symptom development in these patient groups.
Reference List


