

# Defecation Symptoms in Relation to Stool Consistency Significantly Reflect the Dyssynergic Pattern in High-resolution Anorectal Manometry in Constipated Patients

Anna Ingemansson, MSc,\* Susanna A. Walter, MD, PhD,\*  
Michael P. Jones, PhD, A.STAT, C.STAT,† and Jenny Sjö Dahl, PhD\*

**Goals:** To evaluate the usefulness of a 2-week patient-completed bowel habit and symptom diary as a screening tool for disordered rectoanal coordination (DRC).

**Background:** DRC is an important subgroup of chronic constipation that benefits from biofeedback treatment. Diagnosis of DRC requires a dyssynergic pattern (DP) of attempted defecation in high-resolution anorectal manometry (HRAM) and at least 1 other positive standardized examination, such as the balloon expulsion test or defecography. However, HRAM is generally limited to tertiary gastroenterology centres and finding tools for selecting patients for referral for further investigations would be of clinical value.

**Study:** Retrospective data from HRAM and a 2-week patient-completed bowel habit and symptom diary from 99 chronically constipated patients were analyzed.

**Results:** Fifty-seven percent of the patients had a DP pattern during HRAM. In the DP group, 76% of bowel movements with loose or normal stool resulted in a sense of incomplete evacuation compared with 55% of the non-DP group ( $P=0.004$ ). Straining and sensation of incomplete evacuation with the loose stool were significantly more common in the DP group ( $P=0.032$ ). Hard stool was a discriminator for non-DP ( $P=0.044$ ). Multiple logistic regression including incomplete evacuation and normal stool predicted DP with a sensitivity of 82% and a specificity of 50%.

**Conclusions:** The sensation of incomplete evacuation with loose or normal stool could be a potential discriminator in favor of DP in chronically constipated patients. The bowel habit and symptom diary may be a useful tool for stratifying constipated patients for further investigation of suspected DRC.

**Key Words:** anorectal functions, constipation, pelvic floor disorder, biofeedback

(*J Clin Gastroenterol* 2024;58:57–63)

Chronic functional constipation has a prevalence of about 8% in western countries when diagnosed according to the Rome IV criteria.<sup>1</sup> In a more recent global

study constipation prevalence was 15% for women and 8% for men.<sup>2</sup>

Evacuation disorder (ED) is an important subtype of constipation,<sup>3</sup> which untreated may increase the risk of hemorrhoids, anal fissures, and solitary rectal ulcers.<sup>4</sup> Prevalence of ED in the general population is unknown but it is reported as a contributory pathophysiology in 30% to 80% of the patients who are diagnosed with functional constipation in specialist clinics.<sup>5–7</sup> Pathophysiology of ED may be structural/anatomic<sup>8–10</sup> or functional. The latter includes disordered rectoanal coordination (DRC) that corresponds to the previous term dyssynergic defecation (DD). DD has a good and persistent treatment response to biofeedback therapy.<sup>7,11,12</sup>

The International Anorectal Physiology Working Group has published the London Classification of disorders of anorectal function and proposed a standardized diagnostic test sequence.<sup>13</sup> As stated in an ANMS-ESNM consensus guideline document, diagnosis of DRC requires an abnormal/prolonged Balloon Expulsion Test (BET) and during simulated defecation/push maneuver in anorectal manometry. An alternative to BET is defecography where the prolonged or reduced percentage of the evacuation of contrast medium can be detected as well as anatomic abnormalities.<sup>14</sup> Disordered coordination is defined as the inability to reduce anal pressure (dyssynergia), increase rectal pressure (poor propulsion), or a combination of these, akin to the dyssynergia type I-IV according to Rao.<sup>15</sup>

Anorectal manometry is suggested as an early measure in several constipation algorithms.<sup>13,16,17</sup> However, anorectal manometry is of limited availability in many countries. Some constipation algorithms advocate the use of digital rectal examination (DRE) to screen for DD.<sup>16–18</sup> Soh et al<sup>19</sup> demonstrated moderate agreement between DRE and high-resolution anorectal manometry (HRAM) in the diagnosis of dyssynergia. Another study demonstrated a sensitivity for the use of DRE in the diagnosis of dyssynergia of 75% and a specificity of 87%.<sup>20</sup> In both studies the single examiner was an expert with extensive experience in diagnosing patients with constipation and pelvic floor disorders. Previous research indicates that final-year medical students and even gastroenterology fellows lack adequate training to perform a DRE.<sup>21,22</sup> We think that it would be relevant to identify symptoms or questions with high sensitivity for DRC as an aid in clinical decision-making.

Previous attempts to find symptoms or combinations of symptoms that can discriminate between different subtypes of constipation have been of varying results.<sup>23–26</sup> Symptoms that have been analyzed include reduced stool frequency, hard stools, excessive straining, the sense of incomplete evacuation, anal digitation, and anal blockage. Koch et al<sup>23</sup>

Received for publication December 17, 2021; accepted October 10, 2022.

From the \*Department of Gastroenterology, and Department of Biomedical and Clinical Sciences, Linköping University, Linköping, Sweden; and †Psychology Department, Macquarie University, North Ryde, NSW, Australia.

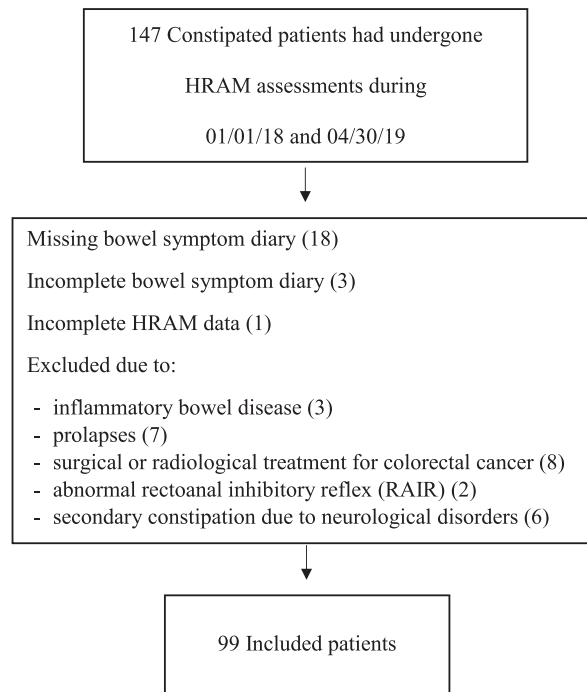
This study was supported by FORSS—the Research Council of Southeast Sweden and by Region Östergötland, Sweden.

The authors declare that they have nothing to disclose.

Address correspondence to: Anna Ingemansson, Department of Gastroenterology, and Department of Biomedical and Clinical Sciences, Linköping University, Linköping 581 85, Sweden (e-mail: anna.ingemansson@regionostergotland.se).

Copyright © 2022 Wolters Kluwer Health, Inc. All rights reserved.

DOI: 10.1097/MCG.0000000000001794



**FIGURE 1.** Flow chart of inclusion process.

evaluated symptoms in a group of 190 chronically constipated patients and identified that the sense of incomplete evacuation had a sensitivity of 84% and a specificity of 54% for disordered defecation. Disordered defecation was not solely defined as DD but included rectocele, prolapse of the anterior rectal wall, intussusception, animus, rectal hypo-sensitivity, or a combination of these. Conversely, neither Glia et al<sup>24</sup> nor Ratuapli et al<sup>25</sup> found any symptoms (including a sense of incomplete evacuation) related to pelvic floor dysfunction in constipated patients. A recent study explored a self-reported symptom questionnaire in patients with chronic constipation.<sup>27</sup> They found no single symptom that was sufficient to predict a diagnosis of DD. When combining symptoms in recursive partitioning trees, they found that a sense of urge with a prolonged straining duration (> 5 minutes) was a predictor of DD with a likelihood rate of 7.74 (95% CI, 1.00-59.3). The addition of a sense of incomplete evacuation was identified as a third potential predictor, identifying 61% of the patients with DD.<sup>27</sup>

Prospective bowel habit and symptom diaries provide the opportunity to gain information on both defecation symptoms and stool consistency for each single bowel movement,<sup>28,29</sup> and reduce the risk of recall bias.<sup>30</sup> To our knowledge defecation symptoms in relation to stool consistency have not been analyzed in relation to anorectal manometry. Based on our experience, we hypothesized that the defecatory symptoms straining and the sensation of incomplete evacuation during bowel movements with loose or normal stool consistency, can be helpful in selecting patients for further investigations with HRAM and BET. Therefore, we aimed to evaluate the usefulness of a 2-week patient-completed bowel habit and symptom diary for patients with chronic constipation as a screening tool to identify patients that should be referred for further investigations to diagnose potential DRC.

## MATERIALS AND METHODS

### Study Design and Setting

A cross-sectional study was undertaken at a tertiary referral pelvic floor unit at the Linköping University hospital in Sweden. The data were collected prospectively in a standardized manner but analyzed retrospectively.

### Participants

Adults (older than or 18 y) who were referred for chronic constipation between January 1, 2018 and April 30, 2019 were included (Fig. 1). Exclusion criteria were inflammatory bowel disease, prolapses, surgical or radiologic treatment for colorectal or gynecological cancer, abnormal rectoanal inhibitory reflex (RAIR) or incomplete symptom data. Patients with secondary constipation due to neurological, or metabolic disorders or due to side effects of medication were also excluded. All patients were evaluated by a physician and an investigation of the colon was performed in the presence of alarm symptoms. The patients also systematically underwent clinical DRE, and the presence of rectocele was noted.

### Bowel Habit and Symptom Diary


All patients at the pelvic floor unit record their bowel habits and symptoms prospectively on validated diaries for 14 days before their first visit (Fig. 2). Along a 24 h time axis, they record bowel movements, stool consistency, and associated defecatory symptoms such as the need of straining, urgency, and the feeling of complete or incomplete bowel evacuation. Defecation frequency is registered, as well. Bristol stool scale type 1 to 2 was defined as “hard”, type 3 to 5 as “normal” and type 6 to 7 as “loose”. Several metrics describing each patient’s stool frequency and consistency were calculated from the diaries. These were an average of > 3 stools per day (yes/no), percentage of normal

**Gastrointestinal Symptom Diary**

Date: \_\_\_\_\_  
Day: \_\_\_\_\_

|   | Hours | 06 | 08 | 10 | 11 | 12 | 13 | 14 | 16 | 18 | 20 | 22 | 24 | 02 | 04 | 06 |
|---|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Note meals with X   |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Note when you have a feeling of sickness:<br>X-----X  |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Note when you have abdominal pain with: X-----X<br>Score the intensity of the pain as indicated below |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

Locate the pain area on the sketch



|  | Hours | 06 | 08 | 10 | 11 | 12 | 13 | 14 | 16 | 18 | 20 | 22 | 24 | 02 | 04 | 06 |
|--|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Note when you have a feeling of abdominal bloating or distension: X-----X              |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Note bowel movements in a circle.<br>Describe the consistency (as below) in the circle |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Did you have to rush to the toilet? Yes/No   |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Did you have to strain passing stool? Yes/No   |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Did you have the feeling that you could empty your bowels completely? Yes/No           |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

|  |   |   |
|--|---|---|
| <b>Intensity of pain:</b><br>1: X---X light pain<br>2: X--X moderate pain<br>3: X-X intense, unbearable pain | <b>Stool consistency:</b><br>1: Separate hard lumps, like nuts (hard to pass)<br>2: Sausage-shaped, but lumpy<br>3: like a sausage but with crackles on its surface | 4: Like a sausage or snake, smooth and soft<br>5: Soft blobs with clear cut edges<br>6: Fluffy pieces with ragged edges-mushy stool<br>7: Entirely liquid |
|--|---|---|

**FIGURE 2.** Prospective bowel diary. Meals, gastrointestinal symptoms, and abdominal pain can be registered. Each bowel movement together with its stool consistency and associated defecation symptoms is registered during 24 hours in 14 days.

(Bristol) stool, percentage of loose (Bristol) stool, percentage of incomplete evacuation, percentage of stool with straining, and percentage of combinations of stool/incomplete evacuation/straining.

### High-resolution Anorectal Manometry

HRAM was performed using the ManoScan system, Given Imaging. The catheter, from Medtronic B.V., was a solid-state, high-resolution catheter with 10 circumferential sensors placed 0.6 cm apart. The ManoShield with 400 mL integrated rectal balloon was used on the catheter. Two additional sensors were placed inside the balloon, 3.5 cm above the most proximal of the 10 anal sensors. The catheter was placed through the anus in the left lateral position and a standardized test protocol was used to test anal resting pressure, anal maximum squeeze pressure (3 attempts), 30 seconds endurance squeeze (2 attempts), attempted defecation (2 attempts), RAIR, sensation thresholds, and cough reflex.

Baseline HRAM data regarding anal resting and squeeze pressures as well as RAIR were extracted. The most normal of the 2 attempted defecations was assessed according to Rao's 4 subtypes with the modification of Heinrich et al.<sup>15,25,31,32</sup> The 4 subtypes are (type I) adequate rectal pressure (propulsion) with paradoxical anal contraction, (type II) inadequate rectal pressure with paradoxical anal contraction, (type III) adequate rectal pressure with either absent or <20% relaxation of the anal pressure and (type IV) inadequate rise in rectal pressure and either absent or <20% relaxation of the anal pressure. Inadequate rectal pressure was defined as <40 mm Hg and paradoxical contraction was defined as an increase in anal pressure of

>40 mm Hg. Next step was a visual assessment to ensure that the anal rise in pressure had the same topography as the squeeze. Abnormal HRAM patterns that did not fit into the Rao classification, for example, inadequate rectal propulsion with normal anal relaxation, were defined as normal. To minimize bias, the assessment of anorectal manometry was performed before the rest of the data collection. The assessors were, at this point blinded to the subject's characteristics, a medical journal, and a bowel habit and symptom diary.

### Statistical Analysis

The statistical package SPSS version 26 (IBM group) was used. To answer the research question patients meeting the criteria for a dyssynergic or obstructed pattern of defecation according to any of the 4 subtypes of DD defined by S.S. Rao<sup>15</sup> were treated as 1 group called the dyssynergic pattern (DP) group and this group was compared with the non-DP group. First, the proportion for each variable and combined variables (eg, loose stool + straining) in each subject was calculated. Secondly, mean proportions (SD) were calculated in the DP groups, the non-DP group, and the total sample to make group comparisons. Normally distributed measures were presented as mean and SD whereas non-normally distributed measures were presented as median with interquartile range. Mann-Whitney *U* test was used to compare mean ranks.  $\chi^2$  test was used to compare the proportions of males in the DP group versus the non-DP group as well as parity and rectocele among the female subjects.

The ability of a combination of metrics derived from stool diaries to discriminate DP pattern patients from non-

**TABLE 1.** Characteristics Regarding Age, Sex, Anal Pressures, Parity, and Rectocele

| Patient Characteristics                | DD (n = 56)   | No-DD (n = 43) | Total Sample (n = 99) | P            | Missing Data, n (%) |
|--|---------------|----------------|-----------------------|--------------|---------------------|
| Age (y), median (IQR)                  | 49 (35-66)    | 62 (46-75)     | 53 (39-73)            | <b>0.030</b> | 0                   |
| Male, n (%)                            | 12 (21)       | 3 (7)          | 15 (15)               | <b>0.047</b> | 0                   |
| Resting pressure (mm Hg), median (IQR) | 80 (55-100)   | 68 (51-81)     | 76 (53-91)            | <b>0.007</b> | 0                   |
| Squeeze pressure (mm Hg), median (IQR) | 150 (114-192) | 147 (97-200)   | 149 (102-196)         | 0.604        | 0                   |
| Parity ≥ 1 vaginal delivery, n (%)     | 26 (59)       | 30 (75)        | 56 (67)               | 0.374        | 9 (11)              |
| Presence of rectocele, n (%)           | 18 (41)       | 21 (53)        | 39 (46)               | 0.539        | 13 (16)             |

Values are presented as medians (IQR) or numbers (%).

Bold *P* values are significant.

*P* values comparing DD group vs. No-DD. Mann-Whitney *U* test was used to compare mean ranks.  $\chi^2$  test was used to compare proportions of sex, parity, and rectocele.

DD indicates dyssynergic defecation; IQR, Interquartile range.

DP pattern patients was evaluated using unconditional logistic regression. All metrics derived from the bowel habit and symptom diaries were considered in a backward elimination algorithm, in which 1 metric was removed at a time until only metrics, which are independently statistically significant discriminators of DP from non-DP remain. The degree of discrimination is reported through the area under the receiver-operator characteristic curve formed from the observed DP status (reference standard) and the model-derived probability of DP (test). The sensitivity and specificity of the model (test) were evaluated at a model-derived probability of 0.5.

## Ethics

The research project was approved by the Ethics Committee, Faculty of Health Sciences, Linköping, Sweden (Dnr 2018/291-31).

## RESULTS

Ninety-nine patients (84 females) aged 19 to 84 (median age 53) with complete data (HRAM and diaries) were included. Fifty-six patients (57%) had a DP during HRAM. There was no statistically significant difference in median squeeze pressure between the DP group and the non-DP group (Table 1). The DP group had a significantly higher resting pressure ( $P=0.007$ ) than the non-DP group. The non-DP group was older ( $P=0.03$ ). There was no statistically significant difference between the groups according to parity or presence of rectocele. In the non-DP group, 75% of women had given birth vaginally and 53% had a rectocele, versus 59% and 41% respectively in the DP group.

The DP group more frequently reported incomplete bowel evacuation with loose or normal stools ( $P=0.004$ ) (Table 2). On average, the DP group reported incomplete bowel evacuation during 76% of these bowel movements versus 55% in the non-DP group. Straining and sensation of incomplete bowel evacuation with the loose stool were more common in the DP group (mean 36% of bowel movements vs 21%,  $P=0.03$ ) than in the non-DP group. No other combinations of straining and/or sensation of incomplete bowel evacuation with loose and/or normal stool were statistically significantly different between the groups. Hard stool itself was a discriminator in favor of non-DP ( $P=0.04$ ). All the patients in the DP group had at least 1 bowel movement with incomplete evacuation. Three patients in the DP group had defecation symptoms only with hard stools and the rest of the patients had defecation symptoms with loose or normal stools.

Multiple logistic models, selected after considering all stool frequency and consistency measures showed useful discrimination of DP from non-DP with an area under the receiver operating characteristic curve of 0.71 (95% CI, 0.60-0.82). If patients were classified as a predicted DP case when the model predicted probability exceeds 0.5, the sensitivity is 82% and the specificity is 50% (Fig. 3). The model was based on the parameters normal stool, a predictor of DP with the odds ratio 1.021 (95% CI, 1.001-1.042),  $P=0.41$  and incomplete evacuation with odds ratio 1.022 (95% CI, 1.008-1.037),  $P=0.002$ .

## DISCUSSION

We demonstrated that the DP group defined by HRAM more frequently reported the sensation of incomplete bowel evacuation with loose or normal stool than the non-DP group. We also found that straining during the evacuation of loose stool followed by the sensation of incomplete bowel evacuation was significantly more frequent in the DP group. Attempts have been made in previous studies to identify specific symptoms that can predict pathophysiology in patients with chronic constipation.<sup>23-25,27</sup> To our knowledge, there is only 1 previous study with similar findings.<sup>23</sup> Koch and colleagues evaluated symptoms in a group of 190 chronically constipated patients and showed that the sensation of incomplete bowel evacuation was the symptom with the highest sensitivity for disordered defecation. The sensation of incomplete bowel evacuation had good sensitivity (84%) but poor specificity (54%) for disordered defecation.<sup>23</sup> Similar findings were reported by Glia et al<sup>24</sup> who found that almost all patients (97%) with DD reported a sensation of incomplete evacuation but so did 61% of the patients in the slow transit group. However, Koch and colleagues and Glia and colleagues did not discriminate DD symptoms in relation to different stool consistencies as it was done in the present study.

We did not find any significant differences between the groups in the proportion of straining with loose or normal stool. Thus, the sensation of incomplete bowel evacuation seems to be a more relevant symptom in relation to HRAM findings rather than straining. This is in line with previous studies where straining was reported by most patients regardless type of constipation.<sup>23,24,33,34</sup> However, Ghoshal et al<sup>34</sup> found that prolonged straining > 30 minutes, was significantly more common among patients with functional ED, of which 54% reported this symptom. Parker et al<sup>27</sup> found that straining duration > 5 minutes was more likely in patients with DD, but only in combination with sometimes having the sense of urge. One disadvantage of the bowel habit and symptom diary used in the present study is that

Downloaded from http://journals.lww.com/ajg by 3ANG442gRv/qRmORjVYH5IAEENs8vdx1onRtdSEMuxgkZFSyB4s on 07/18/2024

**TABLE 2.** Gastrointestinal Diary; Number of Stools, Stool Consistency, and Associated Defecatory Symptoms

|  | DD, Mean (SD) | No-DD, Mean (SD) | Total Sample, Mean (SD) | P            | OR (95% CI)   |
|--|---------------|------------------|-------------------------|--------------|---------------|
| <b>Number of Bowel Movements, Stool Consistency, and Defecatory Symptoms</b>   |               |                  |                         |              |               |
| No. bowel movements/d  | 1.9 (1.6)     | 1.6 (1.4)        | 1.8 (1.5)               | 0.506        | 1.1 (0.8-1.5) |
| Proportion of bowel movements with normal stool consistency  | 34.5 (28.1)*  | 27.4 (20.6)*     | 31.4 (25.2)*            | 0.169        | 1.0 (1.0-1.0) |
| Proportion of bowel movements with loose stool consistency   | 36.8 (28.0)*  | 31.9 (28.9)*     | 34.7 (28.3)*            | 0.391        | 1.0 (1.0-1.0) |
| Proportion of bowel movements with hard stool consistency  | 28.6 (28.1)*  | 40.7 (29.1)*     | 33.9 (29.1)*            | <b>0.044</b> | 1.0 (1.0-1.0) |
| Proportion of bowel movements with loose or normal stool consistency and a simultaneous feeling of incomplete evacuation             | 76.4 (28.3)*  | 54.9 (38.4)*     | 66.7 (34.8)*            | <b>0.004</b> | 1.0 (1.0-1.0) |
| Proportion of bowel movements with loose or normal stool and a simultaneous need of straining  | 56.5 (36.1)*  | 56.6 (37.8)*     | 56.6 (36.7)*            | 0.993        | 1.0 (1.0-1.0) |
| Proportion of bowel movements with loose stool consistency and a simultaneous need to strain and a feeling of incomplete evacuation  | 36.2 (34.9)*  | 20.9 (28.1)*     | 29.5 (32.8)*            | <b>0.032</b> | 1.0 (1.0-1.0) |
| Proportion of bowel movements with normal stool consistency and a simultaneous need to strain and a feeling of incomplete evacuation | 34.3 (36.4)*  | 24.2 (33.5)*     | 29.7 (35.3)*            | 0.175        | 1.0 (1.0-1.0) |
| Proportion of bowel movements with any stool consistency and a simultaneous need to strain and a feeling of incomplete evacuation    | 53.1 (33.7)*  | 45.4 (29.7)*     | 49.7 (32.1)*            | 0.240        | 1.0 (1.0-1.0) |

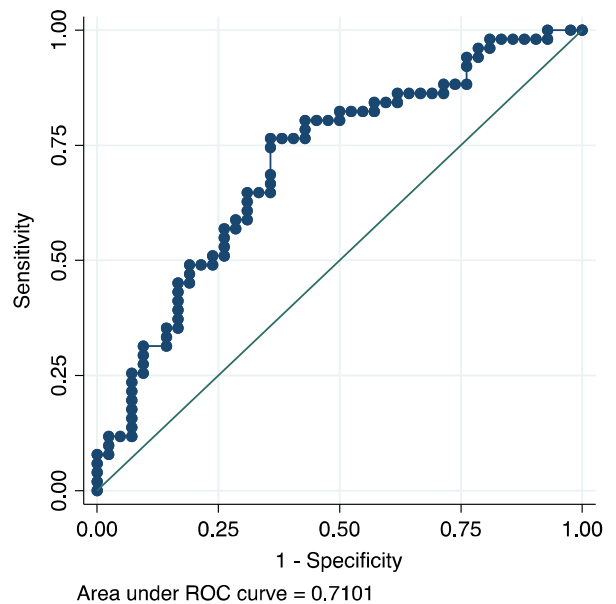
Bold P values are significant.  
 \*Numbers represent mean proportion (SD) for each variable or combined variable. For example, the dyssynergic pattern group had, on average, normal stool consistency in 34% (SD 28.1%) of all registered stools in each subject's bowel and symptom diary.  
 DD indicates dyssynergic defecation; OR, odds ratio.

the degree or duration of straining is not registered. In further research, it would be interesting to include questions on the duration of straining as well as the sense of urge to defecate in the bowel habit and symptoms diary. Another question that would be relevant to include is the use of digital maneuvers during defecation. Patcharatrakul et al<sup>35</sup> found in a post hoc analysis of 127 patients that digital maneuvers were a predictor for successful outcomes with biofeedback therapy.

We also found that hard stool itself was a discriminator in favor of the non-DP group in this population and the clinical implication of this could be that patients who report a great proportion of hard stool may less likely have a DD and could be treated further with laxatives.

The multiple regression analysis included the variables of incomplete bowel evacuation and normal stool that could predict dyssynergia with a sensitivity of 82% but the specificity was low. One could argue that sensitivity is more important than specificity considering that it is important to detect patients with chronic constipation who should proceed with HRAM to diagnose if there is a DD or not. It is important to find and correctly treat these patients, preferably with biofeedback, as untreated DD may lead to complications like anal fissures, solitary rectal ulcer syndrome, pelvic pain, pelvic floor descent, and/or prolapse.<sup>4</sup>

Patients referred to a gastroenterology/pelvic floor centre typically represent a wide range of potentially overlapping disorders such as slow transit constipation, irritable bowel syndrome, DD, structural abnormalities such as rectoanal intussusception or rectocele, obstetric injuries, and general pelvic floor insufficiency. Demographic data revealed that the DP group was significantly younger and had a higher resting pressure compared with the non-DP group. This finding is not unexpected and presumably reflects the diverging pathophysiology. For example, James-Stevenson et al<sup>36</sup> found that women with fecal incontinence



**FIGURE 3.** Receiver operating characteristic (ROC) curve of the logistic regression model presented for the odds of patient having dyssynergic defecation. Model including proportion of normal stool and sense of incomplete evacuation as independent factors. Area under the ROC curve = 71% (95% CI, 60, 82).

with dyssynergia were younger and had more normal anal sphincter pressures than women without dyssynergia. It is also known that slow transit and normal transit constipation become more prevalent with higher age.<sup>37</sup>

Limitations include that the use of laxatives during diary registration was not systematically recorded. Proper diagnosis of disordered evacuation requires BET.<sup>14</sup> This study analyzed retrospective data and the BET was not routinely performed in these patients. This is another limitation, possibly leading to overdiagnosis bias.

As the patients in the present study were not systematically evaluated with radiologic diagnostic tools to distinguish between structural causes (eg, rectal prolapse, perineal descent, rectoanal intussusception, rectocele, and enterocele) and functional disorder, there could be some unknown potentially confounding factors. The most common structural alteration, which is known to be a rectocele,<sup>16</sup> was clinically assessed in this study. Dietz and Korda<sup>38</sup> found a strong association between rectocele and incomplete bowel evacuation and the prevalence of rectocele is therefore a potential confounder in relation to evacuation symptoms. In the present study, there was no significant difference in the prevalence of rectocele between the groups. Although a patient's bowel evacuation symptoms might be due to a combination of structural cause and dyssynergic pelvic floor, the dyssynergia needs to be addressed and treated.<sup>39</sup>

Methodological strengths of our study include a prospective 2-week bowel habit and symptom diary that is detailed and validated.<sup>40</sup> The HRAM assessment was standardized and performed by 2 trained assistant nurses with long experience and the assessors of HRAM were physiotherapists with several years of experience within the field. In further research, the BET (or another evacuation test) should be included according to the consensus on the necessity of 2 positive tests for diagnosis of DD.<sup>14</sup>

## CONCLUSION

The sense of incomplete evacuation with loose or normal stool could be a potential discriminator in favor of DP in chronically constipated patients. The bowel habit and symptom diary may be a useful tool for stratifying patients with a more extensive pelvic floor evaluation, including HRAM and BET.

## REFERENCES

1. Palsson OS, Whitehead W, Tornblom H, et al. Prevalence of Rome IV functional bowel disorders among adults in the United States, Canada, and the United Kingdom. *Gastroenterology*. 2020;158:1262–73 e3.
2. Sperber AD, Bangdiwala SI, Drossman DA, et al. Worldwide prevalence and burden of functional gastrointestinal disorders, results of Rome Foundation Global Study. *Gastroenterology*. 2021;160:99–114 e3.
3. Wald A. Constipation: advances in diagnosis and treatment. *JAMA*. 2016;315:185–191.
4. Jain M, Baijal R, Srinivas M, et al. Fecal evacuation disorders in anal fissure, hemorrhoids, and solitary rectal ulcer syndrome. *Indian J Gastroenterol*. 2019;38:173–177.
5. Skardoon GR, Khera AJ, Emmanuel AV, et al. Review article: dyssynergic defaecation and biofeedback therapy in the pathophysiology and management of functional constipation. *Aliment Pharmacol Ther*. 2017;46:410–23.
6. Ribas YSE, Martí-Ragué J, Clavé P. Prevalence and pathophysiology of functional constipation among women in Catalonia, Spain. *Dis Colon Rectum*. 2011;54:1560–1569.
7. Chiarioni G, Salandini L, Whitehead WE. Biofeedback benefits only patients with outlet dysfunction, not patients with isolated slow transit constipation. *Gastroenterology*. 2005;129:86–97.
8. Lau CW, Heymen S, Alabaz O, et al. Prognostic significance of rectocele, intussusception, and abnormal perineal descent in biofeedback treatment for constipated patients with paradoxical puborectalis contraction. *Dis Colon Rectum*. 2000;43:478–482.
9. Hicks CW, Weinstein M, Wakamatsu M, et al. Are rectoceles the cause or the result of obstructed defaecation syndrome? A prospective anorectal physiology study. *Colorectal Dis*. 2013;15:993–999.
10. Bozkurt MA, Kocataş A, Karabulut M, et al. Two etiological reasons of constipation: anterior rectocele and internal mucosal intussusception. *Indian J Surg*. 2015;77:868–871.
11. Chiarioni G, Nardo A, Vantini I, et al. Biofeedback is superior to electrogalvanic stimulation and massage for treatment of levator ani syndrome. *Gastroenterology*. 2010;138:1321–1329.
12. Heymen S, Scarlett Y, Jones K, et al. Randomized controlled trial shows biofeedback to be superior to pelvic floor exercises for fecal incontinence. *Dis Colon Rectum*. 2009;52:1730–1737.
13. Carrington EV, Heinrich H, Knowles CH, et al. The international anorectal physiology working group (IAPWG) recommendations: standardized testing protocol and the London classification for disorders of anorectal function. *Neurogastroenterol Motil*. 2020;32:e13679.
14. Rao SS, Benninga MA, Bharucha AE, et al. ANMS-ESNM position paper and consensus guidelines on biofeedback therapy for anorectal disorders. *Neurogastroenterol Motil*. 2015;27:594–609.
15. Rao SS. Dyssynergic defecation. *Gastroenterol Clin North Am*. 2001;30:97–114.
16. Serra J, Pohl D, Azpiroz F, et al. European society of neurogastroenterology and motility guidelines on functional constipation in adults. *Neurogastroenterol Motil*. 2020;32:e13762.
17. Black CJ, Ford AC. Chronic idiopathic constipation in adults: epidemiology, pathophysiology, diagnosis and clinical management. *Med J Aust*. 2018;209:86–91.
18. Heidelbaugh J, Martinez de Andino N, Pineles D, et al. Diagnosing constipation spectrum disorders in a primary care setting. *J Clin Med*. 2021;10:1–15.
19. Soh JS, Lee HJ, Jung KW, et al. The diagnostic value of a digital rectal examination compared with high-resolution anorectal manometry in patients with chronic constipation and fecal incontinence. *Am J Gastroenterol*. 2015;110:1197–1204.
20. Tantiphlachiva K, Rao P, Attaluri A, et al. Digital rectal examination is a useful tool for identifying patients with dyssynergia. *Clin Gastroenterol Hepatol*. 2010;8:955–960.
21. Lawrentschuk N, Bolton DM. Experience and attitudes of final-year medical students to digital rectal examination. *Med J Aust*. 2004;181:323–325.
22. Talley NJ. How to do and interpret a rectal examination in gastroenterology. *Am J Gastroenterol*. 2008;103:820–822.
23. Koch A, Voderholzer WA, Klausner AG, et al. Symptoms in chronic constipation. *Dis Colon Rectum*. 1997;40:902–906.
24. Gliá A, Lindberg G, Nilsson LH, et al. Clinical value of symptom assessment in patients with constipation. *Dis Colon Rectum*. 1999;42:1401–1408.
25. Ratuapli SK, Bharucha AE, Noelting J, et al. Phenotypic identification and classification of functional defecatory disorders using high-resolution anorectal manometry. *Gastroenterology*. 2013;144:314–22 e2.
26. Knowles CH, Scott SM, Legg PE, et al. Level of classification performance of KESS (symptom scoring system for constipation) validated in a prospective series of 105 patients. *Dis Colon Rectum*. 2002;45:842–843.
27. Parker CH, Tomlinson G, Correia A, et al. The use of standardized questions in identifying patients with dyssynergic defecation. *J Can Assoc Gastroenterol*. 2018;1:60–66.
28. Walter S, Hallbook O, Gotthard R, et al. A population-based study on bowel habits in a Swedish community: prevalence of faecal incontinence and constipation. *Scand J Gastroenterol*. 2002;37:911–916.

29. Walter SA, Kjellstrom L, Nyhlin H, et al. Assessment of normal bowel habits in the general adult population: the Popcol study. *Scand J Gastroenterol*. 2010;45:556–566.
30. Jones MP, Walter S, Faresjo A, et al. Gastrointestinal recall questionnaires compare poorly with prospective patient diaries for gastrointestinal symptoms: data from population and primary health centre samples. *Eur J Gastroenterol Hepatol*. 2019;31:163–169.
31. Rao SS, Mudipalli RS, Stessman M, et al. Investigation of the utility of colorectal function tests and Rome II criteria in dyssynergic defecation (Anismus). *Neurogastroenterol Motil*. 2004;16:589–596.
32. Heinrich H, Sauter M, Fox M, et al. Assessment of obstructive defecation by high-resolution anorectal manometry compared with magnetic resonance defecography. *Clin Gastroenterol Hepatol*. 2015;13:1310–1317.
33. Mertz H, Naliboff B, Mayer EA. Symptoms and physiology in severe chronic constipation. *Am J Gastroenterol*. 1999;94:131–138.
34. Ghoshal UC, Verma A, Misra A. Frequency, spectrum, and factors associated with fecal evacuation disorders among patients with chronic constipation referred to a tertiary care center in northern India. *Indian J of Gastroenterol*. 2016;35:83–90.
35. Patcharatrakul T, Valesin J, Schmeltz A, et al. Factors associated with response to biofeedback therapy for dyssynergic defecation. *Clin Gastroenterol Hepatol*. 2018;16:715–21.
36. James-Stevenson TXH, Heit M, Shin A. Age and dyssynergia subtypes associated with normal sphincter pressures in women with fecal incontinence. *Female Pelvic Med Reconstr Surg*. 2018;24:247–251.
37. Tillou J, Poylin V. Functional disorders: slow-transit constipation. *Clin Colon Rectal Surg*. 2017;30:76–86.
38. Dietz HP, Korda A. Which bowel symptoms are most strongly associated with a true rectocele? *Aust N Z J Obstet Gynaecol*. 2005;45:505–508.
39. Patcharatrakul T, Rao SSC. Update on the pathophysiology and management of anorectal disorders. *Gut Liver*. 2018;12:375–84.
40. Ragnarsson G, Bodemar G. Division of the irritable bowel syndrome into subgroups on the basis of daily recorded symptoms in 2 outpatient samples. *Scand J Gastroenterol*. 1999;34:993–1000.