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Original Research Article

Are There Sex Differences in Defecation Patterns in Patients with Defecation Disorders? - A Single-center Observational Study

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Abstract

Objectives: Defecation disorders (DD) are characterized by impaired rectal evacuation due to inadequate defecatory propulsion and/or dyssynergic defecation. DD are assessed by rectal and anal pressures during attempted defecation using anorectal manometry (ARM). Thus far, at least four types of dyssynergic patterns have been recognized on ARM. This study aimed to compare the manometric parameters and dyssynergic patterns between men and women with DD.

Methods: This study enrolled consecutive patients undergoing anorectal tests for symptoms of DD. Anorectal pressure was measured using a waveform ARM system. DD were diagnosed based on the results of ARM, balloon expulsion tests, and barium defecography. Dyssynergic patterns were defined as a paradoxical increase in anal pressure with (type I) or without (type II) an adequate increase in rectal pressure and failure of a reduction in anal pressure with (type III) or without (type IV) an adequate increase in rectal pressure.

Results: This study evaluated 324 women and 234 men. Based on anorectal tests, 73.1% men and 54.6% women were diagnosed with DD. Rectal and anal pressures during attempted defecation in patients with DD were significantly higher in men than in women. Type I patterns were more common in men (64.9%) than in women (28.2%). Conversely, type II (42.9% vs. 24.0%) and IV (20.9% vs. 5.8%) patterns were observed more frequently in women than in men.

Conclusions: Men were more likely to experience dyssynergic defecation whereas women were more likely to experience inadequate defecatory propulsion. However, future studies are warranted to confirm these results.

Keywords

biofeedback, constipation, defecation, diagnosis, pelvic floor disorders, sex

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Introduction

Chronic constipation (CC) is the most common symptom among functional gastrointestinal disorders[1]. The latest international survey found that 10.1% of the global population and 16.6% of the Japanese population met the Rome IV criteria for CC[1]. Most patients with CC can be managed with standard approaches, such as increased fiber intake and empirical laxative therapy[2]. However, if patients do not respond to these treatments, specific tests should be considered to evaluate the pathophysiology of their constipation[2]. Assessment of anorectal function and colonic transit allows

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patients to be divided into three subgroups-normal transit constipation (NTC), slow transit constipation (STC), and defecation disorders (DD)[2,3].

DD are characterized by impaired rectal evacuation due to reduced rectal pushing forces and/or paradoxical contraction/inadequate relaxation of the pelvic floor muscles[2]. DD are common in patients with refractory constipation and often overlap with STC[4]. Therefore, the treatment algorithm recommends anorectal testing prior to colonic transit tests for patients who fail to respond to laxatives[5]. DD are diagnosed on the basis of symptoms and anorectal test results, including anorectal manometry (ARM), electromyography (EMG), balloon expulsion test (BET), and defecography[6]. Category F3 of the Rome IV criteria details the diagnostic criteria for functional DD, i.e., evidence of dyssynergia (impaired rectoanal coordination) on ARM or EMG and impaired evacuation on BET or defecography[6]. The Rome IV criteria further classifies DD into inadequate defecatory propulsion (F3a) and dyssynergic defecation (F3b)[6]. In cases of dyssynergic defecation, biofeedback (BF) and relaxation training is recommended to improve rectoanal coordination during defecation[5,6].

Traditionally, ARM measurements of rectal and anal pressures during attempted defecation (push maneuver) were required to diagnose DD[7]. During a normal push maneuver, an increase in rectal pressure is synchronized with a decrease in anal pressure. Patients with DD cannot relax their anal sphincter muscles sufficiently, leading to higher pressure in the anus than in the rectum when pushing (i.e., negative rectoanal pressure gradient [RAPG])[8]. Although the RAPG is often used to diagnose DD[5], nearly 90% healthy people exhibit dyssynergia on the ARM[7]. In addition, the RAPG is often negative in healthy individuals and patients with CC without DD[7,9]. The cause of these false-positive findings is likely due to the non-physiological setting of ARM measurement (i.e., straining in the left lateral position with an empty rectum)[8]. Therefore, a definitive diagnosis of DD should be based on evidence of impaired rectal evacuation on BET or imaging and dyssynergia on ARM[6].

Rao et al. investigated manometric push patterns in patients with CC using conventional waveform ARM (WF-ARM) and found at least four patterns of dyssynergia[10]. These patterns are characterized by a paradoxical increase in anal pressure with (type I) or without (type II) an adequate increase in rectal pressure and failure to reduce anal pressure with (type III) or without (type IV) an adequate increase in rectal pressure[10]. Type I and III patterns represent F3b, while type II and IV patterns represent F3a[6]. High-resolution ARM (HR-ARM) is a new tool that displays anorectal pressures using colored contour plots[6,7]. Anorectal muscle morphology is visible with greater resolution, allowing separate measurement of puborectalis and anal sphincter contractions[11]. Therefore, Rao et al. reported the presence of four additional dyssynergic patterns using HR-ARM; however, their clinical significance is unclear[8].

CC is more common in women than in men; however, at an advanced age, men have an equal or greater prevalence[12,13]. It is unclear why CC is more pronounced among men in their later years. There are several comprehensive reports on DD, but sex differences in DD have rarely been studied because only women, or a small number of men, have been included[7,9,14-17]. However, the aging population in Japan allows us to accumulate data on a large number of male patients with CC. Therefore, we aimed to investigate manometric parameters and dyssynergic patterns in both men and women with CC using WF-ARM. We also aimed to evaluate whether quantification and pattern classification of anorectal pressure changes during a push maneuver could help identify DD in patients with CC. Further, we aimed to analyze sex-specific differences in the dyssynergic pattern of ARM in patients with DD.

Methods

In this study, we retrospectively reviewed existing clinical data obtained from the medical records. Consecutive patients with CC who visited our hospital between August 2010 and January 2015 and underwent anorectal tests for symptoms suggestive of DD were included. All patients met the Rome criteria for CC and had at least one of the following symptoms linked to DD: excessive straining, feeling of incomplete evacuation, or digital facilitation of defecation. Patients were excluded if they had symptomatic anorectal abnormalities, such as anal strictures, large rectoceles, or rectal prolapses detected on proctologic examination or defecography. Patients who could not understand the examiner's instructions in Japanese were also excluded. Patients with asymptomatic rectoceles or rectal intussusception were not excluded. This study was approved by the institutional review board of our hospital (approval code: K22-003), and written informed consent was obtained from all patients before performing anorectal tests.

Anorectal functional tests

All patients underwent WF-ARM and BET analysis. Barium defecography (BD) was performed if the results conflicted or differed from the clinical impression. As an exception, BD was performed instead of BET when the clinical symptoms suggested a rectocele or intussusception. All tests were performed by the same physicians using the same devices during the study period.

ARM and BET were performed with the patient in the left lateral position without bowel preparation. ARM was performed using a one-channel microtip transducer mounted on a flexible catheter with a 5-mm diameter (P-1401, Star Medical Inc., Tokyo, Japan). The maximal resting pressure

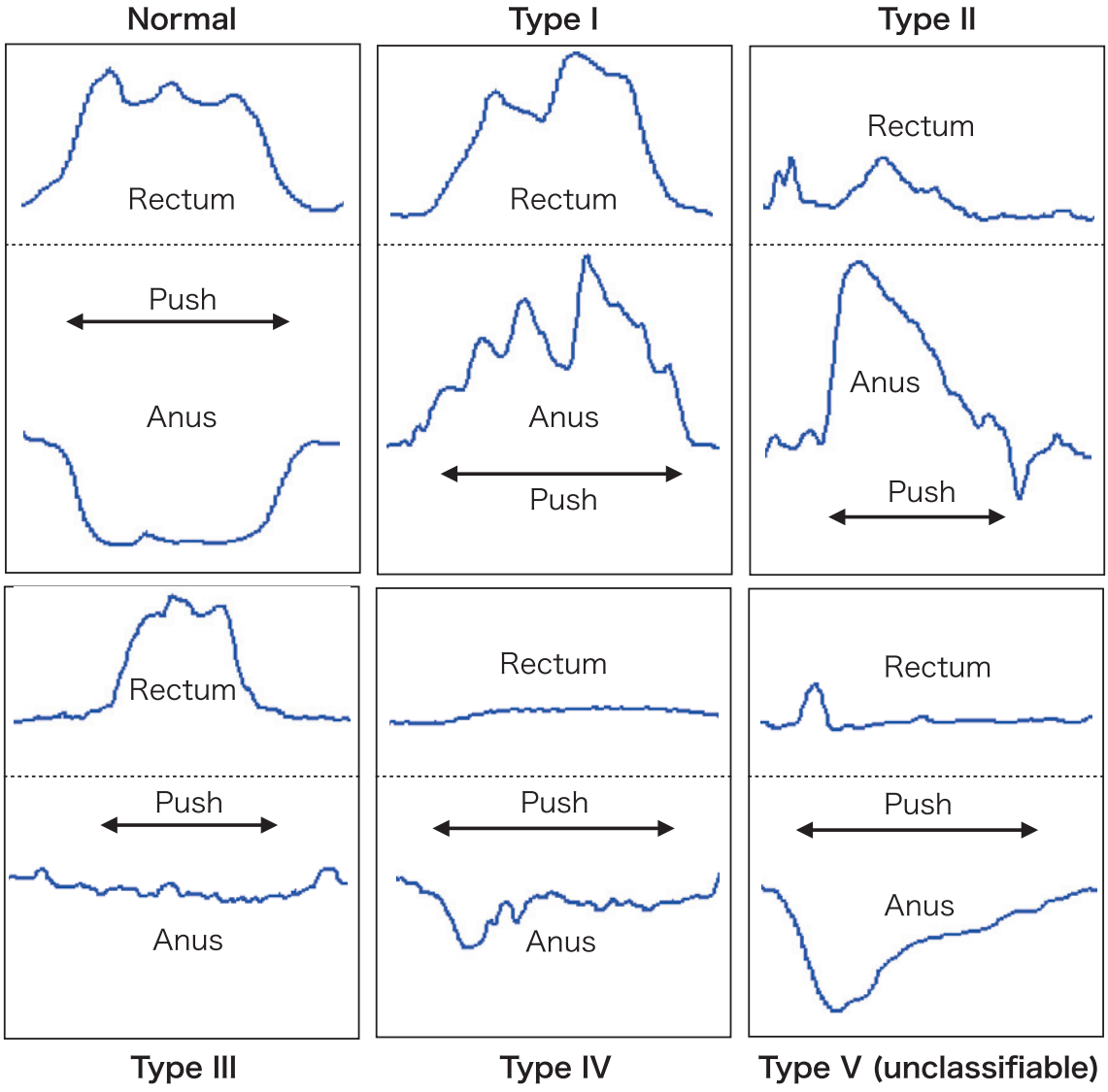

Figure 1. Example waveforms for a normal pattern and dyssynergic patterns during push maneuver. The normal pattern demonstrates an increase in rectal pressure that is synchronized with a decrease in anal pressure. The dyssynergic patterns are characterized by an insufficient increase in rectal pressure (types II, IV, and V), paradoxical increase in anal pressure (types I and II), and incomplete decrease in anal pressure (types III and IV). All unclassifiable cases showed the pattern described above and were designated type V.

was recorded using a rapid pull-through technique and defined as the highest recorded pressure. Subsequently, maximal squeeze pressure, defined as the highest recorded pressure above baseline at any level within the anal canal, was measured.

Then, the patient was instructed to perform a push maneuver, and the staff recorded the rectal and anal pressures during the push. A normal pattern was defined as a sufficient increase in rectal pressure (≥45 mmHg) synchronized with a sufficient decrease (≥20%) in anal pressure[6]. Dyssynergic patterns were classified as follows (Figure 1): type I, a sufficient increase in rectal pressure with a paradoxical increase in anal pressure; type II, an insufficient increase in rectal pressure (<45 mmHg) with a paradoxical increase in anal pressure; type III, a sufficient increase in rectal pressure with an insufficient decrease (<20%) in anal pressure; and type IV, an insufficient increase in rectal pressure with an insufficient decrease in anal pressure[6]. Patterns that were neither normal nor one of the four dyssynergic types were labelled as type V (unclassifiable).

BET was performed after ARM, and a 4-cm long latex balloon filled with 25 mL of air was placed into the patient's rectum. Subsequently the patient was asked to expel the balloon. Failure to expel the balloon within <60 s was considered impaired rectal evacuation[8]. BD was performed after the rectum was emptied with a suppository. The patient was seated on a portable plastic toilet and approximately 150 mL of diluted barium paste was injected into the pa-

Table 1. Characteristics of the Study Population (N = 558).

Variable	Men	Women
Number of patients (%)	234 (41.9)	324 (58.1)
Age (year)	68.6 (17.2)	67.8 (15.8)
Height (cm)	164.6 (8.9)	152.5 (6.2)
Weight (kg)	61.4 (12.4)	52.3 (7.4)
Stool frequency (time/week), n (%)		
≥3	149 (63.7)	195 (60.2)
1–3	76 (32.5)	98 (30.2)
<1	9 (3.8)	31 (9.6)
Bristol stool form scale score, n (%)		
1–2	116 (49.6)	144 (44.4)
3–5	60 (25.6)	115 (35.5)
6–7	18 (7.7)	27 (8.3)
Other	40 (17.1)	38 (11.7)
Cleveland Clinic Constipation Score	9.2 (4.0)	10.1 (5.1)
Frequency of bowel movement	0.5 (0.8)	0.8 (1.1)
Painful evacuation effort	1.8 (1.8)	1.5 (1.2)
Feeling incomplete evacuation	2.2 (1.3)	2.4 (1.4)
Abdominal pain	0.6 (1.0)	0.9 (1.2)
Minutes in lavatory per attempt	1.1 (1.2)	0.8 (1.0)
Assistance required for defecation	1.0 (0.8)	1.2 (0.8)
Unsuccessful attempts per day	1.1 (1.1)	1.1 (0.9)
Duration of constipation	1.2 (1.3)	1.9 (2.3)

Values are presented as mean (standard deviation) unless specified otherwise.

tient's rectum. Then, the patient was asked to defecate, and fluoroscopy was recorded on a video during evacuation. A retention of ≥50% barium contrast was defined as an impaired evacuation[8].

Outcome measures

All patients were provided a questionnaire about CC symptoms based on the Rome criteria and Cleveland Clinic Constipation Score (CCCS)[18]. DD were diagnosed based on at least two of the following criteria: (1) presence of a dyssynergic pattern on ARM, (2) failure to expel the balloon, and (3) impaired evacuation on BD[6]. Patients were stratified into the DD group (those with DD) and the non-DD group (those without DD), and manometric parameters were compared. Furthermore, we investigated whether dyssynergic patterns could be used to discriminate patients with and without DD. Finally, sex differences in ARM in patients with DD were analyzed.

Statistical analysis

All statistical analyses were performed using EZR software version 1.11 (Saitama Medical Center, Jichi Medical University, Saitama, Japan). Between-group comparisons of manometric data were performed using an unpaired t-test. The distribution of manometric patterns between groups was analyzed using the chi-square test or Fisher's exact test according to the sample size. Statistical significance was set at $p < 0.05$. The diagnostic accuracy for discriminating patients with DD from those without DD was determined using sensitivity, specificity, false-positive and -negative rates, positive and negative predictive values, and likelihood ratios (LRs). Clinical relevance was defined as +LR ≥ 2 and −LR ≤ 0.5.

Results

This study included 324 (58.1%) women and 234 (41.9%) men aged 20-93 years (mean, 68.1 years). Patient characteristics and the results of each anorectal test are shown in Table 1, 2, respectively. The positive rate of dyssynergic patterns measured using ARM was 97%, which was considerably higher than the positive rate of impaired rectal evacuation measured on BET (47.0%) and BD (52.2%). Based on these positive findings, 348 (62.4%) patients were diagnosed with DD (Table 2). The diagnosis rate of DD was significantly higher in men (73.1%) than in women (54.6%) ($p < 0.001$).

Table 3 shows the mean anorectal pressure values and manometric pattern distributions in patients with and without DD. The DD group had significantly more men than the non-DD group (49.1% vs. 30.0%). On comparing the anorectal push pressures, anal pressure was significantly higher in the DD group than in the non-DD group, whereas rectal pressure was higher in the non-DD group than in the DD group. Therefore, the RAPG was significantly smaller in the DD group than in the non-DD group (−29.3 mmHg vs. −5.1 mmHg).

The most common manometric patterns in the DD group were type I (46.3%) and type II (33.6%) patterns, with no normal patterns recorded (Table 3). Type I pattern was also common in the non-DD group (63.8%), with normal patterns observed in only 8.1% patients. Type II and IV patterns were more prevalent in the DD group than in the non-DD group, whereas type I and III patterns were more frequent in the non-DD group than in the DD group (Table 3). A small number (≤5%) of type V (unclassifiable) patterns were observed in both groups. All of them showed an insufficient increase in rectal pressure and a sufficient decrease in anal pressure. Therefore, this pattern was designated as type V pattern.

The diagnostic accuracy of DD based on ARM manometric patterns was poor (Table 4). When considering type I-V patterns as positive findings, the false-positive rate was high (91.9%), and the specificity for discriminating DD from non-DD was very low (8.1%). For discrimination of dyssynergic patterns, type II and IV patterns had a +LR of 4.4 and 3.5, respectively, indicating an increase in the likelihood of DD (Table 4).

Table 5 shows differences in manometric parameters and dyssynergic patterns between men and women with DD. Both rectal and anal pressures during push were signifi-

Table 2. Pathological Findings of Anorectal Tests and Their Positivity Rates.

Pathological findings	Positive/participants	Positive rate (%)
Dyssynergic pattern on ARM	541/558	97.0
Failure to expel the balloon on BET	241/513	47.0
Impaired evacuation on BD	94/180	52.2
Meets the Rome IV criteria for DD	348/558	62.4

ARM, anorectal manometry; BET, balloon expulsion test; BD, barium defecography; DD, defecation disorders

Table 3. Anorectal Pressures and Manometric Patterns in Patients with and without Defecation Disorders.

Variable	DD n = 348	Non-DD N = 210	p-value
Age, year	68.6 (16.4)	67.3 (16.3)	0.392
Men (%)	171 (49.1)	63 (30.0)	<0.001
Anorectal pressures (mmHg)			
Maximal resting pressure	51.1 (24.3)	47.1 (20.5)	0.051
Maximal squeeze pressure	181.0 (88.9)	174.3 (83.4)	0.383
Anal pressure during push	81.3 (45.9)	66.2 (28.7)	<0.001
Rectal pressure during push	51.6 (23.7)	61.2 (21.6)	<0.001
RAPG during push	−29.3 (36.6)	−5.1 (22.7)	<0.001
Manometric patterns during push, n (%)			
Normal	0	17 (8.1)	-
Type I	161 (46.3)	134 (63.8)	<0.001
Type II	117 (33.6)	16 (7.6)	<0.001
Type III	18 (5.2)	25 (11.9)	0.006
Type IV	47 (13.5)	8 (3.8)	<0.001
Type V (unclassifiable)	5 (1.4)	10 (4.8)	0.037

Values are presented as mean (standard deviation) unless specified otherwise.
DD, defecation disorders; RAPG, rectoanal pressure gradient

cantly higher in men than in women. The difference in anal pressures was particularly large between both sexes; the RAPG was significantly smaller in men than in women (−42.3 mmHg vs. −19.2 mmHg). On comparing the distribution of dyssynergic patterns, type I patterns were more common in men than in women, and types II and IV patterns were more common in women than in men (Table 5). Therefore, dyssynergic defecation (types I and III patterns) was more prevalent in men than in women, and inadequate defecatory propulsion (types II, IV, and V patterns) was more prevalent in women than in men (Figure 2).

Discussion

We investigated the manometric parameters during attempted defecation in patients with CC and obtained results that support the results of previous studies on DD. In addition, we found sex-specific differences in the pathogenesis of DD. The proportion of DD in patients with CC was higher in men than in women, and DD seemed to be associated with the development of CC in older men. Among patients with DD, inadequate defecatory propulsion was more common in women and dyssynergic defecation was more common in men.

Both ARM and BET are recommended as initial tests for evaluating patients with suspected DD; however, the diagnostic accuracy of ARM alone is questionable[5,7]. The prevalence of dyssynergic patterns measured using ARM is reported as 70%-98% in patients with constipated and 80%-87% in healthy participants (Table 6)[7,9,15-17]. In a systematic review and meta-analysis of the diagnostic accuracy of ARM in diagnosing DD, the summary sensitivity and specificity of 10 cohort studies were 86% and 49%, respectively[19]. This review suggests that ARM has high sensitivity but poor specificity in identifying DD and that BET may be more clinically relevant as a single test[19]. ARM alone may be sufficient to rule out DD due to its high sensitivity, but its low specificity makes a definitive diagnosis difficult.

A negative RAPG has been considered indicative of DD, but it is often observed in patients with CC without DD and healthy subjects[7,20]. In our study, the RAPG was negative in patients without DD (−5.1 mmHg); however, it was more

Table 4. Effectiveness of Anorectal Manometry for Diagnosing Defecation Disorders and Dyssynergic Patterns.

Manometric pattern	DD n =348	Non-DD n = 210	Sensitivity (%)	Specificity (%)	FPR (%)	FNR (%)	PPV (%)	NPV (%)	+LR	−LR
Normal	0	17	100	8.1	91.9	0	64.3	100	1.1	0
Type I	161	134	46.3	36.2	63.8	53.7	54.6	28.9	0.7	1.5
Type II	117	16	33.6	92.4	7.6	66.4	88.0	45.7	4.4	0.7
Type III	18	25	5.2	88.1	11.9	94.8	41.9	35.9	0.4	1.1
Type IV	47	8	13.5	96.2	3.8	86.5	85.5	40.2	3.5	0.9
Type V	5	10	1.4	95.2	4.8	98.6	33.3	36.8	0.3	1.0

DD, defecation disorders; FPR, false-positive rate; FNR, false-negative rate; PPV, positive predictive values; NPV, negative predictive values; LR, likelihood ratio

Table 5. Sex Differences in Manometric Parameters and Dyssynergic Patterns in Patients with Defecation Disorders.

Variable	Men n = 171	Women n = 177	p-value
Age (year)	69.5 (16.5)	67.7 (16.2)	0.309
Anorectal pressures during push (mmHg)			
Rectal pressure	60.3 (25.5)	43.1 (18.3)	<0.001
Anal pressure	101.6 (50.8)	61.6 (29.2)	<0.001
RAPG	−42.3 (45.5)	−19.2 (26.8)	<0.001
Dyssynergic patterns, n (%)			
Type I	111 (64.9)	50 (28.2)	<0.001
Type II	41 (24.0)	76 (42.9)	<0.001
Type III	8 (4.7)	10 (5.7)	0.867
Type IV	10 (5.8)	37 (20.9)	<0.001
Type V	1 (0.6)	4 (2.3)	-

Values are presented as mean (standard deviation) unless specified otherwise.
RAPG, rectoanal pressure gradient

negative in patients with DD (−29.3 mmHg, $p < 0.001$). Likewise, Zhao et al. reported that RAPGs were negative in patients with constipation with and without DD, but there was a large difference in the values: −6.5 mmHg in patients without DD vs. −39.3 mmHg in patients with DD[17]. Moreover, Grossi et al. measured the RAPG using HR-ARM in 85 healthy volunteers (HV) and 85 patients with functional constipation (FC). They reported negative RAPGs in both groups, but a significant difference in the values: −13.4 mmHg in HV vs. −26.3 mmHg in patients with FC ($p = 0.0007$)[7]. This suggests that the relative degree of RAPG value negativity can be used to distinguish DD.

Although type I-IV pattern classification measured using ARM is reproducible, the clinical applications are questionable[19]. Grossi et al. reported that the combined frequency of dyssynergic patterns (types I-IV) was similar in patients with FC (94%) and HV (87%) (Table 6)[7]. Additionally, type I patterns were more prevalent in HV (37%) than in patients with FC (20%), and only type IV patterns were useful in discerning patients with FC from HV[7]. In this study, we identified an additional type of dyssynergic pattern (type V); however, this type was already recognized by Grossi et al[7]. They reported an unclassifiable pattern, characterized by an insufficient increase in rectal pressure with a sufficient decrease in anal pressure, in 7% HV and patients with FC[7]. This was subsequently confirmed by Seong, who designated it as type V pattern and classified it as inadequate defecatory propulsion[9]. Seong measured anorectal pressures using WF-ARM in 76 non-constipated (NC) patients and 75 patients with FC, reporting comparative prevalence of type I-V patterns in both groups (80% vs. 89%) (Table 6)[9]. Only the type IV pattern was more prevalent in patients with FC than NC patients (31% vs. 5%, $p < 0.001$)[9].

In the studies by Grossi et al. and Seong, only type IV pattern was useful in identifying DD; however, both studies included only women[7,9]. In contrast, we also included men when comparing dyssynergic patterns in patients with and without DD. We found that type II and IV patterns were more prevalent in patients with DD, whereas type I and III

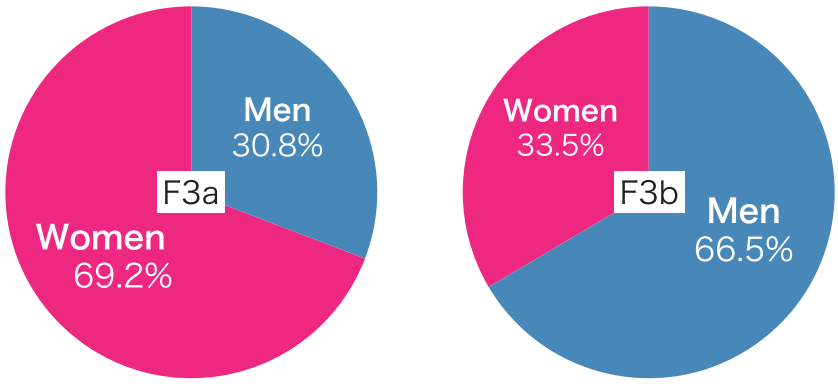

Figure 2. Sex distribution of inadequate defecatory propulsion (F3a) and dyssynergic defecation (F3b) in patients with defecation disorders. F3a is more prevalent in women ($p < 0.001$). F3b is more prevalent in men ($p < 0.001$).

Table 6. Comparison of Data from the Literature on the Distribution of Normal and Dyssynergic Defecation Patterns Measured Using Anorectal Manometry.

Authors (years)	Rao et al.[15] (2004)	Grossi et al.[7] (2016)		Lee et al.[16] (2018)		Seong.[9] (2018)		Zhao et al.[17] (2019)	Abe et al. (Present study)	
Men/women (n)	20/80	0/170		16/77		0/151		25/57	234/324	
Mean age (years)	53	46	42	48		54	55	42	69	67
Ethnicity	Western	Western		Western		Asian		Asian	Asian	
Methodology	WF-ARM	HR-ARM		HR-ARM	WF-ARM	WF-ARM		HR-ARM	WF-ARM	
Participants	FC	FC	HV	DD		FC	NC	FC	DD	FC
Manometric patterns, n (%)										
Normal	30 (30)	5 (6)	11 (13)	2 (2)	2 (2)	8 (11)	15 (20)	22 (27)	0	17 (8)
Type I	32 (32)	17 (20)	31 (37)	21 (23)	30 (32)	13 (17)	14 (18)	24 (29)	161 (46)	134 (64)
Type II	24 (24)	4 (5)	7 (8)	28 (30)	27 (29)	9 (12)	16 (21)	12 (15)	117 (34)	16 (8)
Type III	14 (14)	14 (17)	13 (15)	14 (15)	13 (14)	9 (12)	6 (8)	11 (13)	18 (5)	25 (12)
Type IV	-	39 (46)	17 (20)	28 (30)	21 (23)	23 (31)	4 (5)	13 (16)	47 (14)	8 (4)
Type V	-	6 (7)	6 (7)	-	-	13 (17)	21 (28)	-	5 (1)	10 (5)

WF-ARM, waveform anorectal manometry; HR-ARM, high-resonance anorectal manometry; FC, functional constipation; HV, healthy volunteer; DD, defecation disorders; NC, non-constipation

patterns were more prevalent in patients without DD. This is similar to the findings reported by Grossi et al., showing that a type IV pattern is more common in patients with FC (+LR = 2.3) and a type I pattern is more common in HV[7]. Likewise, we observed that types II (+LR = 4.4) and IV (+LR = 3.5) patterns are useful in differentiating patients with and without DD. Therefore, ARM may help to recognize inadequate defecatory propulsion (type II and IV patterns), but not dyssynergic defecation (type I and III patterns). In other words, rectal push pressure can be reliably measured using ARM, but not anal push pressure.

Although a few reports discussing dyssynergic pattern classification included men, no study has analyzed sex differences in dyssynergic patterns; our study is likely to be the first[15-17]. We revealed that the pathogenesis of DD is predominantly dyssynergic defecation (F3b) in men and inadequate defecatory propulsion (F3a) in women. Thus, combining dyssynergic patterns with sex or RAPG values may improve the diagnostic accuracy of DD. For example, a woman demonstrating type II or IV patterns on ARM is more likely to have F3a, and a man with a type I pattern and a significantly negative RAPG is more likely to have F3b.

In patients with CC, identifying DD is important because DD are best managed with pelvic floor retraining and BF therapy rather than laxatives[10]. Furthermore, differentiation between F3a and F3b ensures that an appropriate BF regimen is followed[6]. For patients with F3a, a regimen that strengthens the pushing force with feedback from the intrarectal sensors is recommended. Patients with F3b benefit more from focusing on pelvic floor muscle relaxation while pushing, with feedback on anal pressure or EMG ac-

tivity[6]. Sensory BF training is also important for male patients with DD as they are more likely to have reduced anorectal sensation[21].

This study has the strength of investigating manometric parameters in a large number of patients with constipation in Japan, an aging country. Therefore, we enrolled more men than those in previous studies and were able to examine sex-specific differences in DD. The limitations of this study are its retrospective, single-center, observational design and inclusion only Japanese patients. Additionally, we did not include healthy subjects as controls. However, in clinical practice, there is no need to distinguish between healthy subjects and patients with DD because healthy individuals do not visit clinics. Rather, it is important to identify DD in patients with CC because of the different treatment strategies. In this study, anorectal pressures were measured using conventional WF-ARM rather than the latest HR-ARM. The use of HR-ARM is expected to improve the diagnostic accuracy of DD; however, a recent meta-analysis reported that the choice of manometry system, whether WF-ARM, two-dimensional HR-ARM, or three-dimensional HR-ARM, does not affect diagnostic accuracy[19]. Nevertheless, ARM in the diagnosis of DD often provides false-positive or unreliable results, particularly with regard to anal pressure during attempted defecation. Ideally, BET should be performed in a private setting with the patient in seated position[8]. However, due to the limitations at our facility, patients were examined in the left lateral position in the present study.

In conclusion, men and women with DD shows different anorectal pressure changes during push, suggesting sex differences in the pathophysiology of DD. F3a is more common in women than in men and may be diagnosed using ARM alone. Conversely, men appear to be more likely to develop F3b than women. F3b is difficult to diagnose using ARM alone, but including sex or RAPG values may help aid diagnosis. Future studies should be performed to confirm these results and determine whether dyssynergic pattern classification can affect the response to pelvic floor retraining and BF therapy.

Conflicts of Interest

There are no conflicts of interest.

Author Contributions

Tatsuya Abe contributed to the concept and design, data acquisition and analysis, and drafted and revised the manuscript; and Masao Kunimoto, Yoshikazu Hachiro, Shigenori Ota, Kei Ohara, Mitsuhiro Inagaki, and Masanori Murakami contributed to data acquisition, revised the manuscript, and approved the final version.

Approval by Institutional Review Board (IRB)

This research was approved by the IRB of Kunimoto Hospital (approval code, K22-003).

Disclaimer

Tatsuya Abe is one of the Associate Editors of Journal of the Anus, Rectum and Colon and on the journal's Editorial Board. He was not involved in the editorial evaluation or decision to accept this article for publication at all.

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