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The Prevalence and Impact of Dyssynergic Defecation in Patients Who Solely Report Fecal Incontinence

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ABSTRACT

Background/Aims: Dyssynergic Defecation (DD) has been associated with fecal soiling but has not been studied in patients with fecal incontinence (FI). The aim is to measure the prevalence of DD in FI patients undergoing High Resolution ARM (HRARM).

Methods: A retrospective analysis of patients with FI who underwent HRARM at a tertiary care center (May 2015-November 2017) was performed. DD was defined as an abnormal sphincter response during simulated defecation and an abnormal BET. At the time of HRARM, patients completed two validated surveys: Fecal Incontinence Severity Index (FISI) and the Fecal Incontinence Quality of Life Instrument FIQL. Bivariate analyses with student's t test and Pearson's chi square test were performed to assess the association between DD and ARM findings/FISI/FIQL.

Key Results: 336 subjects with FI had undergone HRARM. 14.5% with FI were found to have DD (FI-DD). 52.3% were noted to have a paradoxical sphincter contraction on HRARM. 30.4% of the FI cohort were found to have an abnormal BET. Of those patients found to have DD by both criteria, the DD types found were type 1-61.2%, type 3-32.7% and type 4-6.1%. There were no significant demographic, HRARM findings, symptom severity or QOL differences between patient with FI-DD and FI.

Conclusions: 1 in 7 FI patients have DD and almost a third have an abnormal BET. Symptom severity and QOL was similar between FI patients with and without DD. Further research to determine whether physical therapy and biofeedback directed at DD improves FI is warranted.

KEYWORDS

Fecal incontinence, Dyssynergic defecation, Accidental bowel loss

ABBREVIATIONS

FI	:	Fecal Incontinence
DM	:	Diabetes Mellitus
GI	:	Gastrointestinal
IBS	:	Irritable Bowel Syndrome
NIH	:	National Institutes of Health
PROMIS	:	Patient Reported Outcomes Measurement Information System

INTRODUCTION

Dyssynergic Defecation (DD) is now recognized as an important and under-recognized cause of chronic constipation. Studies have found a 27-59% prevalence in patients with refractory constipation evaluated at referral centers [1,2]. Patients with this disorder most commonly report excessive straining and incomplete evacuation. In addition, some patients with DD somewhat paradoxically report fecal seepage [3,4]. Rao, *et al*. reported a 72% prevalence of DD in a prospective cohort of 25 patients presenting with fecal staining of undergarments. Fecal seepage is on the spectrum of fecal incontinence and typically the etiology for FI is multifold. However, constipation itself is a risk factor for fecal incontinence as defined as the involuntary loss of solid or liquid stool with 1.7-2.7 fold higher risk of FI as compared to non-constipated patients [5,6]. With this in mind, dyssynergic defecation may contribute to fecal incontinence. There is little data assessing the prevalence of DD in patients who only report Fecal Incontinence (FI). Nor is it known how DD in patients with FI impacts severity of FI symptoms or quality of life as compared to patients with FI without DD. Additionally, DD in patients with FI has not been evaluated by high resolution anorectal manometry (HRARM). Therefore, the aim of this study was to measure the prevalence of DD in patients with the sole complaint of FI undergoing HRARM. Additionally, our goal was to compare severity of FI symptoms and quality of life of FI patients with and without DD.

MATERIALS AND METHODS

Study Design

We performed a retrospective analysis of FI patients who underwent high resolution anorectal manometry at a tertiary care center from May 2015-November 2017. Prior to study initiation, we obtained Institutional Review Board approval. Patients who solely reported FI, completed a demographics questionnaire and two validated surveys: the Fecal Incontinence Quality of Life Instrument (FIQ-L) and Fecal Incontinence Severity Index (FISI) at the time of HRARM. The following HRARM characteristics were collected: high pressure zone (HPZ), resting and maximum squeeze pressures, rectal sensation (first sensation, urgency, and maximum tolerated) [7]. DD was defined as an abnormal sphincter response during simulated defecation(an intra-rectal pressure ≤ 45 mmHg and anal relaxation of ≤20%) [8] and an abnormal BET (>60 seconds) [9].

HRARM Procedure

All high resolution anorectal manometry tests were performed by one of three highly trained gastrointestinal physiology technicians, utilizing the same catheter design, identical testing protocols, and interpreted by only one provider. For the procedure, an enema was given if stool is detected on digital rectal examination. At least thirty minutes elapsed from enema insertion to the start of the procedure. Patients were placed in the left lateral position with knees and hips bent at a 90° angle. A lubricated Sand hill high resolution anorectal manometry probe (Sand hill Scientific, Denver, CO, USA) was then inserted into the rectum. The catheter is 4 mm in outer diameter and includes 8 directional solid state sensors. The most proximal sensor is located inside the rectal balloon. Another 5 sensors are positioned in the anal canal 10 mm apart, and lastly an external sensor is located 1 cm outside the anal verge. The resting pressures were collected for 15 seconds followed by at least 15 seconds in recovery time and/or until the basal baseline returned. The maximum squeeze pressure trials were collected for 15 seconds followed by at least 15 seconds in recovery time and/or until the basal baseline returned. Simulated defecation was defined to the patient with the following instructions: "please attempt to poop out the catheter until you hear relax" (15 seconds). Each trial was followed by at least 15 seconds and/or until the basal baseline was returned. We use the word poop to limit health literacy confusion defining simulated defecation. Data were obtained on rest, squeeze, cough reflex, simulated defecation, graded balloon distension (threshold, urgency and maximal tolerated). Data were analyzed using the Bio view analysis software with the Insight Ul-tima system (Diversatek, Milwaukee, WI).

The balloon expulsion catheter was placed while the subject is in the left decubitus position with the hips and knees in the flexed position. A lubricated balloon and catheter was inserted 10 cm post the distal balloon location. The balloon was filled with 50 ml of room temperature of water over a 25-seconds. The subject was escorted from the gurney to a toilet to perform the test. All subjects were instructed to refrain from abdominal massage, using a rocking motion, and/or finger manipulation to assist in expelling the water filled balloon. Subjects were given 2 minutes to achieve balloon expulsion and would alert the technician of balloon expulsion using a nurse assist button. If balloon expulsion was unsuccessful within 2 minutes, the technician slowly deflates the balloon and gently removes the catheter. For all of the BETs, a cut-off of > 60 seconds is considered abnormal [9].

Statistical Analysis

Descriptive statistics of the FI cohort were used to describe demographics and baseline symptoms. Our primary outcome was to assess the prevalence of DD in patients with FI. Our secondary outcomes were to compare HRARM characteristics, FISI and FIQL score between those with FI and DD and those with FI without DD in HRARM. Bivariate analyses with student's t test and Pearson's chi square test were used to assess for continuous and categorical variables. Data analyses were conducted using SAS 9.4 (SAS Institute Inc. Cary, NC) with significance set at an alpha of 0.05.

RESULTS

336 subjects with fecal incontinence had undergone high resolution ARM. Demographic characteristics of the population categorized by the presence of DD are available in (**Table 1**). There were no significant demographic or clinical characteristic differences between the two groups of patients. 49 of 336 people (14.5%) with FI were found to have DD (FI-DD) having both an abnormal sphincter response during simulated defecation and an abnormal BET. The DD types found were the following: type 1-61.2%, type 3-32.7% and type 4-6.1%. 170 of 336 (50.8%) of the FI cohort had an abnormal sphincter response during simulated defecation with a paradoxical sphincter contraction on HRARM. 102 of 336 subjects (30.4%) of the FI cohort were found to have an abnormal BET. We found no differences for any of the other HRARM parameters in subjects with and without DD (**Table 2**).

The presence of DD did not significantly affect the severity of FI nor the quality of life among subjects as seen in (**Table 3**). Additionally, the type of fecal incontinence that participants had experienced did not significantly vary by the presence of DD (**Table 4**). However, there was a trend that subjects with DD were more likely to suffer from liquid incontinence as compared to people without DD (Odds ratio 6.76; 95% Confidence interval 0.9-50.8).

DISCUSSION

In this large HRARM study in FI patients, we found that one in seven patients with FI have findings of DD by an abnormal simulated defecation and an abnormal BET. Type I was the most common type of DD found in this population. As FI has often multiple contributors, testing for this entity should be considered, as a positive finding will alter the management plan for FI.

DD has been associated with both fecal seepage and constipation [4,1,2]. Until recently however, there has been little assessment of DD in patients with FI. James-Stevenson et al. performed a retrospective chart review of 134 women with FI and found that 57% of women met HRARM criteria for DD [10]. This finding is similar to our HRARM findings for abnormal anal sphincter contraction during simulated defecation. However, in their study, the authors do not specify how many patients fulfilled the requirement of 2 abnormal tests (ARM, BET, imaging) as suggested by recent guidance documents [11,12]. Prior studies have shown a high rate of dyssynergic patterns in asymptomatic subjects undergoing HRARM and ARM which is why it is important to combine with a BET or defecography for diagnosis of DD [13,14]. However, the only study assessing for DD utilizing dual cri-

Table 1: Clinical Characteristics by Presence of Dyssynergic Defecation

	FI with DD	FI without DD	
	N=49	N=287	
Characteristic	**N (%)**	**N (%)**	***P*-value**
Age, years			
18 - 24	1 (4)	3 (1.1)	
25 – 45	4 (8.2)	36 (12.5)	0.725
46 – 65	20 (40.8)	113 (39.3)	
> 65	24 (48)	122 (42.5)	
BMI, kg/m² + SD	28.0 + 6.7	28.5 + 5.9	0.644
Gender			
Female	32 (13.1)	212 (86.9)	0.108
Male	18 (20.2)	71 (79.8)	
Race			
White	44 (89.8)	237 (82.6)	
African-American	3 (7.6)	19 (6.6)	0.558
Other	2 (2.9)	12 (4.1)	
Comorbidities			
Diabetes Mellitus	12 (24)	53 (18.7)	0.385
IBS	17 (36.2)	91 (34.9)	0.863
Celiac	1 (2)	4 (1.4)	0.753
IBD	4 (8)	15 (5.3)	0.452
Urinary Incontinence	20 (40)	106 (37.5)	0.732
Hemorrhoidectomy	4 (8)	18 (6.4)	0.667
Tobacco Use			
Smoker	5 (10.2)	28 (10.9)	0.971
Nonsmoker	44 (90.8)	44 (89.1)	
Opiate Use	7 (14)	47 (16.6)	0.644

Table 2: HRARM parameters in FI patients with and without Dyssynergic Defecation

HRARM measures	FI with DD	FI without DD	*P*-value
High pressure zone (cm)	3.64	3.6	0.846
Resting Pressure (mmHg)	52.9	57.2	0.293
Maximum Squeeze (mmHg)	128.3	135.1	0.592
First Sensation (ml)	51.9	56.6	0.347
Urgency (ml)	91.4	95.9	0.509
Maximum tolerated (ml)	141.8	134.9	0.45

Table 3: FISI and FIQL questionnaires in FI patients with and without Dyssynergic Defecation

Fecal Incontinence Symptoms or Related Outcomes	FI with DD	FI without DD	*P*-value
FISI, mean ± SD	33.9 ± 12.8	35.8 ± 15.6	0.467
FIQL, mean ± SD			
Lifestyle	2.5 ± 0.91	2.7 ± 0.94	0.212
Coping/Behavior	2.0 ± 0.76	2.0 ± 0.84	0.891
Depression/Self-Perception	2.5 ± 0.75	2.5 ± 0.75	0.716
Embarrassment	1.9 ± 0.82	2.0 ± 0.81	0.53

Table 4: Incontinence Type by Presence of Dyssynergic Defecation

	FI with DD	FI without DD	OR (95% Confidence Interval)
Type of Incontinence	**N (%)**	**N (%)**	
Solid	32 (76)	167 (72)	1.245 (0.579-2.678)
Liquid	41 (97)	200 (85)	6.763 (0.900-50.840)
Gas	38 (92)	216 (93)	0.880 (0.243-3.185)
Mucus	19 (48)	142 (62)	0.582 (0.294-1.151)

teria was performed in a large prospective registry of ARM subjects, Brochard, *et al*. found that 9% of their subjects had DD with 45% of these having normal anal function [15].

Interestingly, the presence of DD did not significantly worsen FI symptom severity or quality of life. Our population had moderately severe symptoms of FI with a FISI >30 for both groups. Though severity was mildly less in subjects with DD, the difference between groups was not statistically significant. The subjects' FIQL scores showed at least moderate reduction in quality of life in all parameters with embarrassment category being the worst. There are two studies on quality of life in dyssynergic patients with constipation. The first study assessed dyssynergic subjects, slow transit constipation subjects and controls which demonstrated lower sub- scores for role-emotional and mental health in dyssynergia and control participants. Both dyssynergic and slow transit constipation showed significantly lower subscores in physical functioning, bodily pain, role-physical, general health, vitality and social functioning as compared to control subjects. In a separate study of subjects with dyssynergic defecation, Rao, *et al*., noted that 74% of participants reported that DD interfered with their social life, 69% reported interference with work life, and 56% and 33% reported that it interference with sexual life and family relationships, respectively.

The identification of DD in FI patients is potentially important as it could alter the management plan. For example, clinicians may choose to avoid anti-diarrheal or large doses of supplemental fiber in patients with DD. In addition, the presence of DD is likely to significantly alter the plan for physical therapy and biofeedback training [15]. Patients who have FI and DD may benefit from pelvic floor biofeedback therapy.

There are several limitations relevant to our analysis which merit consideration. First and foremost is the testing that we utilized to determine DD. We realize that even in healthy volunteers, a dyssynergic pattern during simulated evacuation can be seen which is why using the BET as a confirmatory test is essential [13,16]. However, the BET also has limitations in that Rao, *et al*. found that many patients with DD could expel the balloon as compared to the finding 97% negative predictive value by Minguez, *et al*., [17,16]. This is a retrospective analysis; Albeit of data that was prospectively collected using validated questionnaires. The cross-sectional study design may introduce bias for the validated surveys since these measurements were collected prior to anorectal manometry testing without controlling for anxiety metrics. The study cohort was from a single tertiary care medical center. Thus, the study results may not be generalizable to the total population of FI patients encountered in routine clinical practice. Finally, we did not collect outcomes data following treatment of our study cohort. Thus, we can only speculate about a cause and effect relationship between DD and FI. Further, can we cannot definitively say that the discovery of DD in FI patients led to improved clinical outcomes.

CONCLUSION

In conclusion, 14% of patients with FI had findings of DD by an abnormal simulated defecation during HRARM and an abnormal BET. Type 1 and 3 by HRARM accounted for the majority of DD subtypes. There was no other discerning clinical or ARM characteristics of those with FI-DD. Further prospective studies are necessary to better understand if there is a causative relationship between DD and FI and

if the discovery of DD in FI patients alters the management plan in a way that improves clinical outcomes.

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