Research Article

Effect of Pelvic Floor Descent on Posterior Pelvic Floor Disorders in Women with Obstructed Defecation Syndrome

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Abstract

Background: The relation between age, parity, and posterior pelvic floor disorders involving obstructed defecation syndrome (ODS) is a matter of controversy. This study aimed to determine the effect of pelvic floor descent (PFD) on the prevalence of posterior pelvic floor disorders in women with ODS.

Methods: Data for women with ODS, collected in a prospective pelvic floor database, and were assessed retrospectively. Data on demographic variables and defecography were analyzed. PFD during defecation was estimated by the degree of the anorectal junction in relation to the inferior margin of the ischial tuberosity.

Results: Of 334 women with ODS, the most frequently detected defecographic abnormalities were rectal intussusception (58%) and rectocele (45%). Regression analysis showed that the presence of rectocele and enterocele was more common in women with increased PFD. A higher incidence of rectocele and enterocele was found in women with excessive PFD ($\geqq 30$ mm) than those without excessive PFD [58% (68/118) vs. 37% (77/209), $P < 0.0001$; 23% (27/118) vs. 14% (29/209), $P = 0.038$, respectively]. Increasing size of rectocele was significantly associated with increasing PFD. There were no significant differences in the prevalence of various posterior pelvic floor disorders between nulliparous and parous women.

Conclusions: The prevalence of both rectocele and enterocele increased significantly with increasing PFD in women with ODS, but the incidence of rectal intussusception showed no such relationship.

Keywords: Defecography; Pelvic Floor Descent; Rectocele; Rectal Intussusception; Enterocele

Introduction

Disorders of posterior pelvic floor are relatively common. They are frequently found in elderly female patients and are caused by morphologic and functional abnormalities due to changes in musculoaponeurotic support of the pelvic floor. Previous studies on the pelvic floor disorders have mainly focused on incontinence, and obstetric injury is strongly associated with the prevalence of fecal incontinence [1,2]. However, the relation between age, vaginal delivery, and posterior pelvic floor disorders involving obstructed defecation syndrome (ODS) is a matter of controversy [3-5]. The influence of aging or vaginal delivery on such disorders has been described in the previous studies [3,6,7], but others have failed to

identify the associations between childbirth and such disorders [4,8].

Pelvic floor descent (PFD) was first described by Parks., *et al.* [9]. Excessive PFD indicates injury to the innervation of the pelvic floor [10]. We previously evaluated PFD in women without ODS using defecography and found that PFD on straining was more prevalent in parous women than nulliparous [11]. Although increased PFD has been also found in constipated patients, the relationships between the PFD and various anatomical abnormalities causing ODS such as rectocele, rectal intussusception or enterocele remains unclear [12,13].

Aim of the Study

The aim of this study was to determine the effect of PFD on the prevalence of posterior pelvic floor disorders as seen on defecography in women with ODS using multivariate analyses.

Methods

Patients seen in the proctology clinic with symptoms of rectal evacuatory disorder underwent defecography as a part of the investigation protocol. Between February 2010 and December 2019, 902 patients underwent defecography and data for these patients were prospectively entered into a pelvic floor database. Of those, male patients (n = 262), or patients with external rectal prolapse (n = 131), fecal incontinence (FI) alone (n = 119), mucus discharge alone (n = 12) and other symptoms (n = 44) were excluded. The remaining 334 female patients with ODS were included in this study. Symptoms of ODS include incomplete evacuation, straining, digitation, sensation of incomplete evacuation and repetitive visits to the toilet. The Constipation Scoring System (CSS) score was used to quantify constipation on a scale of 0-30 points, with a higher score indicating worse constipation14). Patients were stratified in subgroups by parity to evaluate the prevalence of defecographic abnormalities.

This study was approved by the Ethical Committee of Kameda Medical Center (approved number, 19-176). Information of the study was made public, and patients were ensured that they could withdraw consent. However, no patient or their relatives subsequently refused to participate in the study.

Defecography

A standardized defecography technique was used in this study. The small bowel was opacified with a mixture containing 100 mL barium sulfate (100% w/w) and 10 mL Urografin (60% w/w), ingested 2 h prior to the procedure. Proctograms were evaluated using the criteria proposed by Shorvon., *et al.* [15]. Briefly, rectal intussusception is a circumferential descent of the entire thickness of the rectal wall, which might extent into the anal canal but not through the anal verge. A rectocele greater than 2 cm in diameter was regarded as abnormal. The size was calculated in the standard fashion in the anterior-posterior dimension by measuring the distance between the most ventral part of the anterior rectal wall and an extrapolated line indicating the expected position of the rectal wall [16]. PFD during defecation was estimated by the degree of the anorectal junction in relation to the inferior margin of the ischial

tuberosity. Excessive PFD was defined as a descent of the anorectal junction 3 cm or more below the inferior margin of the ischial tuberosity. Enterocele was diagnosed when the extension of the loop of the bowel was located between the vagina and rectum. Mucosal prolapse is a thin prolapse starting 3 to 4 cm above the anal verge and passing through the anal verge. Pelvic floor dyssynergia was reported when the contour of the puborectalis muscle increased and/or the anorectal angle decreased at straining. Inadequate defecatory propulsion was reported when inadequate propulsive force was seen with or without the increased anorectal angle at straining. Images from defecography were analyzed by one of the authors (T. T.), who is experienced in the evaluation and was blinded at that time to the symptomatology of the individual patients.

Statistical analysis

Statistical analysis was performed using SPSS version 11.0 (SPSS Inc., Chicago, IL, USA). Continuous variables are expressed as median (range). Univariate associations were analyzed using the Mann-Whitney U-test or Pearson's correlation analysis for continuous variables and the chi-square or Fisher's exact test for categorical variables. Stepwise multivariate regression analysis was used to establish which variables best predicted the presence of anatomical abnormality. In the regression analysis, the presence of rectocele, rectal intussusception, or enterocele was selected as the dependent variable, respectively. Independent variables included age, parity, PFD, and the presence of other anatomical abnormalities. A value of $P < 0.05$ was taken as significant for all tests except for the stepwise multiple regression, where variables were entered at a P -value of $\leqq 0.01$ to reduce the risk of type I errors.

Results

The median age was 68 years (range, 22 - 95 years). Sixty-eight (20%) women were nulliparous and 266 (80%) had undergone one or more vaginal deliveries (median: 2; range 1 - 5). Forty-three women (13%) had undergone a hysterectomy. Two hundred and twenty women (66%) had OD alone, while 114 (34%) had OD and FI. The median CSS score was 12 (6 - 30). The median PFD measured in 327 women was 25 (-7 to 64) mm, and excessive PFD was found in 36% (118/327).

Table 1 shows the prevalence of various defecographic abnormalities. The most frequently detected abnormalities were rectal intussusception and rectocele irrespective of the additional findings on defecography and their frequency was 58% (194/334) and 45% (149/334), respectively.

Rectal intussusception (RI) alone	103 (30.8)
Rectocele (RC) alone	63 (18.9)
RI+RC	56 (16.8)
RI+enterocele (EC)	17 (5.1)
RI+RC+EC	16 (4.8)
RC+EC	14 (4.2)
EC alone	9 (2.7)
RI+mucosal prolapse	2 (0.6)
Inappropriate defecatory propulsion	12 (3.6)
Pelvic floor dyssynergia	3 (0.9)
Parenthesis, percentage	

Table 1: Prevalence of defecographic abnormalities in female patients with obstructed defecation syndrome (n = 334).

Role of PFD

The prevalence of defecographic abnormalities by PFD (< 30 mm versus ≧ 30 mm) are shown in table 2. Excessive PFD was significantly associated with the increased incidence of rectocele and enterocele, respectively. There were no significant differences in age, parity, or CSS score between the groups.

Role of parity

The prevalence of defecographic abnormalities by parity are shown in table 3. There were no significant differences in the incidence of various defecographic abnormalities between nulliparous and parous women. Nulliparous women were significantly younger than parous women. PFD was not significantly different between nulliparous and parous women. CSS scores in nulliparous women were significantly higher than those in parous women.

	Pelvic floor descent		P
	<30 mm (n = 209)	30 mm (n = 118)	
Rectal intussusception	128 (61%)	63 (53%)	0.17
Rectocele	77 (37%)	68 (58%)	<0.0001
Enterocele	29 (14%)	27 (23%)	0.04
Inappropriate defecatory propulsion	10 (5%)	2 (2%)	0.22
Pelvic floor dyssynergia	3 (196)	0 (0%)	0.56
Age (years)	71 (22-96)	67 (29-90)	0.09
Nulliparae	46 (22%)	22 (19%)	0.47
Previous hysterectomy	29 (14%)	13 (11%)	0.46
CSS score	12 (6-30)	13 (5-21)	0.09

Table 2: Prevalence of defecographic abnormalities by pelvic floor descent (n = 327).

	Parity		P
	Nulharous (n = 68)	Vaginal parous (n = 266)	
Rectal intussusception	38 (56%)	156 (59%)	0.68
Rectocele	32 (47%)	117 (44%)	0.65
Enterocele	9 (13%)	47 (18%)	0.38
Inappropriate defecatory propulsion	2 (3%)	10 (4%)	1.00
Pelvic floor dyssynergia	2 (3%)	1 (0.4%)	0.11
Pelvic floor descent (mm)	24 (-6-60)	25 (-4-64)	0.31
Age (years)	57 (22-92)	70 (30-95)	<0.0001
Previous hysterectomy	5 (7%)	38 (14%)	0.16
CSS score	14 (5-30)	12 (6-21)	0.005

Table 3: Prevalence of defecographic abnormalities by parity.

Pearson's correlation coefficients and regression analysis

Presence of rectocele

The correlation between the presence of a rectocele, demographic findings, and morphologic parameters are shown in table 4. Younger age, increasing PFD, and the absence of rectal intussusception were significantly associated with the presence of rectocele. The results of the stepwise multiple regression analysis are shown in table 8. Younger age and increasing PFD were significantly associated with the presence of rectocele.

	Coefficients	P
Age (years)	-0.37	<0.0001
Pelvic floor descent (mm)	0.32	<0.0001
Rectal intussusception (no,yes)	-0.18	0.001
Enterocele (no,yes)	0.08	0.14
Previous hysterectomy (no,yes)	0.03	0.55
Parity (no,yes)	-0.03	0.65

Table 4: Pearson's correlation coefficients between the presence of rectocele and variables.

Size of rectocele (n = 149)

The median size of rectocele was 30 (21-59) mm. The correlation between the size of the rectocele, demographic, and morphologic variables are shown in table 5. Increasing PFD, age, and the presence of enterocele were significantly associated with the size of the rectocele. The results of multivariate analysis showed that increasing PFD and younger age were significantly associated with increasing size of rectocele (Table 8).

	Coefficients	P
Pelvic floor descent (mm)	0.32	<0.0001
Age (years)	-0.24	0.004
Enterocele (no, yes)	0.20	0.02
Rectal intussusception (no, yes)	-0.13	0.13
CSS score	0.11	0.21
Previous hysterectomy (no, yes)	-0.04	0.66
Parity (no, yes)	-0.04	0.62

Table 5: Pearson's correlation coefficients between the size of rectocele and variables (n = 149).

Presence of rectal intussusception

The correlation between the presence of rectal intussusception, demographic, and morphologic variables are shown in table 6. Older age and the absence of rectocele were significantly associated with the presence of rectal intussusception. The results of multi-variate analysis showed that older age was significantly associated with the presence of rectal intussusception (Table 8).

Presence of enterocele

The prevalence of enterocele was 17% (56/334). More than three-quarters (43/56) of patients with EC had undergone hysterectomy. The correlation between the presence of enterocele, demographic, and morphologic variables are shown in table 7. Increasing PFD and previous hysterectomy were significantly associated with the presence of enterocele. The results of the multivariate analysis showed that previous hysterectomy and increasing PFD were significantly associated with the presence of enterocele (Table 8).

	Coefficients	P
Age (years)	0.21	<0.0001
Rectocele (no, yes)	-0.18	0.001
Pelvic floor descent (mm)	-0.09	0.11
Previous hysterectomy (no, yes)	0.02	0.68
Parity (no, yes)	0.02	0.68
Enterocele (no, yes)	0.01	0.89

Table 6: Pearson's correlation coefficients between the presence of rectal intussusception and variables.

	Coefficients	P
Previous hysterectomy (no, yes)	0.31	<0.0001
Pelvic floor descent (mm)	0.16	0.004
Rectocele (no, yes)	0.08	0.14
Age (years)	0.08	0.14
Parity (no, yes)	0.05	0.38
Rectal intussusception (no, yes)	0.01	0.89

Table 7: Pearson's correlation coefficients between the presence of enterocele and variables.

Figure 1: PFD, pelvic floor descent.

PFD was estimated by the degree of the anorectal junction in relation to the inferior margin of the ischial tuberosity during defecation.

Variables included in equation	Unstandardized regression weight	t value	P value	Variance explained
The presence of rectocele				
Age (years)	-1.16E-02	-7.02	<0.0001	22%
Pelvic floor descent (mm)	1.15E-02	5.92	<0.0001	
The size of rectocele				
Pelvic floor descent (mm)	0.24	4.32	<0.0001	17%
Age (years)	-0.14	-3.23	0.002	
The presence of rectal intussusception				
Age (years)	7.24E-03	4.01	<0.0001	5%
The presence of enterocele				
Previous hysterectomy (no, yes)	0.36	6.17	<0.0001	13 %
Pelvic floor descent (mm)	5.26E-03	3.39	0.001	

Table 8: Multiple regression.

Discussion

This study demonstrated that the prevalence of either rectocele or enterocele increased significantly with increasing PFD in women with ODS. Increasing rectocele size was also significantly associated with increasing PFD.

Our results support the view that vaginal delivery had no significant influence on the prevalence of ODS-related posterior pelvic floor disorders [4,5]. However, results vary between studies due to differences in population profile, study designs, techniques and imaging method performed during evaluation [3-5,17]. Kepenekci., et al. [3] estimated the prevalence of pelvic floor disorders among the general population of women by a questionnaire and found that childbirth and age to be associated with the development of both anterior and posterior pelvic floor disorders. Karasick., et al. [6] asked women who underwent defecography to provide information regarding obstetric history and pelvic surgery and found that trauma from childbirth or hysterectomy contributed to the development of defecation disorders. Murad-Regadas., et al. [7] evaluated the women presenting with ODS using 3D anorectal ultrasonography to assess the posterior pelvic floor disorders and found that delivery mode and parity were not correlated with the prevalence of rectocele, rectal intussusception and pelvic floor dyssynergia.

This study included 334 female patients presenting with ODS, with a median CSS score of 12. The patients were evaluated using defecography to assess the prevalence of posterior pelvic floor disorders using multivariate analyses. Historically, defecography has placed an important role in the diagnosis of anatomical and functional abnormalities of the pelvic floor [18]. Magnetic resonance imaging and anorectal ultrasonography have limitations; both techniques are hindered by patient positioning (supine) because this position is non-physiologic and defecation in this system imposes practical difficulties and can lead to under-diagnosis of pelvic floor disorders [19,20]. Although the usefulness of the images acquired using dynamic magnetic resonance defecography with patient sitting in an open-magnet unit has been reported, this technique has not gained popularity because of the limited availability [21].

The major advantage of defecography consists in the fact that it provides a near physiologic evaluation of evacuation, allowing examination of the anatomy and function while the patient is in a position similar to the one in which the daily maneuvers that generate symptoms are performed [22]. This method is valuable in determining the maximum evacuation of the rectum, which allows for measuring not only the size of rectocele but also the physiologic extent of PFD. Rectal intussusception can be diagnosed at the end of evacuation stage, which is difficult to obtain in supine position [23].

Rectocele was common in women with increased PFD in this study, supporting the results of previous studies [12,13]. Excessive PFD was observed more than one-third of our patients. One explanation for this correlation might be chronic straining during defecation in women with rectocele, which is considered an etiologic factor of increased PFD. Conversely, chronic straining effort in women with constipation may cause fascial tears or detachment of the rectovaginal septum from the perineal body, which causes

PFD. This has been described as possible factor attributing to the formation of rectocele [24]. It is uncertain why the presence of rectocele was more common in younger women. Although perineal trauma after childbirth was reported as a causing mechanism for rectocele formation [25], rectoceles have been described in nulliparous women in a few studies [17,25]. Diets., *et al*. [17] presumed that women are born with pre-existing defects of fascia that grow larger with time until they become evident on imaging or clinically. This may be possible explanation for the correlation between the presence of RC and younger age in this study. It is understandable that the size of rectocele became greater with increasing PFD, because the base of rectocele is likely to correlate with its depth, but the reason why younger women had a larger rectocele is uncertain. Carter., *et al*. [26] failed to find a significant correlation between the size of rectocele and age or parity.

The presence of rectal intussusception was more common in older women in this study, supporting the results of the previous study [8]. Hawskin., *et al*. [27] assessed 147 patients with OD who underwent defecography and showed that the patients with rectal intussusception were significantly older than those without rectal intussusception.

The incidence of enterocele was 17% in this study, similar to the incidence (19%) reported in a review of 2,816 proctographies of patients with defecation disorders [28]. A previous history of hysterectomy predisposed women with ODS to have an enterocele in this study, supporting the results of the previous studies [28,29]. Hysterectomy may lead to a possible iatrogenic disruption of vaginal supportive tissue, which causes a change in vaginal axis or loss of continuing of fibrous connective tissue [30]. The possible causal relationship between the presence of enterocele and increasing PFD might be chronic straining effort in women with constipation. Chronic straining may cause not only deep Douglas pouch, but also pudendal neuropathy by stretching the nerve, which may lead to the development of increased PFD [9,10].

Our study has certain limitations. This was a retrospective study of prospectively collected data. The symptoms of constipation or its severity may be affected by different factors apart from anatomical abnormalities such as health status and physical limitations. The study population comes from a single tertiary care center, and our findings may not be generalizable to all patients with posterior pelvic floor disorders causing ODS.

Conclusion

In conclusion, this study demonstrated that the prevalence of either rectocele or enterocele increased significantly with increasing PFD in women with ODS, but not the incidence of rectal intussusception. In women with ODS, vaginal delivery had no impact on the prevalence of posterior pelvic floor disorders, when assessed by defecography. To further determine the role of PFD on such disorders, prospective studies based on clinical and radiological tests are required.

Acknowledgements

Conflict of Interest

The authors declare that there are no conflicts of interest.

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