ORIGINAL RESEARCH ARTICLE

Rectoanal intussusception is very common in patients with fecal incontinence

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Abstract:

Objectives: Fecal incontinence (FI) is a multifactorial disorder, the etiology of which is not fully understood. Recent data have shown the significance of rectoanal intussusception (RAI) in the evaluation of FI. The present study aimed to determine the incidence of RAI in patients with FI. Methods: Between June 2010 and February 2016, 74 patients, who were evaluated using evacuation proctography, anorectal manometry, ultrasound, and incontinence scores, were included in this study. RAI was diagnosed when the apex of the rectal intussusception (RI) impinged on the internal anal orifice or was intra-anal, based on the images taken during maximal straining defecation at evacuation proctography. The characteristics of RAI patients were further analyzed. Results: There were 59 women (80%) and 15 men, with a median age of 74 (52-93) years. Sixty patients (81%) had RI, and 56 (76%) showed RAI. The incidence of RAI among the 32 patients with FI alone and the 42 patients with FI and symptoms of obstructed defecation (OD) was 72% (23/32) and 79% (33/42), respectively. The incidence of RAI was not significantly different between the patients with normal manometry (maximum resting pressure [MRP] $\geq$55 cmH$_2$O and maximum squeeze pressure [MSP] $\geq$150 cmH$_2$O, n=26) and those with subnormal manometry (MRP <55 cmH$_2$O and/or MSP <150 cmH$_2$O, n=48). Conclusion: RAI is common in patients with FI. Evacuation proctography should be taken into account as a part of the regular study of FI patients.

Keywords:

evacuation proctography, fecal incontinence, laparoscopic ventral rectopexy, rectoanal inhibitory reflex, rectoanal intussusception

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Introduction

Fecal incontinence (FI) is a psychologically distressing and socially disabling condition with a significant impact on quality of life[1]. The etiology of FI is not fully comprehended because of its complexity. Continence is maintained via a compound process entailing the central and peripheral nervous systems, along with hormonal, intestinal, muscular and psychological factors.

Rectal intussusception (RI) is an infolding of the rectal wall that may occur during defecation. RI is a common finding on evacuation proctography. The incidence of RI as a cause of FI or obstructed defecation (OD) is unknown. In individuals referred for proctography to investigate symptoms of OD, one researcher reported an incidence of 40%[2]. Conversely, RI was diagnosed in only 10% of patients referred for proctopgraphy to investigate FI[3]. On the other hand, circumferential RI was seen in asymptomatic individuals at proctography with an incidence of 59% (27/46)[4], and the clinical significance of this finding has been questioned[5]. A recent study has addressed the differences in anorectal morphology during defecation between patients with evacuation disorder and asymptomatic individuals, and it was found that intussusception thickness was significantly greater in patients with symptomatic RI[6].

RI may cause FI[7], but the role of RI in the etiology of FI remains under debate[8]. In addition, whether evacuation proctography should be routine in the work-up of FI is unclear. RI can be classified as rectorectal intussusception (RRI) and rectoanal intussusception (RAI). A previous study reported that more patients with RAI than RRI had FI[9].

The present study aimed to determine the incidence of RAI using evacuation proctography in the evaluation of FI.

Methods

Between June 2010 and February 2016, 146 patients with symptoms of FI were seen in a proctology clinic and prospectively entered into a pelvic floor database. Of these 146 patients, 74 FI patients, who were evaluated with anorectal manometry, transanal ultrasound, and evacuation proctography, were included in this study. The remaining 72 patients, who were examined by proctography, but not examined by either manometry or ultrasound, were excluded. Incontinence severity was documented using the Fecal Incontinence Severity Index (FISI) score[10]. Symptoms of OD include incomplete evacuation, straining, digitation, sensation of incomplete evacuation and repetitive visits to the toilet. Patients then underwent the standard work-up with anorectal physiology, ultrasound and evacuation proctogra-

Figure 1.   Image of rectoanal intussusception (RAI). The apex of the rectal intussusception is intra-anal.

phy. Anorectal manometry was measured with a catheter-tip transducer (UniTip Catheter, Unisensor AG and Medtronic Polygraf ID). Maximum resting pressure (MRP) and maximum squeeze pressure (MSP) are shown as cmH_2O. The defined in-hospital normal ranges were: MRP, 55-110 cmH_2O and MSP, 150-300 cmH_2O. Transanal ultrasound was performed on the patient using a 10-MHz radial transducer (Flex Focus 800 Ultrasound Machine BK Ultrasound) to determine whether there was a defect of the anal sphincter muscle.

The proctography technique was standardized. The small bowel was opacified with a mixture containing 100 ml Barister™ (Barium sulfate 100% w/w; Fushimi Health Care Ltd, Kagawa, Japan) and 10 ml Urografin (60% w/w; Bayer Pharmaceuticals Ltd. Osaka, Japan), ingested 30 minutes prior to the procedure. The rectum was prepared with 150 ml of synthetic stool consisting of barium sulfate, porridge oats, and water injected per anum using a 50-ml bladder syringe. For patients with weak sphincter muscle, 50-100 ml of synthetic stool was introduced to prevent a backward flow. The patients were then seated on a radiolucent commode on a fluoroscopic X-ray table. Images were taken at rest, squeeze, and evacuation. Images from proctography were analyzed by one of the authors (T.T.), who is experienced in evacuation assessments[11]. Measurements were taken using the X-ray flat panel detector (Toshiba Ultimax, Toshiba Medical Systems, Tochigi, Japan), calibrated to a metal globe of known dimensions screened within the image field during proctography.

RAI was diagnosed when the apex of the RI impinged on the internal anal orifice or was intra-anal, based on the images taken during maximal straining defecation (Figure 1). Rectorectal intussusception was differentiated from RAI by examining whether the apex remained intrarectal and did not impinge on the internal anal orifice. The grade of RI, according to a more detailed classification, the Oxford rectal prolapse grade[7], is shown in Table 1. Rectocele was classified as Grade 1 (<2 cm in depth), Grade 2 (2-4 cm in depth), or Grade 3 (>4 cm in depth). The size was calculated in a 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 of the expected portion of the rectal wall[12]. Pelvic floor descent during defecation was estimated by the extent to which the

Table 1.   Oxford Rectal Prolapse Grading System.

Radiological characteristics of prolapse		
Rectorectal	Gd I	Descends to proximal limit of rectocele
intussusception	Gd II	Descends into level of rectocele, but not onto anal canal
Rectoanal	Gd III	Descends onto anal canal
intussusception	Gd IV	Descends into anal canal

Gd, grade

anorectal junction descended in relation to the inferior margin of the ischial tuberosity. The defined in-hospital normal range was less than 3 cm. Informed consent was obtained from all patients prior to their inclusion in the study. This study was approved by the regional Ethics Committee and was, therefore, performed in accordance with the 1964 Declaration of Helsinki and its later amendments.

Statistical analysis

All statistical analyses were performed with EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan), which is a graphical user interface for R (The R Foundation for Statistical Computing, Vienna, Austria). More precisely, it is a modified version of R commander, designed to add statistical functions frequently used in biostatistics[13]. Continuous variables are expressed as medians and range. Univariate associations were analyzed using the Mann-Whitney U-test for continuous variables and the chi-squared or Fisher's exact test for categorical variables. A p value < 0.05 was taken as significant for all tests.

Results

Patient demographics

A total of 74 patients (59 women (80%) and 15 men; median age 74 (52-93) years) were included in this study. The median age was not significantly different between the patients with RAI (74 years) and those without RAI (76 years). Of the 74 patients, 32 (43%) had FI alone, and 42 (55%) had FI and OD. Details of OD symptoms are shown in Table 2.

Incontinence Score

The median FISI score was 23 (6-49). No significant dif-

ference in the FISI score was found between patients with RAI (24 (6-47)) and those without RAI (20 (7-49)).

Anorectal manometry

The median MRP was 58 (17-241) cmH$_2$O. Thirty-four patients (46%) had a lower MRP (<55 cmH$_2$O). The median MSP was 167 (43-548) cmH$_2$O. Twenty-nine patients (39%) had a lower MSP (<150 cmH$_2$O). Twenty-six patients (35%) had both normal MRP and MSP (normal manometric study). The remaining 48 patients had lower MRP and/or lower MSP (subnormal manometric study). MRP was significantly lower in patients with RAI than in those without RAI (median 52.7 vs. 67.0 cmH$_2$O, P=0.03). MRP was not significantly different between patients with RAI who were under 75 years of age (n=32) and those who were 75 years or older (n=24). No significant difference in the FISI score was noted between patients with a normal manometric study (24 (8-42)) and those with a subnormal manometric study (23 (6-49)).

Transanal ultrasound

All patients had intact anal sphincters. Two patients had anal fistula surgery and one had a history of obstetric sphincter injury; thus, 97% (72/74) had a normal internal sphincter and 96% (71/74) had a normal external sphincter. There were no discrete external sphincter separations.

Evacuation proctography

Three patients, including one of the two patients having had anal fistula surgery and the patient with the obstetric sphincter injury, had normal proctograms. Sixty patients (81%) had RI. The grade of RI, according to ORPG, is shown in Table 3. Fifty-six (76%) patients, including the third patient having anal fistula surgery, had RAI (ORPG 3/4), and four had rectorectal intussusception (ORPG 1/2). The incidence of RAI among the 32 patients with FI alone and the 42 patients with FI and OD was 72% (23/32) and 79% (33/42), respectively. A rectocele was observed in 28 (38%) patients. The grade of rectocele is shown in Table 4. The existence of RAI was not significantly combined with size of rectocele >2 cm (P=0.39). Pelvic floor descent more than 3 cm was observed in 20 patients (27%).

Table 2. Detail of Obstructed Defecation (OD) Symptoms.

Detail of OD symptom	Yes	No
Incomplete evacuation	29	13
straining	18	24
dugitation	16	26
Sensation of incomplete evacuation	39	3
Repetitive visits to the toilet	29	13

Table 3. Frequency of Rectal Intussusception by Grade (n=74).

Grade	No RI	Rectorectal intussusception Gd I	Gd II	Rectoanal intussusception Gd III	Gd IV
Frequencies	14 (19%)	0 (0%)	4 (5%)	19 (26%)	37 (50%)

RI, rectal intussusception; Gd, grade

Table 4. Characteristics of Rectocele (n=74).

Gd of RI	Size of rectocele			
	None	<2 cm	≥2 - <4 cm	≥4 cm
No RI	9	3	2	0
Rectorectal intussusception	0	0	4	0
Rectoanal intussusception	37	6	12	1

RI, rectal intussusception; Gd, grade

Table 5. Incontinence Score vs. Proctography Findings.

		FISI scores	*P*
RAI	Yes (n=56)	23.5 (6-47)	0.66
	No (n=18)	20.0 (7-49)	-
Rectocele	Yes (n=28)	27.0 (8-47)	0.11
	No (n=46)	21.0 (6-49)	-
Pelvic floor descent	Yes* (n=20)	24.5 (8-40)	0.56
	No (n=54)	21.5 (6-49)	-

RAI, rectoanal intussusception; FISI, fecal incontinence severity index
*pelvic floor descent (extent of anorectal junction relative to the inferior margin of the ischial tuberosity during defecation) was more than 3 cm.

Table 6. Manometric Study vs. Rectoanal Intussusception.

	Manometric study		
	Normal (n=26)	Subnormal (n=48)	
	(MRP ≥55 cmH₂O and MSP ≥150 cmH₂O)	(MRP <55 cmH₂O and/or MSP <150 cmH₂O)	*P*
RAI yes	17	39	0.16
no	9	9	-

RAI, rectoanal intussusception; MRP, maximum resting pressure; MSP, maximum squeeze pressure

Evacuation proctography vs incontinence score

There was no significant difference in the FISI score between patients with and those without RAI, with and without rectocele, and with and without pelvic floor descent (Table 5).

Evacuation proctography vs anorectal manometry

The incidence of RAI was not significantly different between patients with normal manometry (MRP ≥55 cmH₂O and MSP ≥150 cmH₂O, n=26) and those with subnormal manometry (MRP <55 cmH₂O and/or MSP <150 cmH₂O, n=48) (see Table 6). Twenty-seven of the 56 patients with RAI underwent laparoscopic ventral rectopexy (LVR), leading to disappearance of RAI and improved FI postoperatively.

Discussion

The aim of this study was to assess the frequency of RAI in patients with symptoms of FI. Overall, 76% of the evaluated patients had RAI. Neither the presence of RAI nor the severity of FI was associated with lower anal pressure. Importantly, only three patients had a partial defect of the anal sphincter.

Since the etiology of FI in patients with a normal sphincter remains obscure, it is hard to evaluate the clinical importance of these findings. The effect of RAI on continence may occur partly through a reduction in resting pressure[14], which was consistent with the results of the present study. Additionally, RAI may cause FI more commonly as a result of inappropriate activation of the rectoanal inhibitory reflex (RAIR), or by prolapse of the rectal "bolus", as previously suggested by Faroux et al.[15]. Other researchers also supported this theory[16,17]. Our recent study showed that the severity of FI may be affected by anterior intussusception descent, which could trigger the RAIR in patients with RAI[18]. It is possible that the higher intra-abdominal pressure created during daily life may expose the anterior part of the rectal wall to forces consistent with the development of anterior or circumferential RAI and may, thus, trigger the RAIR. The significance of the RAIR on the pathogenesis of FI was also supported by previous studies, where continence was improved, and a postoperative increase in anal pressure was not found after abdominal surgical techniques for correcting RAI[19,20]. These findings suggest that the preoperative anal pressure was not predictive of postoperative improvement in continence.

Other mechanisms leading to FI may be manometric alterations, such as abnormal rectal waves, intermittent relaxation of the internal sphincter[21], or incomplete rectal emptying[22].

The previous studies supported the practice of routine proctography in patients under examination of FI[8,9], where 63% (25/40) and 27% (14/51) of the patients with FI demonstrated RAI by proctography. Rex et al.[23] reported that the clinical utility of proctography in patients with FI was in determining the cause of concurrent outlet obstruction symptoms. However, in the present study a higher incidence of RAI was seen in patients with not only FI and OD (79%),

but also FI alone (72%). Bloemendaal et al.[24] reported that half of the patients with FI alone, without anal sphincter defect, demonstrated RAI. It is difficult to determine the clinical significance of RAI. However, RAI negatively affected the efficacy of sacral nerve stimulation[25], which has been a popular treatment for FI, thus, it is increasingly important to recognize the high frequency of RAI in FI.

At our institution, RAI is recognized as a causative factor, and proctography is part of the standard investigation for FI. Patients with RAI found on routine proctography are offered LVR after failed standard medical treatment[26]. RAI is also found on proctography in patients without FI. During the same period of this study, proctography was performed on 385 patients with defecation disorders, where those with external rectal prolapse were not included. Among the 385 patients, 239 patients did not have FI, 222 only had OD, and 17 had mucus discharge or other ailments. RAI was found in 99 (41%) patients without FI. This finding is in accordance with other studies[7,27], where RAI may cause not only FI but also OD.

The clinical outcomes of surgery aimed at RAI or rectocele support its significance as a cause of FI. Postoperative improvement of continence was seen in patients with RAI who underwent LVR[28-30]. Rectocele is also regarded as a cause of FI and an improvement of continence was observed after perineal rectocele repair[17,31]. The mechanisms of FI in rectocele are uncertain, but fecal trapping, leading to leakage after defecation to occur, can be considered a cause. We recently reported that LVR for RAI produced an adequate improvement of continence, and successful anatomical correction of RAI and rectocele was confirmed by postoperative proctography[26].

Symptoms of FI were more common in the elderly than in younger patients[32], and a strong relationship between age and prolapse grade was reported[33]. Therefore, the difference in age within the groups would cause an overestimation of the number of patients with FI in the RAI group. It was found that older patients (≥75 years) with RAI did not have a significantly lower MRP than younger patients (<75 years) with RAI, and patients with RAI were not significantly older than those without RAI.

There are certain limitations to the present study. First, this was a small retrospective study. Second, as previously shown[18], pelvic floor descent or anterior intussusception descent may have an additional effect on the appearance of FI. Third, other factors, such as health status and physical limitations[32], which have been verified to be accompanied with FI, were not evaluated in this study.

RAI is a common phenomenon in patients with FI who have an intact sphincter. During the examination of these patient, it should be born in mind that the majority of them have RAI. Further studies are necessary to confirm the results.

Conflicts of Interest

There are no conflicts of interest.

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