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Comparison of conventional and magnetic resonance defecography for diagnosis of outlet obstructive syndrome

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Abstract. Background. Outlet obstruction syndrome refers to all pelvic floor dysfunctions that are responsible for incomplete evacuation of fecal contents from the rectum. Defecography is the first step for diagnosis of outlet obstruction syndrome. The free selection of imaging planes, good temporal resolution, and excellent soft tissue contrast has helped to transform this method into the preferred imaging modality for evaluation of patients with pelvic floor dysfunction. The purpose of our study was to compare conventional and magnetic resonance (MR) defecography in patients who were admitted for outlet obstruction syndrome. **Materials and methods.** Twenty-eight patients who presented with constipation between January 2015 and January 2020 were included in this study. MR defecography was performed 1 to 2 weeks after conventional defecography. The methods were compared with regard to their ability to diagnose anterior rectocele, internal mucosal intussusception with or without rectocele, and puborectal spasm. Additional abnormalities were also noted. **Results.** Comparison of conventional and MR defecography for their ability to diagnose anterior rectocele, internal mucosal intussusception, and puborectal spasm showed no significant differences between the 2 methods. The continuity correction ratio of the 2 methods for diagnosis of anterior rectocele, internal mucosal intussusception, and puborectal spasm was 0.146, 0.007, and 1.000, respectively. **Conclusions.** Although conventional defecography is the gold standard for diagnosis of rectocele, intussusception, and puborectal spasm, MR defecography has garnered considerable attention due to the lower radiation, increased safety, and higher incidence for diagnosis of another pathology, such as uterine diversion.

Keywords: magnetic resonance defecography; conventional defecography; outlet obstructive syndrome; rectocele; puborectal spasm

Introduction

Constipation is the most common symptom related to the gastrointestinal system. Three types of constipation have been differentiated: slow-transit colonic constipation, outlet obstruction, and a mixture of both [1, 2].

Outlet obstruction syndrome refers to all pelvic floor dysfunctions that are responsible for incomplete evacuation of fecal contents from the rectum [3]. Defecography is the first step for diagnosis of outlet obstruction and subsequent treatment planning. Conventional defecography allows reliable assessment of various morphologic and functional causes of outlet obstruction, including rectocele,

enterocele, internal mucosal intussusception, and anismus [4]. Although conventional defecography is the gold standard for diagnosis, it has some significant limitations, such as the use of high radiation and inability to detect soft tissue disorders [5].

On the other hand, magnetic resonance (MR) defecography has gained increasing interest for assessment of pelvic floor abnormalities. The free selection of imaging planes, good temporal resolution, and excellent soft tissue contrast has helped to transform this method into the preferred imaging modality for evaluation of patients with pelvic floor dysfunction [5].

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The purpose of our study was to compare conventional and MR defecography in patients who were admitted for outlet obstruction syndrome.

Materials and methods

This study was designed retrospectively. Patients who presented with constipation and were admitted to the general surgery outpatient clinic between January 2015 and January 2020 were included. Patients were evaluated according to Rome III criteria for constipation at admission. Colonic transit time was also evaluated and those with slow colonic transit were excluded.

Patients with normal colonic transit time were evaluated by conventional defecography followed by MR defecography. Conventional defecography was performed in the endoscopy unit by a general surgeon. Enema followed by 250 cc of barium was administered to patients and video of defecation was recorded.

MR defecography was performed by a radiologist 1 to 2 weeks after conventional defecography. Dynamic pelvic MR imaging was performed in the supine position, which can be achieved in almost all available closed-configuration MR imaging systems with horizontal access. Enema followed by 250 cc of barium was used to evaluate the rectum. Viscosity of the enema was arranged to be similar to that of normal rectal content.

Both methods were compared with regard to their ability to diagnose anterior rectocele, internal mucosal intussusception with or without rectocele, and puborectal spasm by a colorectal surgeon and radiologist. Additional abnormalities were also noted.

This retrospective study was approved by the Ethics Committee of the University of Health Sciences.

Number Cruncher Statistical System (2007; NCCS, Kaysville, Utah, USA) was used to compare the 2 procedures. P values < 0.05 were considered statistically significant.

Results

Twenty-eight patients who presented with constipation were included. There were 22 women and 6 men with a mean age of 42.5 years (range, 17–76 years).

Using conventional defecography, we detected anterior rectocele in 15 patients, internal mucosal intussusception in 22 patients, and puborectal spasm in 5 patients. Using MR defecography, we detected anterior rectocele in 9 patients, internal mucosal intussusception in 11 patients, and puborectal spasm in 6 patients. We also detected retroverted uterus in 3 patients and myoma uteri in 2 patients.

Comparison of conventional and MR defecography for their ability to diagnose rectocele, internal mucosal intussusception, and puborectal spasm showed no significant differences between the 2 methods. The continuity correction ratio of the 2 methods for diagnosis of anterior rectocele, internal mucosal intussusception, and puborectal spasm was 0.146, 0.007, and 1.000, respectively (P > 0.05 for all; tables 1–3).

Discussion

Functional outlet obstruction during defecation is one of the causes of chronic constipation. It is characterized by either paradoxical contraction, inability to relax the anal sphincter and/or puborectalis muscle, or impaired abdominal and rectal pushing forces [6].

Table 1. Anterior rectocele comparison

	MR Defecography	Conventional Defecography			p
		Negative, n (%)	Positive, n (%)	Total, n (%)	
Anterior rectocele comparison	Negative	10 (35.7)	9 (32.1)	19 (67.9)	0.146
	Positive	3 (10.7)	6 (21.4)	9 (32.1)	
	Total	13 (46.4)	15 (53.6)	28 (100)	

McNemar Test

Table 2. Internal mucosal intussusception comparison

	MR Defecography	Conventional Defecography			p
		Negative, n (%)	Positive, n (%)	Total, n (%)	
Internal mucosal intussusception comparison	Negative	4 (14.3)	13 (46.4)	17 (60.7)	0.007
	Positive	2 (7.1)	9 (32.1)	11 (39.3)	
	Total	6 (21.4)	22 (78.6)	28 (100)	

McNemar Test

Table 3. Puborectal spasm comparison

	MR Defecography	Conventional Defecography			p
		Negative, n (%)	Positive, n (%)	Total, n (%)	
Puborectal spasm comparison	Negative	18 (64.3)	4 (14.3)	22 (78.6)	1.000
	Positive	5 (17.9)	1 (3.6)	6 (21.4)	
	Total	23 (82.1)	5 (17.9)	28 (100)	

McNemar Test

Anterior rectocele and intussusception are 2 etiologic causes of outlet obstruction syndrome. Anterior rectocele, defined as rectal wall protrusion or bulging during defecation, is the most frequent anatomical abnormality in patients with pelvic floor disorders [7, 8]. Two pathogenetic mechanisms are involved in the formation of rectoceles: 1 — weakness of the rectovaginal septum, which is either congenital or develops following obstetric trauma, and 2 — chronic straining during defecation in patients with constipation. There is general agreement that only rectoceles with a sagittal diameter > 2 cm may result in outlet obstruction and/or the need for digital maneuvers to empty the rectum [9, 10]. A clinically significant rectocele should be considered based on the following criteria: patient history, sagittal diameter > 2 cm, retention of contrast medium, reproducibility of the patient's symptoms, and need for evacuation assistance [11]. Dynamic MR imaging enables accurate assessment of the size and location of a rectocele as well as the degree of rectal emptying. Enterocoele, another possible anatomical abnormality, is defined as internal herniation of the peritoneal sac into the rectovaginal space below the pubococcygeal line [12].

Different physiologic tests can be used to investigate this functional disorder, including the balloon-expulsion test, electromyography of the puborectalis muscle, and anorectal manometry. Defecography can be performed to rule out structural rectal abnormalities and provide an estimate of the degree of rectal emptying. Despite a combination of diagnostic tests and clinical history, defecography remains the gold standard for diagnosis of anterior rectocele, internal mucosal intussusception, and puborectal spasm [13]. MR defecography is a good alternative to conventional defecography due to several advantages, such as being performed without radiation and enabling simultaneous detection of additional malformations [14, 15].

Reiner et al described a spectrum of findings and the diagnostic value of MR defecography in patients referred for suspicion of dyssynergic defecation. Thus, MR defecography can detect functional and structural abnormalities that are helpful for establishing a diagnosis of dyssynergic defecation [16, 17].

Although MR imaging performed in the sitting position using an open-configuration MR imaging system would enable a more physiologic approach to defecation, the use of such systems is limited by their lack of availability. Furthermore, K.M. Bertschinger et al. [18] reported that no clinically significant findings were missed when comparing dynamic pelvic MR imaging in the supine vs sitting position. Dynamic pelvic MR imaging with patients in either position enables accurate assessment of the morphologic and functional causes of outlet obstruction. As dynamic MR imaging allows better evaluation of all pelvic compartments as well as various abnormalities associated with outlet obstruction, the method is a reliable alternative to conventional evacuation proctography [19].

Another study comparing clinical examination, videoproctography, and dynamic MR imaging for diagnosis of anterior rectocele was published by J.B. Delemarre et al. [20]. In their study, patients were examined in the prone position without any rectal enema, which made evaluation of the defecation process itself impossible. The pubosacral line

reaching from the most inferior part of the pubic symphysis to the lower part of the sacrum was selected as the reference line for MR imaging. Measurements were performed at rest and during straining for both imaging techniques.

D. Vanbeckevoort et al. compared colposcystoproctography (videoproctography with opacification of the vagina and bladder) and dynamic MR imaging in the supine position. For MR imaging, the rectum was filled with 100 mL of ultrasound gel, which was not meant to be voided. Measurements were taken during maximal straining using the pubococcygeal line as the reference line [21].

Our data on intussusception coincide with those found in the literature, in which there is underestimation of rectal intussusception when using MR defecography. However, in this study, the degree of underestimation was far smaller than that reported in previous comparative studies and, moreover, had a moderate concordance [22].

S. Cappabianca et al. compared conventional and MR defecography and emphasized that MR defecography had lower sensitivity for detection of pelvic floor disorders. However, they also noted that the less-invasive MR defecography may have a role in better evaluation of the entire pelvic anatomy and pelvic organ interaction, especially in patients with multicompartamental defects planned to undergo surgery [23]. In our study, there was no difference between the 2 methods for their ability to diagnose rectocele, but for intussusception, conventional defecography was better than MR defecography.

A.G. Schreyer et al. evaluated a wide range of normal findings in asymptomatic women using dynamic MR defecography. In their study, rectocele was diagnosed in 8 of 10 volunteers, showing an average diameter of 25.9 mm. Thus, based on the range of standard values in asymptomatic volunteers, MR defecography values for pathologic change have to be re-evaluated [24].

The relatively small number of patients in our study might be considered as a limitation. Furthermore, we did not compare MR imaging findings between healthy subjects and patients with dyssynergic defecation. Another potential limitation is the fact that MR defecography was not performed in the sitting position.

Conclusions

Although conventional defecography is the gold standard for diagnosis of rectocele, intussusception, and puborectal spasm, MR defecography has garnered considerable attention due to the lower radiation, increased safety, and higher incidence for diagnosis of another pathology, such as uterine diversion.

Additional information. The authors state that the article is original, has not been submitted for publication in other journals and has not yet been published either wholly or in part. The authors state that all authors are responsible for the research that all authors have designed and carried out; that all authors have participated in drafting and revising the manuscript submitted, whose contents we approve.

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Порівняння методів звичайної та магнітно-резонансної дефекографії для діагностики дисфункції тазового дна в пацієнтів з ожирінням

Резюме. Актуальність. Синдром обструкції належить до всіх дисфункцій тазового дна, які є причиною неповної евакуації калу з прямої кишки. Дефекографія — перший крок для діагностики зазначеного синдрому. Вільний вибір площин візуалізації, роздільна здатність та контраст м'яких тканин із кращою модальністю зображення вказують на переваги цього методу для оцінки дисфункції тазового дна. **Мета дослідження** — порівняння звичайної та магнітно-резонансної дефекографії в пацієнтів із синдромом обструкції прямої кишки. **Матеріали та методи.** Двадцять вісім пацієнтів, які страждали від запорів, із січня 2015 року по січень 2020 року були включені в дослідження. Магнітно-резонансна дефекографія проводилася через 1–2 тижні після звичайної дефекографії. Здійснювали порівняльний аналіз методів щодо їх здатності діагностувати патологічне випинання передньої або задньої стінки прямої кишки, що порушує евакуаторну функцію кишечника, ректальний пролапс, прямокишкову грижу,

дивертикул прямої кишки. **Результати.** Порівняння звичайної та магнітно-резонансної дефекографії за їх здатністю діагностувати переднє ректоцеле, інвагінацію внутрішньої слизової оболонки та спазм прямої кишки не доказало істотних відмінностей між двома методами. Статистичний коефіцієнт використання двох методів діагностики переднього ректоцеле, інвагінації внутрішньої слизової оболонки та спазмів прямої кишки становив відповідно 0,146, 0,007 та 1000. **Висновки.** Хоча звичайна дефекографія є золотим стандартом для діагностики ректоцеле, інвагінації внутрішньої слизової оболонки та пуборектального спазму, магнітно-резонансна дефекографія має переваги завдяки меншому радіаційному навантаженню, підвищеній безпеці та можливості виявлення патології репродуктивної сфери.

Ключові слова: магнітно-резонансна дефекографія; звичайна дефекографія; дисфункція тазового дна; ректоцеле; спазм прямої кишки

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Сравнение методов обычной и магнитно-резонансной дефекографии для диагностики дисфункции тазового дна у пациентов с ожирением

Резюме. Актуальность. Синдром обструкции принадлежит к дисфункциям тазового дна, которые являются причиной неполной эвакуации кала из прямой кишки. Дефекография — первый шаг для диагностики указанного синдрома. Свободный выбор плоскостей визуализации, разрешение и контраст мягких тканей с лучшей модальностью изображения указывают на преимущества этого метода для оценки дисфункции тазового дна. **Цель исследования** — сравнение обычной и магнитно-резонансной дефекографии у пациентов с синдромом обструкции прямой кишки. **Материалы и методы.** Двадцать восемь пациентов, страдающих запорами, с января 2015 г. по январь 2020 г. были включены в исследование. Магнитно-резонансная дефекография проводилась через 1–2 недели после обычной дефекографии. Осуществляли сравнительный анализ методов относительно их способности диагностировать патологическое выпячивание передней или задней стенки прямой кишки, нарушающее эвакуаторную функцию кишечника, ректальный пролапс, прямокишечную

грыжу, дивертикул прямой кишки. **Результаты.** Сравнение обычной и магнитно-резонансной дефекографии по их способности диагностировать переднее ректоцеле, инвагинацию внутренней слизистой оболочки и спазм прямой кишки не подтверждает существенных различий между двумя методами. Статистический коэффициент использования двух методов диагностики переднего ректоцеле, инвагинации внутренней слизистой оболочки и спазмов прямой кишки составил соответственно 0,146, 0,007 и 1000. **Выводы.** Хотя обычная дефекография является золотым стандартом для диагностики ректоцеле, инвагинации внутренней слизистой оболочки и пуборектального спазма, магнитно-резонансная дефекография обладает преимуществами благодаря меньшей радиационной нагрузке, повышенной безопасности и возможности выявления патологии репродуктивной сферы.

Ключевые слова: магнитно-резонансная дефекография; обычная дефекография; дисфункция тазового дна; ректоцеле; спазм прямой кишки