Tech Coloproctol (2013) 17:501–510
DOI 10.1007/s10151-013-0993-z

ORIGINAL ARTICLE

MR-defecography in obstructed defecation syndrome (ODS): technique, diagnostic criteria and grading

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Received: 29 August 2012 / Accepted: 22 February 2013 / Published online: 5 April 2013

Abstract
Background The aim of this study was to evaluate the use of a magnetic resonance (MR)-based classification system of obstructive defecation syndrome (ODS) to guide physicians in patient management.
Methods The medical records and imaging series of 105 consecutive patients (90 female, 15 male, aged 21–78 years, mean age 46.1 ± 5.1 years) referred to our center between April 2011 and January 2012 for symptoms of ODS were retrospectively examined. After history taking and a complete clinical examination, patients underwent MR imaging according to a standard protocol using a 0.35 T permanent field, horizontally oriented open-configuration magnet. Static and dynamic MR-defecography was performed using recognized parameters and well-established diagnostic criteria.
Results Sixty-seven out of 105 (64 %) patients found the prone position more comfortable for the evacuation of rectal contrast while 10/105 (9.5 %) were unable to empty their rectum despite repeated attempts. Increased hiatus size, anterior rectocele and focal or extensive defects of the levator ani muscle were the most frequent abnormalities (67.6, 60.0 and 51.4 %, respectively). An MR-based classification was developed based on the combinations of abnormalities found: Grade 1 = functional abnormality, including paradoxical contraction of the puborectalis muscle, without anatomical defect affecting the musculofascial structures; Grade 2 = functional defect associated with a minor anatomical defect such as rectocele ≤2 cm in size and/or first-degree intussusception; Grade 3 = severe defects confined to the posterior anatomical compartment, including >2 cm rectocele, second- or higher-degree intussusception, full-thickness external rectal prolapse, poor mesorectal posterior fixation, rectal descent >5 cm, levator ani muscle rupture, ballooning of the levator hiatus and focal detachment of the endopelvic fascia; Grade 4 = combined defects of two or three pelvic floor compartments, including cystocele, hysterocele, enlarged urogenital hiatus, fascial tears enterocele or peritoneocele; Grade 5 = changes after failed surgical repair abscess/sinus tracts, rectal pockets, anastomotic strictures, small uncompliant rectum, kinking and/or lateral shift of supra-anastomotic portion and pudendal nerve entrapment.
Conclusions According to our classification, Grades 1 and 2 may be amenable to conservative therapy; Grade 3 may require surgical intervention by a coloproctologist; Grade 4 would need a combined urogynecological and coloproctological approach; and Grade 5 may require an even more complex multidisciplinary approach. Validation studies are needed to assess whether this MR-based classification system leads to a better management of patients with ODS.

Keywords Obstructive defecation syndrome · MR-defecography · Surgical strategies in pelvic floor disorders · Clinical impact of imaging techniques

Introduction

Magnetic resonance (MR) proctography, first described by Lienemann in 1997 [1], is currently considered a well-established diagnostic tool in patients with functional constipation associated with difficulty in evacuation,

This article is discussed in the editorial available at doi:10.1007/s10151-013-0995-x.

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excessive straining at stool and obstructive defecation syndrome (ODS). Without exposing the patient to harmful ionizing radiation (women of reproductive age are more frequently affected than men), the examination can routinely be performed by most conventional horizontally oriented MR systems, even though rectal evacuation is more comfortably obtained in the sitting position. While there is general agreement that a paradoxical contraction of the puborectalis muscle during evacuation revealed by imaging techniques virtually indicates the need for conservative treatment and biofeedback training [2], there is still an extensive debate on whether or not rectocele and recto-anal intussusception should always be treated surgically [3, 4]. Moreover, to add a note of confusion to the issue of management, in case of coexistence of pelvic floor defects [5], there is a further challenge for surgeon since he/she must decide which compartment should be repaired first.

Thank to its multiplanar capabilities, panoramic views and speed, magnetic resonance imaging (MRI) can now be used for evaluating the entire pelvic floor anatomy in a dynamic way [6–9] so as to assist the clinician when planning treatment in single cases. Unfortunately, the true usefulness of the examination in patients with ODS has not been established yet.

The aim of this study was to assess our experience of the last 8 months with a recent refinement of a previously described technique and MR-based grading system [10] developed to assist in clinical decision-making and in the treatment for ODS.

Materials and methods

Patients

The medical records and imaging series of 105 consecutive patients (90 female, 15 male, aged 21–78 years, mean age 46.1 ± 5.1 years) referred to our diagnostic center between April 2011 and January 2012 for symptoms of ODS, that is, difficulty in expulsion, straining at stool for more than 25 % of the time, prolonged toilet time, hard feces and need for self-digitation, were reviewed. ODS symptoms were diagnosed in all cases by the referring physician on the basis of medical history and clinical examination. Using the Rome III criteria [11] we excluded patients with symptoms suggestive of constipation not secondary to ODS that is, lumpy stools, stools rarely loose without laxatives and fewer than three defecations per week. We also excludedpatients with irritable bowel syndrome (IBS), i.e. recurrent abdominal pain and/or discomfort 3 days/month for the past 3 months associated with two of the following: (a) improvement with defecation and (b) onset associated with change in stool frequency and/or stool form including also IBS-C subtype. C3 days/month for the past 3 months associated with two of the following: (a) improvement with defecation and (b) onset associated with change in stool frequency and/or stool form including also IBS-C subtype were excluded. The severity of each ODS symptom (see Table 1) was classified according to the Altomare classification [12] depending on the mean time spent in the toilet, the number of attempts to defecate per day, the use of digitation to assist evacuation, as well as that of laxatives and enemas, the percentage of time with straining at stool and stool consistency. Additional investigations included anorectal manometry, ano-proctoscopy and electromyography or biopsy, when needed. Overall, 15 women had had total or partial hysterectomy with and without oophorectomy for benign pathologies including uterine myoma and ovarian cyst, and 25 patients (20 females and 5 males) were examined because of recurrent symptoms of ODS after failed surgical repair with the stapled transanal rectal resection (STARR) procedure. In the latter group, which was considered apart due to its peculiarity, additional symptoms included a combination of the following: pain, urgency, dyspareunia, reduced control of liquid stools and gas.

MR-defecography was performed by the same radiologist (VP) who was trained in dynamic imaging of pelvic floor dysfunctions with X-ray defecography, perineal ultrasonography and dynamic pelvic MRI, taking into account the conclusions of a previous paper suggesting the impact of findings at conventional defecography on clinical decision-making [13].

Imaging technique

MRI was performed according to a standard protocol using a 0.3 T permanent field, horizontally oriented open-configuration magnet (Airis Vento; Hitachi Medical Systems, Genoa, Italy) equipped with high-speed gradients (max GC, 22mT/m; max SR, 55T/m/s) and solenoid-shaped four-channel surface phased-array (Body FLEX) coils wrapped around the patient's pelvis, measuring 120 or 150 mm depending on body size.

After careful patient coaching by two skilled technicians (P.T and M.V) just before performing the study, a standard interactive imaging technique was used as follows: while lying on his/her left side, the patient is positioned on the MRI gantry with knees flexed and a proof pad placed beneath the exposed buttocks to collect any material. A rectal tube is then inserted through the anus as a luminal marker and for subsequent contrast administration without interruption during scanning or patient movement.

Static T2-weighted images of the pelvic region were acquired first in the axial, coronal and sagittal plane to provide complete anatomic evaluation using a driven equilibrium (DE) FSE pulse sequence (TR/TE, 3,400/

Table 1 The obstructed defecation syndrome scoring system adopted in the current study

Clinical features	Score			
	1	2	3	4
Mean time spent at lavatory (min)	6–10	11–20	21–30	>30
Attempts to defecate/day (no)	2	3–4	5–6	>6
Digitation (no)	>1/month, <1/week	1/week	2–3/week	Every defecation
Use of laxatives (no)	>1/month, <1/week	1/week	2–3/week	Every day
Use of enemas (no)	>1/month, <1/week	1/week	2–3/week	Every day
Incomplete defecation (no)	>1/month, <1/week	1/week	2–3/week	Every defecation
Straining at stool (%/time)	<25	<50	<75	Every defecation
Stool consistency	Hard	Hard and few	Fecaloma	

According to Altomare et al. [12]

120 ms; FA, 90° FOV, 35 cm; slice thickness, 6 mm; interslice gap, 0.5 mm; matrix size, 288 × 224; BW, 24.1 kHz.; echo train length, 12; NEX 1; acquisition time, 4.40 min; number (no) of images, 25). Thereafter, 180 mL of ultrasound gel mixed with 1.5 mL of gadopentetate dimeglumine was injected as rectal contrast material via the previously positioned rectal tube. This figure, which corresponds to the average rectal capacity in normal subjects, proved pertinent either to obtain sufficient distal gut visualization up to the sigmoid colon or to concurrently determine the urge to evacuate in the large majority of the patients. After probe withdrawal, dynamic images were obtained at rest, on squeezing and maximal straining in the midsagittal plane using a T1-weighted RF-spoiled SARGE (RSSG) pulse sequence (TR/TE, 10/3.7 ms; FA, 60°; FOV, 34 cm; section thickness, 20 mm; interslice gap, 10; matrix size, 256 × 180; BW, 60.0 kHz; NEX, 1; acquisition time, 1.23 min; no of images, 24) and BASG pulse sequence (TR/TE, 8.8/4.4; FA, 60; FOV, 340; section thickness, 20; gap, 10; matrix size, 256 × 180; NEX, 1; acquisition time, 36 s; no of images, 12). Before moving through the evacuation portion of the examination, the patient is instructed to start the movement at will and indicate this by intercom to allow for contemporary acquisition of images by the examiner. All patients were given the choice of undergoing the expulsion test in either prone or supine position. Also, using real-time image reconstruction, the examiner could constantly monitor, instruct or encourage the patient and ensure performance of desired maneuvers. The same sequence is then repeated during evacuation in the coronal plane centered over the anorectal junction on the basis of sagittal images. Finally, three to six parallel, contiguous 1-cm-thick sections, using a FSE pulse sequence (TR/TE, 1700/140; FA, 90°; echo train length, 16; acquisition time, 16 s), are obtained in the axial plane starting just above pubic symphysis down to the level of the anal margin to image the levator hiatus during the Valsalva maneuver, regardless of further expulsion of rectal contrast. All the dynamic series are then shown in cine loop and recorded on videotape.

Image analysis

According to the literature, images are analyzed with regard to the presence of mucous prolapse, paradoxical contraction of puborectalis muscle, enterocele, anterior or posterior rectocele, intussusception, rectal descent, bladder descent and vaginal vault descent [14–16]. Enterocele is defined as herniation of the pelvic peritoneum beyond the normal confines of the cul-de-sac. It may contain fat, small bowel or sigmoid colon. The positions of pelvic organs are related to the pubococcygeal line. This is defined as a line joining the inferior border of the symphysis pubis to the last coccygeal joint. Rectocele is defined as an abnormal outpouching of the rectum involving most frequently the anterior wall and extending more than 2 cm anterior to a line drawn through the anterior aspect of the anorectal junction. Rectocele is graded as small if it measures less than 2 cm in depth, moderate if it measures 2–4 cm and large if it measures 4 cm or more. Lateral or posterior bulging of the rectum, occurring in areas where there is weakness of the levator ani muscle, can also be observed, though less frequently. Intussusception is defined as a circumferential infolding of the rectal wall that descends toward the anal canal and differs in thickness depending on the presence of wall's components (mucosal or mural). According to Roos [9], the intussusception may remain intrarectal, extend into the anal canal or even pass the anal sphincter eventually leading to an external rectal prolapse. Therefore, according to the widely used system at defecography, the corresponding grading adopted was as follows: In Grade 1 intussusception, the head of intussuscipiens does not overcome the upper third of the anal canal;

in Grade 2, it reaches the proximal two-thirds; in Grade 3, it is seen to impinge on the distal third; and in Grade 4, it passes beyond the anal verge. In addition, we defined the intussusception as *reducible* when it disappeared at the end of the evacuation, either spontaneously or due to voluntary squeezing by the patient, and *unreducible* if it could only be reduced manually.

Paradoxical contraction of the puborectalis muscle is defined as a persistent impression at the posterior aspect of the anorectal junction and thickening of the muscle during defecation of rectal contrast. External anal sphincter (EAS) dyssynergia is also occasionally seen on the antero-posterior view as a lack of anal canal widening together with a weak barium stream revealing a narrow and more or less symmetrical internal lumen. Additional features include (a) prolonged evacuation time; (b) contrast retention after repeated attempts; and (c) associated anterior rectocele sliding below the puborectalis sling.

Quantification of pelvic floor relaxation and visceral prolapse on sagittal MRI is performed according to Comiter et al. [14] using the HMO classification system, where the "H-line" (levator hiatus) measures the distance from the pubis to the posterior margin of the external anal orifice, the "M-line" (muscular pelvic floor relaxation) measures the descent of the levator plate from the pubococcygeal line, and the "O" classification (organ prolapse) characterizes the degree of organ dislocation below the reference line. The urogenital hiatus width, shape and geometrical configuration are also analyzed according to Tunn and DeLancey [17] on key axial and coronal images for evidence of focal defects affecting pelvic organ support system, ligament complex, endopelvic fascia and levator ani (LA) muscle. More particularly, the following anatomical defects occurring in the LA components are noted: (a) focal thinning/attenuation/asymmetry, (b) tear or discontinuity, (c) fibrofatty degeneration, (d) fascial detachment; and (e) hernia of the fat recesses. According to Dietz [18], a hiatal area of less than 25 cm^2 on Valsalva maneuver was considered to be associated with normal pelvic floor support, 30–34.9 cm^2 with mild organ prolapse, 35–39 cm^2 with moderate organ prolapse and 40–50 cm^2 with severe organ prolapse. Finally, the diagnosis of pudendal nerve neuropathy relies on the presence of one or more of the following features: increased MRI signal intensity, mechanical distortion of the nerve at any point along its course consistent with nerve entrapment and focal increase in the nerve caliber and/or stricture.

Results

MR-defecography was well tolerated by 95/105 (90 %) patients who found the diagnostic setup sufficiently comfortable. Despite the open-configuration type of magnet, 3/105 (3 %) patients mentioned that the MRI unit was somewhat claustrophobic. Sixty-seven out of 105 patients (64 %) found the prone position to be more suitable than the supine one for the evacuation study, and a total of 10 were unable to successfully empty their rectum regardless of the position assumed on the diagnostic table.

Table 2 lists the most relevant pathological conditions found in the patients examined, 95 of whom (90.4 %) actually evacuated the contrast (more than one abnormality in over 81 % of cases). The static portion of the examination allowed identification of pathologic conditions not otherwise visible such as focal attenuation of the LA, partial muscular and fascial detachment, distortion of vaginal configuration and discontinuity of urethral and paraurethral supporting ligaments which were best depicted in the axial plane. More particularly, close comparison between images taken at rest and on straining by the same scan plane proved critical when assessing and measuring the enlargement of the hiatus size, that is, >25 cm^2, and focal derangements of its boundaries.

Depending on the combination of abnormalities seen at MR-defecography, each case could be classified according to a recent refinement of a previously described classification system of ODS [10] as follows (Table 3): *Grade 1* was assigned in the presence of a simple functional defect, that is, paradoxical contraction of the puborectalis muscle,

Table 2 List of abnormalities[a] seen at static and dynamic MR-defecography in 105 consecutive patients with ODS

Finding	No	%
Increased hiatus size (>25 cm^2)	71	67.6
Rectocele (2–4 cm in size)	63	60.0
Levator ani muscle damage		
Minor	54	51.4
Major	51	48.5
Distortion of vaginal configuration	39	37.1
Detachment of endopelvic fascia	38	36.1
Urethral support system defect	35	33.3
Residue of contrast >½[b]	33	31.4
Intussusception	18	17.1
Puborectalis dyssynergia	16	15.2
Anastomotic stricture/kinking/deformity	12	11.4
Cystocele	10	9.5
Enterocele	7	6.6
Genital prolapse	6	5.7
Pudendal nerve neuropathy	6	5.7
Peritoneocele	4	3.8

ODS obstructive defecation syndrome

[a] Multiple findings for each patient; [b] after no less than four consecutive attempts

weak contrast stream or no emptying at all and no anatomical defect affecting the muscular and fascial structures (Fig. 1); *Grade 2* was assigned when one or more *Grade 1* functional defects were associated with minor anatomical defects, that is, rectocele equal or less than 2 cm in size, first-degree intussusception and focal damage of the LA such as discontinuity (Fig. 2), scarring, attenuation, thinning and fatty degeneration; *Grade 3* was assigned in the presence of more severe defects confined to the posterior anatomical compartment, that is, rectocele greater than 2 cm in size, second-, third- and fourth-degree intussusception (Fig. 3a, b), full-thickness external rectal prolapse, poor mesorectal posterior fixation, rectal descent >5 cm, LA rupture, balooning of the levator hiatus and focal detachment of the endopelvic fascia; and *Grade 4* was assigned if multiple anatomical defects were visible in the three compartments of the pelvic floor (Fig. 4a, b), that is, disruption of the perineal body, cystocele, hysterocele and an enlarged urogenital hiatus, fascial tears, enterocele and peritoneocele. With respect to the prior version of the classification [10], *Grade 5* was added to indicate evidence of any abnormality associated with symptom recurrence and/or worsening after failed surgical repair for ODS, including one or more of the following: abscess/sinus tracts, rectal pockets, anastomotic strictures, small uncompliant rectum, kinking and/or lateral shift of supra-anastomotic portion, and pudendal nerve entrapment (Fig. 5a, b).

Although beyond the scope of this paper, a comparison between the Altomare clinical score for ODS [12] and the current 1–5-point MR-based grading system obtained in the observed population was attempted and is reported in Table 4.

Discussion

Until recently, the issue of providing the clinician with a validated tool, that is, a score system, to quantify the severity of ODS allowing evaluation of the efficacy of surgical and medical therapy has received only few mentions in the literature. With the exception of the ODS score and structured eight-item questionnaire by Altomare et al. [12], most of the widely used systems, such as the Cleveland Clinic Constipation score, the Patient Assessment of Constipation score and the Knowles Eccersley Scott System score, are more related to any form of constipation and do not address symptoms specific to obstructed defecation [19, 20]. As such, they are not suitable for monitoring the effect of therapy for ODS. The results of treatment reported in the literature are often controversial. Many different surgical approaches have been proposed, including transvaginal, endorectal and abdominal, using different techniques which have almost always produced apparently good short-term results. However, long-term results suggest that no more than half the patients with ODS treated with surgery have their symptoms completely resolved in the long term, whatever the treatment. One of the reasons for these conflicting results is lack of a common base for evaluating patients using a validated disease-specific questionnaire and/or objective tool. Until recently, the radiologist was involved only marginally in the evaluation and management of patients with ODS. After history taking, physical examination and anoscopy/proctoscopy, eventually leading to evidence of rectocele and intussusception, conservative treatment was administered for no less than 6 months, before surgical treatment was offered. The description of a simple radiologic technique with the patient seated on a commode, called defecography, almost three decades ago [21–23], opened up the study of the rectal expulsion to diagnostic imaging, improving disease management. At the time of its introduction, this examination represented a definite step forward giving information on the completeness and speed of the emptying phenomenon associated with various abnormalities such as rectocele, intussusception and mucous prolapse. However, due to the marked overlap of abnormal defecographic findings between different patient groups as well as between patients and healthy controls, the clinical relevance of the examination has been put in doubt and the question of whether or not a specific treatment could be instituted on the basis of the information obtained remained unanswered for many years. Currently, the true impact of defecography on clinical decision-making has not yet been established, the most widely accepted opinion being that its main value is as a simple exploratory method for selecting patients who require admission to biofeedback and pelvic floor reeducation (puborectalis dyssynergia) versus those who require surgery (large rectocele/intussusception) [13]. Another recognized disadvantage of contrast radiography is that, to augment the diagnostic performance of the examination, simultaneous administration of contrast material into the vagina, small bowel and bladder is often necessary in order to properly depict pelvic organ prolapse and in an attempt to visualize surrounding soft tissue structures. This, however, inevitably introduces an element of concern about technical challenges and associated risks which, in turn, prevent incorporation of this method into clinical practice in most institution. MRI seems to offer some advantages over defecography and a superior clinical relevance. In both techniques, the rectum is filled with contrast material, and the dynamic performances during the emptying phase are quite similar in regard to detection of the most common abnormalities including rectocele, intussusception and rectal prolapse despite the non-physiological (horizontal) position assumed by the patient at MR-defecography as opposed to the sitting position

Table 3 MRI-based classification in 105 patients with ODS: grading, characteristics and impact on therapy planning

Grade	No	Category	MR features	Therapeutic options
1	17	Simple functional	Puborectalis dyssynergia	Pelvic floor rehabilitation
			EAS dyssynergia	
2	21	Same as 1 + minor anatomical defects	Rectocele ≤2 cm	Pelvic floor rehabilitation
			First-degree intussusception	
			Mucous prolapse	
			Focal LA defects <1 cm	
3	12	Same as 2 + major anatomical defects of posterior compartment	Rectocele >2 cm or trapping	Surgical (coloproctological)
			Second-, third- and fourth-degree intussusception	
			Rectal floor descent >5 cm below PCL	
			Focal LA defects ≤1 cm	
4	30	Same as 3 + major anatomical defects in all three compartments	Multiple pelvic organ prolapse	Surgical (urogynecological and coloproctological)
			Multifocal LA defects >1 cm	
			Detachment of endopelvic fascia	
5	25	Surgical failure[a]	Anastomotic stricture/deformity; reduced rectal capacity	Multidisciplinary approach
			Rectal pockets; sinus tracts; granulomas	
			Persistent rectocele/intussusception	
			Difficult emptying/contrast retention	
			Distortion of vaginal shape	
			Pudendal nerve neuropathy	

The classification consists of five grades and relies on the anatomy seen at MR imaging in axial, coronal and sagittal planes of patients evaluated before (Grade 1–4) or after (Grade 5) surgical repair

MR magnetic resonance imaging, *ODS* obstructive defecation syndrome, *PCL* pubococcygeal line taken as reference point, *LA* levator ani muscle, *EAS* external anal sphincter

[a] ODS recurrence after stapled hemorrhoidectomy ($n = 8$), and stapled transanal rectal resection ($n = 17$)

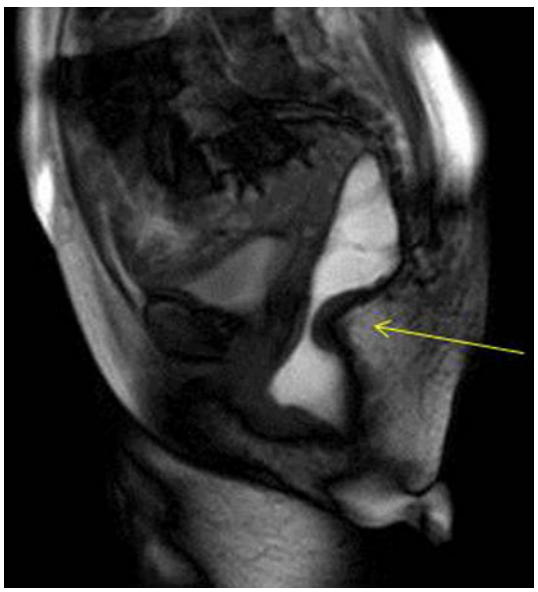

Fig. 1 Grade 1 ODS: MR-defecography. Midsagittal BASG pulse sequence (TR/TE, 8.8/4.4 ms; FA, 60°; thickness, 20.0 mm; acquisition time, 36 s) showing paradoxical contraction of the puborectalis muscle (*arrow*) and no evidence of anatomical defects on static pelvic floor MRI (not shown)

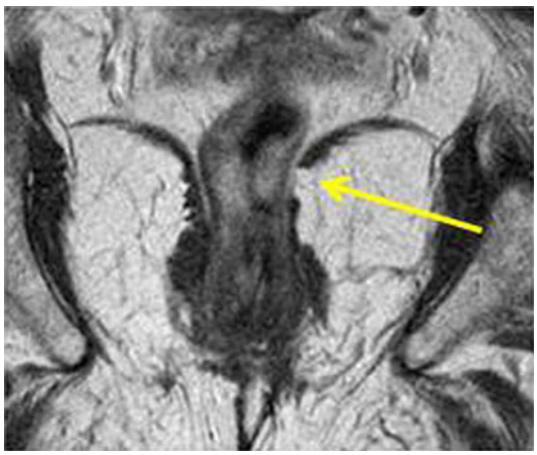

Fig. 2 Grade 2 ODS: A focal defect affecting the left iliococcygeal muscle (*arrow*) was shown on the coronal T2-weighted MRI image of the pelvis in this 36-year-old woman with ODS and a small rectocele (not shown)

during fluoroscopic defecography. With MR-defecography, besides the lack of ionizing radiation and a more reproducible measurement of recognized parameters such as the

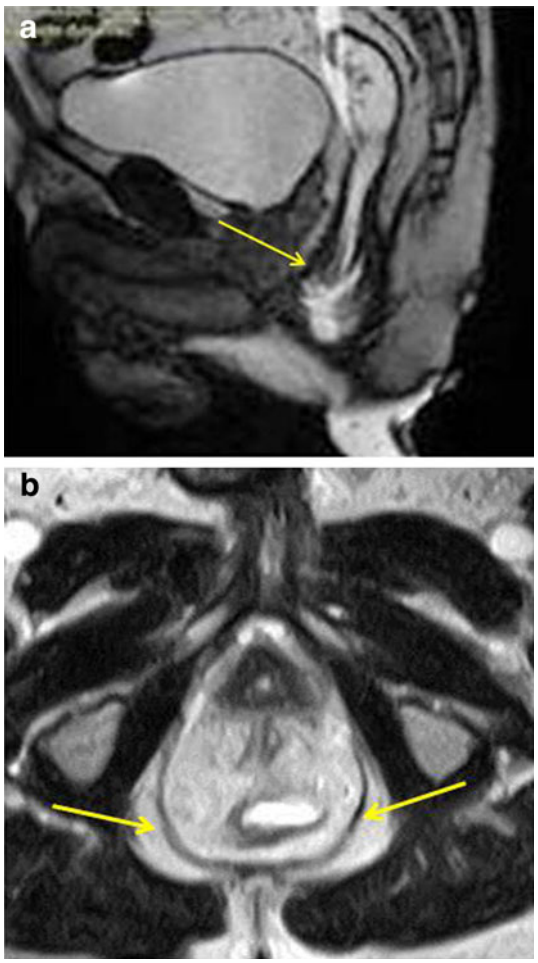

Fig. 3 Grade 3 ODS: MR-defecography (**a**) in a 53-year-old man with rectal intussusception starting at the point of fascial detachment (*arrow*) combined with an enlarged urogenital hiatus (*arrows*) visible on the axial FSE T2-weighted plane during straining (**b**)

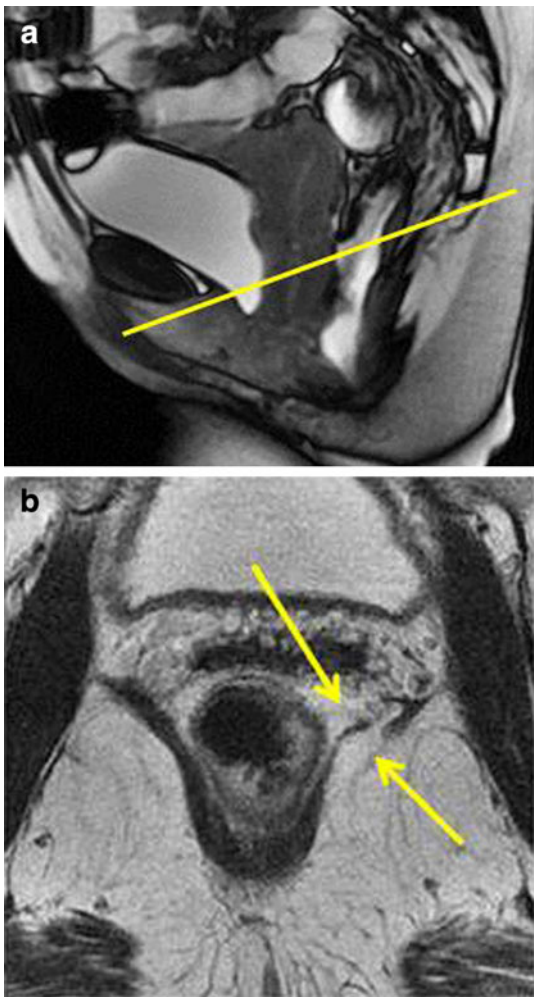

Fig. 4 Grade 4 ODS: MR-defecography in a nulliparous 34-year-old woman. Note the multiple pelvic organ prolapse (**a**) below the pubococcygeal reference line on straining and the extensive tear (*arrows*) of the ventral half of the left pubococcygeal muscle (**b**)

anorectal angle, pelvic organ descent on straining and rectocele depth, assessment of adjacent structures and spaces is possible without additional administration of contrast material. In particular, the chosen amount of 180 mL of rectal contrast proved adequate to depict all cases of pelvic organ impingement on the levator hiatus on straining so that in no case was the so-called crowded pelvis syndrome observed. The natural soft tissue contrast inherent in the technique allows visualization of the bladder, small bowel, female internal genital organs, fat recesses, muscles and ligaments. Not by chance, in the vast majority of our patient population, MR-defecography was able to demonstrate occult anatomical defects affecting the integrity of the endopelvic fascia, the paravaginal attachments and the LA not otherwise visible, with potential impact on clinical decision-making. This was particularly true in those patients who exhibited symptom recurrence or even worsening of their ODS after the failure of STARR, due to de novo complaints such as dyspareunia, intractable pain and fecal urgency. MR-defecography proved critical to revealing not only the rate of persistent changes such as the lack of speed and effectiveness of evacuation, the trapping of contrast media, the limited reduction in depth of the rectocele and any persistence of intussusceptions, but also a wide spectrum of additional abnormalities highly consistent with those new complaints : a reduced rectal capacity, perianastomotic asymmetric stricture and fibrosis, multinodular granulomas, dynamic kinking at the anastomotic site, scarring of the rectovaginal septum, thickening of the vaginal wall and partial obliteration of the vaginal lumen, abnormal signal intensity and focal defects of the puborectalis muscle, chronic fluid collection in the pouch of Douglas and pudendal nerve involvement. While defecography is the most traditional of the radiologic techniques used to define the pre- and postoperative anatomy in ODS patients [24], it often fails to directly visualize

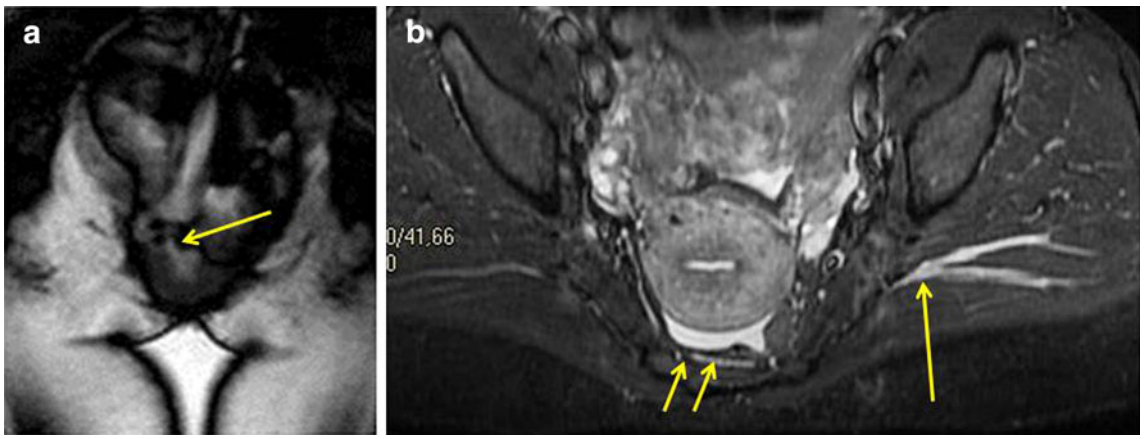

Fig. 5 Grade 5 ODS: 36-year-old woman with persistent straining at stool, urgency, feeling of incomplete emptying, dyspareunia and chronic pelvic pain 2 years after failed repair with STARR : at MR-defecography in the coronal plane, anastomotic stricture and kinking on emptying (*arrow*) in a small, uncompliant rectum (**a**); chronic fluid collection (*double arrows*) and pudendal nerve neuropathy (*long arrow*) on the left side are visible on this axial STIR image (**b**)

Table 4 Comparison of the proposed MR-grading system with the Altomare score [12] for ODS in the patient population

	ODS score 1	ODS score 2	ODS score 3	ODS score 4	
Number of patients					
MR grade 1	5	4	6	2	17
MR grade 2	8	4	3	6	21
MR grade 3	1	2	4	5	12
MR grade 4		9	14	7	30
MR grade 5		3	5	17	25
Total	14	22	32	37	**105**

Bold value indicates the total number of cases considered

MR magnetic resonance imaging, *ODS* obstructed defecation syndrome

those changes affecting the pararectal space. Conversely, thanks to imaging capabilities in the sagittal, coronal and axial planes, MR-defecography is proving to have a significant role in diagnosis due to the superior anatomic details visualized and greater concordance with patients' complaints.

Despite poor correlation with the severity of ODS complaints (see Table 4) and, to date, a lack of clinical validation by surgically proven cases with documented long-term outcome, the MRI-based classification described here is easy to use because it utilizes anatomic landmarks familiar to both radiologists and coloproctologists. Moreover, its application relies on simple evaluation of recognized diagnostic criteria and robust and reproducible discriminators which are useful for patient management: It can be maintained that ODS patients with a G*rade 1 and 2* MRI pattern require simple conservative therapy and rehabilitation; those with a *Grade 3* pattern require specific proctologic surgery; those with a *Grade 4* pattern require surgical treatment consisting of a combined urogynecological and coloproctological approach. Following our prior experience with surgical cases, especially cases where there was concern about residual disease activity, postoperative abscess formation and healing inflammatory tissue, granulomas and scarring, we reappraised our prior 1–4-point system and added a *Grade 5* pattern which characterizes those patients who need even more complex management by an expert multidisciplinary team. In our experience, the possible impact on clinical decision-making was assessed by asking the referring physician to fill in a standard form indicating his/her treatment plan before (1st clinical decision) and after (2nd clinical decision) reading the MR-based ODS classification described above (data not shown). The vast majority of clinicians (>75 %) reported that they then chose a different therapeutic option, the most frequent being non-surgical treatment. In addition, even in those cases requiring surgery, the diagnostic yield of MRI proved critical when choosing the most appropriate procedure. In particular, in the presence of rectocele, which was the most frequent finding in our series, MR-defecography was capable of identifying specific sites of damage on the basis of anatomical observations, allowing differentiation between those defects occurring in the middle vaginal support with intact perineal body (which required simple plication of the rectovaginal fascia) and those with separated fibers of the perineal body (which required in addition retrieval and reuniting of the fibers) [25]. Finally, when addressing the role of transperineal ultrasound as an alternative to defecography in coloproctological disease and pelvic prolapse syndromes, many contributions have highlighted the potential of this noninvasive technique in a number of clinical applications including ODS. However, while just focussing on the perineum provides useful

information, it can be argued that ultrasound assessment may have to include rectal voiding to become a valuable examination in coloproctology, since trapping in rectocele, full-thickness intussusception and puborectalis or anal dyssynergia occur only when the rectum is stressed maximally by evacuation. Therefore, the lack of the expulsion of rectal contrast by sonographic techniques should still be considered a fundamental limitation as opposed to their well-established diagnostic value in the assessment of pelvic floor anatomy, particularly when three-dimensional (3D) ultrasound is available, with comparable results to MRI studies in the diagnosis of focal defects of the LA, total avulsion, detachment of paravaginal fascia and levator hiatus enlargement.

Conclusions

When imaging the anorectum in patients with evacuation disorders, the radiologist is no longer asked to simply provide an anatomical map of existent abnormalities. Rather, in order to expand the clinical utility of the examination, it is important to indicate which treatment option is more appropriate in individual cases.

The excellent soft tissue contrast and improved temporal resolution obtained in the last 15 years have made pelvic MRI an attractive alternative to fluoroscopy in proctology. In addition, significant technical improvements have recently been implemented with modern MRI systems which allow the radiologist to interactively control the position and patient performance, while images are reconstructed and displayed on a video console in almost real time. A major drawback of this method remains the immobile architecture of currently available systems, which limit the patient position to the horizontal plane. Today, careful patient coaching seems to be the single most important factor affecting a successful examination, followed by standardization of the procedure and close cooperation with the technical staff. Besides the analysis of defecation dynamics, a feature unique to MRI technique is the ability to display the pelvic anatomy in the axial plane which is critical for imaging the integrity of organ support structures such as the levator ani muscle, ligaments and fascia and fat recesses. The additional value of the other two planes for identification of anatomical defects should also be emphasized. When considering the issue of the influence of the diagnostic yield obtained by the examination on the subsequent treatment, the adoption of the classification system described in this article seems promising. In our center, further work is in progress with MRI grading of ODS to assess whether or not its use permits a more systematic study of surgical strategies and is associated with a satisfactory outcome.

Conflict of interest None.

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