

Type I and Type II Rectocele in Patients with Obstructed Defecation Syndrome (ODS), as Seen at MR-Defecography

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Abstract

Background: Current classification and grading systems of rectocele in use have so far failed to help clinicians in planning therapy.

Aim: To ascertain whether or not MR-defecography can contribute solve the problem of decision making.

Materials and Methods: The imaging series of thirty-seven consecutive women (aged 26 - 83 years, mean 57.6 ± 4.6 , median 66.8 yr), referred to MR-defecography for ODS between January and May 2020, were reviewed blinded to their clinical findings. Standard MR examination included static and dynamic image acquisition in the sagittal, coronal and axial planes, after injection of acoustic gel as contrast into the vaginal canal and rectum with a half filled bladder. Image analysis of rectocele included its overall shape, size, descent and kinematic development, as well as the diameter and alignment of the two connecting segments located above and below the outpocketing. Any bulge occurring in sites other than the anterior rectal wall, namely the posterolateral aspect, were considered trans-levator hernia. Once image analysis is over, clinical data are examined for comparison and association of symptoms.

Results: On emptying, two types of rectocele were discovered by MR imaging showing different features, as follows: Type I (21/37, 56.7%), which mimicked the shape of a sand glass showing a posterior angle of about 90 degrees located at the inlet of the levator ani hiatus; and Type II (16/37, 43.2%), showing a smoking-pipe shape with an average posterior angle of 140 ± 6 degrees, greater descent relative to the hymen plane taken as reference and association with various pelvic organ prolapse. Type I and Type II rectoceles were also different for their emptying pattern (delay time in starting the movement, number of attempts, site of trapping and total amount of contrast retained), rather than for their size and descent of their lowermost border on straining. Besides a sensation of pressure in vagina - present in both groups, symptoms most frequently associated with Type I rectocele (19/21, 90.4%) included tenesmus, perianal discomfort, straining defecation, hard feces and pain at intercourse; those associated with Type II rectocele (11/16, 68.7%) included split evacuation, feeling of incomplete emptying, mucous discharge and rectal bleeding, need for digitation or manual support to assist the evacuation, pelvic organ prolapse and lower urinary tract symptoms.

Conclusion: By virtue of the two different patterns reported above, MR-defecography may offer better help to clinicians when deciding the optimal treatment of rectocele, whether surgical or conservative.

Keywords: Rectocele; MR-Defecography; Decision Making; Surgical Repair; Biofeedback Treatment; Obstructive Defecation

Introduction

The term rectocele is commonly used to describe an out pocketing of the anterior rectal wall which herniates into the posterior vaginal wall of women while straining as during evacuation [1]. Less frequently, rectocele has occasionally been reported also in males, after pros-

tatectomy [2]. The abnormality is universally considered a defect of the endopelvic fascia determining a separation of the rectovaginal septum which is, most frequently, subsequent to child birth trauma or chronic straining at stool.

While small rectoceles cause no signs or symptoms, the larger the size, the more likely the start and number of complaints, including a sense of pressure/protrusion into the vagina leading to discomfort or pain on evacuation and at intercourse, symptoms of obstructed defecation and feeling of incomplete emptying. Digital evacuation or manual sustainment of the hymeneal plane to help bowel movement are also admitted by the majority of patients. In severe cases, bulging through the vaginal opening or intermittent external prolapse and vaginal bleeding, are also referred.

Usually, the diagnosis of rectocele relies on pelvic examination of the vaginal and ano-rectal region by the gynecologist or coloproctologist who try to determine its size and location so as to guide treatment decisions. Only rarely, if ever, the physician recommends imaging tests to confirm the size of the bulging and determine how efficiently the rectum empties. Still today, however, neither the symptom's characteristics, the size of rectocele, nor its anatomic location have been proven valid criteria for choosing with certainty the best treatment of the lesion, whether surgical or conservative. The current paper was carried out in the hypothesis that MR-defecography, the most powerful imaging tool available today, might help clinicians in the difficult phase of decision-making, provided it is able to obtain one or two patterns specific enough to show high discriminatory capability.

Materials and Methods

The imaging series of thirty-seven women, (aged 26 - 83 years, mean 57.6 ± 4.6 , median 66.8 yr), referred to the Diagnostic Imaging Center of Affidea-Iniziativa Medica (Monselice, Padua, Italy) between February and May 2020 to undergo MR-defecography, were reviewed. Of them, 10 (27.02%) were nulliparous and 27 (72.9%) parous, of whom 25 gave birth by vaginal delivery (seven primiparous, twenty multiparous, average number of deliveries 1.8, range 2 - 5) and two by cesarean section. Twelve patients also had had total hysterectomy. At physical examination, a symptomatic rectocele was present in all cases with complaints including a combination of the following: sensation of pressure in vagina, evacuatory difficulty, fecal blockade and feeling of incomplete evacuation, excessive strain at stool, prolonged staying at lavatory, split evacuation, hard and small fecal material and tenesmus. Rectal bleeding, mucous discharge and pain/discomfort during evacuation or at intercourse and lower urinary tract symptoms (LUTs) were also present in some cases. MR-Defecography (Philips Multiva 1.5 T horizontal scanner, The Netherlands, external phased array coil) was performed with a standard technique, as described in a previous report [3] using 250 ml of acoustic gel instilled into the rectum and 8 ml into the vaginal canal and a half filled bladder with natural urine. Static T2 w TSE images of the female pelvis were acquired firstly in the three planes at rest. Thereafter, dynamic images with BTFE pulse sequences were taken during squeeze, straining and evacuation of rectal contrast in the sagittal, coronal and axial planes. A rectocele was defined as any focal bulging beyond the expected line of the anterior profile of the rectal ampulla greater than 20 mm. As previously reported, by us [4] any bulging of the rectal profile occurring in sites other than the anterior wall, namely the posterior and lateral aspect, was defined "translevator hernia". This term was preferred to that reported by other researchers [5] as "posterior or lateral rectocele", because considered indicative of a different anatomical entity, as can be demonstrated only by dynamic MR images obtained in the coronal and axial planes (Figure 1). With regard to the basic elements setting out the diagnostic criteria of rectocele on MR defecography, besides the protruding portion of the rectal wall alone, the image analysis took into consideration also the two connecting segments located above and below the outpocketing i.e. the junction with the sacral portion of rectum (above) and that with the anal canal (below), respectively (Figure 2). More specifically, special attention was reserved to detect any difference in the shape and kinematic features exhibited at the time of rectocele's development, as well as to the assessment of the emptying pattern as a whole, including the following parameters: the delay time before starting the movement, if any; the overall time employed to empty the contrast injected and; the amount retained after no less than three attempts. Finally, the presence of any puborectalis impression on the posterior anorectal junction during evacuation was also noted as an index of dyssynergia [6] and classified as transient or persistent, depending on its duration along the entire cycle of rectal emptying. All the above, considered representative of the efficiency and speed of rectal evacuation, has been given high priority in the reporting description because of its potential impact on decision-making and therapy planning. After completion of the examination, all imaging series were transferred in a different work station for analysis. To obtain linear

measurements from frozen images, the depth of rectocele was measured in mm according to the method described by Healy, *et al.* [7] from the most anterior part of the rectocele to the anterior margin of the extrapolated line of rectal wall. The maximum value recorded during the entire emptying cycle was taken as representative of the depth of rectocele. In addition, the vertical distances of the lowermost margin of rectocele, bladder neck, uterine cervix and anorectal junction (ARJ) from the hymen plane taken as reference, were calculated and expressed by negative (proximal) or positive (distal) numbers. With regard to the emptying phase, as seen in the three scan planes, it was directly videorecorded from the monitor at the time of the examination and subsequently revised in a real time or slow motion mode; this strategy has proved critical to appreciate the kinematic features of rectocele from its onset. In all cases, the image analysis (PV) of MR series was performed blind to clinical files which were examined at the end and discussed with the colorectal surgeon (DG) so as to allow determining the correspondence between symptoms, signs and imaging features, and deciding the optimal therapy planning, accordingly.

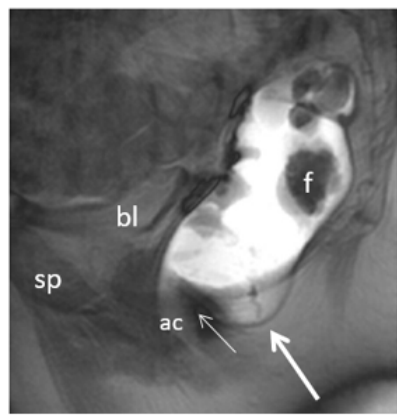


Figure 1A

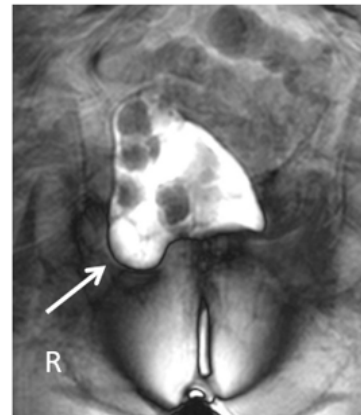


Figure 1B

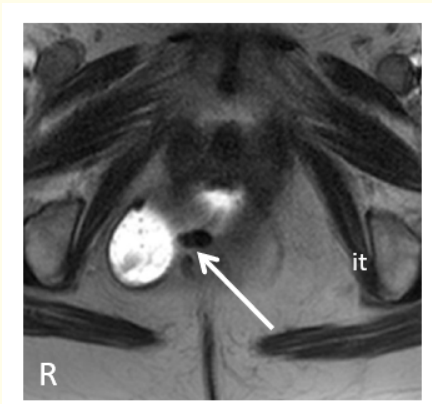


Figure 1C

Figure 1: Midsagittal BTFE-pulse sequence MR image of a 48-yr-old woman during rectal expulsion (A) showing bulging of the posterior rectal wall (thick arrow) and lack of anorectal angle widening due to persistent impression by a dyssinergic puborectalis muscle (thin arrow). However, emptying MR images taken in the coronal (B) and axial (C) planes better define the outpocketing as a rectal wall hernia occurring at the right posterolateral border of the levator ani muscle (thick arrows). R: Right Side; it: Ischial Tuberosities; Sp: Symphysis Pubis; v: Vagina; bl: Bladder; f: Fecalomas.

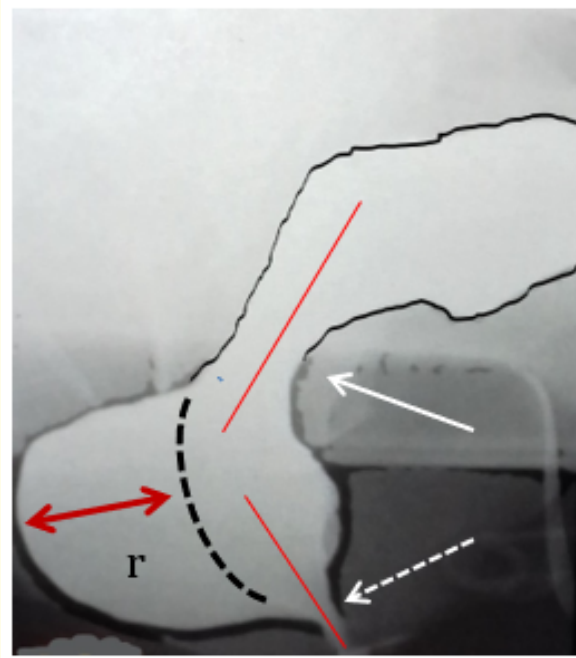


Figure 2: Schematic drawing showing how to calculate (1) the depth of rectocele (r) as the distance from the expected anterior rectal wall (dotted curved line) to the furthest margin of the outpocketing registered during the entire cycle of rectal emptying; and (2) the angle between the central axes (red line) of the upper (continuous line arrow) and lower (dotted line arrow) connecting segments.

Results

MR imaging

With the exception of those cases in whom the most prominent outpocketing of the rectal ampulla occurred at any point of the posterolateral rectal wall (See figure 1), two types of rectoceles were found exhibiting peculiar features and different characteristics as follows: Type I (21/37, 56.7%) showing a sort of anteriorly kneeled “sand glass” shape (Figure 3); and Type II (16/37, 43.2%) showing the morphology of a “smoking pipe” (Figure 4). On emptying, features of Type I rectocele included (1) a short and narrow segment of variable diameter (range, 3 - 9 mm) mimicking the neck of a sandglass, located at the entrance of the hiatus just above the outpocketing which is seen to develop as a sliding hernia directed anteriorly and downward; (2) sharp posterior angle, up to 90° or less, between the central axes of the two connecting segments located above and below the outpocketing, resulting in misalignment and outlet obstruction; (3) delay in starting the emptying (> 120 sec.) and significant increase in the number of attempts (≥ 3) to force out rectal content resulting in no more than a weak stream of contrast and high residue ($> 2/3$ the amount injected). On the other hand, features of Type II rectocele included (1) maintained alignment and straightening of the two connecting segments located above and below the outpocketing which reaches greater size than Type I (average depth. 36 ± 5.2 mm vs 19 ± 4.3 mm), and becomes displaced down at a lower level, relative to the hymen plane taken as reference (average descent 39 ± 4.1 mm vs 22 ± 4.6 mm, respectively); (2) scarce or absent delay and strain in producing the stream of contrast, although obtained in a split way resulting in lengthening and incomplete emptying, with trapping limited to the site of rectocele in most cases (3) frequent association with other pelvic organ prolapse and abnormalities, including rectoanal intussusception, vaginal and uterine descent, peritoneocele and enterocele, funneling of bladder neck with/out cystocele, and levator ani hiatus ballooning greater than 40 cm^2 (nv, $\leq 25 \text{ cm}^2$).

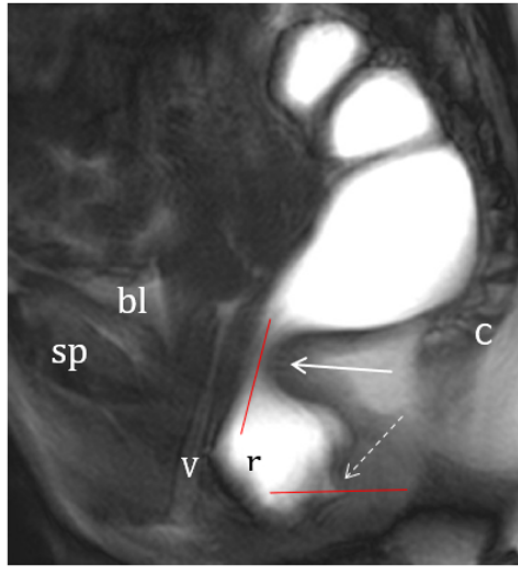


Figure 3: Frozen midsagittal MR image of Type I rectocele from videotape review of a 47-yr-old woman with history of traumatic vaginal delivery (33 old), weight sensation, pain and tenesmus: note the kinking “sandglass-shaped” morphology of the rectal wall resulting from tightening of the upper connecting segment (continuous line arrow) which acts as a neck of variable size at the levator ani hiatus outlet and lack of coaxiality between the two segments (red lines). On kinematic display, the rectocele was seen to develop as sliding hernia below the hiatus which tilts strongly forward and down with its bottom margin, up to a lower level of the anal verge (dotted line arrow). Sp: Symphysis Pubis; bl: Bladder; v: Vaginal Canal; r: Rectocele; c: Coccyx.

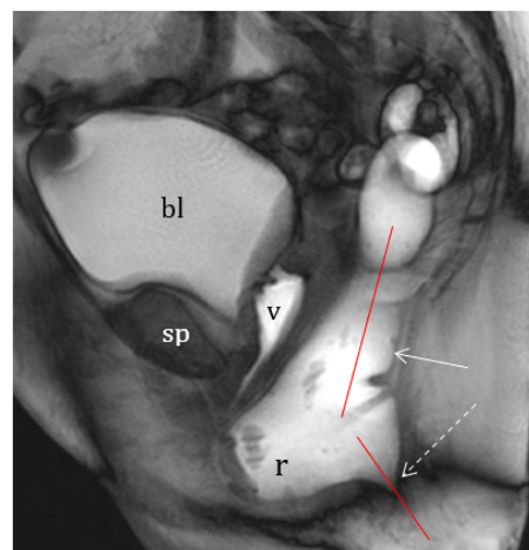


Figure 4A

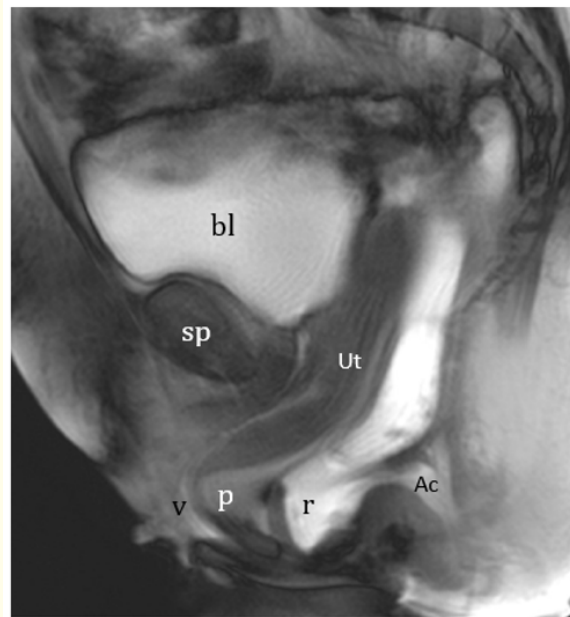


Figure 4B

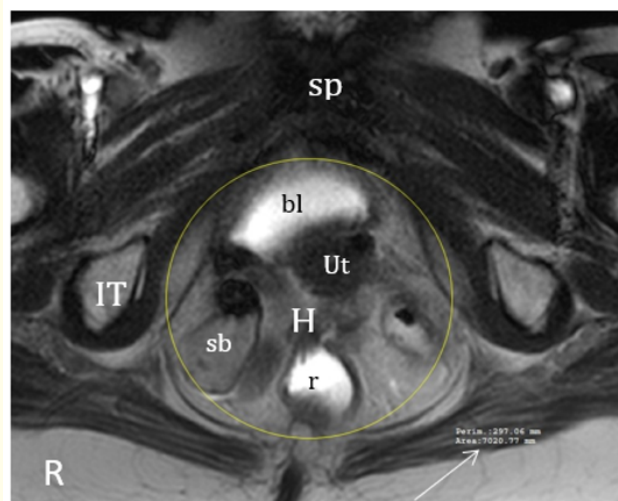


Figure 4C

Figure 4: Typical MR midsagittal image of Type II rectocele (A): note the “smoking pipe” shaped morphology of the outpocketing together with the maintained co-axiality of the upper and lower connecting segments (dotted lines). During the second attempt of rectal emptying (B) other associated abnormalities are also highlighted including peritoneocele (p), enterocele (sb), and levator ani hiatus ballooning (C) reaching an area of 70 cm² (n.v., < 25 cm²). R: Right Side; IT: Ischial Tuberosity; H: Levator Ani Hiatus Area (encircled); Sp: Symphysis Pubis; bl: Bladder; v: Vaginal Canal; r: Rectocele; p: Peritoneocele; Ac: Anal Canal; Ut: Uterus; sb: Small Bowel.

Item	Type I Sandglass shaped (21)	Type II Smoking-pipe shaped (16)
Morphology		
Bulging site	Anterior	Anterior
Kinematic feature	Tilting down-forward	Descending vertically
Connecting segment		
Upper	Neck-like narrowing	Normal calibre
Lower	Oblique front-to-back	Straight
Angle between central axes	≤ 90°	≥ 135°
Associated abnormality (n°)		
Intussusception	/	13
Puborectalis impression	21	3
Uro-Genital prolapse	4	16
LA hiatus ballooning \diamond	/	9
Depth (mm)		
< 20		3
20 - 40	5	8
> 40	16	5
Vertical distance (mm)^{&}		
Hymen plane	22 (15 - 29)	39 (33 - 54)
Emptying pattern		
Delay time to start (sec)	> 60	< 60
Total time (sec)	> 180	< 90
N° of movements	> 3	< 3
Contrast retained		
< Half	/	9
> Half	21	7

Table 1: Characterization of Rectocele by morphology, size and emptying pattern at MR- Defecography (n = 37).

\diamond LA = Levator ani hiatus area > 25 cm² on emptying; & Average values and range (parenthesis) relative to the lowermost border of the outpocketing.

Type I	Item	Type II
Angulated	Overall anorectal shape	Straight
Lost	Alignment between upper and lower connecting segments	Maintained
< 30 mm	Size of outpocketing	> 30 mm
All segments	Contrast trapping (site)	Outpocket
Lack of ARA° widening Lack of hiatus widening	Associated changes	Intussusception pelvic organ prolapse peritoneocele
Less pronounced (area < 40 cm ²)	Hiatus ballooning	More pronounced (area > 40cm ²)
Upper	Bottom edge position and of the outpocket	Lower
Poor-to-absent	Contrast stream	Present but intermitted
Often	Hesitancy to start emptying	Occasionally
> 3	n° of emptying attempts	< 3
Forceful, unproductive	Emptying pattern	Split and incomplete

Table 2: Card of differential criteria between type I and type II rectocele at MR-defecography and relative to hymene plane taken as reference.

Clinical findings

Regardless of the type and severity grading of rectocele (reported in a generic way in the request in over two thirds of cases), a more or less constant feeling of pressure in vagina, has emerged as the cause for gynecological or urological referral in over 88% of cases. This symptom was variously combined with sensation of vaginal prolapse and lower urinary tract (LUTs) symptoms and with a sort of discomfort at intercourse or even overt dyspareunia (sexually active women) in a significant minority of cases (9/37, 24.3%). What prompted patients to the colorectal surgeon more frequently (29/37, 78.3%), however, was a combination of the following: difficulty in stool evacuation, obstructed defecation, frequent and prolonged straining during attempted evacuation, feelings of incomplete evacuation and a continuous feeling of an urge to defecate and need to empty the rectum digitally. Other patients (12/37, 32.4%) admitted to utilize manual pressure on the side or the front of the rectal outlet and against the posterior wall of the vagina wall in order to empty the bowel. In some cases, despite a daily call to stool, it was extremely difficult to empty the rectum, while other complained of pelvic pain and fecal soiling. Occasionally, symptoms such as bleeding, hemorrhoidal swelling, and soiling or problems of control ranging from poor to complete incontinence were also reported. In no case, however it was possible to determine whether the such symptoms of obstructed defecation were due to the rectocele alone or to other associated abnormalities such as rectoanal intussusception and anismus. When analyzing the correspondence between the presenting symptoms and results of imaging series, MR Type I rectocele was most frequently associated (19/21, 90.4%) with tenesmus, perianal discomfort, straining defecation, hard feces and pain at intercourse, while MR Type II made the same (11/16, 68.7%) with split evacuation, feeling of incomplete emptying, mucous discharge and rectal bleeding, need for digitation or manual support to assist the evacuation, various organ prolapse and lower urinary tract symptoms.

Discussion

The protrusion of the anterior rectal wall into the posterior vaginal lumen (rectocele) can be considered as a typical example of boundary pathology. As often is the case in geopolitics, alongside the numerous positive interaction opportunities, in some cases problems and disputes arise over the definition of borders, territorial competences, trade or migratory flows, customs duties, etc. As a matter of fact, the two neighbor countries (i.e. gynecologists and coloproctologists) are still today looking for agreement on how to classify the type of abnormality, which grading system adopt for its severity and which criteria take into account when deciding whether or not, and how

to operate [8-14]. Under some perspectives, the only existing certainty concerns the anatomy of the defect which has been shown by DeLancey [15] to be located at any point of the rectovaginal septum. On the other hand, it is well known that rectocele may remain totally asymptomatic for a long time or give rise to no more than minimal, vague and non-specific disturbances before prompting patients to specialist's consultation. In such cases, most common symptoms include weight sensation and pressure in the vagina, difficult evacuation and feeling of incomplete emptying, fecal blockade and digitation to help bowel movement, pain/discomfort at stool and at sexual intercourse. Usually, at physical examination the clinician, while instructing patients to perform an abdominal strain as if evacuating in the left recumbent position, try to determine how deeply his finger pushes into the pocket of the rectal wall. Doing so, he/she obtains information on the size and location of the abnormality so as to allow classifying the rectocele as high, middle, or low depending on its anatomical position relative to level of the posterior vaginal wall defect. More precisely, high rectocele is generally associated with disruption of cardinal and utero-sacral ligaments; middle rectocele, probably the most frequent, is due to a defect or simple weakness of rectovaginal septum; low rectocele, the most severe, is the direct consequence of damage to the perineal body, perineal membrane and converging musculo-fascial structures. It should be argued, however, that such a classification is only rarely, if ever, adopted in the clinical practice, as demonstrated by the fact that, in the personal experience of one of the writing authors (PV), matured in over 40 years of defecographic examinations, the terms high and middle rectocele were not mentioned at any time in the request of the referring physician. Rather, the size of rectocele, described as small i.e. < 20 mm, medium, between 20 and 40 mm, and large i.e. > 40 mm [16], was reported from time to time. In any case, the management of the condition remains a difficult challenge for the clinicians and depends mainly by the severity and duration of evacuation dysfunctions and vaginal discomfort, with options including change in lifestyle, drugs, pessaries and surgery. The latter, in particular, is reserved to those with obstructive defecation syndrome who did not respond to other forms of treatment. In practice, however, no one has ever definitely established whether the symptoms of obstructed defecation are due to rectocele alone or to some other associated abnormality, thus leading to deep uncertainty by the surgeon whether to operate or not.

The current study is an attempt to approach the issue of rectocele from a different point of view, as follows: given the persistent inability to adopt reliable clinical criteria for treatment planning, including size, anatomical position or symptom's combination, the authors decided to test the way of the imaging features of the abnormality from its very beginning, as seen on MR resonance defecography. The above, in the hypothesis that, during the kinematic display of the emptying phase, one or more peculiar features could be found, capable to permit easier subdivision of rectoceles into clearly different categories. Nichols and Randall for the first time in 1989 [17] have suggested dividing middle-anterior rectoceles into Type I or distension rectocele, characterized by normal pelvic position of the corpus uteri and vaginal vault, and type II or displacement rectocele where the posterior vaginal wall and uterus show abnormal descent. Subsequently, in 1996 Pucciani *et al.* [18] adopted the same classification for distinguishing rectoceles on the basis of their dynamic behaviour. In particular, they compared the clinical findings, colonic transit times, the results of anorectal manometry and conventional defecography of two groups of patients with rectocele and one group of healthy females without defecatory disorders. Despite similar stool frequency and clinical features, the two categories of rectocele were found to have different anatomical, clinical and therapeutic profiles, as follows: significantly higher anal pressure and impaired rectoanal inhibitory reflex at manometry, together with defecographic evidence of pelvic floor dyssynergia (Type I) as opposed to lower anal pressure, fairly normal rectoanal inhibitory reflex and higher anorectal angle with an abnormal pelvic floor descent, at defecography (Type II). Only few years later, Zbar *et al.* [19] reinforced the concept of that distinction in a study of 14 Type I and 26 Type II patients which included also 33 volunteer controls with no evidence of anorectal disease; they used a combination of conventional anorectal manometry, vector manometry, parametric assessment of the rectoanal inhibitory reflex (RAIR) and defecography and demonstrated that significant differences between the two types of rectocele were seen to occur for maximal squeeze pressure and vector volume; by contrast, only minimal differences in parameters of the RAIR were noted, together with a reduced maximal inhibitory pressure in type I rectocele and no measured differences in rectocele depth (type 1, 2.87 ± 0.7 cm; type 2, 2.84 ± 1.4 cm). The authors concluded also that only few physiological differences were obtained between the two categories of rectocele based on the presence or absence of associated genital prolapse.

The results of the current study compare favourably with those of Pucciani with regard to the subdivision into Type I and Type II rectocele and their defecographic findings, such as a persistent impression on the anorectal junction by the dyssynergic puborectalis muscle

of Type I, as opposed to a greater pelvic floor descent and association with organ prolapse of Type II. On the other hand, lesser agreement does exist with the results of Zbar, who claims not to have noted significant measurable differences in rectocele depth and/or associated genital prolapse between the two categories. It can be argued, however, that both authors have focused their observation in a much more detailed way on the functional aspects seen, as derived by anorectal manometry, rather than by defecography, of which they do not even show an image in their papers. In addition, it should be noted that conventional (X-ray) defecography, in continuous decline with respect to the more advanced imaging techniques currently available, could be judged somewhat inadequate today. Not for nothing, the priority of the current study has been specifically centered on the relevance of some innovative features of rectocele, not previously reported in literature at our knowledge, which were only visible at MR defecography. First of all, the unique value of MR images obtained during rectal emptying in the coronal and axial plane (See figure 1B and 1C) should be highlighted to avoid diagnosing erroneously as posterior rectocele what actually is a hernia of rectal wall through the levator ani hiatus. Although still unclear the clinical usefulness of such a differentiation today, its potential role for developing new site specific repair surgical techniques in the future can be anticipated. Besides the overt differences in morphology which distinguished Type 1 (i.e. "sandglass" shaped) from Type II (i.e. "smoking-pipe" shaped) rectocele, the most striking and innovative feature of the study, however, consists in having directed the image analysis also on the upper and lower connecting segments rather than toward the outpocketing alone. This strategy, in turn, proved effective to detect further substantial differences between the two types, probably reflecting different pathophysiological mechanisms and need for adequate treatment, accordingly. In this context, the critical value the videorecording facility for image capturing and reviewing at various speed during the entire cycle of rectal emptying, should be emphasized. Finally, although beyond the scope of the present study, it should be noted that a distinct affinity for different combination of symptoms was also observed by MR Type I and Type II rectocele, with potential clinical impact on decision making for treatment, whether surgical or conservative [20]. To confirm such observation, a systematic retrospective analysis extending 10 years back is currently ongoing at our Imaging Diagnostic Center with the goal of verifying the follow-up of the MR diagnosis on larger series.

Conclusion

Unlike clinics, diagnostic imaging seems capable to distinguish between two distinct forms of rectocele, each showing its own way of developing, morphology and kinematic emptying characteristics. Type I, also known in the past as "distension rectocele", exhibits a posteriorly angled sandglass-like shape located at the neck site and a rectal emptying pattern consistent with severe dyssynergic outlet obstruction. Conversely, Type II or "displacement rectocele" shows a smoking-pipe shape, lesser obstructive pattern on emptying, greater descent and frequent association with multiple pelvic organ prolapse. Interestingly, preliminary data from the current study indicate also in both types of rectocele a sort of preferential affinity toward a specific combination of symptoms, suggesting a potential role for therapy planning. Further studies are needed on larger series extending back enough time to verify the validity of such observation. At present, it can be concluded that, thanks to MR-defecography, better characterization of rectocele has become possible today by assigning its identity to one type or the other on the basis of the morphologic and kinematic features. Clinicians, still reluctant to rely on something other than rectal digital examination for the assessment of rectocele size, are encouraged to be more confident in using this imaging tools, so as to get help when engaged in the difficult decision of treatment planning.

Disclosure

The authors have nothing to declare.

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