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Role of Magnetic Resonance Defecography in Assessment of Obstructed Defecation Syndrome in Adult Male Patient

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ABSTRACT

Background: Dynamic magnetic resonance defecography (MRD) is a safe noninvasive modality for the diagnosis, stratification, therapy-guidance of cases with obstructed defecation syndrome (ODS). The MRD emerged as a valuable method in evaluating pelvic floor disorders. **Aim:** This study aimed to evaluate the effectiveness of dynamic magnetic resonance defecography in identifying pelvic floor dysfunction in adult male cases with obstructed defecation syndrome, assessing its correlation with clinical severity scores. **Methods:** This prospective research has been performed on Thirty-five patients with obstructed defecation syndrome who were referred from Mansoura University Outpatient General Surgery Clinics for imaging centers using MRI devices over a period of one year from November 2022 till November 2023.

Results: All patients were adult males (mean age 39.5 ± 14.1 years). Median Cleveland Clinic Constipation Score (CCCS) and Altomare Obstructed Defecation Syndrome (ODS) score were 14.5 (12–20) and 18 (14–27), respectively. Mean ARA was 110.9 ± 11 at rest, 94.8 ± 12.7 at squeeze, and 108.2 ± 14.4 at defecation. Mean H-line increased from 4.1 ± 0.6 cm at rest to 5.3 ± 1.5 cm at defecation, and mean M-line from 1.1 ± 0.7 cm to 3.2 ± 1.9 cm. Pelvic descent occurred in 65%, anterior rectocele in 30%, rectal intussusception in 5%, and anismus in 45%. Both scores correlated negatively with ARA change and positively with H-line and M-line changes, with strong positive correlations for M-line.

Conclusion: Dynamic pelvic MR defecography is a reliable tool for assessing pelvic floor function, as it lacks ionizing radiation and provides good contrast, with a strong correlation between M-line changes.

Keywords: Obstructed defecation syndrome, Pelvic floor dysfunction, Magnetic resonance defecography, M-line.

INTRODUCTION

Constipation is a prevalent problem that arises from either blocked defecation or impaired colonic transit [(1)]. Normal defecation needs normal colonic motions anorectal sensation, (colonic transit), expulsion force and a coordinated function of the pelvic floor for evacuation. Consequently, constipated cases may have diminished colonic transit and/or pelvic floor dysfunction [(2)].

Magnetic resonance (MR) proctography, 1st introduced by Lienemann in 1997, is now regarded as a reliable diagnostic modality for cases with obstructive defecation syndrome and functional constipation [(3)]. Imaging is crucial for differentiating functional from structural etiologies of constipation [(1)]. Pelvic MRI is a beneficial instrument in the pre-operative planning of these conditions and might result in an alteration of surgical treatment [(4)]. Pelvic floor MRI utilizing dynamic and static sequences permits the identification and classification of a wide range of functional and morphologic pelvic floor illnesses. In typical observations, the base of the middle and anterior compartments of the pelvic floor is positioned above the pubococcygeal line (PCL) at rest, and the pelvic floor rises throughout contraction. Throughout straining, the pelvic floor muscles should relax, allowing the pelvic floor to descend properly by less than three centimeters below the PCL [(5)]. The aim of this research was to estimate the role of MRID in recognition of the possible pathophysiologic and anatomic causes of obstructed defecation to guide physicians in patient management.

PATIENTS AND METHODS

This prospective research has been conducted on patients who were referred from Mansoura University Outpatient General Surgery Clinics for imaging centers using MRI devices over a period of one year from November 2022 till November 2023. Informed consents have been obtained from all cases enrolled in this study. Personal privacy was respected in all levels. Thirty-five cases with obstructed defecation syndrome were presented, fifteen patients were excluded & twenty patients have been involved in this research.

Magnetic resonance defecography technique:

Patient preparation: Rectal cleansing enema the night prior to the investigation. The patient voided about two hours prior to the investigation to have the bladder moderately filled. Rectum was filled by 120 to 250 cc ultrasound gel to initiate the feeling of rectal fullness & allow evaluation of the defecation stage. Prior to the assessment, cases received training on how to carry out the dynamic stages of squeezing, straining and defecation. Cases were given instructions to exert maximal straining without evacuation. During the defecation phase, cases received instructions to evacuate and to repeat the evacuation maneuvers until the rectum has been cleared. The MR defecography has been conducted with 1.5 T equipment utilizing a low-centered phased array coil to facilitate the visualization of prolapsed organs. The cases have been positioned supine with elevated knees,

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supported by a hard pillow, to aid in evacuation and straining.

MRI Sequences: Static images of the pelvis have been gathered in 3 planes utilizing T2- weighted turbo spin-echo (TSE) sequences (TR/TE 1250/200 meter of second, FOV 297x113 millimeters, slice thickness six millimeters, gap 0.6 millimeters, flip angle ninety degree & matrix 256x256).

Dynamic sequences have been carried out in sagittal plane utilizing a balanced fast-field echo (BFFE) sequence (TR/TE 850/120 meter of second, FOV 305x145 millimeters slice thickness six millimeters, gap 0.6 millimeters, flip angle ninety degree & matrix 256x256).

Interpretation: The alteration of the anorectal angle (ARA) throughout defecation, in contrast to the ARA at rest, reflects the function of the puborectalis muscle. A notable puborectalis impression at maximal straining, along with the anal canal's inability to open (insufficient evacuation), was deemed diagnostic of anismus. Any rectal outpouching that extends beyond the predicted line of the rectal wall is classified as a rectocele. PCL has been taken as the reference line to identify pelvic organ prolapse. The perpendicular distance from each reference point was determined to the pubococcygeal line at rest & at straining or defecation graded by the "Rule of two".

The hiatus/muscle/organ (HMO) grading system has been applied to assess pelvic floor relaxation depending on the H and M lines.

Ethical Approval: The research was permitted through the Ethics Committee of Pediatrics Department, Faculty of Medicine, Mansoura University, Egypt (IRB number: MS.22.09.2114). All participants gave written informed consent before enrolment. The research adhered to the Helsinki Declaration throughout its execution.

Statistical analysis

Qualitative data were described as number and percentage. Quantitative data were described as standard deviation and mean following examining normality utilizing Kolmogorov-Smirnov test. "P value ≤ 0.05" has been regarded to be statistically significant and <0.01 has been deemed high statistically significant. All tests were 2-tailed.

RESULTS

Our study included 20 adult male patients diagnosed with obstructed defecation syndrome. This methodological study aimed to evaluate the accuracy of dynamic MR defecography in evaluating pelvic floor illnesses in the study population. A strong correlation has been found between the alteration in the M-line from rest to defecation and both the Altomare ODS score and the CCCS compared to the change in the H-line and the anorectal angle (ARA). Table (1) showed that all the involved cases were adult men with a mean age of 39.5 ± 14.1 years. The median CCCS score was 14.5 (range: 12–20), and the median Altomare ODS score was 18 (range: 14–27). The mean anorectal angle (ARA) at rest was 110.9 ± 11°, at squeeze was 94.8 ± 12.7°, and at defecation was 108.2 ± 14.4°, with a mean decline during defecation of 2.8 ± 16.6°. The mean H line (levator hiatus diameter) at rest was 4.1 ± 0.6 cm and at defecation was 5.3 ± 1.5 cm, with a rest-to-defecation difference of 1.3 ± 1.5 cm. The mean M line (descent of the hiatus) at rest was 1.1 ± 0.7 cm and at defecation was 3.2 ± 1.9 cm, with a rest-to-defecation difference of 2.2 ± 1.3 cm. Pelvic descent was present in 13 patients (65%), anterior rectocele in 6 (30%), rectal intussusception in 1 (5%), and anismus in 9 (45%).

Table (1): The data statistics

Item	Value
Age (year), mean ± SD	39.5 ± 14.1
CCCS, median (range)	14.5 (12–20)
Altomare ODS, median (range)	18 (14–27)
ARA in degrees	
at rest, mean ± SD	110.9 ± 11
at squeeze, mean ± SD	94.8 ± 12.7
at defecation, mean ± SD	108.2 ± 14.4
decline during defecation, mean ± SD	2.8 ± 16.6
H-Line (diameter of the levator hiatus) in cm	
at rest, mean ± SD	4.1 ± 0.6
at defecation, mean ± SD	5.3 ± 1.5
rest to defecation difference, mean ± SD	1.3 ± 1.5
M-Line (descent of the hiatus) in cm	
at rest, mean ± SD	1.1 ± 0.7
at defecation, mean ± SD	3.2 ± 1.9
rest to defecation difference, mean ± SD	2.2 ± 1.3
**Posterior Compartment Findings, *n (%)* **	
Pelvic descent	13 (65%)
Anterior rectocele	6 (30%)
Rectal intussusception/prolapse	1 (5%)
Anismus	9 (45%)

Regarding the person correlation coefficient: There was moderate negative correlation between Altomare ODS score and difference between the ARA at rest and defecation. There was moderate positive association between Altomare ODS score and variance between the H-line at rest and defecation. A strong positive association has been observed between Altomare ODS score and variance between the M-line at rest and defecation (good correlation). There was moderate negative correlation between CCCS score and difference between the ARA at rest and defecation. There was moderate positive association between CCCS score and variance between the H-line at rest and defecation. A strong positive association has been found between CCCS score and variance between the M-line at rest and defecation (good correlation) (Table 2 & figures 21-26).

Table (2): person correlation coefficient

X	Y	R-value	Strength	P value	To report as	Fig.
Altomare ODS	ARA (Rest – Defecation)	-0.44	Moderate	**0.0498**	$r(19) = -0.44$, $p = 0.0498$	21
	H-Line (Defecation – Rest)	0.42	Moderate	0.062	$r(19) = 0.42$, $p = 0.062$	22
	M-Line (Defecation – Rest)	0.87	**Strong**	**<0.0001**	$r(19) = 0.87$, $p < 0.0001$	23
CCCS	ARA (Rest – Defecation)	-0.46	Moderate	**0.04**	$r(19) = -0.46$, $p = 0.04$	24
	H-Line (Defecation – Rest)	0.42	Moderate	0.067	$r(19) = 0.42$, $p = 0.067$	25
	M-Line (Defecation – Rest)	0.8	**Strong**	**<0.0001**	$r(19) = 0.8$, $p < 0.0001$	26

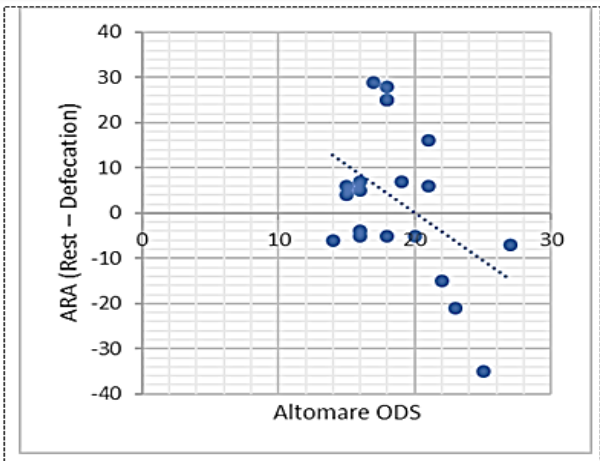

Fig. 21

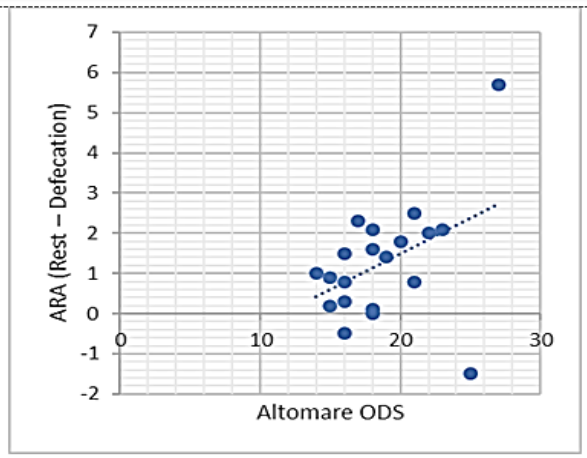

Fig. 22

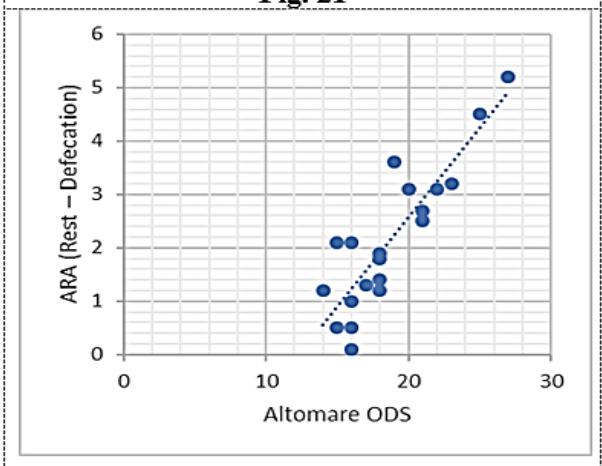

Fig. 23

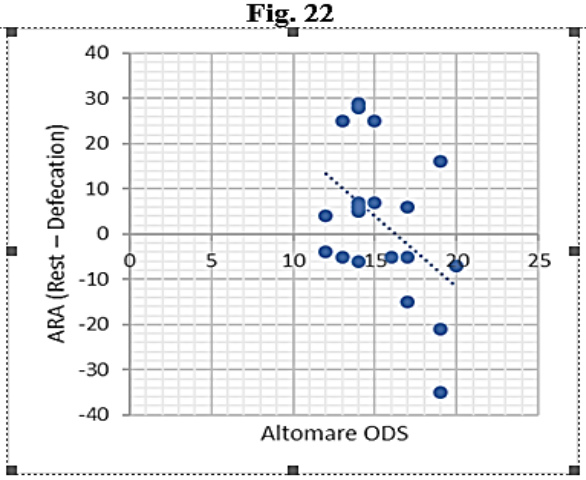

Fig. 24

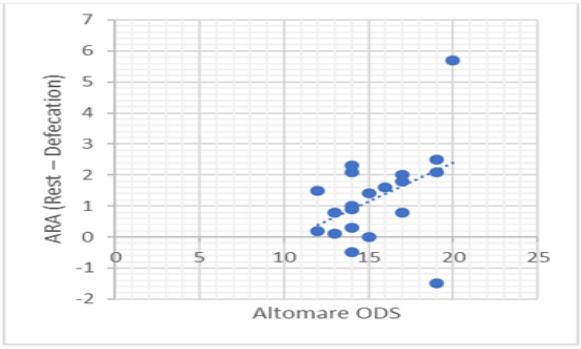

Fig. 25

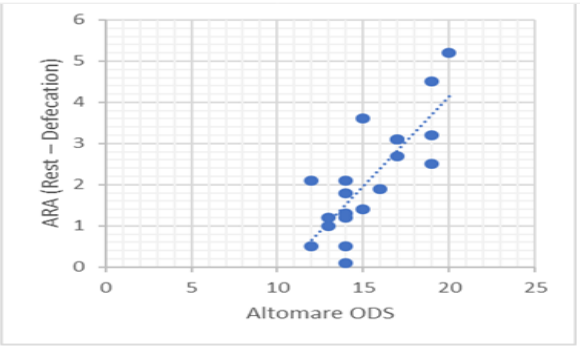

Fig. 26

DISCUSSION

Pelvic floor dysfunction is a common condition where patients are unable to correctly relax and coordinate their pelvic floor muscles to urinate or defecate [6]. While physical examination acts as the 1st option for evaluating cases with pelvic floor disorder, the diagnostic restrictions of this investigation have required the use of more direct and comprehensive diagnostic techniques [7].

MRID may overcome specific limitations of traditional defecography and ultrasonography, as it allows for the evaluation of all three compartments without requiring further contrast delivery into the middle or anterior compartments [8].

The objective of this research was to estimate the role of the dynamic MRI in adult male patients complaining of obstructed defecation. It included 20 adult male patients. The mean age of the cases was 39.5 years, all complaining of difficult defecation. All cases underwent history taking, dynamic MRI defecography, and clinical examination to acquire anatomical and functional data, with 150 milliliters of intra-rectal gel introduced.

The grading of the descent of the pelvic organs has been carried out with regard to the perpendicular distance between the reference points and the pubococcygeal line. Grading has been carried out with H and M lines. Both M and H lines were measured. Their value was in their significant change between the rest and defecation stages as they were elevated throughout defecation and straining in cases with pelvic floor dysfunction.

In comparison between the rest and defecation the H line (which represents diameter of the levator hiatus) was normal in all included patients at rest (mean at rest 4.1 +/- 0.6), while at defecation the H line was normal only in 16 patients, mildly increased in 3 patients and marked increased in 1 patient. (mean at defecation 5.3 +/- 1.5). As regard the M line (which represents descend of the hiatus) at rest and defecation, it was normal in all included patients at rest (mean at rest 1.1 +/- 0.7) but at defecation the M line was normal only in 8 patients. There was mild increase in the M line in six cases, moderate increase in 4 patients and marked increase in 2 cases. (mean at defecation 3.2 +/- 1.9).

Dynamic MRI defecography in this study presented pelvic descent in 13 cases (65%), mild rectal descent in 5 cases (25%) and moderate rectal descent in 6 cases (30%) and sever rectal descent in 2 cases (10%). Another research performed by **Darwish *et al.*** [9] on twenty-one cases with pelvic floor disorder with mean age of 37.3 years where 15 were females and 6 were males. They found rectoceles in 33.3%, intussusception in 47.6% with the commonest type being intra-rectal and anismus in 14.28%. These outcomes are in line with our most frequent pathologies as anterior rectoceles were found in 30%. Also, another research performed by **Pilkington *et al.*** [10] illustrated that rectoceles were extremely frequent.

The value of the anorectal angle in normal conditions must be increased at defecation. In this study, the patients with anismus showed decrease in the ARA with paradoxical contraction of the puborectalis muscle throughout defecation and straining, which was shown in 9 patients (45 %) of the involved in this research. In the majority of the cases the ARA increased during defecation. This goes with the research performed by **Chu *et al.*** [11] to assess the ARA in patients with anismus.

Clinically, the median score of CCCS was 14.5 with range 12 – 20 and the median score of Altomare ODS was 18 with range 14 – 27.

LIMITATIONS

Our investigation had a specific restriction since MR defecography was conducted in the supine posture. This may not completely represent the defecation process as observed in the physiological sitting position. Another limitation of the study was that the luxury to correlate the results with the operative data was not available. This didn't permit the assessment of the sensitivity and diagnostic accuracy of dynamic MRI defecography. The disadvantages of dynamic floor MRI encompass the inconvenience of rectal contrast injection, the embarrassment and pain associated with the maneuver being conducted in a non-physiological position (supine instead of seated), and the inability to accommodate claustrophobic cases. Finally, the study quality is dependent on the patient compliance and participation, so with good patient preparation and training the obtained results would be more accurate.

The advantage of the dynamic MRI defecography over the conventional defecography is the high contrast resolution of the pelvic organs with better evaluation. Also, the direct visualization of the muscles of pelvic floor. In addition, it provides the ability to simultaneously assess all of the three compartments of the pelvis. Not to mention the lack of ionizing radiation in dynamic MRI study.

At last in this study, we targeted the male patients knowing that the dynamic pelvic MRI is more conducted in female but we aimed to enter a more difficult area to provide new data, which was not easily available in many previous studies.

CONCLUSION

Dynamic pelvic MR defecography had many advantages as a well stablished tool in assessing the pelvic floor function as it lacks ionizing radiation and also allows

assessment of the pelvic organs with good contrast. There was a strong relation between the change of the M-line in rest to defecation and the Altomare ODS score and the CCCS in comparison with the change in the H-line.

DECLARATIONS

Consent for publication: I certify that each author has granted permission for the work to be submitted.
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Availability of data & material: Available
Conflicts of interest: None.
Competing interests: None.

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