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Significance of MRI Defecography in the Evaluation of Pelvic Floor Abnormalities

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Abstract: ***Objective: To evaluate the significance of MRI defecography in detecting and characterizing pelvic floor abnormalities. Methods: An ambispective study was conducted on 20 patients (10 males, 10 females) presenting with symptoms suggestive of pelvic floor dysfunction. All patients underwent MRI defecography. Patient demographics, clinical presentations, and MRI findings were analyzed. Results: The study population ranged from 20 to over 60 years old, with 75% of patients above 40 years. Constipation (85%), incomplete evacuation (65%), and chronic pain (50%) were the most common presenting complaints. MRI defecography revealed rectal prolapse as the predominant abnormality (85% of patients), followed by rectocele (25%), cystocele (15%), and other pelvic organ prolapses. 45% of patients had Grade 2 rectal prolapse. Multiparity (45%) and history of pelvic surgery (30%) were identified as potential risk factors. No statistically significant associations were found between pelvic abnormalities and age, BMI, or risk factors. Conclusion: MRI defecography proved to be a valuable tool in comprehensively evaluating pelvic floor abnormalities, particularly in detecting and grading rectal prolapse and other pelvic organ prolapses. This imaging technique provides detailed information that can aid in accurate diagnosis and treatment planning for patients with pelvic floor dysfunction.***

Keywords: MRI defecography, pelvic floor abnormalities, rectal prolapse, pelvic organ prolapse

1. Introduction

Dysfunctional pelvic floors are a serious health concern.[1-3] The connective tissues, muscles, and ligaments that support the pelvic organs make up the pelvic floor. Dysfunction of the pelvic floor may result from injury to any of these components.
Although it can affect men as well, pelvic floor dysfunction, which includes organ prolapse, is more common in women. Clinically, it manifests as a variety of symptoms, such as blocked faeces and prolonged constipation.

Evacuatory dysfunction is characterised by symptoms such as painful defecation, prolonged straining, difficulty initiating rectal emptying, and a sense of incomplete evacuation. An estimated 50% of parous women experience some form of prolapse, and by the time they are 80 years old, approximately 11% of them will have had an operation for prolapse or incontinence.[4,5] Incontinence of the bowels and urine, as well as pelvic discomfort and pelvic organ prolapse, are symptoms of pelvic floor dysfunction.[1-3] Pelvic floor diseases are more common as people age, and their prevalence is expected to rise in the Western world as a result of changing demographics.

The integrity of the pelvic floor can be damaged by age, genetics, childbirth, obesity, pelvic surgery, constipation, and strenuous physical activity.[6] It is difficult to clinically evaluate patients with pelvic floor dysfunction. Symptoms like constipation, incontinence, and pain are non-specific in nature, and physical examination is frequently not very accurate.[7]

Three compartments make up the female pelvic floor: the anterior compartment, which houses the urethra and bladder, the middle compartment, which houses the uterus and vagina, and the posterior anorectal compartments. The primary anomalies that occur in the anterior and middle compartments are cystocele and uterine/vaginal descent, respectively; the posterior compartment is affected by rectocele, enterocele, intussusception, anismus, and anorectal junction descent.[8] Regardless of the presenting symptoms, individuals typically show anomalies in many compartments despite varying clinical presentations, hence a thorough pelvic floor assessment is necessary. This is especially important to consider while planning surgical management.[9]

Consequently, imaging has gained popularity recently as an extra tool for diagnosing pelvic floor disorders at academic medical centres.[2,10]

The anal sphincter complex and associated pathologic changes are depicted in exquisite anatomic detail on endoanal sonography and endoanal MRI[11,12], but both modalities are very restricted in the assessment of pelvic floor function.

A number of methods are employed to evaluate anomalies of the pelvic organs. Physical examinations are unreliable in assessing these anomalies because they can underestimate or misdiagnose the prolapse site.[13] Although the procedure has numerous limitations, fluoroscopic defecography, which was initially reported in 1952[14], has historically been crucial in the detection of functional abnormalities of the pelvic floor.[15]The pelvic soft tissues are mostly depicted in a limited way since contrast material can only be injected into a few anatomical compartments, including the vagina, bladder, small intestine, and peritoneum, to enhance the tissues.[15, 16]This step undoubtedly makes the examination more intrusive. The fluoroscopic procedure also subjects the patient to ionising radiation. As a result, interest in MR defecography grew. This method avoids the radiation

burden of traditional fluoroscopic defecography by using the superior multiplanar soft-tissue contrast of magnetic resonance imaging (MRI) to see the pelvic viscera and supporting soft-tissue structures.[17]MRI is an excellent technique in evaluation of pelvic floor abnormalities. The other technique for studying these abnormalities, fluoroscopic defecography, frequently misses some concomitant multicompartmental abnormalities. In addition, it takes a lot of time and employs ionising radiation, which is dangerous, especially for young girls. However, because of its superior soft tissue resolution in many imaging planes and lack of hazardous ionising radiation[22], MR defecography (MRD) is a great technique for evaluating pelvic organ anomalies. Additionally, it enables the dynamic evaluation of the pelvic organs' behaviour, offering an objective grading system for pelvic organ prolapse.[5,22]

The purpose of our study was to assess the importance of MRI Defecography in the evaluation of pelvic floor disorders.

2. Methodology

- **Study design:** Ambispective study.
- **Study area:** Department of radio-diagnosis, Dr. D.Y. Patil Hospital, Navi Mumbai.
- **Study period:** Research study was conducted between September 2022 to June 2024 Below is the work plan.

Table 1: Work plan of the study with percentage of allocation of study time and duration in months

Work plan	% of allocation of study time	Duration in months
Understanding the problem, preparation of questionnaire.	5-10%	September 2022 to November 2022
Pilot study, Validation of questionnaire, data collection and manipulation	Upto 80%	December 2022 to December 2023
Analysis and interpretation	5-10%	January 2024 to March 2024
Dissertation write-up and submission	5-10%	April 2024 to June 2024

- **Sample size:** 20 patients

Inclusion criteria:
- Patients presenting with suspected pelvic floor dysfunction
- Those who have given their consent MRI defecography

Exclusion criteria:
- Patients with Claustrophobia.
- Other contraindications for MRI defecography such as those with metallic implants

Source of data:
Source of data for cases in this research study was supported by primary data source.

Primary source of data: The material for the present study is from patients with clinical suspicion of pelvic floor abnormalities referred to department of radio-diagnosis, Dr.
D.Y. Patil Hospital, Navi Mumbai for MRI defecography.

To meet the objectives of our study, a primary source of information technique was adopted with direct interview method using pre-tested semi-structured questionnaire.
Secondary source of data: Secondary data source was used to estimate the sample size and also to frame the questionnaire. The sources of secondary data were multiple- journals, academic books, research articles, review articles, newspapers and references from the web, all of which are listed in the bibliography.

Method of Data collection:
After obtaining approval and clearance from the institutional ethics committee, the patients fulfilling the inclusion criteria were enrolled for the study after obtaining informed consent. (Annexure 1)

To collect the required information from the study subjects the "Direct interview method" of Primary source of information technique was used. The patients were interviewed for collection of necessary information using the pre-tested, semi structured questionnaire method. The questionnaire was prepared by a thorough review of literature.

In order to obtain co-operation of the patient, patient was made comfortable and a positive reinforcement was exerted. No answers were influenced and patient was helped during difficulty.

Demographic data were collected using a questionnaire that was administered by the principal researcher to the patients after signing the informed consent. Detailed history regarding symptoms like constipation, straining, mass descending per rectum, dyspepsis\a, low backache, urge incontinence, anal region pain and dirhhoea, clinical and radiological examination was done for all patients.

They were assessed and followed by MRI defecography for further evaluation. The procedure of MRI defecography was explained to the patient in his/her vernacular language to make him/her relaxed and be cooperative with the examiner while performing MRI.

For the study, patients were first positioned in left lateral position and ultrasound gel was introduced into the rectum by a rectal catheter till the patient felt full (approximately 200- 250 ml of jelly). On conclusion, the patient was instructed to wear an adult diaper. The patient was then taken into the MRI room and told to lie supine on the MRI gantry. Axial, coronal and sagittal T2W sequences of the pelvis are developed to look for structural abnormalities of the musculature, endopelvic fascia, and pelvic viscera.

Procedure details:
1) Patient Preparation:
- Explained the procedure to the patient and obtained informed consent.
- Screened for contraindications to MRI (e.g., metal

implants, claustrophobia).
- Instructed the patient to fast for 4-6 hours before the exam.
- Asked the patient to empty their bladder before the procedure.

2) Ultrasound gel Administration:
- Prepared 200-250 mL of ultrasound gel mixed with minimal normal saline.
- Using a rectal catheter instilled the gel mixture into the patient's rectum.
- Instructed the patient to retain the mixture.

3) Patient Positioning:
- Positioned the patient in the MRI scanner in a supine position.
- Use a pelvic phased-array coil for optimal image quality.
- Ensured patient comfort and provide an emergency call button.

4) Scout Images:
- Obtained initial localizer images in three planes (sagittal, coronal, axial).
- Used these images to plan subsequent sequences.

5) Static Imaging:
- Performed T2-weighted turbo spin-echo sequences in sagittal, coronal, and axial planes.
- Used high-resolution sequences with slice thickness of 3-4 mm.
- Cover the entire pelvis from the iliac crests to below the anal verge.

6) Dynamic Imaging:
- Used a T2-weighted single-shot fast spin-echo sequence in the midsagittal plane.
- Set up the sequence for continuous acquisition (2-3 images per second).
- Total acquisition time should be about 2-3 minutes.

7) Defecation Phase:
a) Instruct the patient to perform the following maneuvers during dynamic imaging:
- Rest: The rest phase forms the foundation of the examination. During this phase, the patient lies still and relaxed, with no active muscle contraction. This allows for assessment of the normal anatomical position of pelvic organs and the anorectal angle in their baseline state. The resting images provide a crucial reference point for comparing changes observed in subsequent phases. Radiologists carefully examine the position of pelvic organs, the anorectal angle, and the configuration of pelvic floor muscles in their natural, uncontracted state.
- Squeeze (pelvic floor contraction): In the squeeze phase, also known as the pelvic floor contraction phase, the patient is instructed to contract their pelvic floor muscles as if trying to hold in urine or stool. This phase evaluates the strength and effectiveness of pelvic floor muscle contraction. Observers look for elevation of the pelvic floor, narrowing of the anorectal angle, and contraction of the puborectalis muscle. Any asymmetry or weakness in muscle function becomes apparent during this phase, providing valuable information about the patient's ability to voluntarily control their pelvic floor muscles.
- Strain (bearing down without evacuation): The strain phase involves the patient bearing down or pushing as if having a bowel movement, but without actually evacuating. This phase is critical for assessing pelvic organ descent and identifying any structural abnormalities under pressure. Radiologists observe the descent of pelvic organs such as the bladder, uterus (in females), and rectum. They also note changes in the anorectal angle and look for the presence of conditions like rectocele, cystocele, uterine prolapse, intussusception, or rectal prolapse. The strain phase often reveals abnormalities that may not be apparent at rest.
- Defecate (evacuation of rectal contrast): Finally, the defecation phase, or evacuation phase, is where the patient is instructed to evacuate the contrast material from the rectum.This phase evaluates the coordinated function of pelvic floor muscles during defecation and assesses evacuation efficiency. Observers look for widening of the anorectal angle, descent of the pelvic floor, and relaxation of the puborectalis muscle. The efficiency and completeness of evacuation are carefully noted, as are any obstructive features such as non-relaxing puborectalis muscle. This phase is particularly important for diagnosing functional defecation disorders and understanding the patient's ability to coordinate pelvic floor relaxation with evacuation efforts.
- Provided clear instructions through the intercom system.
- Encouraged the patient to perform each maneuver for 20-30 seconds.

b) Post-Evacuation Imaging:
- After defecation, perform another set of static T2-weighted images.
- This helps assess residual contrast and post-evacuation anatomy.

8) Additional Sequences (if needed):
- Consider adding diffusion-weighted imaging or T1-weighted post-contrast sequences if there's suspicion of pelvic pathology.

9) Image Processing and Analysis:
- Transfer images to a workstation for post-processing.
- Use cine-loop display for dynamic images.

10) Measure and analyze:
- Anorectal angle at rest and during maneuvers
- Pelvic organ descent
- Presence of rectocele, intussusception, or prolapse
- Puborectalis relaxation
- Evacuation efficiency

11) Patient Care Post-Procedure:
- Assist the patient off the MRI table and provide privacy for cleaning.

- Offer sanitary facilities and supplies.
- Instruct the patient about possible short-term effects (e.g., loose stools).

12) Reporting:
- Generate a comprehensive report including both static and dynamic findings.
- Compare measurements to established normal values.
- Provide relevant images and cine-loops with the report.

Grading of Rectal Prolapse:
The recommended grading system for rectal descent is therefore as follows:

°0 = up to +3 cm below the PCL,
°I = between +3 and +5 cm below the PCL, and
°II = more than +5 cm below the PCL

Figure 1: MR Defecography

Rest phase in sitting (a) and supine (b) position. Evacuation phase in sitting (c) and supine (d) position. The pathological fixed descent was detected only in sitting position in rest phase (a). In evacuation phase, a cystocele became evident (d), whereas the maximal descent of the ARJ is similar in both sitting and supine position (c, d). BB: bladder base; VF: vaginal fornix; ARJ: anorectal junction

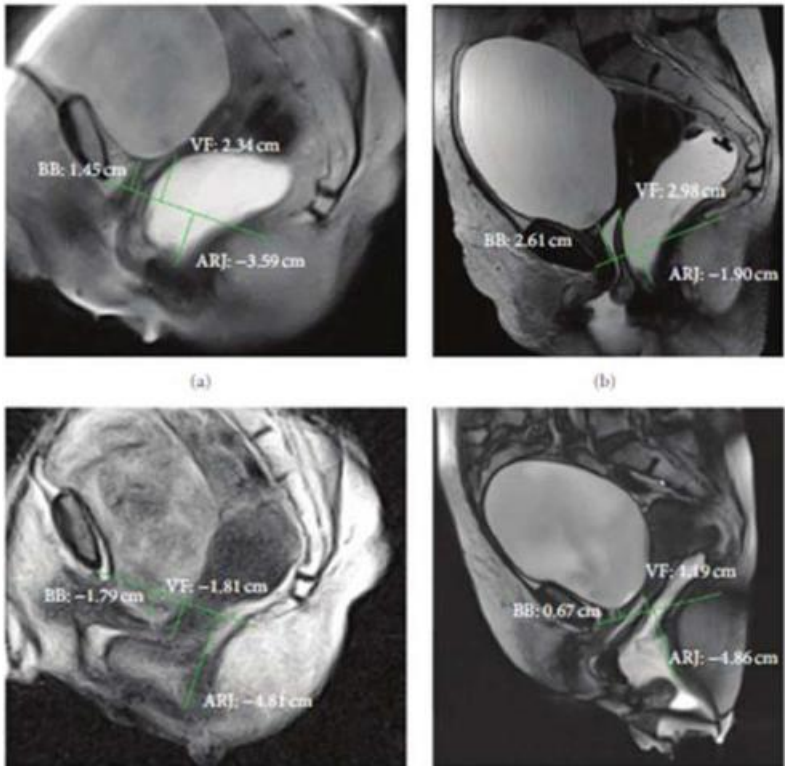


Figure 2: Phases of defecation seen in MRI defecography – in rest phase, squeeze phase, strain phase and defecation phase

Imaging Technique:
A 3T MRI scanner (Signa Pioneer) was used for each examination, and the patient was placed in the supine position. The patients were told not to use the loo an hour before to the examination. There was no use of oral or intravenous contrast media, nor was there any bowel preparation. With the patient lying on the scanner table in a lateral decubitus position, a flexible tube was used to insert 200 cc of sonographic gel into the rectum. The test involved encircling the pelvis with a body array coil. A midline sagittal plane including the symphysis pubis, coccyx, rectum, vagina, and bladder neck was identified using scout pictures. During pelvic floor squeezing, straining, and faeces, pictures were acquired using this plane while the subject was at rest.

For the pelvis, 25 slices of 4.5 mm thickness were acquired using triplanar T2W images (TR/TE = 3700/105; 230 mm field of view; 384*384 image matrix). True FISP (Fast Imaging with Steady-state Precession; TR/TE = 55.95/1.66; 400 mm field of view; 218*384 matrix) was used to provide dynamic imaging of 10 mm slices. A one-second image update was given, and 100 repetitions were obtained in the first five seconds beginning with complete rest. In order to account for any improper patient motion or miscommunication, three to four recordings were typically taken for each patient.

Interpretation:
Any protrusion of a pelvic organ—the bladder, uterus, rectum, or small bowel—below the level of the pelvic floor through the levator hiatus is referred to as pelvic organ prolapse. Rectal wall bulging, either anterior or posterior, is also included in this. The HMO (H line, M line, organ prolapse) grading method, shown in Fig. 1, was used to grade pelvic organ prolapse based on a midsagittal plane pelvic picture taken during maximal straining or defecation. An organ's prolapse was categorised as mild (6 cm) depending on how much below the pubococcygeal line it was. The size of the anterior rectal wall's (4 cm)

protrusion towards the vagina was used to grade rectocele. At repose, the anorectal angle (ARA) typically ranges from 108 to 127. When paradoxical contraction of the puborectalis muscle, paradoxical reduction of the ARA during defecation, and absence of lowering of the pelvic floor during straining and faeces were noted, anismus was identified. There are two types of rectal invagination (intussusception): full/partial thickness rectal wall prolapse occurring extra-anally, and intra-rectal intra-anal.

Parameters assessed were:

1) Anterior, middle and posterior compartments of the pelvis were assessed for any pelvic floor dysfunction.
2) After the acquisition of the appropriate images, the following lines were drawn and measurements were taken for the evaluation and assessment of the outcome of this study.
   a) PCL line: a line joining the inferior margin of the pubic symphysis to the final coccygeal joint. This line corresponds to the plane of the levator muscle.
   b) Mid pubic line: This line is drawn along the axis of the pubic symphysis and then perpendicular lines are drawn from the organ specific reference points in the same manner as the PCL.
   c) H Line: from the pubic symphysis to the posterior aspect of the anorectal junction and corresponds to the AP diameter of the hiatus.
   d) M Line: drawn perpendicular from the PCL to the posterior end of the H line and corresponds to pelvic hiatal descent during evacuation.

The pubococcygeal line (PCL) is drawn from the inferior margin of the symphysis pubis (A) to the last coccygeal joint (B). H line represents the anteroposterior hiatal width that extends from point (A) to the posterior aspect of the puborectalis muscle sling (C). M line is the perpendicular distance from the posterior end of H line (C) to the PCL and measures pelvic floor descent.

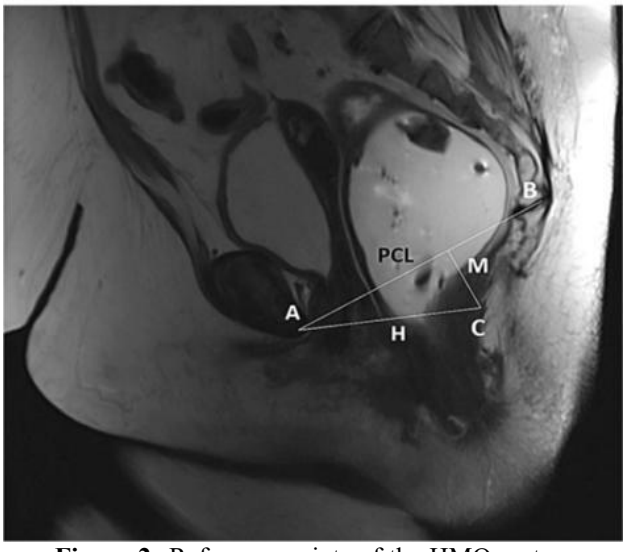


Figure 2: Reference points of the HMO system

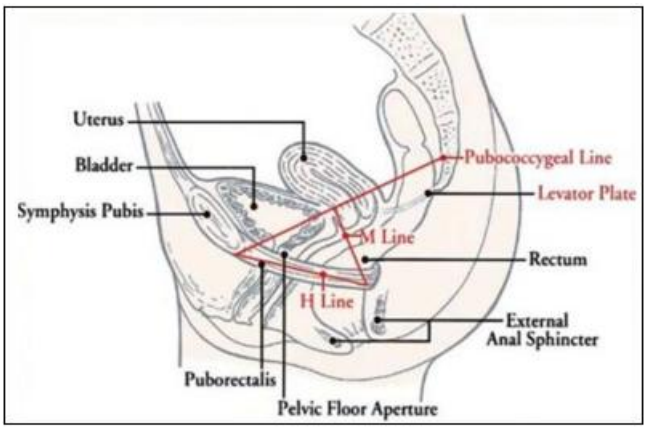


Figure 3: The pubococcygeal line (PCL) is drawn from the inferior margin of the symphysis pubis to the last coccygeal joint. H line represents the anteroposterior hiatal width that extends from the inferior margin of the symphysis pubis to the posterior aspect of the puborectalis muscle sling. M line is the perpendicular distance from the posterior end of H line to the PCL and measures pelvic floor descent.

Anorectal Angle:

The anorectal angle is defined as the angle formed between the longitudinal axis of the anal canal and the posterior rectal wall. More specifically, it's the angle between a line drawn along the posterior border of the distal rectum and a line drawn through the central axis of the anal canal.

Cut-off (Normal Values): The normal values for the anorectal angle vary depending on the patient's position and the phase of defecation. Generally accepted normal ranges are:

1) At rest:
   - Normal range: 90-110 degrees
   - Some sources cite a wider range of 90-135 degrees
2) During squeeze (contraction):
   - The angle should decrease by 10-15 degrees from the resting angle
   - Typically becomes more acute, often around 75-100 degrees
3) During straining/defecation:
   - The angle should increase by 15-20 degrees from the resting angle
   - Typically becomes more obtuse, often around 110-130 degrees or more

Ethical Consideration

Ethical clearance was taken from Ethical Committee of Dr. D.Y. Patil Hospital, Navi Mumbai before conducting the study. There are four universal ethical principles in biomedical research described in the landmark book- *Principles of biomedical ethics* by Beauchamp and Childress.

a) Respect for autonomy
b) Beneficence
c) Non-maleficence
d) Justice

a) Respect for Autonomy

The study subjects were explained in local language about the study and prior written informed consent

was taken from the respondent. Confidentiality of the information collected through the questionnaire was strictly followed throughout.

b) Beneficence

Individuals who were found to have abnormal lipid profile were treated for the same and educated about complications of stroke. Since it was not a funded project study subjects were informed that they will not be getting any financial benefit by participating in the study.

c) Non- Maleficence

Due care was taken to protect the privacy of the study subjects.

d) Justice

Due care was taken while recruiting the participants and special protection for vulnerable groups.

Analysis

The data was analyzed using SPSS software version 21.0. Descriptive statistics were used to describe the sample. The correlation between ARJ descent, cystocele, uterine descent, anterior and posterior rectocele, and patient symptoms was done, and the Chi-square test was employed to analyse differences in the frequency of anomalies according to gender and age. A statistically significant result was defined as one with a p value of less than 0.05.

3. Results

The following results were noted:

1) **Demographics:**
   - The study included an equal distribution of male and female patients (50% each).
   - The majority of patients (75%) were over 40 years old, with the highest percentage (30%) in the 41-50 age group.
   - 55% of patients were overweight (BMI 25-29.9), while 45% had normal BMI.
2) **Presenting complaints:**
   - The most common complaints were constipation (85%), incomplete evacuation (65%), and chronic pain (50%).
   - Pelvic organ prolapse was reported in 45% of cases.
3) **Pelvic floor abnormalities:**
   - Rectal prolapse was the most prevalent abnormality, found in 85% of patients.
   - Other abnormalities included rectocele (25%), cystocele (15%), enterocele (5%), and vaginal organ prolapse (5%).
   - 95% of patients had a normal anorectal angle, with only 5% showing abnormality.
4) **Grades of rectal prolapse:**
   - 45% of patients had Grade 2 rectal prolapse, 40% had Grade 1, and 15% had Grade 0.
5) **Risk factors:**
   - Multiparity was identified as a risk factor in 45% of patients.
   - History of pelvic surgery was present in 30% of patients.
6) **Associations:**
   - No statistically significant associations were found between pelvic abnormalities and age, BMI, or risk factors (p-values > 0.05).

4. Discussion

Pelvic floor disorders are a group of conditions that affect the normal functioning of the pelvic organs and their supporting structures. These disorders can significantly impact quality of life and are often underdiagnosed due to their complex nature and patients' reluctance to discuss symptoms. Magnetic Resonance Imaging (MRI) defecography has emerged as a valuable diagnostic tool in the evaluation of pelvic floor abnormalities, offering detailed visualization of the pelvic anatomy and dynamic assessment of pelvic organ function. Because all three compartments can be clearly seen without the need for additional contrast to be added to the anterior and middle compartments, MRI defecography can overcome some of the limitations of conventional defecography and ultrasonography. As a result, many other disorders that may affect the patient's management can be identified.[58] This study aimed to evaluate the significance of MRI defecography in diagnosing and characterizing pelvic floor abnormalities, with a focus on its ability to detect various pelvic compartment disorders and their associations with demographic and clinical factors.

Our study included 20 patients who underwent MRI defecography for evaluation of pelvic floor abnormalities. The demographic profile of our patient cohort revealed a balanced gender distribution (50% female, 50% male) and a predominance of patients in the 41-50 age group (30%). This age distribution is consistent with the findings of M.S.Al-Najar et al.[59], who reported mean age of 48years (20–81years). The majority of Rafiq S et al.[60] patients were in the 40–50 age range. In a research conducted solely on female patients, Abdelzaher et al.[61] found that the patients' mean age was 38.7 years. Because of the relaxation of the pelvic ligaments following childbirth, women are more likely to suffer from pelvic floor diseases. However, our gender distribution differs from most published literature, which typically reports a female predominance in pelvic floor disorders. M.S.Al-Najar et al.[59] reported 25 males and 70 females among 95 patients studied. Of the 24 individuals analysed, Rafiq S et al.[60] observed that 14 were female and 11 were male. This discrepancy may be due to our among men with pelvic floor symptoms. The BMI distribution in our study showed that 55% of patients were overweight (BMI 25- 29.9), while 45% had normal BMI. This aligns with the growing body of evidence suggesting a strong association between increased BMI and pelvic floor disorders. Our findings underscore the importance of weight management in the prevention and management of pelvic floor abnormalities.

Presenting complaints in our patient cohort was diverse, with constipation (85%) and incomplete evacuation (65%) being the most common. These symptoms are typical of posterior compartment disorders, which our study found to be prevalent. According to M.S. Al-Najar et al.[59], blocked defecation (29.5%; 21.1% among females and 54.2% among men) was the second most common presenting symptom, after chronic constipation (56.8%; 62.0% among

females and 41.7% among males). According to a research by Abdelzaher et al.[61], the most prevalent symptoms were faecal incontinence (36%), stress UI (38%), and blocked defecation (84%).

The high prevalence of these symptoms highlights the significant impact of pelvic floor disorders on bowel function and the need for comprehensive evaluation.

Depending on how much the organ descends below the PCL Line, organ prolapse can be rated. Grading is crucial for the treatment plan since bladder neck suspension techniques can be used to observe or treat grade 1 cystocele. On the other hand, grade 2 and 4 are fixed using transvaginal or trans abdominal means using different techniques. Our study found rectal prolapse to be the most common pelvic compartment abnormality (85%), followed by rectocele (25%) and cystocele (15%). In this group, posterior compartment anomaly manifested as an anterior rectocele was shown to be the second most prevalent pelvic floor dysfunction, primarily affecting females, according to M.S. Al-Najar et al.[59] Reiner et al.[62] also reported a similar finding. Rectoceles (anterior and posterior) were rare, seen in just 17% of patients[63] in another investigation with only men. The more common type of rectocele was posterior.

The most frequent observation, according to Rafiq S et al.[60], was organ prolapse in 9 out of the patients, including 6 patients with anterior rectocele and 3 patients with rectal prolapse. Two patients also exhibited anterior (cystocele) and middle compartment descent (uterine prolapse). According to Abdelzaher et al.[61], the incidence of rectocele, peritonocele, and enterocele was 52%, 34%, and 4%, respectively. Rectoceles were demonstrated by Pilkington et al.[64] to be incredibly prevalent.

This difference could be attributed to variations in patient selection criteria or regional differences in the prevalence of specific pelvic floor disorders.

In line with earlier research, M.S. Al-Najar et al.[59] found that the intermediate compartment was the least affected.[65] It was typically linked to an anterior compartment anomaly, specifically cystocele. Maglinte et al.[66] observed vaginal prolapse in 45% of patients with anterior compartmental symptoms and cystocele in 91% of patients presenting with middle compartmental symptoms in a cystoproctography investigation. In fact, they discovered anomalies in all three compartments in 95% of patients with pelvic floor dysfunction.

The grading of rectal prolapse in our study showed that 45% of patients had grade 2 prolapse, while 40% had grade 1. The ability of MRI defecography to accurately grade rectal prolapse is crucial for treatment planning and surgical decision-making.

We found no statistically significant association between age and specific pelvic abnormalities ($p>0.05$ for all comparisons). This is similar with the findings of M.S.Al-Najar et al.[59], who reported frequency of pelvic floor abnormality did not differ significantly between patients younger than 50 years and patients 50 years or older.

The association between BMI and pelvic abnormalities was also not statistically significant in our study. However, there was a trend towards a higher prevalence of cystocele and rectocele in overweight patients. This trend aligns with the findings of M.S.Al-Najar et al.[59] who reported that rectocele had a significant strong association with obesity and parity.

Multiparity and history of pelvic surgery were identified as risk factors in our study, present in 45% and 30% of patients, respectively. These findings are consistent with those of M.S. Al-Najar et al.[59], who identified multiparity as a significant risk factor for pelvic floor disorders. The role of previous pelvic surgery in predisposing individuals to pelvic floor abnormalities is also well-documented in the literature.[67] According to M.S. Al-Najar et al.[59], 79% of the women were parous, and 11% had previously undergone a hysterectomy. Not a single male patient had undergone prior pelvic surgery.

The high prevalence of normal anorectal angle (95%) in our study population was an unexpected finding. This contrasts with the results of M.S.Al-Najar et al.[59] who reported abnormal anorectal angles in 72.6% of patients with obstructed defecation. They reported that anterior rectocele, cystocele, and uterine descent were more commonly encountered in those with ARJ descent than those without ARJ descent. This discrepancy may be due to differences in measurement techniques or patient selection criteria and warrants further investigation. Another concept which has to be put in discussion is the abnormal anorectal angle which is seen in a patient of obstructed defecation syndrome

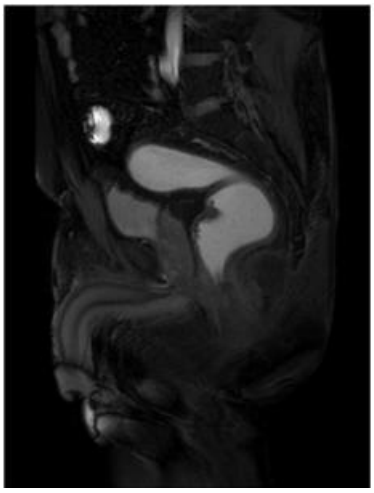
In conclusion, our study demonstrates the value of MRI defecography in comprehensively evaluating pelvic floor abnormalities. The technique's ability to detect and characterize various pelvic compartment disorders, particularly rectal prolapse and rectocele, makes it a valuable tool in the diagnostic workup of patients with pelvic floor symptoms. While our study did not find statistically significant associations between demographic factors and specific pelvic abnormalities, the trends observed align with existing literature. Larger, prospective studies are needed to further elucidate these relationships and to establish the role of MRI defecography in guiding treatment decisions for pelvic floor disorders.

5. Case Images

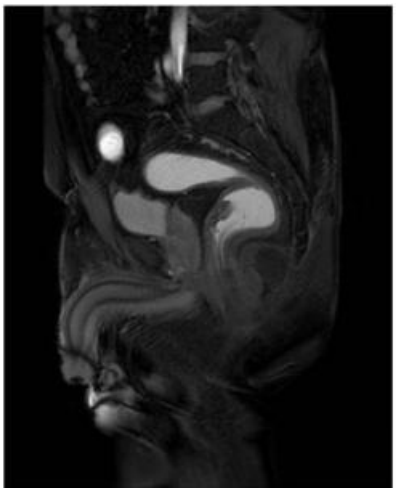
Case 1: A 44 year old male patient with h/o sensation of incomplete evacuation, constipation and chronic pain.

In mid sagittal SSFP images obtained

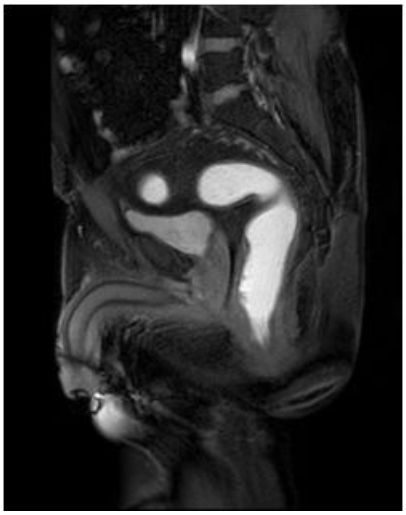
a) Rest Phase
b) Squeeze phase
c) Strain phase
d) Defecation phase- showing ARJ at a distance of 6.1 cm below PCL suggestive of grade II rectal prolapse



a



b



c



d

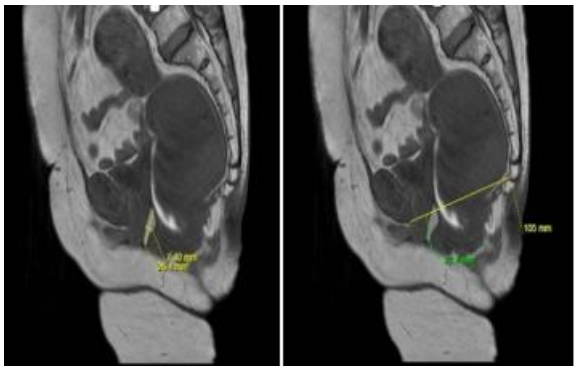
Case 2: A 55- year old female with h/o sensation of incomplete evacuation, constipation and chronic pain.

In mid sagittal SSFP images obtained

a) Rest Phase
b) Squeeze phase
c) Strain phase
d) Defecation phase- showing ARJ at a distance of 5.1 cm below PCL suggestive of grade II rectal prolapse
e) and f) Mid sagittal T1W image a 2.6*0.7 cm size T1 hyperintense cyst appearing hypointense on STIR images is noted in lower 1/3rd of vagina suggestive of Bartholin cyst ? hemorrhagic components, (g) the inferior margin of which is seen descending 2.2 cm below the PCL line suggestive of Vaginal prolapse



A B



C D

6. Conclusion

MRI defecography proved particularly valuable in detecting and classifying rectal prolapse, which was the most common abnormality observed in 85% of patients. The technique also successfully identified other pelvic compartment abnormalities such as rectocele, cystocele, and enterocele, albeit in smaller proportions. Notably, the study found that 95% of patients had a normal anorectal angle, suggesting that this parameter may not be a primary indicator of pelvic floor dysfunction in most cases.

The study identified multiparity and history of pelvic surgery as potential risk factors for pelvic floor abnormalities, present in 45% and 30% of patients respectively. However, statistical analysis did not reveal significant associations between these risk factors or demographic characteristics (age and BMI) and specific pelvic abnormalities. This lack of clear associations might be due to the limited sample size and warrants further investigation with larger cohorts.

In conclusion, this study underscores the significance of MRI defecography as a comprehensive diagnostic tool for evaluating pelvic floor disorders. Its ability to detect various abnormalities, particularly rectal prolapse and other pelvic organ prolapses, makes it a valuable asset in clinical practice. The detailed information provided by this imaging technique can greatly assist in accurate diagnosis and inform appropriate treatment planning for patients with pelvic floor dysfunction. While the study provides important insights, further research with larger sample sizes is recommended to establish more definitive relationships between risk factors and specific pelvic floor abnormalities.

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