|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
PubMed (National Library of Medicine ID: 101738825)
Index Copernicus Value 2018: 75.71
Original Research Article Volume 4, Issue 1; January: 2020; Page No. 235-251

A DESCRIPTIVE STUDY OF MR DEFECOGRAPHY FOR EVALUATION OF OBSTRUCTED DEFECATION SYNDROME

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Article Info: Received 04 January 2020; Accepted 28 January. 2020
DOI: https://doi.org/10.32553/ijmbs.v4i1.905
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Conflict of interest: No conflict of interest.

Abstract

Objective:-This study aims to ascertain the role of MR Defecography in the evaluation of obstructed defecation syndrome (ODS) with objective to describe spectrum of MR Defecography findings in obstructed defecation syndrome (ODS) and describe a number of reference lines and measurement points used to diagnose and grade pelvic floor disorders and Document the MRI appearance of disorders associated with ano-rectal dysfunction. MR Defecography demonstrated the profile of obstructed defecation syndrome on the basis of MR defecography and demonstrate its utility in simultaneous & objective evaluation of all three pelvic compartments. This diagnostic modalities provide a detailed pelvic floor anatomy and functional evaluation, as well as their respective abnormalities, making a precise diagnosis and provides valuable information on treatment planning & decrease chance of postoperative recurrence.

Subjects and Methods: It was Cross-sectional and prospective (quantitative) hospital based descriptive type of observational study carried out at a tertiary hospital SMS hospital, jaipur. Chosen the patients diagnosed with ODS as per Rome criteria (III) whose colonoscopy or rectosigmoidoscopy, had been done to rule out other findings from Feb 2018 to September 2019.MR defecography (static and dynamic) with 3 T (PHILIPS INGENIA) MRI system having tunnel configuration. After written and informed consent, patient was positioned supine in MR machine gantry . Static imaging performed in the axial T1WI high resolution, axial, coronal and sagittal T2WI high resolution images at rest for anatomical evaluation. Following this,after ultrasound gel instilled in the patient's rectum and intravaginaly ,dynamic imaging were taken in the midsagittal plane through the anal canal using a T2 weighted sequence. This sequence was ran for almost 2 min, while the patient performs various maneuvers (Kegel (squeeze), valsalva menuvere (strain), and defecation). MR defecography structurally and functionally evaluated in all 3 pelvic floor compartments and associated defects noted and grading of specific findings like organ specific prolapse, pelvic floor relaxiation and descent were measured.

Results: In our study most common findings were pelvic floor descent and anorectal junction descent in 92.68% cases each followed by rectocele in 82.93% cases. Among the females, vaginal/uterine prolapse were observed in 65.31% cases. Least common findings were paradoxical contraction (8.54%) and sigmoidocele (0%). Significant difference was observed in MRI functional parameters in resting state and during defecation/maximal strain position, utilising HMO system for pelvic floor relaxation and descent, as significant difference ($p < 0.001S$) was observed in all parameters including H line, M line, bladder base descent, cervical/vaginal and anorectal junction descent during resting state and during defecation/maximal strain position. Out of 82 conservative biofeedback therapy was given to 79.27 % patients, surgical management was done in (7.32%) and combination of both therapies was given in 13.41% of cases. Out of 82 patients 68.29% showed benefit from management and showed improvement on follow and 31.71% patients were not improved on follow up.

Conclusion: As complete survey of the entire pelvis is necessary before surgical repair Magnetic resonance imaging permits evaluation of all three pelvic compartments and as we demonstrated in our study more than one compartment are frequently affected in obstructed defecation syndrome. Static MR Imaging can be also useful to identify the defects responsible for pelvic organ prolapse and stress urinary incontinence, and so help perform site specific repair in surgery, to avoid the high recurrence rates.Findings reported at dynamic MR imaging of the pelvic floor are valuable for selecting candidates for surgical treatment and for indicating the most appropriate surgical approach as detection rate of pathologies increased during defecation / maximal straning as concluded by our study.

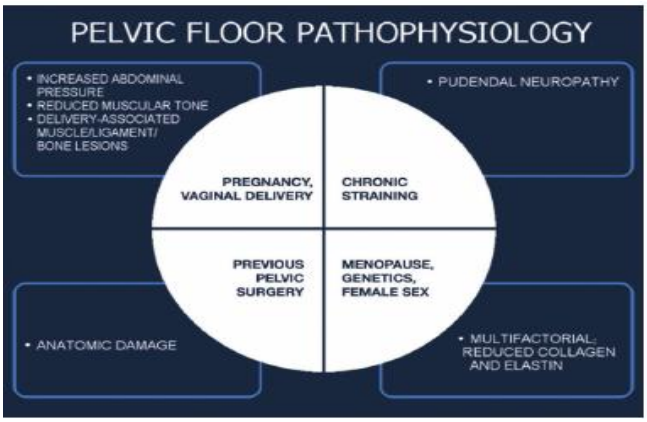
Introduction

Defecation process encompasses a normal colonic transit, adequate anorectal sensation, and coordinated function of the pelvic floor structures. The Puborectalis muscle and external anal sphincter should be in a state of continuous activity at rest, and a coordinated inhibition is expected during defecation.[1] Normal evacuation lasts about 30 seconds, with the descent of the pelvic floor, opening of the anal canal, and widening of the anorectal angle. Normally, the change in the anorectal angle between rest

and defecation is about 15°-20°. Complete loss of puborectal sling impression on the posterior wall of caudal rectum should also be seen. At the end of evacuation, rectum is expected to be almost completely empty.[2-4]When evacuation is difficult and infrequent with or without a sense of incomplete evacuation it is called "constipation". Chronic constipation is a common health problem which significantly reduces the quality of life. Conservative therapies and surgical procedures can be performed to relieve the patient. Obstructed defecation is responsible for the frustrating symptoms in half of the severely constipated patients who are refractory to conservative therapies.[3]

Obstructed defecation means that the passage of stool has been opposed and there is an inadequate evacuation of fecal contents from rectum. Most of these patients complain about their need to apply digital support and excessive straining during defecation with repeated and prolonged attempts for evacuation. These patients usually are not relieved after defecation and feel uncomfortable all day long.

Obstructed defecation syndrome (ODS) is a complex and multifactorial condition, characterised by an urge to defecate but an impaired ability to expel the faecal bolus.[5]It is a functional disorder leading to defecatory dysfunction that leads to sensing of outlet obstruction in absence of any pathological findings.[6] In ODS faeces reach the rectum but the rectal emptying is extremely difficult.[7] Symptoms includes unsuccessful faecal evacuation attempts, excessive straining, pain, bleeding after defecation,a sense of incomplete faecal evacuation, digital rectal evacuation, incontinence.[7-8]



The etiology of ODS is controversial. The etiology is multifactorial: hysterectomy, low estrogen levels, advanced age, high BMI, excessive straining during defecation, etc. It is presumed that in childbearing women damage to the innervation and soft tissues of the pelvis may occur as a direct consequence of vaginal childbirth.[9,10] Trauma to the pelvic soft tissues can result in endopelvic fascial and pelvic support defects.[10,11] Cumulative nerve damage from stretching of pelvic floor due to childbirth in multipara women and activities that cause chronic and repetitive increases in the intra-abdominal pressure such as obesity and chronic cough may also predispose to the development of symptomatic defects.[12]

Decreased rectal sensory perception has been suggested as aputative cause of obstructed defecation seen in subtotal colectomy with ileorectal anastomosis deficit of parasympathetic sacral nerves (Nervi Erigentes) and pelvic surgery, hysterectomy. Patients who have undergone rectopexy frequently experience diminished rectal sensory perception that has been attributed to the division of the “lateral ligaments”, which contain branches of the parasympathetic sacral nerves.[13-15].[16] Patients with the cauda equina syndrome report suffering from obstructed defecation.[17]

There is growing interest in the influence of psychological distress on bowel dysfunction. The most frequently reported symptoms of these sexual maltreated patients were of constipation and obstructed defecation.[18-20]

Anismus, also known as spastic pelvic floor and pelvic floor dyssynergia, is a malfunction of the external anal sphincter and Puborectalis sling during defecation.[21] During defecation, the muscles of rectal wall contract whereas the Puborectalis sling and the external anal sphincter relax to permit defecation. The concept of pelvic floor dys-synergy encompasses many diagnoses including anismus, spastic pelvic floor syndrome and paradoxical Puborectalis contraction.[22] It is also seen in patients of rectocele, rectal prolapse and other pelvic floor disorders. Hyperactive Puborectalis is also seen in patients of solitary rectal ulcer syndrome.[22]

Mega-rectum is defined as an enlarged rectal diameter of >6 cm at the level of the pelvic brim, or total rectal capacity of over 450 ml of air on manometry.[21] Descending perineum syndrome is characterized by a descent of more than 3 cm of the perineal body during straining at stools. Excessive straining and weakened perineal muscles (possible stretching damage to the pudendal nerves) are responsible for it.[7]

A vicious cycle of straining and perineal descent develops in the patients of ODS that eventually culminates with the development of prolapse. An important thing to note here is that though functional and mechanical variants of ODS have been described, but in reality, they belong to the same spectrum. Deterioration of functional variant eventually leads to morphological anomalies causing mechanical blockage to the passage of feces and accentuating the ODS.

ODS is often associated with structural defects in the rectum such as rectocele (herniation of rectum into vagina), internal rectal prolapse (intussusception) and perineal descent.[5]

Chronic constipation recently define as Rome III criteria. As per the Rome III guidelines,[5,7] patients labelled as suffering from functional constipation will also include cases of ODS.

Using the Rome III criteria[23] 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 excluded patients 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. (c) 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 sub type were excluded.

Constipation caused by obstructed defecation is of two basic types[7]

Functional-which includes Idiopathic megarectum, anismus (pelvic floor dys-synergy) and descending perineal syndrome.

Mechanical-includes rectocele, enterocele, intussusception and overt rectal prolapse.

About 50% of all women aged > 50 years suffer from pelvic floor dysfunction; nearly 11% of those who seek medical help have already undergone surgery, and 30% of these require repeat surgery.[24]

There are physiological tests and imaging studies to be performed. Physiological tests include balloon expulsion test, anal manometry and electromyography (EMG). Evacuation proctography was the gold standard imaging study for many years as it is a cost-effective, simple and widely available technique which is performed in physiologic defecatory position. Nevertheless limited projectional planes, radiation exposure, and inability to demonstrate soft tissues are the disadvanteges of this technique. Also the need for additional contrast administration to view the bladder, vagina, and small intestine makes this method increasingly invasive.

Transperineal and endoanal ultrasonography can also demonstrate pelvic floor abnormalities especially in experienced hands. Ultrasonography may allow the use of MR imaging for more selected cases but today the gold standard imaging technique appears to be MR defecography.

Conservative treatment (including biofeedback technique) improves symptoms in majority of patients. Surgery required if conservative treatment have failed and where there is development of structural abnormalities severe enough to affect daily functional activities. Various surgical procedure used to correct underlying structural conditions taking an abdominal, vaginal or laparoscopic approach.

MR defecography allows for pelvic floor anatomy and functional evaluation, as well as their respective abnormalities, making a precise diagnosis and provides valuable information on treatment planning.[7] Magnetic resonance defecography (MRD) has shown to demonstrate the structural abnormalities associated with ODS, and patients with significant structural abnormalities may benefit from surgical interventions .

Patients who do not demonstrate significant structural abnormalities can be referred for biofeedback techniques.

As many as 30% of cases report recurrence[27-28] due to multicompartment involvement. MR Defecography allows assessment of all three compartments: Anterior compartment (Urethra and bladder), Middle compartment (Vagina and uterus),Posterior compartment (Ano-rectum).

For these reasons a multi-compartment pre-surgical diagnostic examination is mandatory for preoperative planning which is made possible by MR Defecography.

PUBLIC HEALTH IMPORTANCE

This study will demonstrate the advantages of MR Defecography for evaluation of obstructed defecation syndromes. This diagnostic modalities provide a detailed pelvic floor anatomy and functional evaluation, as well as their respective abnormalities, making a precise diagnosis and provides valuable information on treatment planning & decrease chance of postoperative recurrence.

PURPOSE OF THE STUDY

To present the profile of obstructed defecation syndrome on the basis of MR defecography and demonstrate its utility in simultaneous & objective evaluation of all three pelvic compartments.

MATERIAL AND METHODS

STUDY TYPE:- Cross-sectional and prospective (quantitative) study.

STUDY DESIGN:- Hospital based descriptive type of observational study.

STUDY LOCATION:- Department of Radio-diagnosis and modern imaging SMS Medical College and associate groups of Hospitals, Jaipur.

STUDY DURATION:- Feb 2018 to September 2019.

STUDY TOOL:- Pre-tested ,pre-designed proforma will be used to collect data.

EQUIPMENT:-3.0 tesla MRI from PHILIPS INGENIA.

SAMPLE SIZE-Sample size is calculated at 95% confidence level and alpha error of 0.05,assuming 71% rectocele as one of the abnormality identified in patient with suspected obstructed defecation syndrome by MR Defecography as per seed article(MR defecography for obstructed defecation syndrome Indian Journal of Radiology and Imaging / February 2015 / Vol 25 /Issue 1).[36]At 10% absolute allowable error the required sample size will be 82 patient with obstructed defecation syndrome.

INCLUSION CRITERIA

1. Patients referred from department of surgery, gastro-intestinal surgery, gastroenterology and Gynaecologyof obstructed defecation syndrome (ODS) as per Rome

criteria (III) whose colonoscopy or rectosigmoidoscopy, has been done to rule out other findings.

2. Patients must give informed written consent.

EXCLUSION CRITERIA

1. Patients with pace maker or any kind of metallic implants/prosthesis or metallic foreign body.
2. Patients suffering from claustrophobia.

METHODOLOGY

Patients with suspected ODS are referred to our department for MRD. All patients undergo colonoscopy or rectosigmoidoscopy prior to the MRD to exclude other colonic pathologies like colon neoplasms and polyps. MRD will be performed on a 3 T (PHILIPS INGENIA) MRI system having a tunnel configuration using a standardized protocol. No prior colon preparation is necessary.

The procedure will be explained in detail for optimal patient cooperation. Moderately filled bladder and use of disposable diaper is recommended.

After written and informed consent, upto 120 ml (as per patient tolerance) of ultrasound jelly will be instilled in the patient's rectum using rectal tube in left lateral decubitus position. 30 ml jelly will be given intra vaginally also in females.

The patient will be made to lie down in supine position on the MR machine gantry and static imaging will be performed in the axial T1WI high resolution, axial, coronal and sagittal T2WI high resolution images at rest for anatomical evaluation.

Following this, dynamic imaging will be in the midsagittal plane through the anal canal using a T2 weighted sequence. This sequence is run for almost 2 min, while the patient performs various maneuvers:

- He/she is first asked to squeeze the anal sphincters inward, so as to elevate the pelvic floor.
- Then, he/she is asked to apply short transient downward straining effort and relax immediately.
- The patient is asked to apply sustained downward straining effort and pass the ultrasound jelly (defecate) than with maximum staining efforts
- Finally post defecation resting stage

The dynamic scan is repeated if necessary. The study will be considered to be of non-diagnostic quality if the patient is unable to effectively strain in the supine position.

MRI findings were confirmed by the consultant radiologist. MRI findings were compared with the clinical and surgical finding of the patients.

STASTICAL ANALYSIS

Nominal/categorical variables will be summarized as proportions (%). Significance of difference in proportion will be inferred by chi-square test. Sensitivity, specificity, PPV (positive predictive value), NPV (negative predictive value)and diagnostic accuracy will be calculated as per standard formulae. P value <0.05 will be taken as significant. Descriptive statistics, one sample proportion test, Liner regression and Logistic regression. Medcalc 16.4 version software was used for all statistical calculations.

MR IMAGING TECHNIQUE

Dynamic MR imaging of the pelvic floor was performed with the patient supine position on a conventional high-field-strength magnet(3T Tunnel configuration MR system) with direct visualization of all pelvic organ and musculature in dynamic fashion.

Functional imaging with defecation was done with instillation of 120 ml,30ml ultrasound gel intra rectal and intra vaginal(in female) respectively for better visualization of bowel, bladder ,vagina with contrast.

Urinary bladder partially distended at the time of imaging to prevent obscure prolapsed of other compartment and for better visualization of its conture.

Patient positioned supine with a wearied a adult size daiper on MR table and ultrasound gel was instilled using a catheter tip in lateral decubitus position then placed in supine position for imaging with knee slightly flexed on a pillow or wedge for support.

A multichannel phase-array surface coil is positioned over the patient's pelvis for MR image acquisition. T2-weighted (T2w) turbo spin echo (TSE) images in sagittal, axial, and coronal planes and axial T1-weighted gradient echo (GRE) images can be acquired at rest to allow for anatomic evaluation. These followed by cine-type single shot fast spin echo (SSFSE) in a single midsagittal plane for functional imaging performed during Kegel (squeeze), strain, and defecation.we advocated at least 3 attempts at defecation in order to elicit maximum degree of prolapse. The sagittal cine-type SSFSE images should be repeated after defecation with a postdefecation strain maneuver, because this may sometimes show a higher degree of prolapse particularly when the patients are unable to completely empty the rectum during the defecation phases. If patients are not able to defecate after 3 attempts, they are instructed to defecate in the restroom and then immediately return to MR imaging for the postdefecation strain images.

Table 1: MR defecography protocol for 3T MRI

Sequence	Slice orientation	FOV(cm)	Matrix	Slice thickness
T1 TSE HR	Axial	26	320	3 mm
T2 TSE HR	Coronal	26	384	3 mm
T2 TSE HR	Axial	26	384	3 mm
T2 TSE HR	Sagittal	26	384	2.8 mm
T2W SPAIR	Axial	26	320	4.5mm
T2 SSH SAG-DYN -CINE resting	Sagittal	34	320	4.5 mm
T2 SSH SAG-DYN Cine–squeezing	Sagittal	34	320	4.5 mm
T2 SSH SAG-DYN Cine – defecation	Sagittal	33	256	10 mm
T2 SSH SAG-DYN Cine defecation / maximum straining	Sagittal	34	320	4.5 mm
T2 SSH SAG-DYN post-defecation	Sagittal	34	320	4.5 mm

MR IMAGING INTERPRETATION

We evaluated for anatomic findings and functional findings in all 3 pelvic floor compartments.

Anatomical findings:- High-resolution anatomic evaluation in multiple planes was done, Morphologic changes of the pelvic floor seen on MR imaging correlate with functional deficiencies. The levator muscles can be assessed for areas of asymmetric thickening or atrophy, focal defects, scarring , ballooning, or focal eventration.[58]

Puborectalis, may be thinner on the right than on the left when viewed in the axial plane, even in asymptomatic women, likely due to chemical shift artifact.[55,58] Puborectalis muscle tears may be unilateral or bilateral, and they may result from vaginal trauma or injury during childbirth, episiotomy, or other vaginal surgery. When bilateral, these may result in a "batwing shape" of the perineum at the level of the lower vagina and urethra due to absence of the puboviscerallis portion of the levator ani. The vagina may appear flat and protrude laterally into the muscle defects and lie close to the obturator internus muscle on the affected side.[59] anal sphincter complex evaluated on axial images The thick circular internal anal sphincter is typically intermediate in signal intensity on T2w images, whereas the more inferiorly located external sphincter is thinner and more hypointense.

Anatomic evaluation should also report the presence or absence of the uterus and cervix and include assessment of other pelvic organs. The normal urethra should have a circular target-like morphology; however, this may be absent in postmenopausal women.

In the setting of urinary incontinence,there may be distortion of the surrounding tissue, the urethra may appear flattened or may demonstrate funneling,[31] and there may be disruption of the urethral ligaments.[79]

A level I fascial defect as a result of detachment of the uterosacral ligament results in posterior sagging of the vagina bilaterally. The appearance is termed the "chevron sign".[60]

A level II defect of the middle third of the vagina along with Puborectalis muscle defects may cause the vagina to lose its expected "H" shape and appear relatively flat on axial images.[84] A paravaginal level II defect may result in posterior drooping of the urinary bladder resulting in the "saddlebag sign" if bilateral.[60]

A level III endopelvic fascia defect due to deficiency of the urethral ligaments may result in widening of the retropubic space, sometimes termed the "mustache sign."[60]

Functional Evaluation

Establishment of appropriate landmarks on sagittal images is critical for functional evaluation of the anterior, middle, and posterior compartments of the pelvis. Multiple reference lines have been proposed in the literature,[61] with the midpubic line (MPL) and the PCL being the most common.

MPL is drawn through the long axis of the pubic symphysis and corresponds to the level of the hymen on physical examination.[62,63]

PCL corresponding to the level of the pelvic floor is the most widely used reference line.[89] as extending from the inferior tip of the pubic symphysis to the tip of the last nonmobile sacro coccygeal joint. The PCL corresponds the levator plate and had good correlation between PCL and classification of prolapse for anterior and middle compartments. Organ prolapse is measured drawing a perpendicular line below and relative to the PCL for each compartment and respective organ (bladder - anterior, vagina - middle, ano-rectal junction - posterior).

Functional evaluation is performed with reference to the PCL in present study.The "HMO" system is used to grade pelvic floor laxity and organ descent and includes evaluation of the "H-line," "M-line," and organ-specific prolapse.[64]

The "H-line" is a measure of the width of the pelvic floor hiatus in the anteroposterior dimension and is measured from the inferior tip of the pubic symphysis to the posterior circular fibers of the anorectal junction. Normal H-line at rest is 6 cm.

The "M-line" is drawn perpendicularly down from the PCL to the posterior extent of the H-line at the posterior aspect of the anorectal junction. It represents the degree of pelvic floor descent. The M-line at rest is typically 2 cm.

The anorectal junction is demarcated by the impression of the horizontal fibers of the Puborectalis muscle on the posterior wall of the rectum and can be identified by cross-referencing the axial images with a midline sagittal image.

Degree of pelvic hiatus widening(H-line) and floor descent(M-line) is measured during maximal straining or defecation commonly graded based on a previously published grading scale.[52]

Table 2:

Grade	H-line, cm	M-line, cm
0 (normal)	<6	0-2
1 (mild)	6-8	2-4
2 (moderate)	8-10	4-6
3 (severe)	≥10	≥ 6

Ano-rectal angle - measured from the midline of the anal canal to a tangent to the posterior rectal wall; changes in the ano-rectal angle during squeezing and defecation allow estimation of the Puborectalis muscle function. where an ARA reduction during contraction and an increased ARA during defecation are expected, relative to the resting study (70-134°).

The "O" in the HMO system represents organ specific prolapse. Organ prolapse is noted by measuring the lowest point of the organ along a line drawn perpendicular to the PCL and is graded according to the rule of 3's.[43,52]

Table 3: Grading of pelvic organ prolapse relative to pubococcygeal line.

Grade	Perpendicular Distance Caudal to PCL, cm
1 (mild)	<3
2 (moderate)	3-6
3 (severe)	>6

The anorectal angle and levator plate angle are measures of pelvic floor relaxation in the posterior compartment. The anorectal angle should widen during defecation and narrow during Kegel generally by 15 to 20.[40]

Another angle that is often measured in the posterior compartment is the levator plate angle, which is measured between the levator plate and the PCL. The levator plate angle has been shown to be significantly higher during strain in patients with pelvic organ prolapse than in control subjects.[55] During strain or defecation, widening of the levator plate angle greater than 10 compared with baseline angle at rest indicates loss of pelvic floor support.[65]

Anterior compartment

Cystocele

Descent of the bladder greater than 1 cm below the PCL is termed cystocele.14 Grading of cystoceles follows the rule of 3's24,33. Clinically, cystoceles may present with a bulge along the anterior vaginal wall.

Urethral hypermobility

Many patients with anterior compartment prolapse also present with urethral hypermobility, defined as a urethral angle greater than 30 degree at rest, at strain, or an increase in urethral angle by at least 30 degree between rest and defecation.[66]

Urethral angle on MR imaging is measured between the urethral axis and a vertical line drawn at the external meatus, which frequently intersects the inferior margin of the pubic symphysis.[66,67]

Middle compartment

The uterus, cervix, and vagina compose the middle compartment of the pelvis. Disruption of the uterosacral ligaments, potentially after hysterectomy, or tearing of the paracolpium or parametrium may result in middle compartment prolapse. Anterior and posterior vaginal wall bulging may result from disruption of the pubocervical and rectovaginal fasciae, respectively.

The normal "H" shape of the vagina on axial images may be disrupted. During functional imaging, middle compartment prolapse is quantified by measuring the lowest point of the cervix, or the vaginal apex in the case of prior hysterectomy relative to the PCL.

Middle compartment prolapse can also predispose patients to enterocele or peritoneocele formation by increasing traction upon the posterior cul-de-sac and widening the potential space through which the peritoneal sac may herniate.

Posterior compartment

Enterocele

Enterocele refers to herniation of peritoneal contents in the posterior cul-de-sac below the PCL and into the rectovaginal space. This typically results from disruption of the rectovaginal septum. Depending on the contents of the hernia sac, it may be more accurately described as an enterocele (small bowel) , peritoneocele (peritoneal fat), sigmoidocele (sigmoid colon), or less commonly, cecocele (cecum).

Enteroceles may present as a posterior vaginal bulge; however, physical examination alone is often inadequate for enterocele detection.[54,68] Furthermore, when a posterior vaginal bulge is detected clinically, differentiation of enterocele from rectocele (anterior herniation of the rectum discussed later) is often difficult on physical examination.

Enteroceles typically manifest during the late stage of defecation after rectal emptying. Hence, it is important to perform postdefecation strain dynamic images because these may demonstrate enteroceles not seen on defecation images.

Rectocele

A rectocele is an outpouching of the rectal lumen, most typically along the anterior rectal wall less likely posterior or lateral wall. Rarely, outpouchings of the posterior rectal wall occur due to defects in the levator plate, resulting in posterior rectoceles.[35]

On sagittal images by measuring the anteroposterior extent of the outpouching relative to the expected margin of normal anterior rectal wall . They are graded as small (<2 cm), moderate (2-4 cm), or large (>4 cm).[68]

Patients with symptomatic rectoceles may present with incomplete defecation and may report a history of manual splinting at the posterior vaginal wall in order to evacuate. MR defecography may show retained rectal contrast in the rectocele in such cases.

Rectal intussusception

Rectal intussusception refers to herniation of all layers of the rectal wall into the more distal rectum or anus. Depending on location of the prolapsed segment, it may be intrarectal, intraanal, or extraanal (rectal prolapsed).

Full-thickness circumferential intussusception on MR imaging may result in an "arrow" sign of the rectum during defecation.

Anal incontinence

Anal incontinence is the loss of voluntary control of passage of stool or flatus via the anus. It is typically an acquired condition that results from direct injury or deficiency of the sphincter complex, as can be seen with vaginal childbirth or prior episiotomy. It can also be a result of pudendal nerve dysfunction due to chronic straining, advanced age, or heavy smoking.[69]

Deficiency of the internal sphincter typically manifests as passive incontinence at rest, whereas dysfunction of the external sphincter results in urge incontinence.[69]

Pelvic floor dyssynergia

Pelvic floor dyssynergia, alsoreferred to as dyssynergic defecation,anismus,spastic pelvic floor syndrome, or non relaxing Puborectalis syndrome, is a functional condition characterized by paradoxic contraction of or inability to relax the Puborectalis muscle during attempted defecation. Involuntary contraction of the striated muscle results in narrowing rather than widening of the anorectal angle due to anterior and upward traction of the levator plate .

On anatomic images, the Puborectalis muscle may appear hypertrophied with resultant prominent impression upon the anorectal junction. MR defecography demonstrates impaired evacuation, abnormal change in the anorectal angle, and paradoxic sphincter contraction more commonly in patients with dyssynergic defecation than in those without.[69]

Paradoxic levator contraction and anorectal angle narrowing seen during attempts at defecation when seen with signs of adequate increased intraabdominal pressure such as anterior bulging of the abdominal wall and descent of the rectum may indicate true dyssynergia

Descending perineal syndrome

Descending perineal syndrome is characterized by excessive descent of the pelvic floor at rest and/or defecation. Imaging may show a low-lying anorectal junction at rest indicating weakness and reduced tone of the pelvic floor myofascial support system.[71] This may be associated with levator muscle bulging that can be seen on axial and coronal images and implies a widened pelvic floor hiatus. The H-line and M-line will typically be elongated at rest and will demonstrate a further increase during defecation. There may be excessive widening of the anorectal or levator plate angles. When the entire pelvic floor is affected, there will be organ prolapse below the PCL in the anterior and middle compartments as well. There may be diminished elevation of the pelvic floor during Kegel (squeeze).[70]

OBSERVATION AND RESULTS

Table 4: Anatomical evaluation of levator muscle in obstructed defecation syndrome

Levator muscle	Number	Percentage%
Symmetry	59	71.95
Asymmetry	23	28.05
Atrophy	4	4.88
Focal defects	**11**	13.41
1.scarring	4	4.88
2.ballooning	4	4.88
3.focal eventration	3	3.66
Perineal body Tear		
Tear	4	4.88

Levator muscle was symmetrical on MR appearance in 71.95% (59/82) patient and in rest 28.05% it was asymmetrical. Focal defect in levator was seen in 13.41% (11/82) out of which 4 patients showed scarring, 4 patients showed ballooning and 3 patients had focal eventration of levetor ani muscle. Perineal body tear and focal atrophy of levator ani was least common around 4.88% each (4 patients each).

Table 5: Distribution of the case according to level of deformity in endopelvic fascia in patients with ODS

Endopelvic fasia (N=82)	No	%
level I	11	13.41
level II	8	9.75
level III	11	13.41

This table shows out of 82 patients, a total of 30 patients had defect in endopelvic fascia with equal number of patients showing defect at level I and level III (13.41%) each, and the rest of them were at level II (9.75%).

Table 6: MRI functional parameters according to HMO system in resting state and during defecation / maximum strain

HMO system(H Line)	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**	**Median**	
Rest	82	5.91	0.85	4.20	8.00	5.80	<0.0001S
Defecation/Maximal strain	82	7.49	1.44	4.90	10.50	7.20	
M-line							
Rest	82	2.17	0.79	0.90	3.90	2.00	<0.001S
Defecation/Maximal strain	82	4.71	1.55	1.00	6.90	4.80	
Bladder base descent							
REST	82	-1.83	0.86	-3.40	0.00	-2.00	<0.001S
Defecation/Maximal strain	82	1.47	1.87	-2.70	6.20	1.50	
Cervical/Vaginal							
REST	49	2.394	1.5838	.0	5.3	2.000	<0.001S
Defecation/Maximal strain	49	-1.286	2.2159	-5.6	3.0	-1.800	
Anorectal Junction Descent							
REST	82	2.17	0.79	0.90	3.90	2.00	<0.001S
Defecation/Maximal strain	82	4.71	1.55	1.00	6.90	4.80	

Significant difference was observed in MRI functional parameters in resting state and during defecation/maximal strain position, according to HMO system for pelvic floor relaxation and descent as significant difference (p <0.001S) was observed in H line , M line, Bladder base descent,Cervical/Vaginal and Anorectal Junction Descent during resting state and during Defecation/Maximal strain position.

Table 7: Distribution of the case of pelvic floor relaxation according to H line

H line	**REST**		**Defecation**		**P Value LS**
	number	percentage%	number	percentage%	
grade 0	54	65.85	15	18.29	<0.001S
grade 1	28	34.15	31	37.80	
grade 2	0	0	33	40.24	
grade 3	0	0	3	3.66	
Total	82	100	82	100	

This table depicts the distribution of the cases according to pelvic floor relaxation relative to H line. Out of 82 in rest position, 54(65.85%) showed grade 0 relaxation followed by 28(34.15%) in grade 1 relaxation. During defecation, maximum patients 33 out of 82 (40.24 %) showed grade II relaxation followed grade 1 relaxation in 31 (37.80%)

patients and this observation was statistically significant (Chi-square = 58.196 with 3 degrees of freedom; P = 0.000)

Table 8: Distribution of the case of pelvic floor descent according to M-line

M- line	REST		Defecation		P-VALUE
	number	percentage%	number	percentage%	
grade 0	44	53.66	6	7.32	<0.001S
grade 1	38	46.34	22	26.83	
grade 2	0	0.00	29	35.37	
grade 3	0	0.00	25	30.49	
Total	82	100.00	82	100.00	

This table depicts the distribution of the cases according to pelvic floor descent in relation to M line. Out of 82 patients in resting phase, 44 (53.66%) were showing grade 0 descent followed by grade 1 descent in 38 (46.34%), while during defecation grade 2 descent was seen in 29 (35.37%) patients followed by grade 3 descent in 25 (30.49%) patients, grade 1 in 22 (26.83%) and grade 0 being least common in 6 (7.32%) patients. The result was statistically significant (Chi-square = 87.147 with 3 degrees of freedom; P 0.001S)

Table 9: Prolapse of bladder base (Cystocele) according to organ specific prolapse of HMO system

bladder base (cystocele)	REST		Defecation		P-VALUE
	Number	percentage%	number	percentage%	
grade 0	82	100	32	39.02	<0.001S
grade 1	0	0	36	43.90	
grade 2	0	0	12	14.63	
grade 3	0	0	2	2.44	
Total	82	100	82	100	

This table depicts the distribution of the cases according to bladder base prolapse (cystocele) according to HMO system. Out of 82 patients 100% were in grade 0 during resting state while during defecation, 32 (39.02%) cases were in grade 0 followed grade 1 in 36 (43.90%) patients and grade 2 in 12 (14.63%) patients. The result was statistically significant. (Chi-square = 71.930 with 3 degrees of freedom; P< 0.001S)

Table 10: Prolapse of vaginal apex/cervix/uterus according to organ specific prolapse of HMO system

Prolapse of vaginal apex/cervix	Rest (N=49)		Defecation (N=49)		P-Value
	Number	Percentage%	Number	Percentage%	
Grade 0	49	100	17	34.69	<0.001S
Grade 1	0	0	25	51.02	
Grade 2	0	0	7	14.29	
Grade 3	0	0.0	0	0.00	
Total	**49**	100	49	100	

This table depicts the distribution of the cases according to vaginal apex/cervix/uterine prolapse. Out of 49 females, at rest position, all cases were in grade 0 while at defecation grade 0 was seen in 34.69% , grade 1 in 51.02% and grade 2 in 14.29%. P value is significant (Chi-square = 48.516 with 2 degrees of freedom; P = 0.000)

Table 11: Distribution of the case according to anorectal junction descent of HMO system

Anorectal junction descent	Rest		Defecation		P-Value
	Number	Percentage%	Number	Percentage%	
Grade 0	44	53.7	6	7.3	<0.001S
Grade 1	38	46.3	22	26.8	
Grade 2	0	0.0	29	35.4	
Grade 3	0	0.0	25	30.5	
Total	82	100.0	82	100.0	

This table depicts the distribution of cases according to anorectal junction descent. At rest, grade 0 was observed in 44 (53.7%) and grade 1 in 38 (46.3%) patients while at defecation position grade 0 in 6 (7.3%) cases, grade 2 in 29 (35.4%) followed by grade 3 in 25 (30.5%) patients. P value is significant (Chi-square = 87.147 with 3 degrees of freedom; P = 0.000)

Table 12: Mean angles measured in Functional MRI

	N	Mean	Std. Deviation	Minimum	Maximum	Median
Levetor plate angle						
Rest	82	15.11	7.05	6.00	34.00	14.00
Defecation	82	33.15	14.42	9.00	70.00	32.00
Anorectal/levator-anus angle						
Rest	82	106.32	12.70	78.00	132.00	108.50
Kegel	82	89.77	10.96	68.00	110.00	92.00
Defecation/maximum strain	82	124.23	16.78	72.00	142.00	128.50

This table depicts the mean angles measured in functional MRI during rest and defecation / maximum strain state. For levetor plate angle, mean was (15.11 ± 7.05^0) and (33.15 ± 14.42^0) with maximum angles 34^0 and 70^0 during rest and defecation state, respectively. For anorectal/levetor–anus angle, mean was (106.32 ±12.70), (89.77 ±10.96^0) and (124.15 ± 16.78^0) with maximum angles 132^0, 110^{0}and 142^0 during rest, kegel and defecation, respectively.

Table 13: Distribution of the case according to urethral angle

Urethral Angle	Number	Percentage%
Normal (<30^o)	66	80.49
>30^o at rest or increased by >30^o from rest to defecation	16	19.51
Total	82	100.00

This table depicts the distribution of the cases according to urethral angle. Out of 82 patients, 66 (80.49%) showed normal urethral angle and urethral hypermobility was seen in the remaining 16 (19.51%) patients.

Table 14: Distribution of the case according to levetor plate angle

Levetor plate angle						
Criteria at rest			Criteria at defecation			P-Value
	Number	Percentage%		Number	Percentage %	
Normal (<10^o)	34	41.46	Normal (increased by <10 degree)	23	28.05	0.101 NS
Abnormal (>10^o)	48	58.54	Abnormal (increased by >10 degree)	59	71.95	
Total	82	100		82	100	

This table depicts the distribution of the cases according to levetor plate angle. Out of 82 patients during resting phase, abnormal angle was observed in 58.53 % while during defecation phase, abnormal angle was observed in 71.95% (P=0.101NS) (Chi-square = 2.689 with 1 degree of freedom;P = 0.101).

Table 15: Distribution of the case according to anorectal/levator-anus angle

Anorectal/levator-anus angle	Rest		Kegel			Defecation		
Condition of angle	N	%	**Condition of angle**	N	%	**Condition of angle**	N	%
Normal	64	78.05	Expected narrowing	41	50	Excepted widening	50	60.98
Narrowed	12	14.63	Diminished narrowing	41	50	Diminished widening	23	28.05
Widened	6	7.32				No change	2	2.44
						Paradoxical narrowing	7	8.54
Total	82	100		82	100		82	100

This table depicts the distribution of the cases according to anorectal/levator-anus angle. During resting state, normal anorectal angle was seen in 78.05% patients followed by narrowed in 14.63% and widened in 7.32% patients. At Kegel maneuver, expected narrowing and diminished narrowing was seen in equal number of cases (41 each). During defecation/maximal strain, expected widening was observed in 60.98% cases followed by diminished widening in 28.05%, paradoxical narrowing in 8.54% and no change in 2.44%.

Table 16: Distribution of the case according to levator hiatus widening

Levator Haitus	Rest		Defecation		P Value
	Number	Percentage%	Number	Percentage%	
Normal	54	65.85	15	18.29	<0.001S
Mild	28	34.15	31	37.80	
Moderate	0	0	33	40.24	
Severe	0	0	3	3.65	
Total	82	100	82	100	

This table depicts the distribution of the cases according to levator hiatus widening. Out of 82 cases, at resting state levator haitus was normal in 54 (65.85%) cases while during defecation normal widening in 15 (18.29%), mild widening in 31 (37.80%), and moderate widening in 33 (40.24%) cases. The result was statistically significant .(Chi-square = 58.196 with 3 degrees of freedom; P < 0.001S).

Table 17: Distribution of the case according to rectal intussusceptions

Rectal Intussusception (Y/N)		Number N=29	Percentage%
Intra rectal		13	44.83
Intra anal	a. Full thickness	8	27.59
	b. Mucosal	**6**	20.69
Extra Anal		2	6.90
Total		29	100

This table depicts the distribution of the cases to rectal intussusception. Intra-anal intussuseption (48.28%) was the most common during maxiumal strain followed by intra-rectal 44.83% and least common was extraanal intussuception (6.9%).

Table 18: Distribution of the cases of rectocele according to location

Rectocele location	Number (N=68)	Percentage%
Anterior	66	97.06
Posterior	17	25.00
Along upper vagina	4	5.88
Along middle vagina	21	30.88
Along lower vagina	26	38.24
Along entire course of vagina	23	33.82

This table depicts the distribution of the cases of rectocele according to location. Out of 82, most common rectocele was anterior (97.06%) followed by along lower vagina 38.24% and least common along upper vagina(5.88%).

Table 19: Distribution of the cases of rectocele according to grade 0/1/2/3

GRADE	Number	Percentage%
grade 0	14	17.07
grade1	18	21.95
grade 2	36	43.9
grade 3	14	17.07
Total	82	100

This table depicts the distribution of the cases of rectocele during defecation/maxiumal strain according to grade. Out of 82, grade 2 was found 43.9% followed by grade 1 in 21.95%, grade 0 and grade 3 in 17.07 each.

Table 20: Distribution of the case according MR findings of ODS

	Number (N =82)	Percentage%
Pelvic descent	76	92.68
Pelvic floor relaxation	67	81.71
Cystocele	50	60.98
Ano rectal junction descent	76	92.68
Vaginal/ uterine prolapse *	32	65.31
Rectocele	68	82.93
Enterocele	25	30.49
Parodoxical contraction	7	8.54
Peritoneocele	13	15.85
Sigmoidocele	0	0.00
Intussusception	29	35.37

*(in 49 female)

This table depicts the distribution of the cases according MR findings of ODS. The most common findings were pelvic floor descent and anorectal junction descent in 92.68% cases each followed by rectocele in 82.93% cases. Among the females, vaginal/uterine prolapse were observed in 65.31% cases.least common findings were paradoxical contraction (8.54%) and sigmoidocele (0%).

Table 21: Distribution of the case according to enterocele/ peritoniocele/ sigmodocele

	Enterocele		Peritoneocele		Sigmoidocele		P-value
	Number	%	Number	%	Number	%	
Grade 0	57	69.51	69	84.15	82	100	<0.001S
Grade 1	23	28.05	11	13.41	0	0	
Grade 2	2	2.44	2	2.44	0	0	
Grade 3	0	0	0	0	0	0	
Total	82	100	82	100	82	100	

This table depicts the distribution of the cases according to enterocele/peritoniocele / sigmodocele. In enterocele , maximum cases were observed in grade 0 (69.51%) followed by grade 1 (28.05%). In peritoniocele, maximum cases (84.51%) were observed in grade 0 followed by grade I (13.41%) and no cases of sigmoidocele were observed. The result was statistically significant. (Chi-square = 29.863 with 4 degrees of freedom; P<0.001S)

Table 22: Distribution of the case according to treatment

TREATMENT	Number	Percentage%
Congervative therapy(Biofeed back therapy)	65	79.27
Only surgery	06	7.32
Congervative therapy(Biofeed back therapy)+surgery	11	13.41
Total	82	100.00

This table depicts the distribution of the cases according to treatment given. Out of 82 Congervative biofeedback therapy was given in 79.27 % patients and followed by combination of both therapies (13.41%) and surgerically managed 7.32%of cases.

Table 23: Distribution of the case according to follow up

Follow up	Number (BFT+Surgery+both)	Percentage%
Improved	56(43+4+9)	68.29
Unimproved	26(22+2+2)	31.71
Total	82	100.00

This table depicts the distribution of the cases of follow up, out of 82patients68.29% improved and unimproved were 31.71%

ILLUSTRATIONS

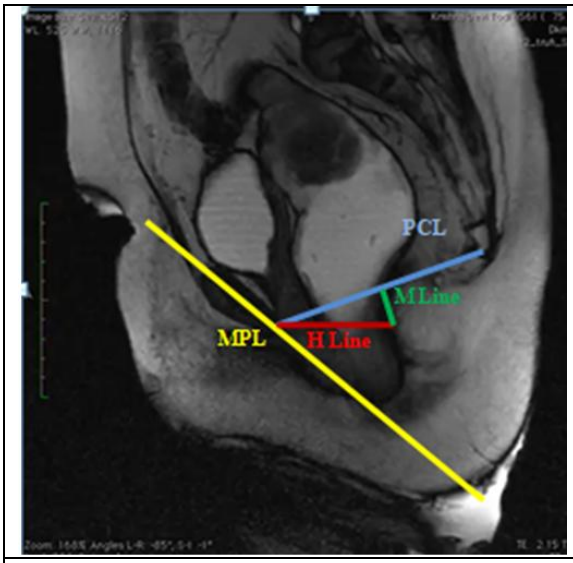


Figure 1: Mid sagittal T2W image shows MPL(yellow), PCL(blue), H-line(red),M-line(green)

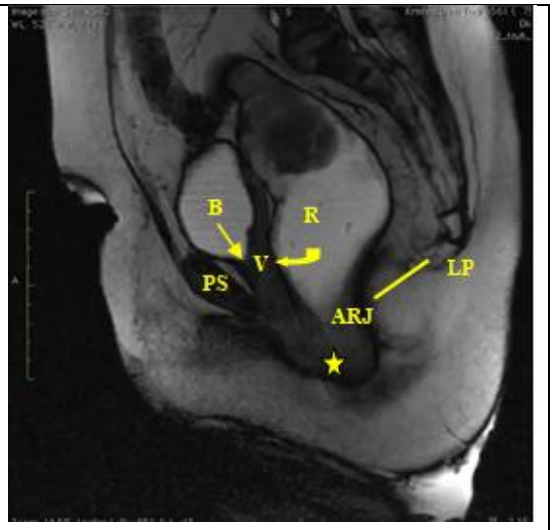


Figure 2: Midsagittal T2W image shows anatomical landmark B-bladder base(straight arrow),PS-pubic symphysis, V-vagina, ARJ-anorectal junction, *perineal body, LP-levator plate

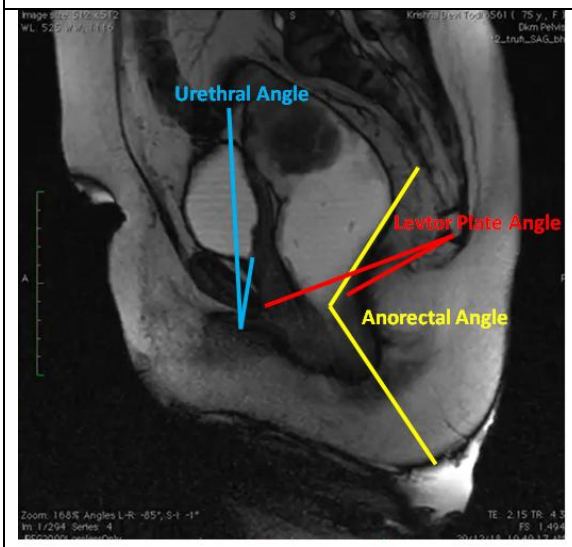


Figure 3: Midsagittal T2W image shows urethral angle(blue), Anorectal angle(yellow),Levetor plate angle (red)

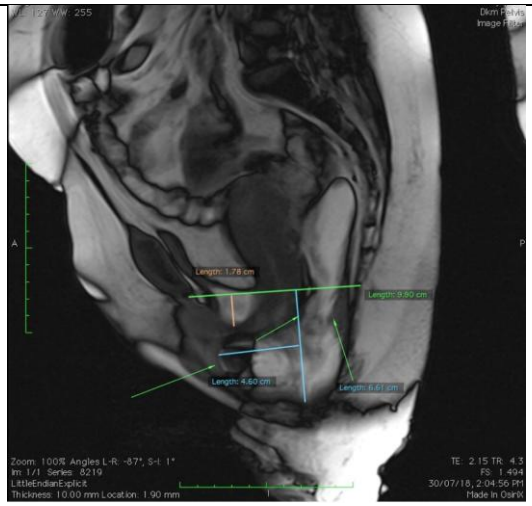


Figure 4: Anorectal junction desent grade 3,cystocele grade1 with anterior rectocele grade 3 during defecation

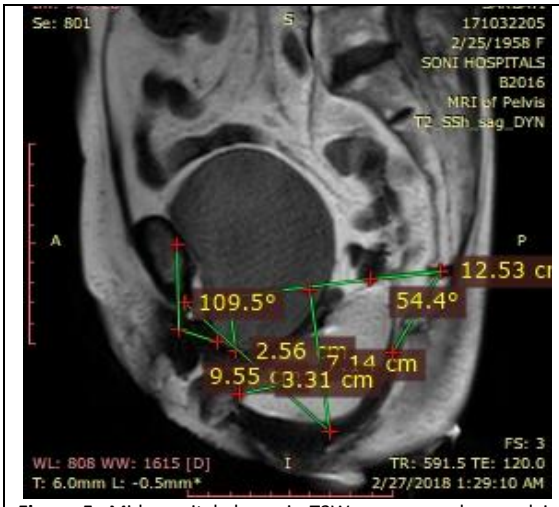


Figure 5: Mid saggital dynamic T2W sequence show pelvic floor relexation (H-line)grade2 with pelvic descent(M-line)grade3 with anorectal junction descent grade3,cystocele grade2,uterine prolapse,enterocele and peritoneocele, anterior rectocele grade 2 with abnormal vrethal angle widening during defecation.

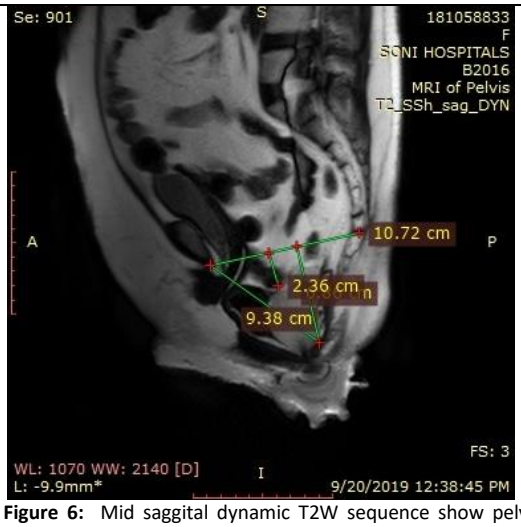


Figure 6: Mid saggital dynamic T2W sequence show pelvic floor relaxation and descent grade2,grade3 respectively.grade 1 enterocele and paritoneocele noted.Anterior rectocele grade2 with intrarectal intussuseption.

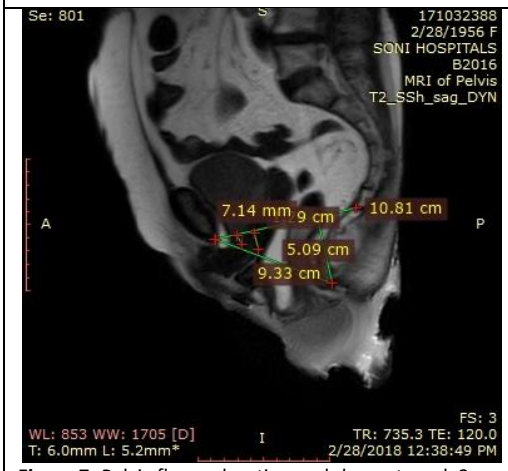


Figure 7: Pelvic floor relaxation and descent grade2 complete rectal prolapsed (extraanal intussusceptions) with cervical prolapsed grade1,with peritoneocele

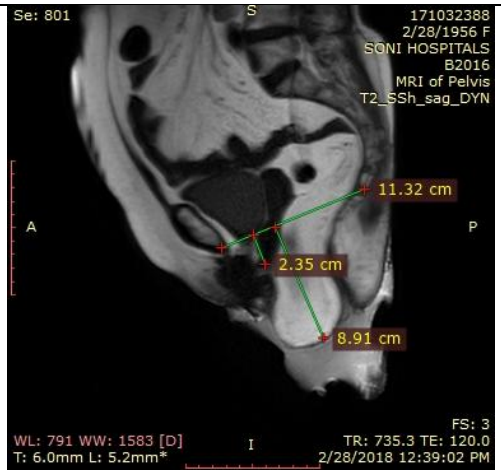


Figure 8: Pelvic floor relaxation and descent grade2 complete rectal prolapsed (extraanal prolapse) with cervical prolapsed grade1,with peritoneocele

DISCUSSION

The evaluation and management of obstructed defecation syndrome and pelvic floor dysfunction is difficult, in part because of the complex anatomy of the pelvic floor. Typically, the pelvic floor is divided into three compartments: anterior (bladder, urethra, and prostate in men), middle (uterus, cervix, and vagina in women), and posterior (anorectum) with support structures such as bones, muscles, and ligaments that are not restricted to a single compartment [22]. Adequate treatment, however, is contingent not only on a detailed understanding of this intricate anatomy but also on accurate pretreatment diagnosis of the presence and degree of pelvic floor abnormalities. This is especially true when surgical treatment is planned. **Hetzer et al**[47] retrospectively reviewed the MR defecographic findings for 50 patients with fecal incontinence who were being evaluated for surgical treatment. These findings led to changes in surgical approach in the care of 22 of 33 patients (67%) who subsequently underwent surgery.

In our study, out of 82 patient of obstructed defecation syndrome, 79.27% patients were treated coservatively with biofeed back therapy, 7.32% patients were treated surgically and 13.41% cases were treated by both therapies based on the study findings. Out of 82 patients 68% patients improved significantly (43 patient by biofeed back therapy, 4 patients by only surgical treatment and 9 patients by benefited by both therapies).

For many years, fluoroscopic defecography has been the investigation of choice for studying the pelvic floor. At many centers, it is gradually being replaced by MR

defecography because of the superior soft-tissue contrast and lack of ionizing radiation of the latter.

Unfortunately, because of the limited availability of open-configuration MRI systems and the physical constraints of closed configuration systems, most of these investigations are being performed with the patients in the supine position. Because this position is nonphysiological and defecation in a closed system imposes practical difficulties, MR defecography is not routinely performed.[137]

We used optimum (120ml) amount of ultrasound gel to give better contrast than air as shown by **Maccioni Francesca & Al Ansari Najwa et al**[76]. A higher volume of gel could have provided support to the pelvic structures thus obscuring the prolapsed and thus might have hampered the results.

MR imaging with defecation in the sitting position may be preferred for evaluation of defecatory dysfunction in the posterior compartment;[38] however, **Gufler and colleagues**[41] showed no significant difference in depiction of prolapse in the anterior and middle compartment between supine MR imaging and upright colpocystoproctography.

In contrast, **Kelvin and colleagues**[42] showed an underestimation of the extent of cystoceles and enteroceles on supine MR defecography relative to fluoroscopic cystocolpoproctography;

In contrast, **Francesca Iacobellis and colleagues**[79] showed in rest and squeezing phases, posisions of bldder, vagina and ARJ were significantly different when the patient was imaged in supine v/s sitting posion. In the defecation phase, a significant difference for the bladder and vagina position was detected between the two exams where as a significant difference for ARJ was not found. A statistically significant difference exists when the pelvic floor desent is evaluated in sitting v/s supine possision.

Patients are also instructed to urinate upon arrival and then drink 16 ounces of water in an effort to achieve standardized mild bladder distention. The goal is to partially fill the bladder while avoiding overdistention because this may obscure prolapse in other compartments[54].

We used posterior point for PCL line as last non mobile saccrococcygeal joint because coccyex typically rotate inferiorly and posterioly due to straining and defecation because downward movement of coccygeal tip alter the location of PCL.

In some cases, there was severe deformity of the rectal wall during defecation, and we found accurate depiction of the anorectal angle difficult. For this reason, we measured the angle between the levator plate and the anal canal.

Many patients with anterior compartment prolapse also present with urethral hypermobility, defined as a urethral angle greater than 30 degree at rest or an increase in urethral angle by at least 30 degree between rest and defecation / straining.[66]

In some case impaired evacuation on MR defecography may sometime be environmental due to unnatural surrounding or positioning. Technologist should be trained adequtly to coach and encourage patients during procedure, especially during defecation phase we should observe adequtaly increased intra abdominal pressure such as anterior bulging of anterior abdominal wall and descent of rectum.

In present study, 82 patients were registered, most of the patients were of with the mean ±SD age of the study population was 46.63±11.77 years (min to max 22 to 68 years) with female (49/82) to male ratio 3:2.Similar study was conducted by **Mohamed F Osman**[77] in 2018, in his study , the mean age was 40.2 years (F-66.7%, M-33.3%).

Levator muscle was symmetrical on MR appearance in 71.95% (59/82) patients and in rest 28.05% it was asymmetrical. Focal defect in levator was seen in 13.41% (11/82) patients out of whom 4 patients showed scarring, 4 patients showed ballooning and 3 patients had focal eventration of levetor ani muscle. Perineal body tear and focal atrophy of levator ani was least common findings around 4.88% each (4 patients each). **In 2011, Loubeyree et al**[73] concluded that 56% of patints had atleast one morphological variant (thinning/aplasia) of muscles of levator ani complex.

Out of 82 patients, 30 patients had a defect in endopelvic fascia with defect at level I and level III in 22 patients (13.41% or 11/82 each), and the rest of them were at level II (9.75% or 8/82). Similar results were achieved by **El Sayed et al**[72] in 2008 as level I and II fascial defect was 21% in 34 patients.

Out of 82 patient, grade 0 pelvic floor relaxation relative to H line in rest position was seen in 54(65.85%) patients followed by 28(34.15%) patients showing grade 1 relaxation. During defecation, maximum patients 33 out of 82 (40.24 %) showed grade II relaxation followed grade 1 relaxation in 31 (37.80%) patients and this observation was statistically significant (Chi-square = 58.196 with 3 degrees of freedom; P = 0.000). So there was increased detection of abnormal pelvic floor relaxation during defecation / starining (81% 67/82) compared from resting state 34%. Similar results were achieved by **V.Piloni et al**[74] in 2013 with increased hiatus in 67.6%.

Out of 82 patients, pelvic floor descent in relation to M line was seen in resting phase, which showed 44 (53.66%) patients with grade 0 descent followed by grade 1 descent in 38 (46.34%), while during defecation grade 2 descent was most common in 29 (35.37%) patients followed by grade 3 descent in 25 (30.49%) patients, grade 1 in 22 (26.83%) and grade 0 being least common in 6 (7.32%) patients. The result was statistically significant (Chi-square = 87.147 with 3 degrees of freedom; P 0.001S).

This was in concordance to a study done by **Hetzer at al**[34] in 2006. Similar results were observed by **Ravi b thapar et al**[29] which showed pelvic floor descent was grade 1 in 37.10% patients during defecation followed by grade 2 in 30.81% and grade 3 descent in 33.96% patients. We can conclude that the detection of pelvic floor descent was increased during defecation (92.68% 76/82) as compared from resting state (46.34% 38/82) and it was stastically significant (P 0.001).

Out of 82 patients, cystocele was not detected in any patients during resting state.(all 100% cases were in grade 0) while during defecation, 32 (39.02%) cases showed grade 0 cystocele followed grade 1 in 36 (43.90%) patients and grade 2 in 12 (14.63%) patients. The result was statistically significant. (Chi-square = 71.930 with 3 degrees of freedom; P< 0.001S). The study was in concordance to a study done by **Hetzer et al**[34] in 2006. Similarly **Ravi B Thapar et al**[29] observed grade 1 cystocele in (59.62%) cases followed by grade 2(18.98%) and grade 3(11.30%). In our study detection of cystocele during defecation was increased from 0 to 50 patients (60.1%) which was statistically significant.

Out of 49 females, vaginal apex/cervix/uterine prolapse was not observed in any patients during resting state (all 100% cases were in grade 0) while during defecation grade 0 prolapse was seen in 34.69%, grade 1 in 51.02% and grade 2 in 14.29%. P value was significant (Chi-square = 48.516 with 2 degrees of freedom; P = 0.000). The study is in concordance to a study done by **Hetzer et al**[34] in 2006 and by **M. Li.T.Jiang**[75] in 2015. In our study 65% cases of vaginal apex/cervix/uterine prolapsed were detected additionally during defecation which was statistically significant.

Significant difference was observed in MRI functional parameters in resting state and during defecation/maximal strain position, utilising HMO system for pelvic floor relaxation and descent, as significant difference (p <0.001S) was observed in all parameters including H line, M line, bladder base descent, cervical/vaginal and anorectal junction descent during resting state and during defecation/maximal strain position. According to **Flusberg M, et al**[80] compared with images obtained in the other phases, defecation phase images showed additional findings of increased abnormal bladder descent in 43 examinations (50.6%), abnormal vaginal descent in 52 examinations (61.2%), and abnormal rectal descent in 11 examinations (12.9%). Similarly, only defecation phase images depicted previously undetected rectoceles (2 cm or larger) in 31 examinations (36.5%), enteroceles in 34 examinations (40%), and intussusceptions in 22 examinations (25.9%). The number of additional cases of abnormalities identified on defecation phase images was significantly greater than the number identified on images obtained in the other phases (p < 0.005). The average total scores for the rest, squeeze, strain, and defecation phases were 1.4, 0.7, 2.3, and 6.6. The average total defecation phase score was significantly greater than the average total score in any of the other phases (p < 0.001).

Levetor plate angle, mean during rest and defecation state was (15.11 ± 7.05^0) and (33.15 ± 14.42^0) with maximum angles 34^0 and 70^0, respectively.

For anorectal/levetor–anus angle, mean during rest, kegel and defecation was (106.32 ±12.70), (89.77 ± 10.96^0) and (124.15 ± 16.78^0) with maximum angles 132^0, $110^0$and 142^0 , respectively.

Out of 82 patients, 66 (80.49%) showed normal urethral angle and urethral hypermobility (urethral angle > 30 degree at rest or an increase in urethral angle by at least 30 degree between rest and defecation) was seen in the remaining 16 (19.51%) patients.

Out of 82 patients, abnormal levator plate angle during resting phase was observed in 58.53 % while during defecation phase, abnormal angle was observed in 71.95% however it was not statistically significact.

During resting state, normal anorectal angle was seen in 78.049 % patients followed by narrowed angle in 14.634% and widened angle in 7.317% patients. During Kegel maneuver, expected narrowing and diminished narrowing was seen in equal number of cases (41 each). During defecation/maximal strain, expected widening was observed in 60.976% cases followed by diminished widening in 28.049%, paradoxical narrowing seen in 8.537% and no change in 2.439% patients. Similar findings noted in study conducted **M. Li.T.jiang**[75] 2015 as anismus (paradoxical narrowing).

Out of 82 cases, at resting state levator hiatus was normal in 54 (65.85%) cases while during defecation normal widening seen in 15 (18.29%), mild widening seen in 31 (37.80%), and moderate widening in 33 (40.24%) cases. The result was statistically significant.(P < 0.001S).

Intra-anal intussusception was most common during maximal strain (48.28%) followed by intra-rectal intussusception (44.83%) and least common was extraanal intussuception (6.9%). Similar findings noted by **Mohamed F.osman**.[77]

Out of 82, most common rectocele was anterior (97.06%) followed by posterior rectocele (25%). In anterior rectocele most common was along lower vagina (38%) followed by along entire course of vagina (34%) and least common along upper vagina(5.88%).

Out of 82, grade 2 rectocele during defecation/maximal strain was found in 43.9% patients followed by grade 1 in 21.95% and rest were grade 0 and grade 3 (17.07% each). **Ravi b thapar et al**[29] observed that grade 1 rectocele in 77.37% cases, grade 2 in 15.32% cases and grade 3 in 7.29% cases.

In enterocele , maximum cases were observed in grade 0 (69.51%) followed by grade 1 (28.05%). In peritoniocele,

maximum cases (84.51%) were observed in grade 0 followed by grade I (13.41%) and no cases of sigmoidocele were detected in our study. The result was statistically significant (Chi-square = 29.863 with 4 degrees of freedom; P<0.001S).

In our study most common findings were pelvic floor descent and anorectal junction descent in 92.68% cases each followed by rectocele in 82.93% cases. Among the females, vaginal/uterine prolapse were observed in 65.31% cases. Least common findings were paradoxical contraction (8.54%) and sigmoidocele (0%). Similar study was conducted by **Ravi B Thaper at el**[29] which reported 82.81% (159/192) cases of anorectal desent, 41.14%(79/192) cases of cystocele, 71.35% (137/192) cases of rectocele, 45.31%(87/192) cases of rectal intussuseption, 5.72% (11/192) cases of spastic perineum and 1.04%(2/192) cases of enterocele .

Out of 82 conservative biofeedback therapy was given to 79.27 % patients, surgical management was done in (7.32%) and combination of both therapies was given in 13.41% of cases.

Out of 82 patients 68.29% showed benefit from management and showed improvement on follow and 31.71% patients were not improved on follow up.

SUMMARY AND CONCLUSION

MRI is a non-invasive technique without ionizing radiation with extraordinary soft tissue contrast, which can be an important auxilliary tool for pelvic floor anatomy and functional evaluation in obstructed defecation syndrome.

It is a technique that, when adequately integrated with prior clinical evaluation and exclusion of organic disease may have an invaluable role in the diagnosis, therapeutic guidance and follow-up of pelvic floor dysfunction disorders and obstructed defecation syndrome.

As complete survey of the entire pelvis is necessary before surgical repair Magnetic resonance imaging permits evaluation of all three pelvic compartments and as we demonstrated in our study more than one compartment are frequently affected in obstructed defecation syndrome.

Assessment of MRI defecography has a good inter-observer correlation and it provides good concordance with clinical examination.

Static MR Imaging can be also useful to identify the defects responsible for pelvic organ prolapse and stress urinary incontinence, and so help perform site specific repair in surgery, to avoid the high recurrence rates.

Findings reported at dynamic MR imaging of the pelvic floor are valuable for selecting candidates for surgical treatment and for indicating the most appropriate surgical approach as detection rate of pathologies increased during defecation / maximal straning as concluded by our study.

Using HMO system in dynamic MR Defecography for pelvic floor relaxation, pelvic floor descent, anorectal junction descent, cystocele, enterocele, peritoneocele and vaginal/cervix/uterine prolapse we concluded that the pathologies related to obstructed defecation syndrome were detected more and also increased in severity during defecation / maximal straining as compared to routine conventional MRI examination in resting state.

However when dynamic MR Defecography was studied in respect to H line the results were statistically significant but HMO system detected pathologies in more number of cases and with increased severity.

LIMITATION

In our study Dynamic MR Defecography was evaluated in midsagittal plane and parasaggital defect and abnormalties were not detected.

On occasion, patients may not defecate during the examination; this limits evaluation for prolapse and is particularly challenging in patients referred for defecatory dysfunction. Inability to defecate due to “stage-fright” or being in a nonphysiologic supine position can be difficult to differentiate from pelvic floor nonrelaxation or dyssynergia. Anterior bowing of the abdominal wall and descent of the pelvic floor can be used as signs of adequate effort, and lack of defecation in this setting may represent true abnormality.

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