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Original Research Article

Role of MRI defecography in assessment of pelvic floor pathologies

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ABSTRACT

Background: Functional disorders of the pelvic floor are a common clinical problem. Diagnosis and treatment of these disorders, which frequently manifest with nonspecific symptoms such as constipation or incontinence, remain difficult. MR Defecography has emerged over the last decade as a modality which additionally images the pelvic floor function in real time besides combining the advantages of previously used modalities and that of magnetic resonance i.e. multiplanar imaging, good temporal resolution and lack of radiation exposure. Dynamic MRI defecography is a relatively new imaging protocol which can be extremely useful in identification of anatomic and functional pelvic floor dysfunction such as organ prolapse, anismus and fecal incontinence. Excellent demonstration of the perirectal soft tissues allows assessment of spastic pelvic floor syndrome and descending perineum syndrome and visualization of enteroceles. The aim of the study was to assess causes of pelvic floor dysfunction.
Methods: Authors evaluated 25 patients with cine Magnetic Resonance Defecography at our center between December 2018 and 15th May 2019. MR Defecography was done with help of 3 Tesla Somatom Seimens MRI. Ultrasound jelly was instilled into the rectum of patient via a short flexible tube while the patient lies in the lateral decubitus position on the scanner table before being moved into the gantry and was asked to defecate when instructed. Scanning was done in four phases-resting, straining, squeezing and defecation as per the standard protocol while patient lied supine.
Results: Most common complaint encountered was that of constipation. Patients in age group 20-70 years were studied. Maximum patient were of the age group 40-50 years. Most common finding was organ prolapse in total 9 patients with anterior rectocele in 6 patients followed by rectal prolapse.
Conclusions: Magnetic resonance defecography is an excellent modality for assessment of pelvic floor disorders. It has very good temporal resolution and high soft tissue contrast, also allows visualization of the pelvic floor function in real-time without any radiation load. Imaging the defecation process in real-time leads to a definitive diagnosis in cases of dysfunctional defecation and a precise diagnostic and pre-operative assessment in cases of organ prolapse.

Keywords: Magnetic resonance defecography, Multiphasic fast imaging employing steady-state acquisitio, Pubococcygeal line

INTRODUCTION

Functional disorders of the pelvic floor are a common clinical problem. Diagnosis and treatment of these disorders, which frequently manifest with nonspecific symptoms such as constipation or incontinence, remain difficult. These are increasingly becoming a common health care problem owing to greater compromise of the

integrity of pelvic floor because of obesity, vaginal delivery, pelvic surgeries, constipation, age and heavy physical exertion, all of these becoming important risk factors for the same.[1] When the pelvic floor is damaged in its fascial, muscular, or neural components at the level of any of its three compartments, several pelvic floor dysfunctions or disorders (PFD) may arise.[2]

In the past, fluoroscopic defecography was used in their diagnosis, but it had its limitations like radiation exposure. Endoanal sonography and Magnetic Resonance Imaging (MRI) were also used to assess the pelvic pathologies but they could not assess the pelvic floor function.

MR Defecography has emerged over the last decade as a modality which additionally images the pelvic floor function in real time besides combining the advantages of previously used modalities and that of magnetic resonance i.e. multiplanar imaging, good temporal resolution and lack of radiation exposure.[3] Dynamic MRI defecography is a relatively new imaging protocol which can be extremely useful in identification of anatomic and functional pelvic floor dysfunction such as organ prolapse, anismus and fecal incontinence. Excellent demonstration of the perirectal soft tissues allows assessment of spastic pelvic floor syndrome and descending perineum syndrome and visualization of enteroceles. The aim of the study was to assess causes of Pelvic floor dysfunction.

METHODS

Authors evaluated 25 patients with cine Magnetic Resonance Defecography at our center between December 2018 and 15th May 2019. These patients were suspected pelvic floor dysfunction and were referred to us by department of medical Gastro-enterology. MR Defecography was done with help of 3 Tesla Somatom Seimens MRI. Proper counseling of patient was done prior to the procedure and proper information was given to patients about investigation.

Ultrasound jelly was instilled into the rectum of patient via a short flexible tube while the patient lies in the lateral decubitus position on the scanner table before being moved into the gantry and was asked to defecate when instructed. Scanning was done in four phases-resting, straining, squeezing and defecation as per the standard protocol while patient lied supine. Although it is not the physiologic defecatory position, it has been shown to be perfectly satisfactory for evaluating pelvic floor weakness.[4–7]

Initially static imaging is performed using high-resolution T2W turbo spin-echo sequences in the axial and coronal planes. Dynamic imaging is then performed using a T2-weighted multiphasic fast imaging employing steady-state acquisition (FIESTA) sequence in the midsagittal plane through the anal canal. This sequence is run for almost 2 min, while the patient performs various maneuvers as follows.

Squeeze phase

Patient was first asked to squeeze the anal sphincters inward, so as to elevate the pelvic floor.

Straining phase

Patient was asked to apply short transient downward straining effort and relax immediately.

Defecation phase

Finally, the patient was asked to apply sustained downward straining effort and pass the ultrasound jelly. The dynamic scan is repeated if necessary.

Post evacuation phase

It is run after the patient had defecated all the jelly. At least four defecation sequences were obtained to assess for complete evacuation of rectal vault.

MR anatomy

A mid-sagittal section through pelvis is used to best study the anatomical details and mark the parameters to be studied. In females, the pelvis is divided into anterior, middle and posterior compartments comprising of Urinary bladder with urethra, uterus with cervix and vagina and rectum with anus respectively while in males they are divided into anterior and posterior compartments with corresponding organs in them. The female pelvic floor is a complex functional and anatomic system. It is composed of an active muscular component and a passive support system. The pelvic floor is an integrated system composed of an active component, the striated muscles, and a passive support system, the suspensory ligaments and fascial coverings, and is associated with an intricate neural network. It not only provides support for the pelvic viscera (bladder, bowel, uterus) but maintains their functioning, thanks to the combined action of the two major pelvic floor structures: the levator ani muscle (LAM), and the endopelvic fascia.[2,8,9] Following reference lines and angles are studies on the MR images.[10]

Pubococcygeal line

PCL is drawn from inferior border of pubic symphysis to the first sacro-coccygeal joint. It is a reference line drawn to assess the level of pelvic organs.

H line

H line is drawn from the inferior border of the pubic symphysis to the posterior wall of the rectum, marks the AP distance of the levator hiatus. Normally <5 cm.[10]

M line

Perpendicular line drawn most posterior aspect of the H line till PCL, suggests ano-rectal descent at rest, if increased. Normal <2 cm.[10]

Ano-rectal angle

Ano-rectal angle is the angle between the posterior border of the distal rectum and central axis of the anal canal. Normal range: 108°-127° at rest.[10]

Anterior rectal line

Anterior rectal line is drawn along the expected margin of normal anorectal wall behind the posterior wall of vagina. Depth of wall protrusion beyond it during resting and straining is used to assess Rectoceles

RESULTS

Out of 24 patients, 14 were females and 11 were males (Figure 1). Most common complaint encountered was that of constipation. Patients in age group 20-70 years were studied. Maximum patient were of the age group 40-50 years (Table 1).

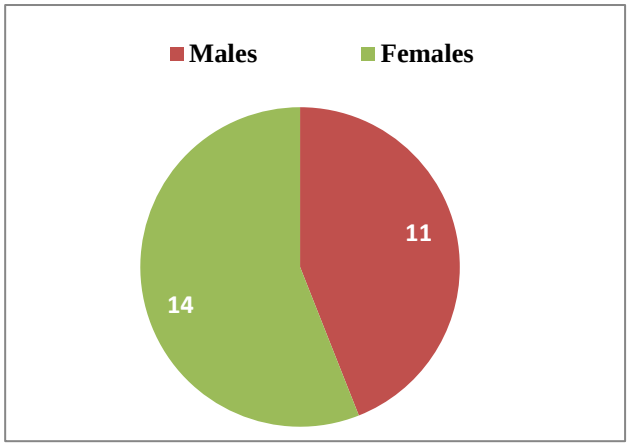

Figure 1: Gender distribution of patients.

Table 1: Distribution of patients in different age groups.

Age group in years	No. of patients
20-30	2
30-40	5
40-50	10
50-60	6
60-70	2

Out of 24 patients, 14 were found normal and 11 were found to have one of the pelvic floor dysfunction disorder. Out of 11 patients 7 were females and 4 were males. Incidence of pelvic floor pathologies in our study is shown in table and Figure 2.

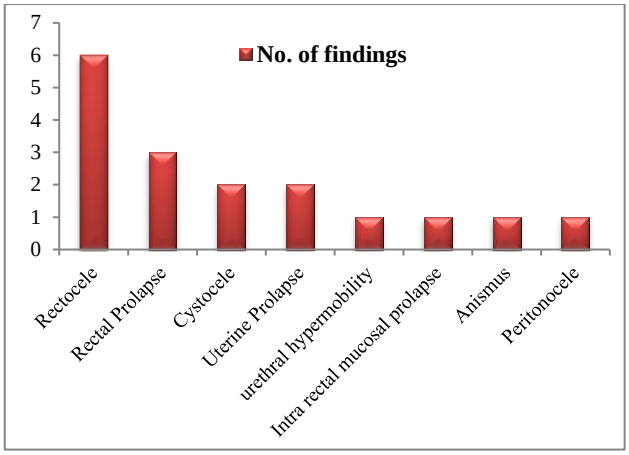

Figure 2: Frequency of various pelvic floor pathologies in patients.

Table 2: Frequency of different pathologies in patients.

Pathology	No. of findings
Rectocele	6
Rectal prolapse	3
Cystocele	2
Uterine prolapse	2
urethral hypermobility	1
Intra rectal mucosal prolapse	1
Anismus	1
Peritonocele	1

Most common finding was organ prolapse in total 9 patients with anterior rectocele in 6 patients (Figure 3), rectal prolapse in 3 patients (Figure 4), two patients had descent of anterior (cystocele) and middle compartment (uterine prolapse) (Figure 5).

Figure 3: Sagittal MR image revealing evidence of anterior pouching of rectal wall above anal canal due to laxity of endopelvic fascia suggestive of anterior rectocele. Since outpouching measures less than 2 cms it is graded as small.

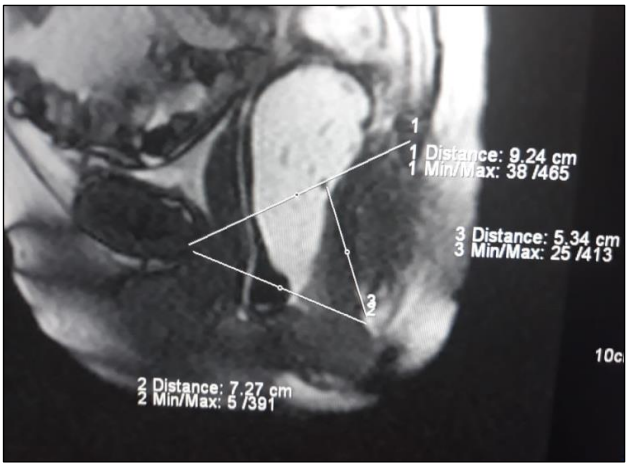

Figure 4: Sagittal MR image revealing evidence of descent of rectum below pubococcygeal line suggestive of moderate rectal prolapse (3-6 cms). H (7.27 cms) and M (5.3 cms) lines are elongated.

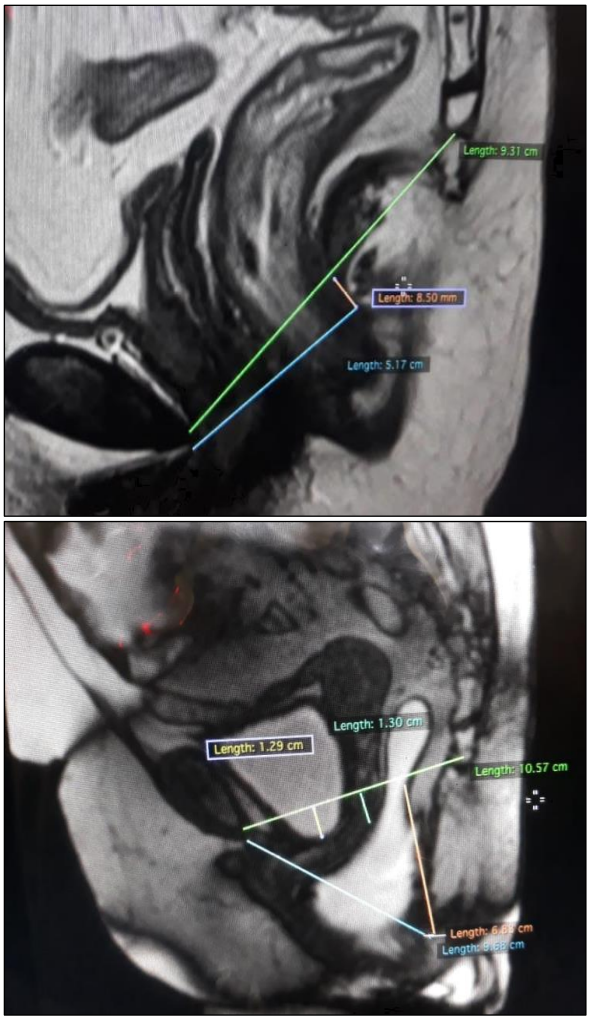

Figure 5: Sagittal MR images taking during resting and defecating phase showing transperineal descent with mild (<3 cms) prolapse of anterior and middle compartment, while as there is severe (>6 cms) rectal prolapse.

Most of the patient had combination of above findings. There was one case of urethral hypermobility (Figure 6), intra rectal mucosal prolapse (Figure 6), peritonocele and spastic pelvic floor syndrome each. Combination of above findings was the most common pattern.

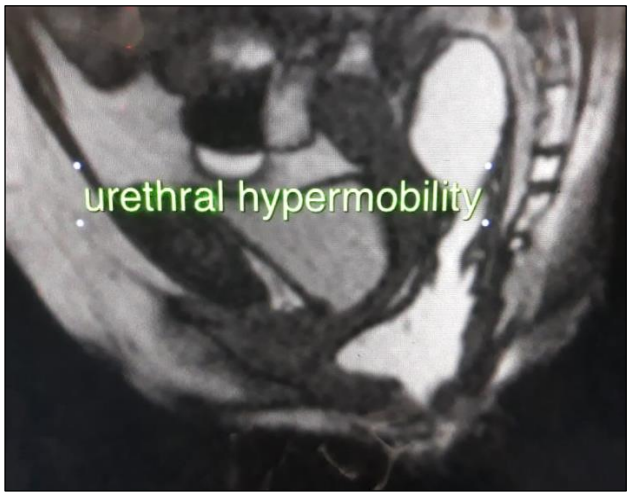

Figure 6: Sagittal MR image revealing evidence of anterior rectocele (outpouching of anterior rectal wall) with intra mucosal rectal prolapse. Urethral axis has turned into horizontal suggestive of urethral hypermobility in same patient.

DISCUSSION

Females tend to have more pelvic floor pathologies due to relaxation of pelvic ligaments during childbirth. Pelvic floor pathologies can be broadly divided into two categories- relaxing and non-relaxing types. Relaxing types involve pelvic floor muscle weakness and thus includes all the organ prolapse cases. According to our study, relaxing disorders are more common especially in females due to stretching of pelvic ligaments during childbirth. According to our study, organ prolapse in females is more common after 40 years of age. Non relaxing type involves pelvic floor's impaired action during defecation process leading to its inability to sustain defecation and thus comprises spastic perineum syndrome, pelvic floor dyssynergia. They are less common.

Clinical evaluation of these disorders is done by physical examination including valsalva maneuver in lithotomy position, which may provide preliminary information in cases of organ prolapse, however it remains inadequate as the total number of compartments affected may often be underdiagnosed.[11]

The limitation of this technique is the patient compliance as it involves performing various maneuvers and hence patience compliance and cooperation is a must for proper acquisition of images. Also, defecating in non-physiological i.e. a supine position can be difficult for the patient.

CONCLUSION

Pelvic floor disorders are common but their diagnosis is difficult. However, magnetic resonance defecography is an excellent modality for assessment of pelvic floor disorders. It has very good temporal resolution and high soft tissue contrast, also allows visualization of the pelvic floor function in real-time without any radiation load. Imaging the defecation process in real-time leads to a definitive diagnosis in cases of dysfunctional defecation and a precise diagnostic and pre-operative assessment in cases of organ prolapse.

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