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The High Rate of Discordance Between Clinical Symptoms and MRI Findings in Patients with Pelvic Floor Dysfunction

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ABSTRACT

Background & Objective: Pelvic floor dysfunctions (PFD) are common disorders among women and affect about 50% of them over 50. About 400,000 American women undergo surgery due to the severity of these disorders. The aim of this study was to investigate the correlation of patients' symptoms with both static and dynamic MRI findings.

Materials & Methods: In this study, we performed MRI on 60 women suspected of pelvic floor disorders in the Imam Khomeini Hospital complex. Following rectal enema of 60-120 cc sonography gel and vaginal enema of 5-10 cc gel, we performed MRI with 3 Tesla equipment (Siemens Magnetom Trio) utilizing multichannel (16 rows) surface coil on the supine position. Static MRI was performed with high-resolution T2 FSE sequences in sagittal, axial, and coronal planes. Dynamic imaging was done using mid-sagittal T2 HASTE or true FISP in 3 different phases (rest, squeeze, strain and defecogram). The radiologists were blinded to the clinical data of patients.

Results: Our study included 60 patients with a mean age of 52.7±14.3 years. Regarding the MRI findings in patients with urinary symptoms, except for the level I fascial defect, the other findings were not related to the patients' symptoms. Among patients with defecation symptoms, other MRI findings did not have a significant relationship with the patient's symptoms except for severe rectal descent. The association between endopelvic fascial defects and levator muscle injury with sexual complaints was not statistically significant.

Conclusion: In conclusion, these results suggest that the patients' symptoms are not good predictors for MRI findings and are limited in reliability. Thus, MRI must be counted necessary to further evaluate patients with pelvic floor abnormalities. Other studies regarding MRI findings' correlation with different symptoms in these patients are required.

Keywords: Clinical symptom, MRI, Pelvic floor dysfunction

Introduction

Pelvic floor dysfunctions (PFD) are common disorders among women and affect about 50% of them over the age of 50 **(1)**. About 400,000 American women undergo surgery due to the severity of these disorders **(2)**. The risk of developing PFD increases by increased number of parities **(3)**. Suffering from PFDs can play a critical role in patients' quality of life as it produces variety of discomforts depending on the involved anatomical structures, as well as social shame **(4, 5)**. A mixture of connective tissues, ligaments and muscles make up the human's pelvic floor which is responsible for supporting pelvic organs. Therefore, PFD can lead to problems in bladder and bowel normal functions **(6)**. These conditions usually develop through collagen defects in endopelvic fascia and Levator Ani Muscle's functional status **(7)**. There are many risk factors for pelvic floor weakness, such as parity, vaginal deli-very, menopause, aging, obesity, chronic pulmonary diseases and smoking **(8, 9)**. Whereas, anterior compartment prolapse usually causes urinary incontinence, voiding dysfunction, and irritative symptoms, posterior wall prolapse is likely to present with symptoms that are related to defecatory dysfunction (such as feeling of incomplete rectal emptying, need for digital manipulation to facilitate defecation, and dyschezia) **(10)**. In contrast, Elerkmann

et al. found that, women with pelvic organ prolapse can experience symptoms that do not correlate with compartment-specific defects, and the severity of pelvic organ prolapse has a mild to moderate association with several specific symptoms that are related to urinary incontinence and voiding, defecatory, and sexual dysfunction **(11)**. Although the diagnosis and grading of PFDs are primarily based on physical examination, more diagnostic evaluation using ultrasound, fluoroscopy and magnetic resonance imaging are mostly suggested to increase the sensitivity and specificity of the diagnosis **(1)**. MRI has gained a pivotal role in clinical planning as it has been shown to change the surgical management in 67% of patients , while improving both outcomes and relapse rate following the surgery **(1)**. It has been proved to be a safe and non-invasive modality in evaluation of pelvic pain and prolapse **(12)**. Moreover, it doesn't require patient's preparation and can provide excellent visualization of the pelvic organs and musculofascial supportive structures in addition to high soft tissue resolution, without any ionizing radiation **(13)**. On the other hand, as these conditions have wide variety of potential treatments such as pelvic floor muscles exercises, pharmacotherapy, and various surgical procedures, MRI can provide a precise modality for assessment of therapeutic actions efficacy. Although lots of studies has been performed regarding different radiologic features of PFDs in MRI **(14-16)**, these findings have been correlated with clinical manifestation of patients in a few studies. In this descriptive-analytical study we qualitatively and quantitatively measured such a correlation and assessed and analyzed the spectrum of different MRI findings with respect to the involved compartment according to patient's symptoms. The aim of this study was to investigate the correlation of patients' symptoms with both static and dynamic MRI findings.

Methods

a. Patient selection

This was a cross-sectional study carried out in the Department of Gynecology at Imam Khomeini Hospital Complex from February 2012 to December 2015. Sixty-one women with clinical presentations of prolapse, incontinency, dyspareunia, anismus or constipation were included. Exclusion criteria consisted of having any kind of metal device in the patient's body such as cochlear implant, cardiac defibrillators and pace makers, clastrophobia or patients' dissatisfaction. All patients signed an informed written consent form approving their consent to all of the examination steps. This study was approved by ethical committee of Hamadan university of Medical sciences. A questionnaire was filled for each patient including following parameters; infertility, pelvic pain, dyspareunia, dysmenorrhea, abdominal pain, ultrasound findings, and MRI findings.

b. MRI Protocol

After obtaining a written informed consent, patients underwent static and dynamic MRI examination using a 3 Tesla equipment (Siemens Magnetom Trio) MRI utilizing multichannel (16 row) surface coil. The patient was positioned supine during the procedure without tilting the pelvis. Enema of 60-120 cc and 5-10 cc of ultrasound gel (Aquasonic) was used to opacify rectum and vagina during the examination respectively. Static MRI with high resolution T2 FSE sequences in sagittal, axial and coronal planes and dynamic imaging using mid-sagittal T2 HASTE in 3 different phases (rest, squeeze, strain and defecogram) were obtained.

We chose the mid-sagittal slice showing the urinary bladder, urethra, uterus, vagina, rectum and the anal canal, dynamic images were taken with ultra-fast T2 weighted sequences (Half fourier single–shot fast spin –echo sequence) (T2 HASTE),with the patients instructed to perform maximum squeeze followed by straining for 10 seconds and finally asking the patient to evacuate the ultrasound gel. Each of those maneuvers were repeated for three times to make sure the maximum image quality is achieved.

The MRI Parameters (static and dynamic parts):

The static protocol consists of Sagittal, axial and coronal planes with parameters of T2W: TR 4000, TE 100, slice thickness of 4 mm, gap of 1.5 mm, 240*240mm field of view (FOV), 320*224 mm matrix. The dynamic protocol includes mid sagittal plane with TR 1500, TE 98, slice thickness of 5 mm, gap of 1.5 mm, 240*240mm FOV, and 320*224 mm matrix.

c. Image Analysis

The images were interpreted by radiologists with 15-years' experience and focus on pelvic floor imaging using the following lines in the mid-sagittal slice showing the urinary bladder, urethra, uterus, vagina, rectum and the anal canal):

d. Pubococcygeal line (PCL) was drawn from the lower border of the symphysis pubis to the last visible horizontal coccygeal joint.

e. Hiatal line (H-line) was drawn from the lower border of the symphysis pubis to the anorectal junction.

f. Muscular pelvic floor relaxation line (M-line) was drawn from the end of the hiatal line perpendicular to the pubococcygeal line.

These lines were drawn at rest, as well as during maximum straining, and were used to assess the degree of hiatal enlargement and muscular pelvic floor relaxation of the HMO grading system (H line, M line, organ prolapse).The type and degree of organ descent below the Pubococcygeal line (PCL) at maximum straining were assessed by measuring the vertical distance between each of the bladder base, uterine cervix and anorectal junction from the PCL as

reference point. Each reference point above the PCL was considered normal and below that as abnormal. The severity of prolapse was graded as mild (0-3cm below PCL), moderate (3-6cm below PCL) and sever (>6cm below PCL). The radiologists were blinded to the clinical data of patients. The data were gathered and analysis was done using SPSS version 20 (SPSS Inc., Chicago, Ill., USA). We used mean+/-SD for the quantitative assessment.

Results

A total of 60 patients, including 29 (48.3%) fertile and 31(51.7%) menopaused women with a mean age of 52.7±14.3 (range: 17-93) were enrolled in the study. The Mean parity was 4.6±2.2 (range: 1-10) of which 34 (55.7%) was NVD, 27(41%) was C/S.

Urinary and defecation complaints each were reported by 41% of patients. Out of 60 patients 39 women were sexually active from which 25.6% reported sexual complaints (Table 1).

Table 1. Different Types of Complaints and Their Distribution

Symptom	No. (%) among all patients	Sign	No. (%) among Patients with Complaints
Urinary Complaint	25 (41)	Stress Incontinence	18 (32)
		Urge Incontinence	17 (28)
Defecation Complaint	25 (41)	Fecal Constipation	20 (80)
		Fecal Splitting	13 (52)
		Fecal Straining	8 (32)
		Gas Incontinence	6 (24)
		Fecal Incontinence	4 (16)
Sexual Complaint	10 (25.6) [39 were sexually active]	Dyspareunia	6 (60)
		Urinary Incontinence	2 (20)
		Partner Dissatisfaction	3 (30)

In patients with isolated cystocele or cystouretrocele in MRI, 37.8% (17/45) reported at least one urinary complaint while in patients without isolated cystocele or cystouretrocele in MRI, 53.3% (8/15) reported urinary complaints (*P*=0.29).For other MRI findings [including bladder neck descend, urethral descend, injury and defect in endopelvic fascia and levator muscle injuries], the relationship with urinary complaints was assessed. However, except for the level I fascial defect, the other relationships were not statistically significant. (Table 2)

Table 2. Relationship of MRI Abnormal Finding with Urinary Complaints

		MRI findings	Any urinary complication	P-value
Bladder Neck Descend [Considering PC Line]	Severe Bladder Neck Descend	Severe Bladder Neck Descend	2/7 (28.6%)	0.67
	Any bladder neck descend	Mild, moderate and severe bladder neck descend	17/45 (37.8%)	0.29
		Mild & moderate Bladder neck Descend & No bladder neck descend	23/53(43.4%)	
		No bladder neck descend	8/15(53.3%)	
Urethral Descend [Considering PC Line]	Severe Urethral Descend	Severe Urethral Descend	0/2(0%)	0.50
	Any Urethral Descend	Mild, moderate and severe urethral descend	16/44(36.4%)	0.11
		Mild and moderate urethral descend & No urethral descent	25/57(43.9%)	

		MRI findings	Any urinary complication	P-value
		No urethral descent	9/13(60%)	
Endopelvic Fascia Defect	Level I Fascia	Defect in Level I Fascia	17/30(56.7%)	0.024
		No Defect in Level I Fascia	8/29(27.6%)	
	Level II Fascia	Defect in Level II Fascia	24/58(41.4%)	0.95
		No Defect in Level II Fascia	1/2 (50%)	
	Level III Fascia	Defect in Level III Fascia	19/41(46.3%)	0.28
		No Defect in Level III Fascia	6/19 (31.6%)	
Pelvic Floor Muscles	Levator Muscle Injury	With any injury [atrophy & detachment]	19/43(44.2%)	0.53
		Intact	6/17(35.3%)	
	Puborectalis Muscle Injury [including: 15 case of Atrophy, 11 case of Avulsion and 6 case With Atrophy and Avulsion	With any injury [atrophy & detachment]	15/32 (46.9%)	0.38
		Intact	10/28 (35.7%)	
	Iliococcygeus muscle Injury [including: 35 case of Atrophy and 1 case of Atrophy and Avulsion]	With any injury [atrophy & detachment]	14/35 (40%)	0.76
		Intact	11/25 (44%)	

Among 60 patients, 39 were sexually active (63.9%). The Relationship between MRI findings and sexual complaints were assessed only on these patients. Frequency of sexual complaints among patients with apical descend in MRI was 20.8% [5/24] while the frequency of these complaints among patients without apical descend in MRI was 28.8% [4/14] [P=0.7]. The association between endopelvic fascial defects and levator muscle injury with sexual complains were not statistically significant (Table 3).

Table 3. Relationship of MRI Abnormal Finding with Sexual Complaints

		MRI findings	Sexual Complaints	P value
Apical Descend [Considering PC Line]	Severe Apical Descend	Severe Apical Descend	0/3 [0]	0.95
	Any Apical Descend	mild, moderate and severe apical descend	9/35 [25.7%]	
		mild and moderate apical descend and no apical descend	5/24 [20.8%]	0.70
		no apical descend	4/14 [28.6%]	
Endopelvic Fascia Defect	Level I Fascia	Defect in Level I Fascia	5/18 [27.8%]	0.71
		No Defect in Level I Fascia	4/19 [21.1%]	
	Level II Fascia	Defect in Level II Fascia	9/36 [25%]	0.95
		No Defect in Level II Fascia	0/2 [0]	
	Level III Fascia	Defect in Level III Fascia	7/28 [25%]	0.95
		No Defect in Level III Fascia	2/10 [20%]	

Pelvic Floor Muscles	Levator Muscle Injury	With any Injury [atrophy and detachment]	6/24 [25%]	0.95
		Intact	3/14 [21.4%]	
	Puborectalis Muscle Injury [including: 15 case of Atrophy, 11 case of Avulsion and 6 case of Atrophy and Avulsion]	With any Injury [atrophy and detachment]	4/19 [21.1%]	0.95
		Intact	5/19 [26.3%]	
	Iliococcygeus muscle Muscle Injury [including: 35 case of Atrophy and 1 case of Atrophy and Avulsion]	With any Injury [atrophy and detachment]	5/19 [26.3%]	0.95
		Intact	4/19 [21.1%]	

Totally 25 patients reported defecation complaints. However, 49 patients showed entrocel (80.3%); including 40 cases of grade I (65.6%), 8 cases of grade II (13.1%) and 1 case of grade III [1.6%]. Among patients with entrocel, 40.8% (20/49) complained defecation problems while 41% of patients not having enterocel reported defecation complaints (0.96). The association between other parameters and defecation complaints are mentioned in Table 4. As it can be seen, except for severe rectal descend, other MRI findings did not have a significant relationship with the patient's symptoms (Table 4).

Table 4. Relationship of MRI Abnormal Finding with Defecation Complaints

		MRI Findings	Defecation Complaints	P-value
Enterocele [Considering PC Line]	Severe Enterocele	Severe Enterocele	1/4 [25%]	0.31
	Any Enterocele	Mild, moderate and severe enterocele	18/31 [58.1%]	0.68
		mild enterocele and moderate enterocele and no enterocele	16/28 [57.1%]	
		no enterocele	3/7 [42.9%]	
Endopelvic Fascia Defect	Level I Fascia	Defect in Level I Fascia	14/30 [46.7%]	0.50
		No Defect in Level I Fascia	11/29 [37.9%]	
	Level II Fascia	Defect in Level II Fascia	24/58 [41.4%]	0.95
		No Defect in Level II Fascia	1/2 [50%]	
	Level III Fascia	Defect in Level III Fascia	18/41 [43.9%]	0.61
		No Defect in Level III Fascia	7/19 [36.8%]	
Pelvic Floor Muscles	Levator Muscle Injury	With any Injury [atrophy and detachment]	19/43 [44.2%]	0.58
		Intact	6/17 [35.3%]	
	Puborectalis Muscle Injury [including: 15 case of Atrophy, 11 case of Avulsion and 6 case of Atrophy and Avulsion]	With any Injury [atrophy and detachment]	11/32 [34.4%]	0.30
		Intact	14/28 [50%]	
	Iliococcygeus muscle Muscle Injury [including: 35 case of Atrophy and 1 case of Atrophy and Avulsion]	With any Injury [atrophy and detachment]	16/35 [45.7%]	0.45
		Intact	9/25 [36%]	
Rectocele		With Rectocele	22/49 [44.9%]	0.95
		Without Rectocele	3/8 [37.5%]	
	Severe Rectal Descend	Severe Rectal Descend	11/14 [78.6%]	0.003

		MRI Findings	Defecation Complaints	P-value
Rectal Descend [Considering PC Line]	Any Rectal Descend	Mild, moderate and severe rectal descend	22/48 [45.8%]	0.95
		Mild and moderate rectal descend and no rectal descend	11/35 [31.4%]	
		No rectal descend	0 [0/1]	

Discussion

MRI can provide valuable information about facial and muscular defects in all three compartments of pelvic floor **(17)**. MRI accounts as a safe, cost-effective and applicable modality in investigation of pelvic floor abnormalities, with better soft tissue resolution and lack of ionizing radiation. In the current study we investigated whether MRI findings can be correlated with patients' symptoms or not. There was no significant correlation between patients' MRI findings with their urinary, defecation and sexual symptoms. Our results were in line with the findings of Ramage *et al.* who reported little to no correlation between MRI findings and Patients' symptoms **(18)**. A few number of studies have assessed the correlation between MRI findings and patients' symptoms to date. In a study by Broekhuis *et al.*, it was reported that the only symptom which was correlated with the MRI findings was complaining from the presence of a bulge in the vagina which could be felt or seen by the patient **(19)**. In another study conducted by Lakeman *et al.* the patients were divided into three groups of symptomatic with at least stage 2 pelvic organ prolapse ,mild symptoms with stage 1 pelvic organ prolapse, and asymptomatic nulliparous women. The patients then filled three questionnaires regarding the severity of their symptoms acquired an overall score based on their answers and .However, none of the MRI findings were correlated with these scores **(20)**. Ellerkmann *et al.* stated in their study that women with pelvic organ prolapse can experience symptoms uncorrelated with compartment-specific defects **(11)**. Lakeman *et al.* found poor correlation between symptoms, location and severity of pelvic organ prolapse in their study **(21, 22)**. These studies are partially consistent with the current study as they suggest lack of significant correlation between symptoms and MRI findings in patients. Although defecation symptoms, could be a good predictor of severe posterior compartment rectocele (P=0.003), these symptoms had no predictive value for other MRI findings in these patients. The absence of a significant correlation between MRI findings and the patient's symptoms caused by different factors. The patient is positioned supine in the MRI scanner, which is not the natural defecation position. In a study by Bertschinger *et al.* the supine and sitting MRI results of patients were compared. They reported that most pelvis floor disorders are detectable is supine position and evaluating all three compartments is possible in this position. However, they indicated that sitting MRI performed better in detecting anterior rectoceles, enteroceles and pelvic floor laxity **(19)**. Flusberg *et al.* in their study performed Magnetic resonance defecography on their patients and scored them based on the positive findings in each of the four phases of rest, squeeze, and defecation. Their results indicated a significantly higher mean score for the defecation phase compared to the other three phases. They also reported a higher rate of diagnosed rectoceles, intussusceptions, and enteroceles as well as a higher degree of anorectal, bladder, and uterovaginal descent, during this phase **(23)**. According to the literature, MRI sensitivity varies between 82% and 100% for rectoceles and for the depiction of rectal descents while clinical exam is only 31 to 80% sensitive **(24, 25)**. This is expected as literature shows vaginal support defects are not correlated with clinical symptoms, as many of the symptoms attributed to pelvic organ prolapse can emerge from other causes **(26)** and thus they don't have any predictive value for MRI findings which mostly have specific etiologies. In this study, similar to urinary symptoms, sexual symptoms had no significant predictive value for any MRI findings. In a study by Handa *et al.* **(27)** pelvic organ prolapse was not associated with any sexual complaint which suggests the lack of any correlation between sexual clinical symptoms and MRI findings which is in line with the current study. Our study had several limitations, one of which is the most important was the absence of a control group of healthy people. Our cases were all symptomatic and suspected for pelvic floor disorders, which can be the reason to the high prevalence of MRI abnormal findings. We would suggest the future research studies to include a control group in order to compare the results with.

Conclusion

In conclusion, these results suggest that the patient's symptoms are not good predictors for MRI findings and are limited in reliability. Thus, MRI must be counted as a necessity for further evaluation of patients with pelvic floor abnormalities. Further studies are required regarding MRI findings correlation with different symptoms in these patients.

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None.

Conflict of Interest

All authors declare that they have no conflict of interest.

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