

Specialty area: Innovation in Body MRI

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Highlights:

- Proper patient instruction is a key to successful dynamic pelvic floor exam.
- To achieve good visualization of the vagina and rectum, intraluminal gel should be instilled. Lack of vaginal and rectal distention may lead to suboptimal evaluation of the pelvic floor on the supine MRI.
- Rectal evacuation sequence is necessary for a complete assessment of defecatory function on MRI.

Title: Pelvic Floor Imaging

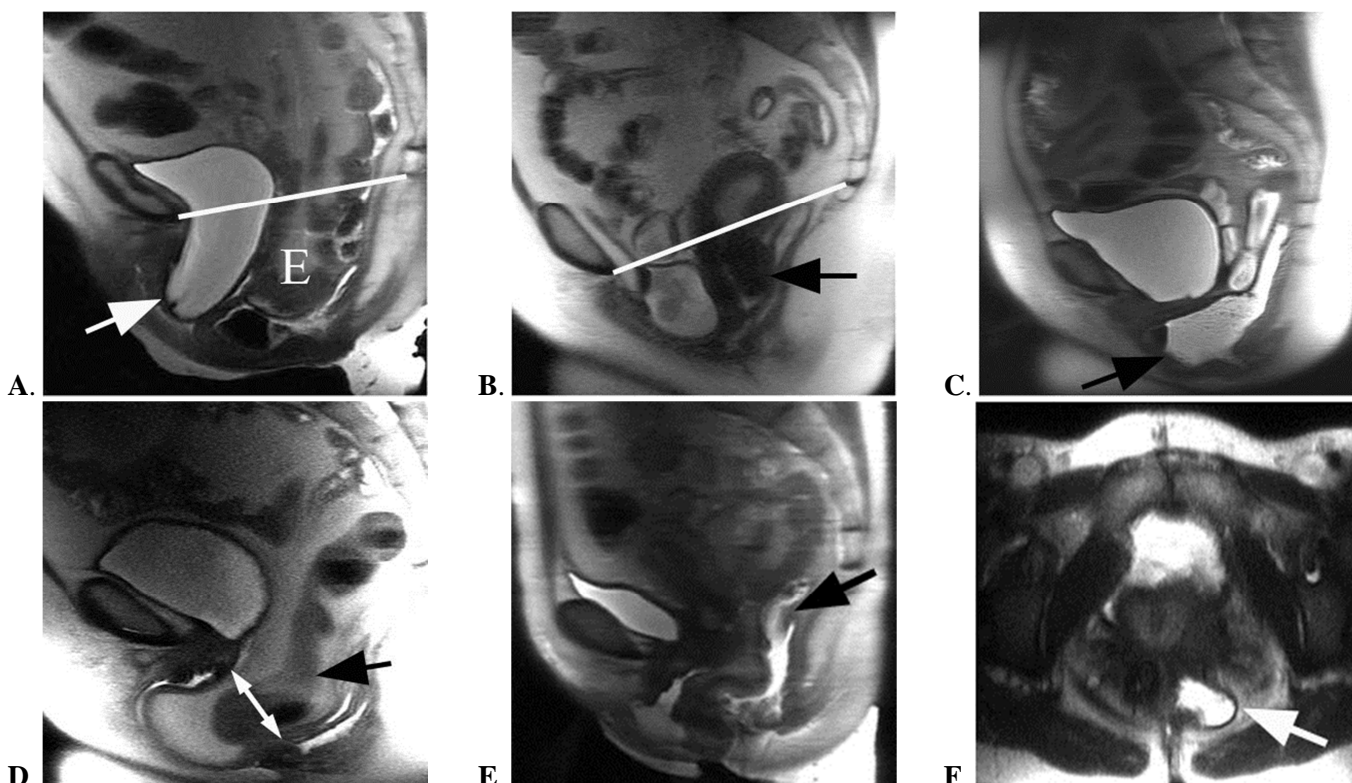
Target audience: – Radiologists interested in the evaluation of pelvic floor defect with dynamic MRI

Objectives: – 1) Identify the anatomical landmarks and describe the imaging technique and criteria used for diagnosis of pelvic floor defects; 2) Assess the anterior, middle, and posterior pelvic floor compartments on MR images; 3) Discuss the limitations and advantages of MR imaging in the evaluation of pelvic floor dysfunction.

Overview: MR imaging can be used in the initial evaluation of patients with pelvic floor defects, especially those who have symptoms of multicompartamental involvement and are evaluated prior to a complex pelvic floor reconstruction, or as a problem solving modality for those patients who have failed previous repairs or present with defecatory dysfunction.

The primary supportive structures of the pelvis consist of the pelvic fascia and pelvic floor musculature. Progressive weakening of the pelvic floor musculature leads to stretching and tears of the overpowered endopelvic fascia, and subsequently to prolapse of unsupported pelvic organs such as the urinary bladder and urethra (cystocele, urethrocele), the uterus or vaginal apex in post-hysterectomy patient (uterine or vaginal vault prolapse), peritoneal fat or small bowel or sigmoid colon (peritoneocele, enterocele, sigmoidocele), or rectum (rectocele, intrarectal intussusception, complete rectal prolapse).

MRI examples illustrating pelvic floor defects: A. Urethral hypermobility and cystocele (arrow), enterocele (E); B. Cervical/uterine descent (arrow) below PCL (line); C. Rectocele (arrow); D. Widening of recto-vaginal space and sigmoidocele (arrow); E. Intra-rectal intussusception (arrow); E. Levator ani muscle defect and left lateral hernia (arrow).



Imaging Technique: Pelvic coil and fast T2-weighted (T2W) sequences, such as single-shot fast spin echo, half Fourier acquisition turbo spin echo, or steady-state free precession sequences (true FISP) are typically used for dynamic pelvic floor MR imaging. On the T2W images, the fluid in the bowel and urine in the bladder, as well as pelvic fat have bright signal, which allows clear delineation of the pelvic organs. To achieve good visualization of the vagina and rectum, intraluminal gel, which gives high T2 signal, should be instilled; about 20 cc instilled into the vagina, and 120 cc into the rectum. MR imaging of the pelvic floor can be performed without endoluminal contrast, however lack of vaginal and rectal distention may lead to suboptimal evaluation. Vaginal gel allows better visualization of the anterior and posterior vaginal walls, therefore improves detection of the apex of the vagina and its inversion, if present, which can be difficult to reveal otherwise. Without rectal distension with gel, adequate straining, evacuation, and rectal emptying cannot be properly documented, and recto-vaginal septum defects, posterior rectal wall laxity and intrarectal intussusception may not be visualized during the exam while contributing to defecatory dysfunction in the real life.

Imaging is usually performed in three planes (axial, sagittal, and coronal). Images acquired in the sagittal plane at midline should be viewed in a cine loop to visualize pelvic organs descent during strain maneuvers and Valsalva, and during evacuation. Sagittal images are used to evaluate and measure pelvic organ position at rest and their descent during strain. Coronal images are used to assess the symmetry of the levator ani muscles. Axial images are important in the assessment of the levator hiatus, the shape of the vagina, and detection of lateral defects. Patients are instructed to perform different maneuvers during the scanning, such as Kegel squeeze or strain and defecation, to allow the dynamic evaluation of the pelvic floor function. Physiologically, in the upright position the combination of gravity and rectal evacuation maximizes the stress on the pelvic floor. Therefore, during MR scan in the supine position it is especially important to instruct the patient to evacuate rectal contents with multiple attempts as effects of gravity are diminished. Majority of patients can defecate in the supine position, especially if they have their knees bent over the pillow. Typically, pelvic floor MRI can be completed in less than 20 minutes, and no bowel prep or enema are needed prior to the exam.

Anatomical Landmarks on MR Imaging: The level of the pelvic floor can be defined on MR imaging using the **pubococcygeal line (PCL)**. PCL is a line extending from the most inferior portion of the symphysis pubis to the sacrococcygeal joint (Figures A-B). The degree of descent of the pelvic organs within the three pelvic compartments can be evaluated as the vertical distance between the resting and strain positions of the organs in reference to PCL [1-4]. Slightly different reference points are used in the HMO system for grading pelvic organ prolapse or with the Mid pubic line that approximates the level of the hymen on clinical exam and has also been used for quantitative assessment of prolapse. It is important to establish a consensus with the referring clinicians regarding the grading system to be used for reporting of MR imaging findings in order to avoid confusion, maintain consistency, and assure that clinicians understand how the measurements are performed so they can correlate them clinically.

Imaging Findings: The following findings should be routinely reported: (a) findings for the anterior compartment, such as the presence of urethral hypermobility or cystocele; (b) findings for the middle compartment, such as cervical or vaginal vault descent; (c) findings for the posterior compartment, such as the presence of rectocele, widening of recto-vaginal space, presence and type of enterocele, rectal intussusception, or perineal body defect. The symmetry of levator ani muscle should be evaluated and any defects or lateral trans-levator hernia should be mentioned. Paravaginal attachments should be assessed by evaluation of vaginal shape and vagino-levator attachments. Anorectal angle should be assessed in cases of anal sphincter spasm in pelvic dyssynergia, which can contribute to defecatory dysfunction. In pelvic floor dyssynergia, on MR imaging there is no change in the anorectal angle or a more acute change in anorectal angle with attempted defecation; findings are related to paradoxical contraction of the sphincter and puborectalis muscle interfering with rectal emptying.

References:

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