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MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF PELVIC FLOOR DISORDERS

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ABSTRACT

Vaginal prolapse due to pelvic floor dysfunction occurs frequently in postmenopausal women. The disease usually involves all compartments of the vagina, so that isolated defects are uncommon. In advanced disease, it can be difficult to identify which organs are prolapsed, owing to the large bulge in vaginal area. Accurate diagnosis of pelvic floor defects, actual prolapsed organs, and presence of any coexisting abnormalities are essential to correctly plan surgical reconstruction and minimize the risk of recurrence. In this review, we discuss the existing imaging modalities available to evaluate pelvic prolapse, emphasizing the role of dynamic magnetic resonance imaging.

Key words: pelvis; prolapse; magnetic resonance imaging Int Braz J Urol. 2002; 28: 553-9

INTRODUCTION

Female pelvic floor dysfunctions are a relatively usual problem, and their clinical manifestations include cystocele, sigmoid prolapse and/or rectocele, uterine prolapse and enterocele. The alterations found in female pelvic floor dysfunctions affects the whole region, so in more advanced stages, usually a combination of these structures is observed (1). In general, evaluation of pelvic floor prolapses is performed only by physical examination; however, in more complex cases, and with many prolapsed structures, physical examination alone has low specificity and sensibility (2-4). In these cases, it is known that success of treatment is directly related to a thorough preoperative evaluation, with accurate identification of prolapsed organs, and staging of the pelvic floor dysfunction (5).

All physicians who treat patients with pelvic floor dysfunction must understand clearly the anatomy, as well as be capable to establish a net relation among multiple anatomic structures in pelvic region. In patients with a prolapse regional anatomy is altered; thus, for surgical planning, frequently image exams are necessary.

Formerly, since it does not use ionizing radiation and is not invasive, ultrasonography was considered the exam of choice for female pelvis evaluation (6). Later, fluoroscopy was applied to evaluate the rectum and the urinary bladder, to detect rectocele and cystocele, respectively (2,3,7). Recently, magnetic resonance imaging has been used to evaluate and diagnose pelvic floor dysfunctions (Figure-1), for it is a non-invasive procedure that provides detailed images of all pelvic cavity structures in just one and prompt exam, it doesn't expose the patient to ionizing radiation, and doesn't need contrast (8-17). In this review, we present a critical analysis of imaging methods available for pelvic prolapse evaluation, emphasizing the role of the magnetic resonance imaging (MRI).

ENTEROCELE

One can differentiate enteroceles in simple and complex. Simple enteroceles are those where



Figure 1 – *Pelvic floor MRI without evidence of prolapse. All pelvic cavity organs can be easily identified.*

vaginal cupula does not present defects of support. Complex enteroceles present an association with vaginal cupula prolapse, and tend to coexist with anterior and posterior vaginal walls prolapses. Symptomatic enteroceles can cause vaginal pressure, dyspareunia and lumbosacral pain; occasionally patients complain of severe constipation, sensation of incomplete evacuation and symptoms of intestinal obstruction (18). When there is prolapse of more than one vaginal wall, or more than one organ, it becomes difficult to evaluate all compartments just by physical examination (6). Additionally, it is very difficult to accurately differentiate an enterocele from a high rectocele (6). Formerly, defecography was the only method available to help in enterocele diagnosis. Nowadays, cystocolpoproctography with fluoroscopy has been used. However, these exams are highly invasive, exposing the patient to ionizing radiation; and because of the need to contrast bladder, rectum, bowel, and vagina, it takes too much time to carry out. In addition to all these inconveniences, it still presents 20% failure in detecting enteroceles (3,9-24).

More recently, MRI has been effectively used to evaluate pelvic floor morphological alterations. Just as other exams to evaluate a perineal region prolapse, in MRI images are obtained at rest and with straining. In a study comparing physical examination, surgical findings and MRI in women with and without a prolapse, it was observed that MRI presents a sensibility of 87%, and a positive predictive value of 91%

compared to surgical findings, as well as being significantly superior in detecting enterocele when compared to physical examination (15). In the same way, Lienemann et al., using MRI with organ opacification, showed that MRI has a greater sensibility in detecting enterocele than physical examination and dynamic cystoproctography (24). Another advantage of the MRI is to distinguish enteroceles according to their contents (small and large intestine, rectosigmoidocele, or mesenteric fat), making surgical planning easier and more reliable (14,15,24,25). Until recently, fluoroscopic multiphasic cystocolpoproctography was considered the best radiologic exam for detecting pelvic prolapse. A study comparing MRI multiphasic and cystoproctography multiphasic fluoroscopic showed similar rates in detecting enterocele (20). In our practice, we observed that it is possible to obtain excellent images with MRI (Figure-2), without needing oral opacifiers to contrast the bowel and without the need of rectal contrast to the rectum. We also noticed that the gain with the invasive examination is minimum to warrant its use instead of an exam completely unaggressive to the patient (15,20,24). In general, dynamic MRI is a



Figure 2 – MRI showing a big enterocele. Note that rectum and bladder are easily identified.



Figure 3 – MRI showing a grade IV cystocele. Note rectum is clearly visualized.

non-invasive exam, and superior to any other in diagnosing enterocele.

CYSTOCELES

Cystoceles can be traditionally classified according to the severity of vesical prolapse (grades I, II, III, and IV), or by the type of anatomic defect (central, lateral, or both) (26). The majority of cystoceles grades I and II are usually asymptomatic, and may be associated with urethral hypermobility and urinary stress incontinence. The vesical prolapses of higher grades (grade III and IV cystoceles) are commonly symptomatic and associated to other types of prolapse (Figure-3). Usual manifestations include vaginal mass, vaginal pressure, dyspareunia, urinary infection, urinary tract obstructive symptoms, including urinary retention and hydroureteronephrosis. The lack of identification of all types of prolapse can lead to an incomplete surgical correction with resulting recurrence (1,13,14). Physical examination limits individualization and identification of all prolapsed structures when a great vaginal mass is present (2-4). Additionally, isolated repair of a cystocele without any regard to the remaining pelvic floor predispose to an increase in the incidence of de novo enterocele, rectocele, and uterine prolapse, due to a vaginal axis alteration (15). Higher grades cystoceles may mask urinary stress incontinence and urethral hypermobility. Surgical results in the treatment of urinary incontinence tend to be better with complete restoration of pelvic floor anatomy. Due to all reasons mentioned above, we observed that it is essential that prolapsed structures are clearly identified before any pelvic floor procedure.

Optimal image method for cystoceles evaluation should provide information about other types of prolapse; about presence or absence of infravesical and ureteral obstruction; and about presence or absence of urethral hypermobility, as well as evaluate the presence of urinary stress incontinence. Videourodynamics and voiding cystography have been utilized in cystocele evaluation. These studies are done in upright position during abdominal straining and at rest, being useful in determining the severity of cystocele, urethral hypermobility evaluation, and urinary stress incontinence, as well as documenting the postvoid residue (7). Unfortunately, these studies do not provide information related to pelvic floor dysfunctions altogether. Cystocolpoproctography, as discussed before, presents a high ionizing radiation exposition, is time-consuming and needs invasive contrast application (3, 19 - 24). Perineal ultrasonography may be utilized to urethral hypermobility and vaginal prolapse evaluation; however, there are few studies reported, its efficiency is operator and device dependent, and the method doesn't provide adequate visualization of the planes between the tissues (27).

For isolated cystoceles, a physical examination and a voiding cystourethrography are adequate. For a high grade cystocele associated with prolapse of other compartments, we recommend the use of dynamic MRI associated with videourodynamics. Studying, staging, and determining pelvic floor relaxation method using MRI was clearly described (14). MRI provides information about other pelvic compartments with concomitant evaluation of enterocele, uterine prolapse, and rectocele, as well as documenting urethral hypermobility, and postvoid urinary residue. An additional advantage is the evaluation of possible ureteral obstructions due to cystocele, hydronephrosis, and other pelvic pathologies. Gousse et al. demonstrated that MRI utilized for cystocele evaluation presented a 100% sensibility, a 83% specificity, and a

97% positive predictive value compared to surgical findings (15). The same authors found other types of pelvic pathologies in 55% of patients, including 3 with bilateral hydroureteronephrosis (15).

MRI presents a high-grade correlation with cystography in cystocele diagnosis (28). The main concern of MRI is the fact that the examination is done with patient in supine position, what, ultimately, would impair the diagnosis or underestimate the prolapse grade. However, MRI presents many advantages, of which the paramount are: doesn't use ionizing radiation, doesn't require urethral catheterization, provides details of the 3 pelvic compartments, evaluate concomitant pathologies, inform about urethral hypermobility, as well as evaluates ureteral obstruction and postvoid residue (9 - 15, 28).

RECTOCELE

Rectocele results from a defect in prerectal and pararectal fasciae, and in retrovaginal septum (26). Rectocele can be present in up to 80% of asymptomatic patients (13). The symptoms include vaginal pressure, vaginal mass, dyspareunia, and constipation. Diagnosis generally is by physical examination. As well as any other kind of pelvic floor relaxation, rectoceles are usually associated with other types of prolapse. In these cases, due to competition for space between prolapsed organs, there is a difficulty in diagnosis, and the possibility of a non-detected rectocele in physical examination (6). The sensibility of the physical examination alone for the diagnosis of rectocele varies from 31 to 80% (2-4,6,21,29). Additionally, physical examination frequently is not capable to distinguish an enterocele from a high rectocele. For these reasons, imaging exams should be utilized to help identifying rectoceles.

Traditionally, defecography has been used for more accurate diagnosis of rectocele. Since rectocele is commonly associated to other organs prolapses, many authors have used cystocolpoproctography for its diagnosis (3,19-21,29). The disadvantages of these techniques are inability to visualize soft tissue of the pelvic floor, invasiveness and significant use of ionizing radiation. Some authors have used MRI in an

attempt to better evaluate pelvic structures, pelvic floor muscles and soft tissue inside pelvic cavity (Figure-4). In a study comparing MRI in detecting multiple types of vaginal prolapse with surgical findings, 76% sensibility and 96% positive predictive value was observed for rectocele diagnosis (15). These results are relatively poor when compared to detection rates of other types of prolapse by MRI. The authors justified that if the rectum is empty and its walls collapsed, MRI would fail to detect small rectoceles. There are studies presenting high sensibility and specificity with 100% of appropriateness in rectocele diagnosis using MRI with rectal contrast (25). Others showed that dynamic triphasic MRI and fluoroscopic cystocolpoproctography presented a similar rate of detection (20). One way to improve detecting rectocele by MRI is through rectal opacification by introducing gel utilized in ultrasonography. However, this procedure, besides bringing invasiveness to the method, can generate image artifacts through the introduction of air along with the gel (15,20).

UTERINE PROLAPSE

Uterosacral ligament permits the anterior movement of the cervix leading to a progressive ret-



Figure 4 – MRI showing a big rectocele.

roversion of the organ, and subsequent prolapse (26). Uterine prolapse grades I and II are generally asymptomatic, although grades III and IV present as vaginal masses, dyspareunia, urinary retention, and lumbar pain. Uterine prolapse grade IV has been associated to chronic and progressive ureteral obstruction. In surgical planning in this kind of prolapse, is essential to determine uterus size and discard any uterine or ovarian pathology, of benign or malign origin. Since it is necessary to evaluate other prolapse types, and presence of other utero-ovarians pathologies, MRI is the ideal exam to evaluate uterine prolapse (Figure-5). MRI provides information about presence or absence of cystocele, rectocele, urethral hypermobility, and urethral diverticula; information about the size and possible pathologies of the uterus (tumors, myomas, cysts, etc.); ovarian pathologies (cysts or masses); and also evaluate ureteral obstruction (9,10,13-15,28). Gousse et al. reported 83% sensibility, 100% specificity, and 100% positive predictive value when compared to surgical findings. These findings aren't different from those found when performing physical examination (15). However, MRI could define clearly other pelvic cavity compartments, and diagnosed some concomitant uterine and/or ovarian pathology in 30% of the patients (15).

FINAL CONSIDERATIONS

Many studies using MRI of normal patients improved our understanding about the region normal anatomy (30-32). Additionally, analyses of regional musculature by MRI have contributed to the understanding of pelvic floor dysfunctions (33-35). This shows how images provided by MRI are detailed and allows an accurate study of the pelvic region.

Major concern about the use of MRI is related to the high cost of the procedure. However, in severe cases of vaginal prolapses, frequently is necessary the use of ultrasonography, excretory urography, voiding uretrocystography, and/or defecography, for a more accurate diagnosis. In these cases, use of MRI may substitute all these exams, lowering considerably invasiveness to the patient, and making reasonable the relative toll.



Figure 5 – MRI showing a grade IV uterine prolapse.

Pelvic floor dysfunction usually leads to alterations in all compartments of female pelvic cavity. In advanced cases, with involvement of many compartments, accurate identification of all organs occupying the vaginal region is essential to surgical planning and success. In such situations, there is a competition for space in the vaginal region, making diagnosis difficult only by physical examination. In this way, we need an exam that provides a wide and simultaneous evaluation of all pelvic region, and elucidates any doubt that may persist after physical examination. Due to its non-invasiveness, rapidity, simplicity and non-exposition of the patient to ionizing radiation, MRI is an image method very useful to study pelvic floor and identify cystocele, rectocele, enterocele, and uterine prolapse. Furthermore, it provides high quality images that allow throughout evaluation of all pelvic cavity components, including soft tissue, which is not possible with other studies based on fluoroscopy (10,12-16,25,33).

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