



## Review

## Dynamic Magnetic Resonance Imaging and pelvic floor disorders: how and when?



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## ARTICLE INFO

## Article history:

Received 31 March 2014

Received in revised form 11 July 2014

Accepted 20 July 2014

## Keywords:

Pelvic organ prolapse

Pelvic floor dysfunction

Urinary incontinence

Magnetic resonance imaging

Reliability

## ABSTRACT

Pelvic Floor Disorders (PFD) are a major public health problem in the world and decrease seriously the patient's quality of life. In case of recurrence after surgery or complex prolapse, imaging techniques can be used. Dynamic MRI, introduced in the early 1990s, offers information of the four compartments of the pelvis with a high resolution and a direct visualization of muscles and fascias in multiple planes. But for a practical use, such an expensive exam should be well correlated to symptoms and clinical examination or change surgical approach. The aim of our review was to precise the evidence regarding techniques, and indication of dynamic MRI in the assessment of pelvic floor disorders in daily practice.

The first part is a review of available studies on methods of carrying out the dynamic MRI. The second part consists on the comparison of dynamic MRI to other assessment methods in case of pelvic floor disorders.

Results emphasize the lack of strong level studies about the interest of dynamic MRI in the diagnosis and surgical management of pelvic organ prolapse. Although dynamic MRI appears highly reproducible between examiners, especially for the anterior compartment, its correlation with the degree of prolapse or the symptoms appears low. The most interesting field of application seems the detection of levator ani (LA) avulsion with a higher risk of prolapse and recidive in case of LA defects.

More prospective, randomized, comparative studies have to be done.

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**Introduction**

Pelvic Floor Disorders (PFD) are a major public health problem in the world: 10% of women are operated at 70 years old and 23% of the women are affected by this pathology [1,2]. PFD decrease seriously the patient’s quality of life with many symptoms like chronic pelvic pain, urinary or anal incontinence, urogenital prolapse and constipation. Recurrences or failures are frequent: nearly 30% of the women have to go through another surgery [1,3]. A multicompartimental approach management is necessary. In fact 95% have a complex pelvic floor disorder involving anterior and posterior compartment [3,4].

The usual assessment of Urinary Incontinence (UI) and prolapse is clinic, based on gynecologic exam. It collects symptoms, quality of life assessment and clinic evaluation of cervico-urethral mobility, prolapse and muscular trophicity [5].

The colpocystogram was developed since 1965 to investigate PFD with pelvis radiologic scan at rest and at straining [6]. This exam was considered as the gold standard in France until recently but it needs to opacify the bladder, the vagina and the rectum and uses ionizing radiation.

Dynamic Magnetic Resonance Imaging (MRI) was introduced in the early 1990s by Yang [7]. It offers information of the four compartments of the pelvis with a high resolution and a direct visualization of muscles and fascias in multiples planes. This is why many authors have studied its feasibility in pelvic floor disorders assessment. But for practical use, MRI should be also well correlated to symptoms and clinical examination or change surgical approach.

The aim of our review was to precise the evidence regarding techniques, and indication of dynamic MRI in the assessment of pelvic floor disorders in daily practice.

**Material and methods**

The studies included were selected to meet two objectives. The first is a review of available studies on methods of carrying out the dynamic MRI. The second part consists on the comparison of dynamic MRI to other assessment methods in case of pelvic floor disorders. Selection of these studies was not based on a systematic research. Studies were chosen by three uro-gynecologic experts (AF, KN, ACP) because of their importance in clinical practice. The literature search was conducted over a period from inception up to September 2013 using the PubMed database and the following keywords: “pelvic organ prolapse”, “pelvic floor dysfunction”, “urinary incontinence”, “magnetic resonance imaging”, “levator ani muscle”, “fecal incontinence” and “reliability”.

The level of evidence (LE) is indicated for each study through the standard model developed by the Oxford Centre for Evidence-Based Medicine ([www.cebm.net](http://www.cebm.net)), as following: LE1, randomized comparative studies; LE2, cohort studies; LE3, case-control studies; and LE4, case series.

**Technical aspects**

*Should we prefer sitting or supine position during MRI?*

Dynamic MRI is classically realized with patients in supine position [7] (LE3) and flexed legs [8]. Dynamic MRIs with opened antennas are now available to realize the acquisitions in a standing or a sitting position with defecation [9] (LE3). It is not certain that the imaging in a standing position improves its relevance. The only study comparing sitting position in an open-magnet unit versus supine position in a closed-magnet unit found a higher sensitivity in the detection of anterior and posterior compartments in a sitting position but not for vaginal vault descent. Excluding small rectal, bladder or vaginal vault descent, the sensitivity of supine MR Imaging was 100% for the depiction of bladder descents and anterior rectoceles and to 96% for the depiction of rectal descents [10] (LE3).

*Should we opacify the rectum, the bladder or the vagina?*

For some authors, the bladder and the vagina do not need opacification because of spontaneous high resolution and high contrasts on MRI [11–14] (Fig. 1). For others, the bladder has to be semi-filled. But too much filled, the anatomical relationships can be modified and the diagnosis may change [15] (LE3).

Some team choose to fill the rectum with mashed potatoes or gadolinium-DPTA [16]. For them, this method avoids collapse of the anterior wall and helps to diagnose rectoceles. But an excessive rectal filling can also modify the anatomy of the pelvic organs [15] and introducing gel bubble [17] can also lead to difficulties in diagnosing rectoceles (LE3). Rectal gel can also emphasize a discomfort feeling by the fear of the occurrence of fecal leak during the effort.

In our experience, we were able to quantify precisely rectocele (point Bp) without rectal opacification [11] (LE3). Lakeman et al., in a cross-sectional study of symptomatic women with and without prolapse, show good reproducibility for the posterior compartment measurement in the prolapse group without rectal opacification [14] (LE3).

*Which sequences are useful?*

Static sequences are obtained using T2-weighted axial and sagittal planes and dynamic sequences using single-slice ultrafast acquisitions in sagittal and coronal planes. The T2-weighted sagittal sequences are useful to show the bladder neck and the cervix. Sagittal acquisitions help to adjust coronal images by identifying the middle passing through the pubic symphysis and the anatomical landmarks. It also permits a precise morphologic analysis. Coronal planes explore dynamic physiology of the elevator muscles [18] (LE4). Measurement of the urogenital hiatus and detection of levator ani injuries can be performed on axial planes (Fig. 2).

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