

# Predictive Value of Magnetic Resonance Imaging in Differentiating Between Leiomyoma and Adenomyosis

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## ABSTRACT

**Objective:** We evaluated the role of MRI as a preoperative diagnostic tool for leiomyoma and adenomyosis.

**Method:** This is a retrospective chart review at a university-based hospital. The study included 1517 women who underwent hysterectomy or myomectomy over a 5-year period, and 153 women with a preoperative pelvic MRI were included. Comparisons were made between the results of the MRI and postoperative pathology reports.

**Results:** The MRI and pathology report were the same for 136 of 144 women with leiomyoma and 12 of 31 women with adenomyosis. The MRI had 94% sensitivity and 33% specificity for leiomyoma and 38% sensitivity and 91% specificity for adenomyosis. Positive and negative predictive values of MRI for leiomyoma were 95% and 27% with 90% accuracy. Positive and negative predictive values of MRI for adenomyosis were 52% and 85%, respectively, with 80% accuracy.

**Conclusion:** MRI has a high sensitivity and a low specificity for diagnosing leiomyoma and a high specificity and a low sensitivity for diagnosing adenomyosis. Due to the high cost and technical variations, we suggest using MRI only as an adjunctive diagnostic tool when ultrasound is not conclusive and differentiation between the 2 pathologies ultimately affects patient management.

**Key Words:** Leiomyoma, Adenomyosis, MRI (Magnetic

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Resonance Image), Pelvic Ultrasound.

## INTRODUCTION

Uterine leiomyomas and adenomyosis are 2 common pelvic pathologies in women of reproductive age. They may have similar presentations but possibly different treatment modalities, ie, hysterectomy for adenomyosis versus conservative management or hysterectomy for leiomyomas, or both. However, only limited studies have been performed on the efficacy of conservative treatment of adenomyosis, and these typically do not improve or preserve fertility.<sup>1-4</sup>

Thus, preoperative diagnosis becomes important in counseling patients appropriately regarding treatment options. Currently, ultrasound is used as the first diagnostic tool to evaluate pelvic pathology. MRI provides better tissue contrast and may be superior to other imaging modalities in certain pelvic pathologies, such as congenital uterine anomalies, leiomyoma, adenomyosis, and endometriomas.<sup>5-10</sup> Some reports suggest MRI is a reliable preoperative tool available to physicians to assist in differentiating between fibroids and adenomyoma/adenomyosis.<sup>11-14</sup> In this study, we evaluated the predictive value of the preoperative MRI in differentiating between leiomyoma and adenomyosis compared with pathologic findings.

## METHODS

A 5-year retrospective chart review was performed from January 1999 to December 2004 in a university-based hospital among patients who were admitted to undergo hysterectomy, myomectomy, or both. IRB approval was obtained. Although 1517 charts were reviewed, only 153 patients who underwent a preoperative MRI were selected for this study.

Patients ranged in age from 21 to 69 with a mean age of 41 and a median age of 39. The presenting symptoms were as follows: 73(48%) had menorrhagia, 34(22%) had dysmenorrhea, 31(20%) had pelvic pain, 40(26%) had a pelvic mass, 16(10%) had irregular bleeding, 14(9%) had infertility, and 2(1.3%) had postmenopausal bleeding.

Of these patients, 50 had a hysterectomy and the other 103 had a myomectomy. Pathology reports of surgical specimens were compared with the results of preoperative MRI studies.

### MRI Studies

MRI studies were performed in axial, sagittal, and coronal planes with various T1-weighted spin-echo and T2-weighted turbo spin-echo or spin-echo on a 1.5 Tesla system (GYRO scan, Phillips Medical Systems, Bothell, Washington, USA or GE open magnet MRI scanners, General Electric Company, Fairfield, Connecticut, USA) in different centers. Contrast enhanced gadolinium was used as an additive technique in 50 cases to achieve better tissue contrast in the patients suspicious for leiomyoma. Leiomyoma appeared as low-signal intensity in T2-weighted images and intermediate- to high-signal intensity in T1-weighted images.

Adenomyosis was described as a focal or diffuse widening of junctional zone above 12 mm, uterine enlargement, or both, with focal or diffuse low-signal intensity myometrial area in T2-weighted images. Also on contrast enhanced T1-weighted images, (gadolinium scan) small hypointense myometrial spots were indicative of adenomyosis.

MRI interpretation was performed by different observers in different centers including private radiology centers, community and university hospitals.

### RESULTS

Different pathologists in the pathology department at Stanford University Medical Center examined surgical specimens. The results were used to confirm the MRI findings for the presence of leiomyoma and adenomyosis.

According to the pathology reports, 120 had only leiomyoma, 23 had leiomyoma with coexisting adenomyosis, and 9 had adenomyosis. One patient in the hysterectomy group had a normal MRI and pathology report that revealed no myoma or adenomyosis. She was also included in the study. Fifteen patients had other pelvic pathologies coexisting with leiomyoma or adenomyosis, or coexisting with both.

MRI studies correctly diagnosed 136 of 144 patients with leiomyoma. In the remaining 8 patients with leiomyoma, MRI missed the diagnosis. MRI revealed leiomyoma in 6 patients without disease. Only 3 patients without disease had a negative MRI. Data analyses were as follows: sen-

sitivity 94%, specificity 33%, positive predictive value 95%, and negative predictive value 27%.

For adenomyosis, in 31 patients, MRI revealed true positive, false-positive, and false-negative results in 12, 11, and 19 patients, respectively. MRI studies revealed the correct diagnoses in all 111 without adenomyosis.

The positive and negative predictive values of MRI for adenomyosis were 52%, 85%, respectively, with 38% sensitivity and 91% specificity.

As mentioned previously, 23 cases had coexisting leiomyoma and adenomyosis. MRI revealed correct diagnoses in only 9/23 patients, in 12/23 it revealed only myoma, and in 2/23 it diagnosed only adenomyosis. Sensitivity for the diagnosis of both disease entities was only 39%.

### DISCUSSION

Adenomyosis and leiomyoma are 2 benign uterine conditions with similar clinical presentations and different pathogenesises. Adenomyosis or internal endometriosis is a disease of parous women with the peak incidence between 40 to 50 years of age.<sup>15,16</sup> It is characterized by the presence of endometrial glands and stroma inside the uterine myometrium.<sup>17</sup> According to different histological interpretations of the hysterectomy specimens, frequency of adenomyosis may vary from 20% to as high as 65% among parous women.<sup>18-20</sup>

Uterine involvement may be focal or diffuse, and the size of the lesion ranges from a gross macroscopic well-defined lesion (adenomyoma that mimics myoma) to a microscopic lesion. Uterine leiomyoma is a benign smooth muscle tumor with 25% prevalence in women of reproductive age with a predominance among African American women.<sup>21-23</sup> Furthermore, pathology examination of surgical specimens revealed an incidence of leiomyoma as high as 77%.<sup>24</sup>

The clinical presentation can be similar between the disease entities. The most common symptom is abnormal uterine bleeding<sup>25</sup> with a predominance of menorrhagia. Dysmenorrhea, another common symptom, occurs in 25% of patients.<sup>26</sup>

A definitive diagnosis for both categories is possible based on histological examination of surgical specimens, but imaging techniques are increasingly used for preoperative evaluation and diagnosis.

Transvaginal ultrasound and pelvic MRI are increasingly used as a preoperative diagnostic tool for adenomyosis.

Although both techniques have been reported to have almost the same sensitivity (68% versus 70%), the specificity is greater for MRI (86% versus 65%).<sup>11,28-30</sup>

Pelvic MRI is also used in the diagnosis of leiomyoma when a patient's obesity or extreme uterine retroversion, or both, hinder pelvic ultrasound performance. It is also useful in preoperative localization of uterine leiomyoma.<sup>31</sup> Pelvic MRI is highly specific in the diagnosis of adenomyosis (91%) and highly sensitive for leiomyoma (94%) according to our findings.

Currently, pelvic ultrasound, a relatively affordable and effective method, is widely used as an office procedure in the diagnosis of leiomyoma. It is more efficacious to limit the use of MRI for specific conditions when uterine preservation is the goal of therapy, such as localization of leiomyoma in an infertile patient or when the patient is a candidate for uterine artery embolization.

Our results are different from the results in previously published reports that indicated a higher sensitivity (70% vs. 38%) of MRI for adenomyosis<sup>11,28-30</sup> and higher specificity (100% vs. 33%) for leiomyoma.<sup>32</sup> This can possibly be explained because our study was influenced by selection bias. Because the study was performed on a diseased population with a previous diagnosis of myoma or adenomyosis, or both, where ultrasound alone was thought by the physician to be inadequate. Therefore, there were very few patients in our study with negative findings, leading to a low specificity. However, it was not possible to select another population, because of the retrospective nature of the study.

Also, MRI studies were done in different centers and interpreted by different radiologists, which may produce interobserver bias. Like other radiological studies, MRI is highly operator dependent, and the results may be influenced by technical and observer interpretation. Furthermore, different pathologists examined the surgical specimens. However, this may be a strength of the study in the sense that in reality there will not always be the same specialist reviewing all the studies.

Of 153 patients who had MRI as a preoperative diagnostic tool, 103 underwent myomectomies, so there may be an inherent bias against identifying false-negative adenomyosis.

## CONCLUSION

At the present time, pelvic ultrasound is used as a first line for the diagnosis of uterine pathology.<sup>2</sup> MRI is used less

frequently than ultrasound due to cost and technical variations. However, it may be helpful for diagnosis of pelvic pathologies that are not well defined with ultrasound studies.

We suggest MRI be used as a complementary diagnostic tool in patients whose ultrasound examination does not clarify the diagnosis, such as in extreme uterine retroversion or obesity, or both, and in patients whose ultrasound examination is indicative of adenomyosis and there is a desire for conservative management.

MRI has high specificity and negative predictive value for adenomyosis. If the preoperative MRI shows no adenomyosis, patients can be counseled of the low likelihood of having adenomyosis (15%) and therefore conservative management can be offered.

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