RESEARCH PAPER

Diagnostic Accuracy of MRI Versus Ultrasound in Detecting Adenomyosis Among Women with Chronic Pelvic Pain: A Cross-Sectional Study

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ABSTRACT
Background: Adenomyosis is an important gynecological cause of chronic pelvic pain, dysmenorrhea, heavy menstrual bleeding, and reduced quality of life. Accurate diagnosis is essential for appropriate management. Objective: To compare the diagnostic accuracy of MRI and ultrasound in detecting adenomyosis among women presenting with chronic pelvic pain. Methods: This diagnostic accuracy study was conducted at Department of Radiology, Tertiary Care Hospital Nishtar-II Multan from May 2025 to May 2026 included 155 women with chronic pelvic pain. All participants underwent pelvic ultrasound and MRI for evaluation of adenomyosis. Imaging findings were compared with the final reference diagnosis. Results: Adenomyosis was diagnosed in 92 (59.4%) patients, while 63 (40.6%) patients did not have adenomyosis according to the final reference diagnosis. Ultrasound correctly diagnosed 123 (79.4%) cases, with 72 true-positive, 12 false-positive, 51 true-negative, and 20 false-negative results. The sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of ultrasound were 78.3%, 81.0%, 85.7%, 71.8%, and 79.4%, respectively, with moderate kappa agreement of 0.58. MRI correctly diagnosed 140 (90.3%) cases, with 84 true-positive, 7 false-positive, 56 true-negative, and 8 false-negative results. Conclusion: MRI showed higher diagnostic accuracy than ultrasound in detecting adenomyosis among women with chronic pelvic pain..
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INTRODUCTION

Adenomyosis is a benign gynaecologic condition which consists of the presence of endometrial glands and endometrial stroma in the myometrium, with accompanying myometrial hypertrophy, enlargement of the uterus and distortion of the normal uterine junctional zone [1]. It has become well known as a significant cause of chronic pelvic pain, dysmenorrhea, menorrhagia, dyspareunia, abnormal uterine bleeding and infertility in the reproductive and perimenopausal women [2]. While adenomyosis was traditionally known as a postoperative histopathologic diagnosis after hysterectomy, recent advances in imaging modalities have made non-invasive diagnosis increasingly feasible in clinical practice. Chronic pelvic pain is often and often a complex clinical entity in gynecology [3]. It is generally classified as non-cyclic or cyclic pelvic pain that lasts at least 6 months and can have a profound impact on a person's physical, emotional, sexual, social and quality of life. Various factors may cause chronic pelvic pain, such as endometriosis, pelvic inflammatory disease, fibroids, ovarian pathology, adhesion formation, urological conditions, gastrointestinal conditions and adenomyosis. Of these, adenomyosis is frequently misdiagnosed, as the symptoms are similar to those of other gynecological conditions, such as uterine fibroids and endometriosis [4]. This diagnostic challenge may result in delayed treatment and could contribute to redundant meeting with the healthcare provider, unnecessary medication and patient discomfort [5].

The exact mechanism of adenomyosis is still unknown but several mechanisms have been suggested. It is believed that

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one theory is that the endometrial basalis layer invaginates into the myometrium and becomes trapped in the uterine muscle. Other mechanisms suggested are tissue injury and repair, metaplasia of Müllerian remnants, involvement of stem cells and hormonal factors [6]. The clinical manifestations of the disease may be related to estrogen-dependent growth, chronic inflammation, increased angiogenesis, and abnormal uterine contractility. The endometrium that has become ectopic in the myometrium is subject to cyclic hormonal changes that may lead to local bleeding, inflammation, smooth muscle hyperplasia and nerve fiber involvement [7]. The correlation of adenomyosis with dysmenorrhea, chronic pelvic pain and abnormal uterine bleeding may be explained by these changes. The importance of accurate diagnosis of adenomyosis is emphasized as it relies on the severity of the disease, patient age, clinical symptoms, desire for fertility and any coexistent pelvic disease [8]. Non-steroidal anti-inflammatory drugs, hormonal therapy, levonorgestrel-releasing intrauterine system, gonadotropin-releasing hormone analogues, uterine artery embolization, adenomyomectomy and hysterectomy in selected cases are all treatment options. Early and accurate diagnosis by imaging is of special value in women who desire preservation of fertility or avoid surgery. Thus, good non-invasive diagnostic tools are needed for clinical decision making [8].

Radiological investigation of women presenting with pelvic pain and possible uterine disease typically begins with ultrasound. The advantages of transvaginal ultrasound include wide availability, repeatability, non-invasive, low cost, and easy access to ultrasound devices in most clinical settings [9]. On ultrasound examination, common findings of adenomyosis include globular enlargement, asymmetry in myometrial thickening, myometrial heterogenicity and cysts, fan-shaped shadowing and echogenic subendometrial lines and buds, irregular or interrupted junctional zone and increased vascularity [10]. The accuracy with which ultrasound is used for diagnosis, however, may be related to the operator's experience, the quality of the instrument, the patient's condition, and to the presence of other uterine diseases, like leiomyomas [11]. In some cases, it may be hard to distinguish adenomyosis from fibroids, particularly if focal adenomyosis or adenomyoma is involved. Another important imaging technique to aid the diagnosis of adenomyosis is magnetic resonance imaging. MRI is excellent for soft tissue contrast and can be used for detailed examination of the uterus, myometrium, junctional zone and associated pelvic pathology [12]. Thickening of the junctional zone, poorly defined low-signal intensity areas within the myometrium on T2-weighted images, high-signal myometrial foci representing hemorrhagic glands and diffuse or focal myometrial involvement are all features suggestive of adenomyosis on the MRI [13]. MRI is less operator-dependent than ultrasound and is particularly useful in those cases where the ultrasound is not definitive or for obese patients or where there is the suspicion of coexisting fibroids and endometriosis. MRI, though, is more costly, less widely available and may not be appropriate as a standard first-line test in resource-limited environments [14].

Objective

To compare the diagnostic accuracy of MRI and ultrasound in detecting adenomyosis among women presenting with chronic pelvic pain.

Methodology

This was a diagnostic accuracy study conducted at Department of Radiology, Tertiary Care Hospital Nishtar-II Multan from May 2025 to May 2026. A total of 155 patients were included in the study. A non-probability consecutive sampling technique was used. Every eligible female with the inclusion criteria who met during the study period was included until the required sample size was reached. Chronic pelvic pain defined as lasting 6 months or longer was included, and the age range of the women was 18-55 years. The patients with clinical suspicion of adenomyosis and those patients who had performed pelvic ultrasound and MRI for further evaluation were considered eligible. All patients who gave informed consent participated in the study. Pregnant, post-menopausal and those with a known malignancy of the genital tract were excluded. Additionally, women who had acute pelvic inflammatory disease, uterine fibroids that caused significant anatomical distortion, previous surgery of the uterus, contraindication to MRI, incomplete imaging records or refused to participate were excluded from the study.

Data Collection

Demographic and clinical information was gathered and recorded on a pre-designed proforma after informed consent is obtained. Data on age, parity, duration of pelvic pain, menstrual history, dysmenorrhea, dyspareunia, abnormal uterine bleeding and infertility history, and past gynecological surgeries, and the presence of associated pelvic symptoms were recorded. All enrolled patients underwent pelvic ultrasound and MRI. Ultrasound was preferably transvaginal but transabdominal ultrasound was used when transvaginal ultrasound was not suitable. Ultrasound features suggestive of adenomyosis were globular enlargement of the uterus, asymmetrical myometrial thickening, heterogeneous myometrium, myometrial cysts, fan-shaped shadowing, echogenic subendometrial lines or buds, and irregularity of the junctional zone. Pelvic MRI was performed with a standard pelvic MRI protocol. T1-weighted, T2-weighted and other sequences needed were acquired. MRI features suggestive of adenomyosis included poorly defined low-signal intensity regions inside the myometrium, high-signal myometrial foci, diffuse or focal myometrial involvement, thickening of the junctional zone and uterine enlargement. Obscuring observer bias, the ultrasound and MRI interpretations were made by experienced radiologists blinded to the other imaging modality results. Histopathology was used to confirm the final diagnosis of adenomyosis, if available. The final clinical diagnosis,

based on expert gynecological evaluation and imaging correlation was assumed in cases where histopathology was not available. When available, the gold standard for the confirmation of adenomyosis was histopathological examination of hysterectomy specimens. Histologically, a diagnosis of adenomyosis was made when endometrial glands or stroma was seen in the myometrium. A composite clinical and imaging based reference diagnosis was used for patients not undergoing hysterectomy as per institutional protocol. The main outcome was the accuracy of MRI and ultrasound for detecting adenomyosis. The sensitivity, specificity, PPV, NPV, and overall diagnostic accuracy were determined for MRI and ultrasound separately.

Data Analysis

IBM SPSS Statistics was used to enter and analyze data. Quantitative variables (age, duration of symptoms and uterine size) were summarized by mean ± standard deviation or median (interquartile range), depending on the distribution of the data. Categorical variables like ultrasound findings, MRI findings and final diagnosis were reported as frequencies and percentages. Two by two tables were created, one for ultrasound and one for MRI, as diagnostic tests against the reference standard. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were computed. The Chi-square test or Fisher's exact test was used to assess associations between categorical variables. The kappa statistic was used to determine agreement between ultrasound, MRI, and the final diagnosis. The p value of < 0.05 was taken as significant.

Results

Table 1 presents the baseline and clinical characteristics of 155 women included in the study. The mean age of the study participants was 39.4 ± 7.6 years. Women with adenomyosis were older, with a mean age of 41.1 ± 7.2 years, compared with 36.9 ± 7.5 years among women without adenomyosis. The median duration of pelvic pain was 14 months (IQR: 9-24) in the overall study population. Patients with adenomyosis had a longer duration of pelvic pain, with a median of 18 months (IQR: 12-27), compared with 11 months (IQR: 7–18) in those without adenomyosis.

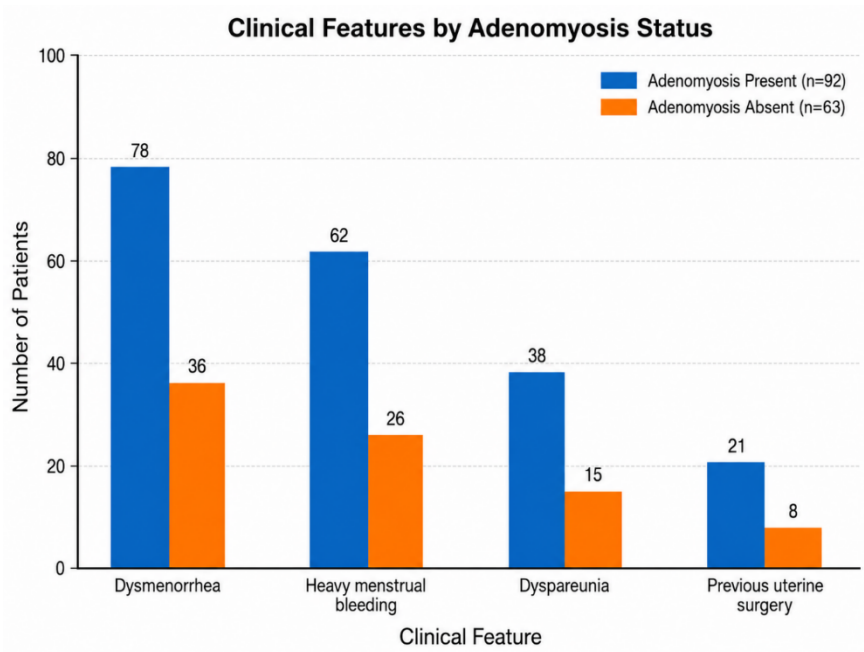
Table 1. Baseline and Clinical Characteristics of Study Participants

Variable	Total Patients (n = 155)	Adenomyosis Present (n = 92)	Adenomyosis Absent (n = 63)
Age, years	39.4 ± 7.6	41.1 ± 7.2	36.9 ± 7.5
Duration of pelvic pain, months	14 (9–24)	18 (12–27)	11 (7–18)
Parity	3 (2–4)	3 (2–4)	2 (1–3)
BMI, kg/m²	27.1 ± 4.3	27.8 ± 4.1	26.2 ± 4.5
Dysmenorrhea	114 (73.5%)	78 (84.8%)	36 (57.1%)
Heavy menstrual bleeding	88 (56.8%)	62 (67.4%)	26 (41.3%)
Dyspareunia	53 (34.2%)	38 (41.3%)	15 (23.8%)
Previous uterine surgery	29 (18.7%)	21 (22.8%)	8 (12.7%)

On ultrasound, the most common finding was heterogeneous myometrium, observed in 79 (51.0%) patients, followed by uterine enlargement or globular uterus in 61 (39.4%), asymmetrical myometrial thickening in 58 (37.4%), irregular junctional zone in 54 (34.8%), fan-shaped shadowing in 49 (31.6%), echogenic subendometrial lines or buds in 45 (29.0%), and myometrial cysts in 42 (27.1%) patients. On MRI, the most frequent finding was irregular or thickened junctional zone, seen in 86 (55.5%) patients, followed by poorly defined low-signal myometrial areas in 74 (47.7%), uterine enlargement in 68 (43.9%) and diffuse adenomyosis pattern in 63 (40.6%).

Table 2. Ultrasound and MRI Findings Suggestive of Adenomyosis

Imaging Finding	Ultrasound n (%)	MRI n (%)
Uterine enlargement / globular uterus	61 (39.4%)	68 (43.9%)
Asymmetrical myometrial thickening	58 (37.4%)	—
Heterogeneous myometrium	79 (51.0%)	—
Myometrial cysts / high-signal myometrial foci	42 (27.1%)	51 (32.9%)
Fan-shaped shadowing	49 (31.6%)	—
Echogenic subendometrial lines/buds	45 (29.0%)	—
Irregular/thickened junctional zone	54 (34.8%)	86 (55.5%)
Poorly defined low-signal myometrial areas	—	74 (47.7%)
Diffuse adenomyosis pattern	—	63 (40.6%)
Focal adenomyosis/adenomyoma	—	28 (18.1%)
Positive diagnosis of adenomyosis	84 (54.2%)	91 (58.7%)
Negative diagnosis of adenomyosis	71 (45.8%)	64 (41.3%)



Ultrasound correctly identified 72 true-positive cases and 51 true-negative cases. However, it produced 12 false-positive and 20 false-negative results. Overall, ultrasound correctly diagnosed 123 (79.4%) patients and incorrectly diagnosed 32 (20.6%) patients.

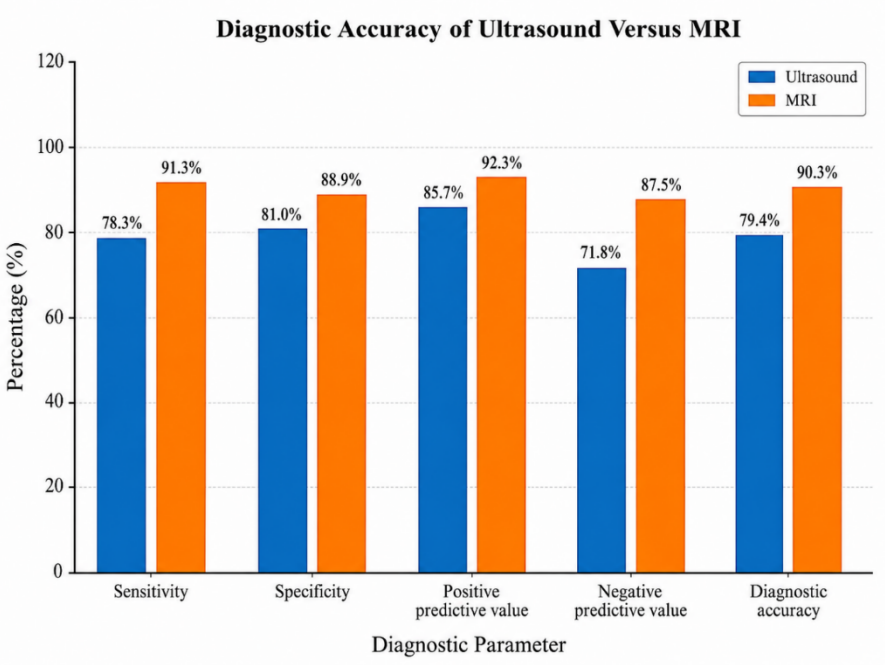
Table 3. Diagnostic Performance of Ultrasound and MRI Against Final Reference Diagnosis

Imaging Modality	True Positive	False Positive	True Negative	False Negative	Correct Diagnosis n (%)	Incorrect Diagnosis n (%)
Ultrasound	72	12	51	20	123 (79.4%)	32 (20.6%)
MRI	84	7	56	8	140 (90.3%)	15 (9.7%)

Ultrasound showed a sensitivity of 78.3%, specificity of 81.0%, positive predictive value of 85.7%, negative predictive value of 71.8%, and overall diagnostic accuracy of 79.4%. Its kappa agreement was 0.58, indicating moderate agreement with the final reference diagnosis.

Table 4. Diagnostic Accuracy Parameters of Ultrasound and MRI

Diagnostic Parameter	Ultrasound	MRI
Sensitivity	78.3%	91.3%
Specificity	81.0%	88.9%
Positive predictive value	85.7%	92.3%
Negative predictive value	71.8%	87.5%
Diagnostic accuracy	79.4%	90.3%
Kappa agreement	0.58	0.80



Discussion

This study aimed to evaluate the accuracy of MRI and ultrasound in the diagnosis of adenomyosis in women who had chronic pelvic pain. The diagnosis of adenomyosis was made in 92/155 patients, indicating that it was common among the study population. The results showed that MRI had a better diagnostic performance than ultrasound with higher sensitivity, specificity, PPV, NPV, diagnostic accuracy and kappa agreement. The results indicate that MRI is more useful than ultrasound for the diagnosis of adenomyosis, particularly in patients with chronic pelvic pain and possible uterine abnormalities. Women who underwent surgery for adenomyosis were slightly older than those who did not have adenomyosis (41.1 ± 7.2 years vs 36.9 ± 7.5 years, respectively). This discovery is in keeping with the typical clinical presentation of adenomyosis, which occurs in reproductive and perimenopausal women more often. Additionally, women with adenomyosis had a median duration of pelvic pain of 18 months, versus 11 months in women without adenomyosis. This means that adenomyosis can cause chronic and chronic pelvic pain and be diagnosed late, causing long-term symptoms [4].

Patients who had adenomyosis had more clinical symptoms. The presence of dysmenorrhea was found in 78 patients (84.8%) with adenomyosis and 36 patients (57.1%) without adenomyosis. However, the adenomyosis group experienced heavy menses more frequently (62 [67.4%] vs 26 [41.3%] patients in the non-adenomyosis group). Thirty-eight patients (41.3%) had dyspareunia in the adenomyosis group, and 15 patients (23.8%) in the non-adenomyosis group. These results suggest that adenomyosis is highly correlated with dysmenorrhea, abnormal uterine bleeding, and sexual discomfort. Such symptoms are caused by endometrial invasion of the myometrium, local inflammation, uterine enlargement and abnormal uterine contractions. Adenomyosis was detected with ultrasound in 84 patients (54.2%) and MRI in 91 patients (58.7%) [6,8,11]. Ultrasound is typically the initial imaging modality used because it is readily available, low cost, rapid and non-invasive. The common ultrasound findings were heterogeneous myometrium (heterogeneous echogenicity, 79 patients, 51.0%), globular uterine enlargement (enlarged and globular, 61 patients, 39.4%), asymmetrical myometrial thickening (thickening of one side of the myometrium, 58 patients, 37.4%), irregular junctional zone (irregular shape, 54 patients, 34.8%), fan-shaped shadowing (echo shadowing, 49 patients, 31.6%), echogenic subendometrial lines or buds (echo lines, 45 patients, 29.0%) and myometrial cysts (42 patients, 27.1%). The results demonstrate ultrasound's ability to detect a significant number of structural abnormalities that are indicative of adenomyosis, and its usefulness as a primary imaging modality. In this study, MRI was superior to ultrasound [16]. The MRI tests gave 84 true positives, 7 false positives, 56 true negatives but just 8 false negatives. It had a sensitivity of 91.3%, specificity of 88.9%, positive predictive value of 92.3%, negative predictive value of 87.5%, and overall diagnostic accuracy of 90.3%. There was a high kappa agreement (0.80) with the final reference diagnosis. MRI showed junctional zone thickening (86 patients, 55.5%), poorly defined low-signal areas in myometrium (74 patients, 47.7%), uterine enlargement (68 patients, 43.9%), diffuse adenomyosis (63 patients, 40.6%) and high-signal areas in myometrium (51 patients, 32.9%) or focal adenomyosis or adenomyoma (28 patients, 18.1%). The results showed that MRI has superior visualization of the junctional zone and myometrial architecture, enhancing the accuracy of diagnosis [17].

The higher sensitivity of MRI means that it was better at identifying patients who truly had adenomyosis. Clinically relevant, because if the diagnosis is missed, the symptoms may persist and treatment may be delayed. MRI also had the added advantage of a higher specificity and thus it was more likely to correctly identify patients without

adenomyosis, which minimised the risk of overdiagnosis. The results obtained from this study are in favor of the use of ultrasound as a first-line screening and MRI as a more reliable confirmatory examination. Safety and availability of ultrasound technology make it the first imaging modality of choice in routine gynecological practice. MRI is recommended for use in situations where ultrasound is inconclusive or where symptoms are present even though ultrasound is negative, when fibroids or endometriosis may be present at the same time, or when accurate mapping of adenomyosis before treatment planning. However, there were certain drawbacks in this study. First, it's based on a small number of patients - just 155, which could make the results less generalizable. Secondly, not all patients might have had histopathology, especially those treated conservatively. In these cases, diagnosis was made based on clinical and imaging correlation, which could be considered a potential source of diagnostic bias. Third, ultrasound requires an operator, and the accuracy can depend on the skill of the sonologist and the quality of the machine. Further multicenter studies with larger numbers of cases and with histopathological confirmation are recommended.

Conclusion

The present study showed that MRI was more accurate in the diagnosis of adenomyosis compared to ultrasound in women with chronic pelvic pain. MRI was more sensitive and specific and had higher PPV, NPV, overall diagnostic accuracy and inter-agreement with final reference diagnosis than ultrasound. While ultrasound was still valuable as an initial imaging tool due to its accessibility, safety and cost-effectiveness, MRI had more false negative cases than ultrasound. As a result, MRI is recommended in women who have a high clinical index of suspicion for adenomyosis, if ultrasound findings are ambiguous, if chronic pelvic pain does not resolve easily, or if further detailed examination is needed to guide therapeutic management. Prompt and accurate diagnosis of adenomyosis can help to direct proper treatment and optimize the clinical outcomes in women with adenomyosis...

REFERENCE

1. Shazia Ashraf, Aisha Asim, Aisha Taj, Yasma Ashraf, Rajesh Kumar, Sadia Asghar. (2024). Diagnostic Accuracy of Pelvic MRI and Transvaginal Ultrasound for Detecting Uterine Fibroids and Adenomyosis. A Cross-Sectional Comparative Study. Pakistan Journal of Medical & Health Sciences, 18(01), 462. https://doi.org/10.53350/pjmhs02024181462
2. Suthar MB, Sethi S, Bhavy K. Diagnostic Accuracy of Transvaginal Ultrasonography Versus MRI in Early Detection of Adenomyosis. International Journal of Clinical Obstetrics and Gynaecology. 2026; 10(1):1216-1219.
3. Islam S, Ullah N. Diagnostic Accuracy of Ultrasonography in Diagnosing Uterine Adenomyosis Using Magnetic Resonance Imaging as the Gold Standard. Biol Clin Sci Res J [Internet]. 2025 May 31 [cited 2026 Jul. 9];6(5):464-7. Available from: https://bcsrj.com/ojs/index.php/bcsrj/article/view/2277
4. Zanolli NC, Cline BC, Befera NT, Martin JG. Diagnostic accuracy of clinically reported adenomyosis on pelvic ultrasound and MRI compared to surgical pathology. Clin Imaging. 2022 Feb;82:117-120. doi: 10.1016/j.clinimag.2021.11.012. Epub 2021 Nov 18. PMID: 34808582.
5. Tellum T, Nygaard S, Lieng M. Noninvasive diagnosis of adenomyosis: a structured review and meta-analysis of diagnostic accuracy in imaging. J Minim Invasive Gynecol. 2020;27(2):408-18.e3.
6. Van den Bosch T, Dueholm M, Leone FPG, et al. Terms, definitions and measurements to describe sonographic features of myometrium and uterine masses: a consensus opinion from the Morphological Uterus Sonographic Assessment group. Ultrasound Obstet Gynecol. 2015;46(3):284-98.
7. Vannuccini S, Tosti C, Cicinelli E, et al. Infertility and adenomyosis. Best Pract Res Clin Obstet Gynaecol. 2017;46:35-46.
8. Dueholm M. Uterine adenomyosis and infertility, review of reproductive outcome after in vitro fertilization and surgery. Acta Obstet Gynecol Scand. 2017;96(6):715-26.
9. Stable G, Temtanakitpaisan T, Enghelabifar M, et al. Diagnostic accuracy of sonography for adenomyosis: systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2022;60(3):309-25.
10. Exacoustos C, Brienza L, Di Giovanni A, et al. Adenomyosis: three-dimensional sonographic findings of the junctional zone and correlation with histology. Ultrasound Obstet Gynecol. 2011;37(4):471-9.
11. Stable G, Temtanakitpaisan T, Henrich W, Enghelabifar M. Accuracy of ultrasonography in the diagnosis of adenomyosis: systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2022;60(3):309-25.
12. Tamai K, Togashi K, Ito T, Morisawa N, Fujiwara T, Koyama T. MR imaging findings of adenomyosis: correlation with histopathologic features and diagnostic pitfalls. Radiographics. 2005;25(1):21-40.
13. Bazot M, Darai E. Role of transvaginal sonography and magnetic resonance imaging in the diagnosis of uterine adenomyosis. Fertil Steril. 2018;109(3):389-97.
14. Dueholm M, Lundorf E. Transvaginal ultrasound or MRI for diagnosis of adenomyosis. Curr Opin Obstet Gynecol. 2007;19(6):505-12.
15. Dueholm M, Lundorf E, Hansen ES, Sørensen JS,

Ledertoug S, Olesen F. Magnetic resonance imaging and transvaginal ultrasonography for the diagnosis of adenomyosis. Fertil Steril. 2001;76(3):588-94.

16. Alcázar JL, Kissling GE, Galván R, Guerriero S. Three-dimensional ultrasound in gynecological clinical practice. Ultrasound Obstet Gynecol. 2018;51(1):148-50.
17. Sharma K, Bora MK, Venkatesh BP, et al. Role of MRI in diagnosis of adenomyosis. Indian J Radiol Imaging. 2013;23(1):39-44.
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