# A sonographic classification of adenomyosis: interobserver reproducibility in the evaluation of type and degree of the myometrial involvement

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**Objective:** To study the interobserver reproducibility of our new ultrasonographic mapping system to define the type and extension of uterine adenomyosis.
**Design:** Interobserver study involving two observers with different medical backgrounds and gynecological ultrasound experience.
**Setting:** University hospital.
**Patients:** Seventy consecutive women who underwent transvaginal ultrasound for suspected endometriosis, pelvic pain, heavy menstrual bleeding, and infertility.
**Intervention:** Two operators (observers A and B), who were blinded, independently reviewed the ultrasound videos offline, assessing the type of adenomyosis and the severity of the disease. Diagnosis of adenomyosis was made when typical ultrasonographic features of the disease were observed at the examination. Adenomyosis was defined as diffuse, focal, and adenomyoma according to the ultrasonographic characteristics. The severity of adenomyosis was described using a new schematic scoring system that describes the extension of the disease considering all possible ultrasound adenomyosis features.
**Main Outcome Measures:** Reproducibility of the new mapping system for adenomyosis and rate agreement between two operators.
**Results:** Multiple rate agreements to classify the different features and the score of adenomyosis (diffuse, focal adenomyoma, and focal or diffuse alteration of junctional zone) ranged from substantial to almost perfect (Cohen $\kappa = 0.658 - 1$) except for adenomyoma score 4 (one or more adenomyomas with the largest diameter >40 mm) in which interobserver agreement was moderate ($\kappa = 0.479$).
**Conclusion:** Our new scoring system for uterine adenomyosis is reproducible and could be useful in clinical practice. The standardization of the transvaginal approach and of the sonographer training represent a crucial point for a correct diagnosis of myometrial disease. (Fertil Steril® 2018;110:1154–61. ©2018 by American Society for Reproductive Medicine.)
**El resumen está disponible en Español al final del artículo.**

**Key Words:** Diffuse adenomyosis, focal adenomyosis, transvaginal ultrasound, classification, dysmenorrhea, heavy menstrual bleeding



Adenomyosis is a common gynecologic disorder, characterized by the presence of endometrial glands and stroma in the myometrium with associated smooth muscle hyperplasia (1–3). There are several typical sonographic and radiological features that allow one to perform noninvasive diagnosis by transvaginal sonography (TVS) (4) or magnetic resonance imaging (MRI) (5) with a high level of accuracy (6–8). Adenomyosis is a heterogeneous disease that may present in different phenotypes in the myometrium: diffuse, focal, and adenomyoma. Furthermore, the junctional zone (JZ) could be impaired, allowing infiltration of endometrial

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tissue into the myometrium (9), representing a typical diagnostic feature of adenomyosis (10). However, endometrial foci could be present in the uterine outer layer without affecting the JZ, suggesting a different pathogenetic mechanism (11). One of the major problems related to adenomyosis is the estimation of the prevalence and staging of the disease. The definitive diagnosis is established by histopathology of the uterine specimen; however, there is no clear agreement on the types of adenomyotic lesions either with histopathology or surgery or even with ultrasound. Literature data show that adenomyosis becomes more common in the later reproductive years and in multiparous women, with a decline in the frequency of diagnosis after menopause. In fact, the vast majority of cases of adenomyosis are reported in women between 40 and 50 years old (12). However, age has not consistently been shown to be associated with the disease, and more recent studies evaluating age showed the presence of adenomyosis in young nulliparous women (13, 14). Nonetheless, both young and reproductive-aged women should be managed with conservative treatments such as medical treatment, which is often effective for clinical symptoms (15, 16). Surgery for adenomyosis is complex and only feasible for well-defined lesions that are confined to a specific area of the myometrium: for this reason, it is rarely proposed as an option to patients. In most cases, the ultrasonographic diagnosis of adenomyosis commonly represents the diagnostic end point without the need for histological diagnosis. Given the importance of the ultrasonographic assessment, we propose a specific and detailed ultrasonographic description of adenomyosis as something new and helpful for clinical and surgical use.

The aim of the study was to evaluate the interobserver reproducibility of our new TVS adenomyosis mapping system (using previously published ultrasonographic uterine features including JZ analysis) to define the type and extension of adenomyosis inside the uterus.

## MATERIALS AND METHODS

An interobserver study was conducted over a 3-month period from November 2016 to January 2017 in a tertiary referral University Hospital for endometriosis and adenomyosis (Department of Biomedicine and Prevention Obstetrics and Gynecological Clinic, University of Rome "Tor Vergata", Rome, Italy). Institutional review board approval was obtained. Two gynecologists both dedicated to gynecological ultrasound assessed pre-recorded video sets of the real-time examination and three-dimensional (3D) volumes obtained from 70 consecutive women who underwent ultrasound examination for suspected endometriosis, pelvic pain (dysmenorrhea dyspareunia), heavy menstrual bleeding, and infertility.

Inclusion criteria were premenopausal status and no hormonal treatment. Exclusion criteria were postmenopausal status, ongoing pregnancy, reproductive tract cancer, and subserosal, intramural, and submucous (International Federation of Gynecology and Obstetrics [FIGO] stage 1–6) fibroids.

### Data Acquisition

All videos and volumes were recorded by two gynecologists (C.E., observer A, and L.L., observer B). Observer A and B are both dedicated to gynecological ultrasound but have different skill sets. In particular, observer A has more than 20 years of ultrasound experience, whereas observer B has about 5 years of experience. The two operators independently reviewed offline all the videos lasting 30 seconds and the volumes, assessing type and eventually grade of adenomyosis. The examiners were blinded to the patient's history and the result of physical examination, which was previously conducted by a third examiner prior to TVS (G.M. or A.P.). When assessing the offline videos and volumes, each observer had to decide whether there was or was not adenomyosis, the type of adenomyosis (diffuse, focal, or adenomyoma), and the score for each type. A score of 1–4 was attributed to each type of disease considered. Finally, the total score was calculated to assess the extent of the disease: mild (range, 1–3), moderate (4–6), and severe (>7). In case of the presence of two different types of adenomyosis (i.e., diffuse and adenomyoma) or of different locations (i.e., focal in the JZ and diffuse in the outer myometrium), the total score sum was used to grade the disease inside the uterus. The transvaginal ultrasound scan was performed with either a GE E8 or E6 (GE Healthcare, Zipf, Austria) ultrasound machine, using a wideband 5- to 9-MHz endocavitary transducer. The scan first involved a conventional two-dimensional (2D) ultrasound assessment of the pelvis to exclude any obvious pathology, followed by visualization of the uterus in the transverse and longitudinal planes. The myometrium was systematically examined for the presence of any abnormalities. The videos included in this study were selected based on real-time representative quality/clarity, and were obtained from sequential patients. Two separate videos were collected from each woman: the first showing the uterus in grayscale and the second with the addition of power Doppler analysis. The 2D examination was followed by acquisition of 3D data using the 3D volume mode. The 3D volume mode displayed a truncated sector that was adjusted to define the area of interest; the sweep angle was set to 120° so as to include the entire uterus, and a 3D dataset was then acquired using the high-quality, slow-sweep mode. The resultant multiplanar display of the entire uterus was examined to confirm its inclusion. The 3D volume of the uterus was acquired with and without power Doppler analysis. Datasets of the uterus from each subject were stored on recordable digital videodiscs for subsequent analysis. The ultrasound settings, both grayscale and Doppler, were standardized and identical for all subjects.

### Data Evaluation

Diagnosis of adenomyosis was made when any of the recognized features of the disease were observed at the examination. These morphological features have been described previously, and there is a wide consensus that they are reliable morphological markers of adenomyosis (4, 10, 17–20). The diagnosis of adenomyosis was made if following features

were present: asymmetrical myometrial thickening, myometrial cysts, linear striations, hyperechoic islands, or an irregular and thickened endometrial−myometrial junction zone on either 2D or 3D imaging.

The type of adenomyosis was defined as diffuse, focal, and adenomyoma according to the TVS characteristics shown in Table 1 and Figure 1. Diffuse and focal adenomyosis was subsequently divided for the outer myometrium and for the JZ (inner myometrium). The main differences between diffuse and focal adenomyosis are shown in Supplemental Figure 1 and Supplemental Figure 2 (available online). Different presentations of adenomyoma are shown in Supplemental Figure 3 (available online). Mainly, focal adenomyosis is surrounded by normal myometrium, whereas adenomyomas are surrounded by hypertrophic myometrium with intralesional vascularization, which is different from capsular vascularization typical of uterine fibroids (4).

The extension of each type of adenomyotic lesion in the external myometrium and in the junctional zone was divided into four grades according to the parameters shown in Table 2. A score ranging from 1 to 4 was attributed to each grade, and the sum of the score numbers was used to calculate the extension of the disease: mild (range, 1−3), moderate (4−6), and severe (>7).

## Statistical Analysis

All statistical analyses were carried out using Medcalc version 9.2.0.2 (Medcalc Software, Mariakerke, Belgium). The interobserver agreement for classifying the presence or absence of adenomyosis and the myometrial involvement was evaluated with the Cohen $\kappa$ index and the 95% confidence interval. General rules for the interpretation of $\kappa$ coefficients were used, i.e., $\leq 0$ = poor agreement, 0.01–0.20 = slight agreement, 0.21–0.40 = fair agreement, 0.41–0.60 = moderate agreement, 0.61–0.80 = substantial agreement, and 0.81–0.99 = almost perfect agreement.

## RESULTS

In the 3-month period, 70 patients were prospectively recruited to the study, and all received a TVS examination performed by two ultrasound gynecologist observers.

The mean age of the patients at recruitment was 37.8 ± 7.2 years, and the mean body mass index was 22.4. In our study population, the main reasons that led women to undergo ultrasound examination were suspected endometriosis, pelvic pain (dysmenorrhea, dyspareunia), heavy menstrual bleeding, and infertility. Endometriosis was also present in 34% of patients (n = 24) in the form of deep endometriosis in 83% of the patients (n = 20) and endometrioma in 16.6% (n = 4). Nine patients with uterine fibroids were initially excluded from the control group. Therefore, only 20 women without ultrasonographic features of adenomyosis and fibroids were considered as a control group to evaluate the presence or absence of adenomyosis as noted by the two observers. This control group was obviously not considered to assess the interobserver agreement of the adenomyosis score.

## TABLE 1

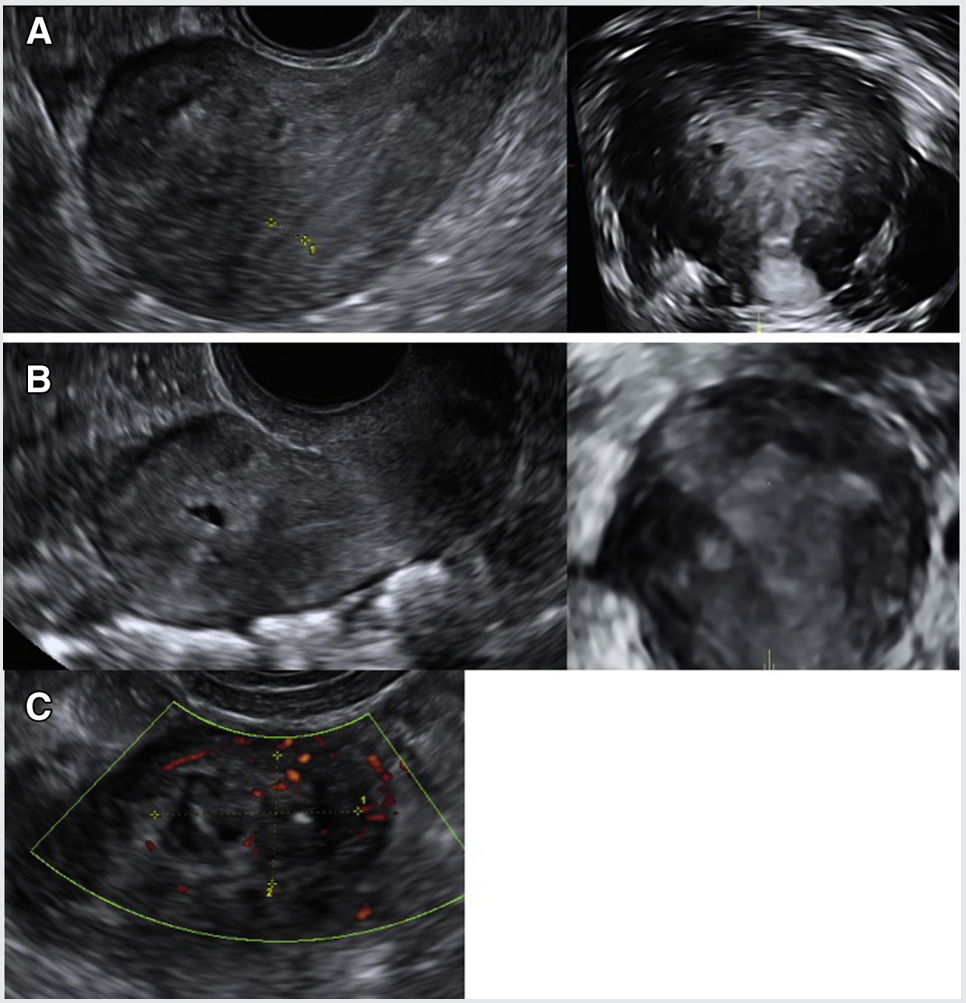
**Ultrasound characteristics of different types of adenomyosis, defined as diffuse, focal, and adenomyoma.**

| 2D US features | Diffuse adenomyosis | Focal adenomyosis | Adenomyoma |
|---|---|---|---|
| Serosal contour of the uterus | Often globally enlarged uterus | Often regular | Lobulated or regular |
| Definition of lesion | Ill-defined | Ill-defined or well defined in case of cystic or hyperecohoic lesions surrounded mostly by normal myometrium | May be well defined surrounded by hypertrophic myometrium |
| Symmetry of uterine walls | Myometrial anterior-posterior or lateral asymmetry | Often symmetric | Asymmetrical in presence of well-defined lesion |
| Shape | Ill-defined | Ill-defined, oval in case of cystic lesions | Round, oval, lobulated |
| Contour | Ill-defined | Irregular or ill-defined | Regular or ill-defined |
| Shadowing | No edge shadows<br>Fan shaped shadowing<br>Linear hypoechoic striation | No edge shadows<br>Rarely fan shaped shadowing, or linear hypoechoic striation | Edge shadows may be present<br>Internal, often fan-shaped. shadowing |
| Echogenicity | Nonuniform diffuse<br>Presence of intramyometrial diffuse areas of:<br>• mixed echogenicity<br>• small cyst<br>• hyper-echogenic islands,<br>• subendometrial echogenic lines | Focal, often isolated surrounded by normal myometrium<br>Presence of intramyometrial focal small areas of:<br>• mixed echogenicity<br>• small and large cyst<br>• hyperechogenic islands,<br>• subendometrial echogenic lines or buds | Focal, lobulated<br>Presence in hyper-, iso-, hypoechogenic intramyometrial lobulated areas of:<br>• mixed echogenicity<br>• small and large cyst<br>• hyperechogenic islands, |
| Vascularity | Translesional flow<br>Diffuse minimal or few vessels | Diffuse minimal<br>Sporadic vessels | Translesional flow<br>Diffuse vessels or circumferential flow |
| Endometrial rim | Irregular or ill-defined<br>Distorted or imprinted | Often regular or imprinted by subendometrial focal lesion | Often regular or distorted by the lobulated lesion |

*Note:* 2D = two-dimensional; US = ultrasonography.

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

FIGURE 1




Two-dimensional (2D) and three-dimensional (3D) ultrasound features of different forms of adenomyosis: (**A**) diffuse adenomyosis, (**B**) focal adenomyosis, and (**C**) adenomyoma.

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

Regarding the interpretation of the presence or absence of adenomyosis ultrasonographic findings among the 70 patients recruited, the agreement was perfect (Cohen $\kappa = 1$).

The specific distribution and rate agreement of all ultrasonographic finding of different forms of adenomyosis detected by both observers are shown in Table 3.

Observer A detected diffuse adenomyosis in 52% of the women (n = 26), focal adenomyosis in 46% (n = 23), and adenomyoma in 24% (n = 12). Observer B detected diffuse adenomyosis in 56% of the women (n = 28), focal adenomyosis in 44% (n = 22), and adenomyoma in 20% (n = 10). The association between diffuse and focal adenomyosis was detected in 10% of the women (n = 5) by observer A, whereas it was detected in 14% (n = 7) by observer B. The concomitant presence of diffuse adenomyosis and adenomyoma was revealed in 12% of the patients (n = 6) for both observers, whereas the association between focal adenomyosis and adenomyoma was detected in 8% (n = 4) by observer A and in 6% (n = 3) by the observer B. Moreover, the combination of three different forms of adenomyosis was discovered in 4% of the patients (n = 2) by both observers.

Multiple rate agreements to classify the different features and scores of adenomyosis (diffuse, focal adenomyoma, and focal or diffuse alteration of JZ) ranged from substantial to almost perfect (Cohen $\kappa = 0.658–1$) except for adenomyoma score 4 (one or more adenomyomas with the largest diameter >40 mm) in which interobserver agreement was moderate ($\kappa = 0.479$). The interobserver agreement between observers A and B for the assessment of the individual features of adenomyosis is shown in Table 3. There are no differences in the agreement between different levels of severity of adenomyosis except for adenomyoma score 4. This could be due to the small number of adenomyomas >40 mm in our group of patients.

Moreover, the total score number, which reflects the total extent of the disease in the whole uterus, showed almost perfect agreement (Cohen $\kappa = 0.969$; 95% confidence interval: 0.910–1.000) between the two observers.

## TABLE 2

**Schematic Mapping System of adenomyosis severity.**

| Score | Diffuse adenomyosis: diffuse inside the myometrium and thickening of the uterine walls | Diffuse adenomyosis of the JZ: diffuse inside the JZ and thickening of the JZ | Focal adenomyosis: Focal lesions within the outer myometrium | Focal adenomyosis of the JZ: focal lesion in the JZ | Adenomyoma |
|---|---|---|---|---|---|
| 1 | • 1 myometrial wall involvement with myometrial wall thickness ≤20 mm | • maximum JZ thickness ($JZ_{max}$) >6 to ≤ 8 mm<br>• difference ($JZ_{max}$) − ($JZ_{min}$) = $JZ_{dif}$. >4 to ≤6 mm<br>• diffuse infiltration of the JZ ≤20 mm in length | • 1 focal intramyometrial lesion ≤10 mm | • 1 focal lesion of the JZ by hyperechoic tissue or cystic areas ≤10 mm | • 1 adenomyoma with the largest diameter ≤ 20 mm |
| 2 | • 2 myometrial wall involvement with wall thickness ≤20 mm<br>• 1 myometrial wall involvement with wall thickness >20 ≤ 30 mm | • maximum JZ thickness ($JZ_{max}$) >8 mm<br>• difference ($JZ_{max}$) − ($JZ_{min}$) = $JZ_{dif}$ >6 mm<br>• diffuse infiltration of the JZ <20 mm in length or <50% of the uterus | • ≥2 focal intramyometrial lesions ≤10 mm<br>• 1 focal intramyometrial lesions >10 to ≤20 mm | • ≥2 focal lesions of the JZ ≤10 mm<br>• 1 focal lesion of the JZ >10 to ≤ 20 mm | • 2 adenomyomas with the largest diameter ≤20 mm<br>• 1 adenomyoma with the largest diameter >20 to ≤ 30 mm |
| 3 | • 1 myometrial wall involvement with wall thickness >30 mm<br>• 2 myometrial wall involvement with wall thickness >20 ≤ 30 mm | • diffuse infiltration of the JZ >50% to ≤80% of the uterus | • ≥ 2 focal intramyometrial lesions >10 to ≤20 mm<br>• 1 focal intramyometrial lesion >20 mm | • ≥ 2 focal lesions of the JZ >10 ≤ 20 mm<br>• 1 focal lesion of the JZ >20 mm | • 2 adenomyomas with the largest diameter >20 ≤ 30 mm<br>• 1 adenomyoma with the largest diameter >30 to ≤40 mm |
| 4 | • 2 myometrial wall involvement with wall thickness >30 mm<br>• All uterus involvements with globally enlarged uterus | • 80% total infiltration of the JZ | • ≥2 focal intramyometrial lesions >20 mm | • ≥2 focal lesions of the JZ >20 mm | • 1 or more adenomyomas with the largest diameter >40 mm |

*Note:* The extension of each type of adenomyotic lesion in the external myometrium and in the junctional zone was divided into four grades according to the ultrasonographic features. JZ = junctional zone.

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

## TABLE 3

**Specific distribution and rate agreement for the ultrasonographic findings of different forms of adenomyosis detected by observers A and B.**

| Adenomyosis n = 50 | Observer A prevalence n (%) | Observer B prevalence n (%) | No. of observed agreements n (%) | Cohen κ | 95% CI |
|---|---|---|---|---|---|
| Diffuse adenomyosis | n =26 | n = 28 | | | |
| Score 1 | 4 (15.3%) | 6 (21.4%) | 48 (96%) | 0.779 | 0.486–1.000 |
| Score 2 | 11 (42.3%) | 12 (42.8) | 48 (96%) | 0.890 | 0.742–1.000 |
| Score 3 | 5 (19.2%) | 3 (10.7%) | 48 (96%) | 0.730 | 0.376–1.000 |
| Score 4 | 6 (23%) | 7 (25%) | 49 (98%) | 0.912 | 0.741–1.000 |
| Diffuse adenomyosis of the JZ | n = 31 | n = 33 | | | |
| Score 1 | 6 (19.3%) | 8 (24.2) | 48 (96%) | 0.834 | 0.610–1.000 |
| Score 2 | 11 (35.5) | 12 (36.3%) | 49 (98%) | 0.944 | 0.834–1.000 |
| Score 3 | 10 (32.2%) | 9 (27.2%) | 49 (98%) | 0.935 | 0.809–1.000 |
| Score 4 | 4 (12.9%) | 5 (15.1%) | 49 (98%) | 0.878 | 0.643–1.000 |
| Focal adenomyosis | n = 23 | n =22 | | | |
| Score 1 | 4 (17.3%) | 4 (18.1%) | 48 (96%) | 0.728 | 0.369–1.000 |
| Score 2 | 13 (56.5%) | 12 (54.5%) | 47 (94%) | 0.840 | 0.665–1.000 |
| Score 3 | 4 (17.3%) | 5 (22.7%) | 49 (98%) | 0.878 | 0.643–1.000 |
| Score 4 | 2 (8.6%) | 1 (4.5%) | 49 (98%) | 0.658 | 0.033–1.000 |
| Focal adenomyosis of the JZ | n = 22 | n = 19 | | | |
| Score 1 | 8 (36.3%) | 5 (26.3%) | 47 (94%) | 0.735 | 0.451–1.000 |
| Score 2 | 10 (45.4%) | 10 (52.6%) | 48 (96%) | 0.875 | 0.706–1.000 |
| Score 3 | 2 (9%) | 2 (10.5%) | 50 (100%) | 1 | 1–1 |
| Score 4 | 2 (9%) | 2 (10.5%) | 50 (100%) | 1 | 1–1 |
| Adenomyoma | n = 12 | n = 10 | | | |
| Score 1 | 3 (25%) | 3 (30%) | 50 (100%) | 1 | 1–1 |
| Score 2 | 4 (33.3%) | 3 (30%) | 49 (98%) | 0.847 | 0.553–1.000 |
| Score 3 | 2 (16.6%) | 2 (20%) | 50 (100%) | 1 | 1–1 |
| Score 4 | 1 (8.3%) | 2 (20%) | 47 (94%) | 0.479 | −0.138 to 1.000 |

*Note:* $\kappa \leq 0$ = poor agreement, 0.01–0.20 = slight agreement, 0.21–0.40 = fair agreement, 0.41–0.60 = moderate agreement, 0.61–0.80 = substantial agreement, and 0.81–0.99 = almost perfect agreement. CI = confidence interval; JZ = junctional zone.

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

## DISCUSSION

In our clinical practice, TVS is the first-line imaging technique currently used for the noninvasive diagnosis of uterine adenomyosis. Previous papers have suggested which signs and terms should be used to describe ultrasound images of adenomyosis, without providing specific descriptions of how to classify morphological types or extent of adenomyosis (4,10,18). Adenomyosis is classified by histology as focal if there are circumscribed nodular aggregates of endometrial glands and stroma surrounded by normal myometrium, whereas diffuse adenomyosis is described as diffusely distributed endometrial glands and stroma throughout the myometrium (1–3). Adenomyomas are a subgroup of focal adenomyosis surrounded by hypertrophic myometrium. Furthermore, evaluations of disease severity with different histological classifications have been suggested (11, 21–23).

The aim of this study was first to introduce an ultrasonographic schematic mapping system describing the ultrasound appearance of uterine adenomyosis using a uniform reporting method. This new scoring system was developed to accurately and schematically assess the type and extent of uterine adenomyosis. Interobserver variability is a crucial point for all diagnostic tests, especially for an operator-dependent diagnostic method such as TVS. Therefore, the second aim of this study was to assess interobserver reproducibility in the diagnosis of adenomyosis and evaluation of myometrial involvement according to the proposed scheme.

Few studies (24) have investigated the interobserver variability of TVS for the diagnosis of adenomyosis, and none have focused on the type of adenomyosis (focal, diffuse, or adenomyoma) or the different locations inside the myometrium. In previous studies (25, 26), the number of adenomyosis ultrasonographic features were considered as an index of disease severity; however, these studies do not report a quantification of the myometrial involvement by the adenomyotic foci.

Standardization models are crucial for clinicians performing ultrasonographic examinations in daily practice, as well as for uniform reporting of adenomyosis for future research. Using our scoring system during ultrasound examination, uterine adenomyosis was completely assessed by two different sonographers, and interobserver variability was evaluated. To the best of our knowledge, no previous studies have addressed the reproducibility of evaluating adenomyosis type and extension using 2D, 3D, and color or power Doppler sonographic features. To be introduced into clinical practice, our schematic report and classifications need to be tested in terms of reproducibility. Despite the different skill experience of the two operators, multiple rating agreements to classify the different forms of adenomyosis ranged from substantial to almost perfect, proving that our scoring system is reproducible and helpful for use in clinical practice and for research purposes. As for endometriosis diagnosis, an accurate ultrasonographic evaluation of myometrial disease is important to avoid underestimation of the presence of adenomyosis and its possible impact on clinical symptoms.

A possible limitation of our study could be the use of database-stored videos rather than real-time examination.

This may represent a bias, as since images were obtained by an expert examiner, which could lead to a different impact of experience when reviewed by different examiners with different levels of experience. On the other hand, the operators were given the option to remove cases from the study if they believed that there were insufficient data to express a diagnosis about the type and score of adenomyosis. In more than 97% of the cases, they deemed that the information provided was satisfactory, which means that it was not very different from that obtained with live scanning. The evaluation of static ultrasonographic images by radiologists is standard practice in many places around the world. This approach has been used in different studies assessing interobserver variability of categorical variables such as sonographic images. The purposed adenomyosis staging system is actually used in our practice to increase the sample size in order to minimize the disagreements in particular for adenomyoma type.

However, no reference standard test was used to histologically confirm the adenomyosis diagnosis, and in our study the interobserver agreement does not indicate diagnostic accuracy. This mapping system has been developed based on ultrasonographic criteria of adenomyosis. However, MRI showed similar radiologic criteria to define adenomyosis (5, 7). The ability to share our TVS mapping system with MRI (according to the radiological criteria) could represent a unique way of imaging definition of adenomyosis.

## CONCLUSION

In conclusion, the present study stressed the need for an accurate ultrasonographic evaluation and definition of the severity of uterine adenomyosis. Our new scoring system for the sonographic evaluation of uterine adenomyosis is reproducible and could be useful in clinical practice. A standardized TVS approach and proper sonographer training are both essential for a correct diagnosis of myometrial disease. Currently there are poor data on the relation between different forms of adenomyosis and clinical symptoms. Women with small lesions on ultrasonography could present with severe symptoms or infertility, whereas women with severe adenomyosis could be asymptomatic. Starting from our adenomyosis staging system, the next goal will be to correlate the severity of adenomyosis (staged by TVS) with the severity of clinical symptoms to choose the best clinical and individualized therapeutic approach.

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**Una clasificación ecográfica de la adenomiosis: reproducibilidad interobservador en la evaluación del tipo y grado de afectación miometrial**

**Objetivo:** Estudiar la reproducibilidad interobservador de un nuevo sistema de mapeo por ecografia para definir el tipo y la extensión de la adenomiosis uterina.

**Diseño:** Estudio interobservador en el que participaron dos observadores con diferente experiencia médica y experiencia en ecografía ginecológica.

**Lugar:** Hospital Universitario

**Pacientes:** 70 mujeres consecutivas que llevaron a cabo una ecografía transvaginal por sospecha de endometriosis, dolor pélvico, sangrado menstrual intenso e infertilidad.

**Intervenciones:** Dos interventores (observador A y B), ciegos para el estudio, revisaron de manera independiente los videos ecográficos, para evaluar el tipo de adenomisosis y la severidad de la enfermedad. El diagnóstico de adenomiosis se realizó cuando se observaron las características típicas ecográficas durante la exploración. Se definió la adenomiosis como difusa, focal y adenomioma acorde a las características ecográficas. La gravedad de la adenomiosis se describió utilizando un nuevo sistema de clasificación esquemática que describe la extensión de la enfermedad considerando todas las posibles características de la adenomiosis por ecografia.

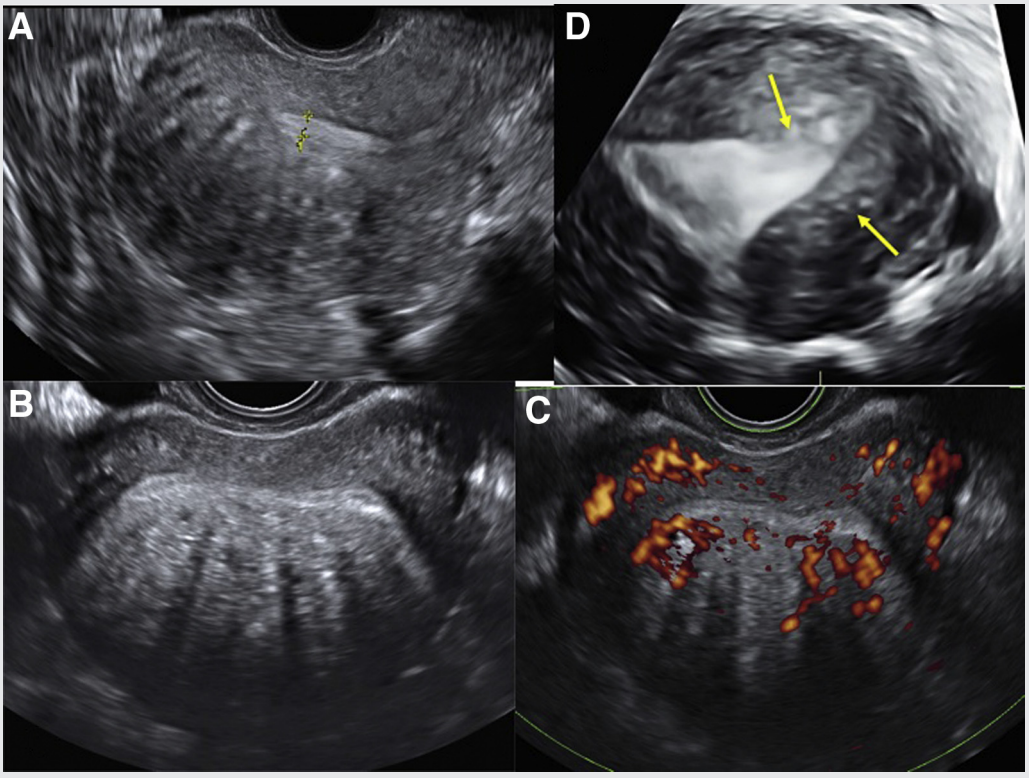
**Principal variable:** Reproducibilidad del nuevo sistema de mapeo para la adenomiosis y grado de acuerdo entre ambos interventores.

**Resultados:** Múltiples acuerdos para clasificar las diferentes características de la adenomiosis (adenomioma focal o difuso, o alteración focal o difusa de la zona de unión) y la puntuación de la adenomiosis varió de sustancial a casi perfecto (Cohen k ¼ 0.658 – 1) a excepción del adenomioma grado 4 (uno o más adenomiomas con el diámetro mayor >40mm) en el que el acuerdo interobservador fue moderado (k ¼ 0.479).

**Conclusión:** El nuevo sistema de clasificación para la adenomiosis uterina es reproducible y podría ser útil en la práctica clínica. La estandarización de la aproximación vaginal y el entrenamiento ecográfico representan un punto crucial para el correcto diagnóstico de la enfermedad miometrial.

**Palabras clave:** Adenomiosis difusa, adenomiosis focal, ecografía transvaginal, clasificación, dismenorrea, sangrado vaginal intenso.

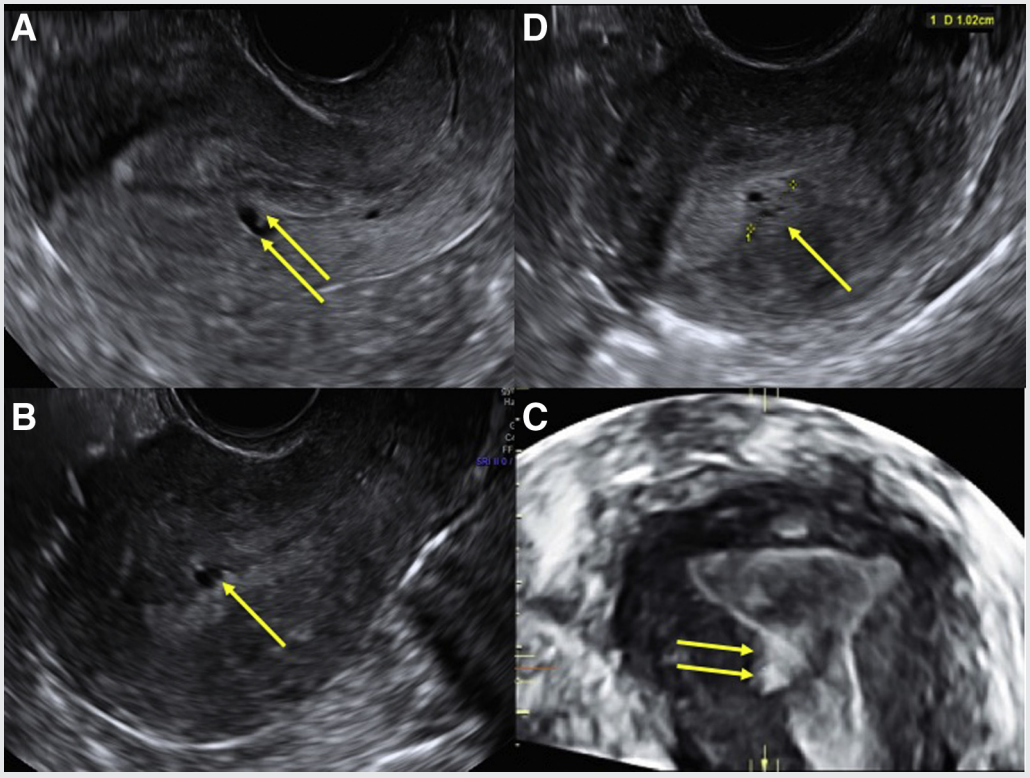
## SUPPLEMENTAL FIGURE 1




Two-dimensional (2D) and three-dimensional (3D) ultrasound features of severe diffuse adenomyosis. (**A**) Longitudinal and (**B**) transversal plane of enlarged uterus with asymmetrical uterine wall, presence of linear hypoechoic striation, and hyperechogenic islands and (**C**) translesional blood flow. (**D**) 3D coronal view showed thickening, invasion, and alteration of junctional zone in diffuse adenomyosis (yellow arrows).

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

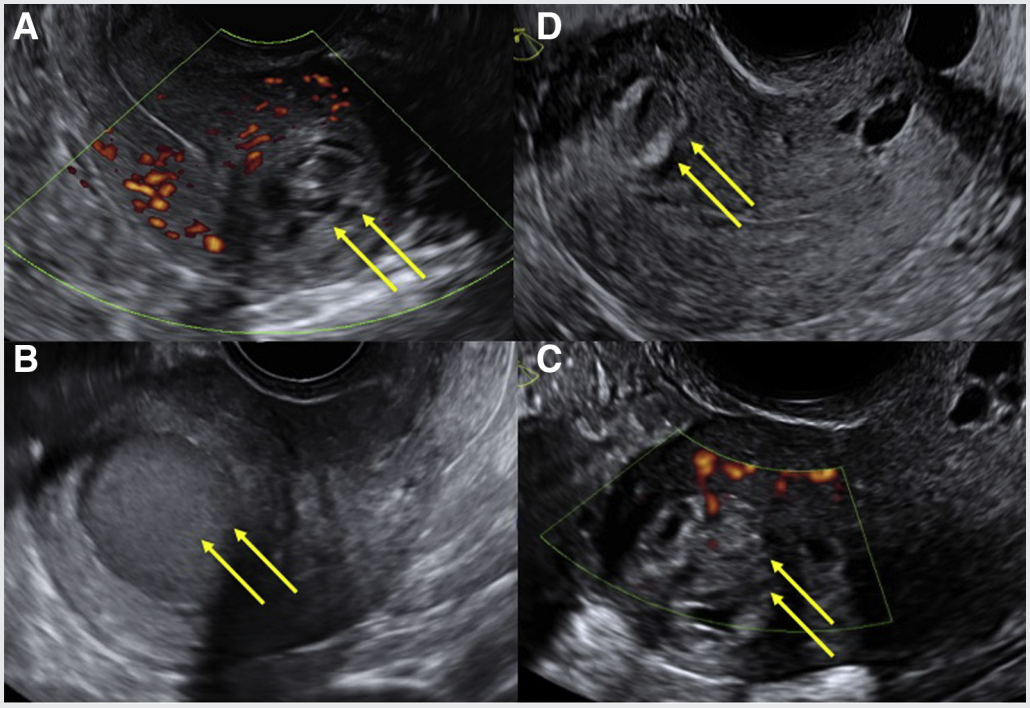
## SUPPLEMENTAL FIGURE 2




Two-dimensional (2D) and three-dimensional (3D) ultrasound features of focal adenomyosis. (**A**) subendometrial cyst and hyperechogenic islands (yellow arrows); (**B**) myometrial cyst with echogenic spots (yellow arrow); (**C**) subendometrial hyperechogenic islands with small myometrial cysts (yellow arrow). (**D**) 3D coronal view showed echogenic subendometrial buds (yellow arrows).

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*

## SUPPLEMENTAL FIGURE 3




Different ultrasonographic presentation of uterine adenomyoma (yellow arrows). (**A**) Hypoechogenic intramyometrial not well defined lesions, (**C** and **D**) defined lobulated lesions with mixed echogenicity, cystic areas, and hyperechogenic islands. (**B**) Unilocular round cyst with ground glass echogenicity (similar to endometrioma ultrasound characteristics) into the myometrium.

*Lazzeri. Sonographic mapping of adenomyosis. Fertil Steril 2018.*