Role of transvaginal sonography and magnetic resonance imaging in the diagnosis of uterine adenomyosis

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The aim of the present review, conducted according to PRISMA statement recommendations, was to evaluate the contribution of transvaginal sonography (TVS) and magnetic resonance imaging (MRI) to diagnose adenomyosis. Although there is a lack of consensus on adenomyosis classification, three subtypes are described, internal, external adenomyosis, and adenomyomas. Using TVS, whatever the subtype, pooled sensitivities, pooled specificities, and pooled positive likelihood ratios are 0.72–0.82, 0.85–0.81, and 4.67–3.7, respectively, but with a high heterogeneity between the studies. MRI has a pooled sensitivity of 0.77, specificity of 0.89, positive likelihood ratio of 6.5, and negative likelihood ratio of 0.2 for all subtypes. Our results suggest that MRI is more useful than TVS in the diagnosis of adenomyosis. Further studies are required to determine the performance of direct signs (cystic component) and indirect signs (characteristics of junctional zone) to avoid misdiagnosis of adenomyosis. (Fertil Steril® 2018;109:389–97. ©2018 by American Society for Reproductive Medicine.)

Key Words: Adenomyosis, endometriosis, transvaginal sonography, magnetic resonance imaging, internal adenomyosis

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Uterine adenomyosis is a benign condition defined by the presence of endometrial glands and stroma within the myometrium (1). Although the prevalence of uterine adenomyosis is unknown, it is usually diagnosed in multiparous women experiencing bleeding or pelvic pain, mainly during the late reproductive period (2–4). However, the increasing use of ultrasonography (US) and magnetic resonance imaging (MRI) in women with chronic pelvic pain or infertility has contributed to the detection of adenomyosis in younger women, suggesting several etiopathogenic conditions and different subtypes.

While there is a lack of consensus about the pathogenesis of adenomyosis, various risk factors have been identified and possible etiopathogenic pathways include alteration in endometrial function, a mechanism of tissue injury and repair, and a theory involving stem cells (5–7).

Recent advances in imaging techniques have had an impact on the detection of uterine adenomyosis (8–12) and imaging criteria are now part of the diagnostic workup along with histopathological features (9–12). However, because previously published imaging data are insufficient to distinguish between the subtypes of adenomyosis, there is a need for uniform terminology and consensus classification (13). The aims of this review are to clarify the definition of adenomyosis and to determine the value of the various US and MRI criteria used in the diagnosis of the various subtypes of adenomyosis.

METHODS

The review was carried out in accordance with the PRISMA statement recommendations for reviews and meta-analysis. The literature search was conducted in MEDLINE, Embase, and the Cochrane Library and was limited to studies published in English and French between 1979 and 2017. The MeSH Database of PubMed helped steer the search by combining the MeSH key words: adenomyosis, uterine adenomyosis, adenomyomas with the terms imaging, transvaginal sonography, ultrasound, MRI, or magnetic resonance imaging. To ensure the relevance of the publications retrieved, additional inclusion criteria were applied. To be included, the published studies had to contain a clear description of the imaging technique. Furthermore, papers describing imaging techniques used to treat adenomyosis were excluded.

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Redundant articles were removed after an initial selection, and other articles were then removed if their title, abstract, or material and methods did not fit the objective of our review. Finally, after reading the remaining studies, we eliminated those that did not provide clear data on the diagnosis of adenomyosis, as well as those assessing the same series of women. Of the 741 articles selected initially, 687 were excluded based on title and abstract. For this review, 57 articles were used.

CLASSIFICATION OF ADENOMYOSIS

Adenomyosis was initially described in 1860 by Rokitansky (14) as fibrous tumors containing gland-like structures that resemble endometrial glands. In 1920, Thomas Cullen (15) published a preliminary report on adenomyoma uteri diffusum benignum and on the distribution of adenomyomas containing uterine mucosa. He suggested that diffuse adenomyoma was the result of basal endometrial invasion and that an encapsulated variety was possibly of müllerian origin (15).

In 1921, Sampson put forward that adenomyoma of the uterus could be differentiated into three groups according to the origin: the first when the growth arises from an invasion of the uterine wall by the mucosa lining (invasion from within the uterus); the second with the growth arising from the serous surface by endometrial tissue from an endometrial cyst (invasion from without the uterus); and the third arising from misplaced endometrial tissue in the uterine wall (16).

In 2012, Kishi et al. (17) differentiated uterine adenomyosis into four subtypes based on MRI analysis: subtype I consists of adenomyosis occurring in the uterine inner layer without affecting the outer structures; subtype II of adenomyosis occurring in the uterine outer layer without affecting the inner structures; subtype III of adenomyosis occurring alone unrelated to structural components; and subtype IV composed of adenomyosis that did not satisfy these criteria (17).

We recently suggested a classification of adenomyosis according to MRI features which allows us to distinguish between internal adenomyosis, external adenomyosis and structural-related adenomyoma subtypes with a potential relation for therapeutic strategy (Table 1, Fig. 1) (18). Internal, external adenomyosis, and adenomyomas can be present alone or in association in this model. Current classification proposals and future perspectives are discussed more extensively by Gordts et al. (19) in this issue.

ULTRASONOGRAPHY AND ADENOMYOSIS

The diagnosis of adenomyosis was initially based on transabdominal US (TUS) criteria (11, 20, 21). This technique can visualize a big, regular, heterogeneous uterus containing tiny cystic lesions of 2–7 mm (20). TUS is useful in patients with bleeding or dysmenorrhea to detect uterine leiomyomas or endometrial disorders. In a study including 129 patients undergoing hysterectomy for bleeding and examined by TUS, the prevalence of adenomyosis in women with and without uterine leiomyomas or endocavitary abnormalities was 24.5% and 91.3%, respectively (22). Despite a high specificity (97%–97.5%), TUS had a low sensitivity (30%–63%) due to its limited image resolution (11, 21). However, as TUS is unable to distinguish between the various subtypes of adenomyosis, transvaginal sonography (TVS) should always be used for the detection of adenomyosis.

Transvaginal Sonography and Internal Adenomyosis

Examination by TVS constitutes an acceptable, moderately accurate and minimally invasive first-line test to detect internal adenomyosis (23) (Table 2). A very detailed description of

TABLE 1

Classification of adenomyosis.

Adenomyosis subtype	Definition	Figure
Internal adenomyosis (Ai)		
Focal adenomyosis (Ai0)	Localized intramyometrial tiny cystic component with or without JZ bulging (unique or multiple)	1A
Superficial adenomyosis (Ai1)	Disseminated subendometrial tiny cystic component without JZ hypertrophy (symmetric or asymmetric)	1B, 1C
Diffuse adenomyosis (Ai2)	Disseminated intramyometrial tiny cystic component with JZ hypertrophy (symmetric or asymmetric)	1D, 1E
Adenomyomas (Ad)		
Intramural solid adenomyoma (Ad1)	Ill-defined myometrial lesion with tiny cystic component (hemorrhagic or not)	1F
Intramural cystic adenomyoma (Ad2)	Ill-defined myometrial lesion with hemorrhagic cystic cavity	1G
Submucosal adenomyoma (Ad3)	Ill-defined myometrial lesion with tiny cystic component and intracavitary protrusion	1H
Subserosal adenomyoma (Ad4)	Ill-defined subserous myometrial lesion with tiny cystic component	1I
External adenomyosis (Ae)		
Posterior external adenomyosis (Ae1)	Ill-defined subserosal posterior myometrial mass associated with posterior deep endometriosis	1J
Anterior external adenomyosis (Ae2)	Ill-defined subserosal anterior myometrial mass associated with anterior deep endometriosis	1K

Note: asymmetric = predominant disseminated involvement by adenomyosis in one uterine wall; JZ = junctional zone; symmetric = disseminated involvement by adenomyosis in anterior and posterior uterine wall.

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