



EVALUATION OF TRANSVAGINAL SONOGRAPHY FINDINGS IN THE DIAGNOSIS OF ADENOMYOSIS

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ABSTRACT **BACKGROUND:** Adenomyosis is a common gynaecological disorder seen in the histopathological examination of hysterectomy specimens. Diagnosis of adenomyosis solely on non-specific clinical findings is low. Among the non-invasive techniques transvaginal sonography has been recommended for the diagnosis of adenomyosis. **OBJECTIVE:** To compare the accuracy of preoperative transvaginal sonography findings with histopathological results for the diagnosis of adenomyosis, and to determine its sensitivity, specificity and positive predictive value and negative predictive value. **MATERIAL AND METHODS:** A prospective study conducted at tertiary care hospital in department of Radiology from July 2019 to April 2020. A total of 60 consecutive patients came to our hospital for hysterectomy had preoperative transvaginal ultrasound examinations and those findings were compared with histopathological examinations. **RESULT:** The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of transvaginal sonography in the diagnosis of adenomyosis were 90.48, 61.54, 55.88, 92.31 and 71.67% respectively. **CONCLUSION:** Subendometrial echogenic linear striations, globular configuration of uterus and myometrial cysts have the highest specificity and PPV for the diagnosis of adenomyosis.

KEYWORDS : Adenomyosis, transvaginal sonography, hysterectomy

INTRODUCTION

Adenomyosis is a common gynaecological disorder, defined by the presence of ectopic endometrial glands & stroma within the myometrium, and hypertrophy & hyperplasia of surrounding adjacent myometrium. It is usually associated with dysmenorrhea, dyspareunia and menorrhagia; however, these findings are generally non-specific and are often seen in other conditions, such as leiomyoma, endometriosis or endometrial polyps. Thus, the clinical diagnosis of adenomyosis is difficult; it is suspected in women with uterus enlargement and pelvic sensitivity on physical examination^{1,2}.

The prevalence of adenomyosis varies from 5 to 70% according to previous articles on hysterectomy³⁻⁶. The probability of making a preoperative diagnosis of adenomyosis based solely on basic clinical findings is low. Recently, non-invasive techniques, such as transabdominal and transvaginal sonography (TVS) and magnetic resonance imaging (MRI), have been recommended for the diagnosis of adenomyosis. The reported sensitivity & specificity of transabdominal and TVS are 52-89% & 57-97.5% respectively⁷⁻¹⁰. Previous studies have shown the diagnostic capacity of transabdominal ultrasound for adenomyosis to be low, especially in women with leiomyomas^{2,11,12}, while TVS has improved substantially the ability to diagnose adenomyosis. Different sonographic features of adenomyosis have been reported, including uterus enlargement not explainable by the presence of myomas, asymmetrical thickening of the anterior or posterior wall, lack of contour abnormality or mass effect, anechoic lacunae or cysts of varying sizes, heterogeneous poorly circumscribed areas within the myometrium and increased echotexture of the myometrium^{2,7-14}.

Although it has been shown that all features are significantly common in uterus with adenomyosis, there is no general agreement on the most specific TVS diagnostic feature. Therefore, we aimed to compare the accuracy of preoperative TVS examination with histopathological results for the diagnosis of adenomyosis, and to determine its sensitivity, specificity and positive predictive value (PPV) and negative (NPV) predictive value.

MATERIALS AND METHODS

From July 2019 to April 2020, 60 consecutive patients came to our hospital for hysterectomy had preoperative transvaginal ultrasound examinations performed by single radiologist. The patient ages ranged from 35 to 61 (mean SD, 47.19 ± 6.45; median, 48) years. Thirty-nine women were premenopausal (65%), and twenty-one were postmenopausal (35%). Most common indication for hysterectomy was leiomyoma (n=26, 43.33%). Other indications were endometrial hyperplasia, adnexal tumour's premenopausal abnormal uterus bleeding, uterus prolapse, cervical dysplasia and postmenopausal bleeding.

All patients underwent sonography with a LOGIQ P5 equipped with a 5 MHz endovaginal transducer. During each examination, the uterus borders (irregular or regular), uterus size, myometrial echotexture, and presence of associated were noted. Adenomyosis was diagnosed on TVS, in the presence of one or more of the following criteria: globular configuration of the uterus, defined as a regularly enlarged uterus; asymmetry of the anteroposterior wall of the myometrium; poor definition of the endometrial-myometrial junction; myometrial cyst, defined as a round anechoic area with a diameter of 1-7 mm; subendometrial echogenic linear striations being hyperechoic and located near the endometrial-myometrial junction; heterogeneous myometrium, defined by the presence of an indistinctly defined myometrial area with increased or decreased echogenicity.

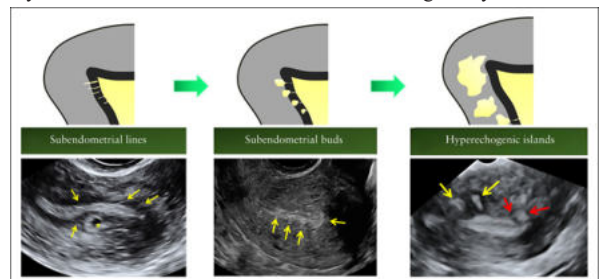


Figure 1: Transvaginal sonography showing features of adenomyosis

All histopathological examinations were performed by the single pathologist, who was blinded to the sonographic findings. Uterus size, macroscopic appearance and associated pathological abnormalities were noted. Fundal, posterior, anterior, left & right maximum uterine wall thicknesses were measured and block sections were taken from these areas. The number of slides per area ranged from 4-6, depending on the myometrial thickness. Macroscopically, adenomyosis was diagnosed by an enlarged, globular and/or asymmetrical uterus, and a dense irregularly fasciculated myometrium with small cavities (0.5-10 mm). Presence of an adenomyoma (circumscribed nodular lesion) mimicking an intramural myoma, or when adenomyotic lesions were restricted to one uterus wall (localized adenomyomas) was considered as focal adenomyosis. In rest cases, the adenomyosis was described as having a diffuse pathology. Histologically, the presence of ectopic endometrial glands and/or stroma associated with surrounding smooth muscle hypertrophy & hyperplasia located 2.5 mm beyond the endometrial-myometrial junction when looking at the specimen with a low-power microscopic lens was considered diagnostic of adenomyosis. Adenomyosis was graded according to the depth of myometrial involvement; Grades 1, 2 and 3 corresponded, respectively, to adenomyotic involvement of the inner third (superficial adenomyosis), two-thirds (deep adenomyosis) and the

entire myometrium. Adenomyosis was also graded as mild, moderate or severe according to the number of endometrial islets observed (1–3, 4–9 and ≥10 foci, respectively).

STATISTICAL ANALYSIS

Descriptive analysis was done using proportions, means and ranges. Sensitivity, specificity, positive & negative predictive values and accuracy were calculated for individual findings and for the final diagnosis. Statistical analysis was achieved using SPSS 22 for Windows (SPSS Inc, Chicago, IL, USA). Student's t- and Mann-Whitney U-tests were used for parametric and non-parametric continuous variables, respectively, and the χ^2 test for categorical variables; 95% CIs were calculated. Probability values of < 0.05 were considered statistically significant.

RESULTS

TVS was diagnostic of adenomyosis in 34 of the 60 patients, but 19 (55.8%) of these had a histopathological diagnosis of adenomyosis (15 false-positive diagnoses). Of the 26 cases in which none of the TVS diagnostic criteria for adenomyosis were seen, two (7.6%) had a histopathological diagnosis of adenomyosis (two false negative diagnoses). TVS yielded a diagnosis of adenomyosis in 19 of the 21 women diagnosed histologically (Table 1).

Table 1: Comparison of adenomyosis patients diagnosed preoperatively by TVS with histopathology results

Transvaginal sonography adenomyosis	Histopathological adenomyosis		Total (n)
	Yes	No	
Yes	19	15	34
No	2	24	26
Total	21	39	60

The sensitivity, specificity, positive predictive values and negative predictive value of TVS in the diagnosis of adenomyosis were 90.48, 61.54, 55.88 and 92.31% respectively. The overall accuracy of TVS was 71.67%. When each sonographic diagnostic feature of adenomyosis was compared with the histopathological results, heterogeneous myometrium, a globular configuration of uterus, myometrial cysts and subendometrial echogenic linear striations in the myometrium were found to have higher statistical significance (P < 0.01) than had myometrial anteroposterior asymmetry and identification of endomyometrial junction (Table 2).

Table 2: Comparison of each diagnostic finding of TVS for adenomyosis with histopathology results

Transvaginal sonography finding	Histopathological adenomyosis		P-value
	Yes (n=21)	No (n=39)	
Globular configuration	Yes	14 (66.67)	0.001*
	No	7 (33.33)	
Myometrial anteroposterior asymmetry	Yes	12 (57.14)	0.042*
	No	9 (42.86)	
Identification of endomyometrial junction	Yes	10 (47.62)	0.013*
	No	11 (52.38)	
Subendometrial echogenic linear striations	Yes	7 (33.33)	0.002*
	No	14 (66.67)	
Myometrial cysts	Yes	13 (61.90)	0.001*
	No	8 (38.10)	
Heterogeneous myometrium	Yes	18 (85.71)	0.001*
	No	3 (14.29)	

*Statistically significant.

Table 3 outlines the sensitivities, specificities, PPVs, NPVs and accuracies for each of the TVS findings. Myometrial heterogeneity was the most sensitive criterion (85.71%) and the one with the highest NPV for adenomyosis. Although the prevalence of subendometrial echogenic linear striations was the lowest in patients with adenomyosis (33.33%), this finding was the most specific criterion and had the highest PPV. Globular configuration of the uterus, myometrial cysts and subendometrial echogenic linear striations had high accuracy for the diagnosis of adenomyosis.

Table 3: Sensitivity, specificity, PPV and NPV of TVS findings for the diagnosis of adenomyosis

Transvaginal sonography finding	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Globular configuration	66.67	84.62	70.00	82.50	78.33
Myometrial anteroposterior asymmetry	57.14	66.67	48.00	74.29	63.33
Identification of endomyometrial junction	47.62	82.05	58.82	74.42	70.00
Subendometrial echogenic linear striations	33.33	94.87	77.78	72.55	73.33
Myometrial cysts	61.90	84.62	68.42	80.49	76.67
Heterogeneous myometrium	85.71	61.54	54.55	88.89	70.00

DISCUSSION

Adenomyosis is one of the most common uterus pathologies seen in the histopathological examination of hysterectomy specimens. The wide range of reported frequency (5 to 70%) may be a result of differences in histological criteria for the diagnosis of adenomyosis, the degree of care with which pathological specimens are evaluated, or the number of sampling sites considered in previous studies^{2,3,6,12-14}. In one series, the diagnostic rate in the same uterus varied between 31% and 62%, depending on the number of samples obtained¹⁵.

Adenomyosis is postulated to be a hormone-dependent disorder, as it is associated with persistently elevated estrogen levels^{12,16}. Bazot et al.¹² found that it was accompanied by additional pelvic disorders in 82.5% of the cases in their study. In our study, it was accompanied primarily by leiomyoma in 46.6% of cases, and secondarily endometrial hyperplasia in 35% of cases.

Bazot et al. found that the sensitivity, specificity and accuracy of TVS for the diagnosis of adenomyosis in selected patients who had menometrorrhagia but no evidence of endometrial disease and leiomyomata were high than in unselected patients who were scheduled for hysterectomy^{2,12}. Ascher et al⁸ proposed MRI as the modality of choice for the diagnosis of adenomyosis, especially in women with myoma. Reinhold et al. reported a specificity of 86% for TVS in their study in 1995 and similar diagnostic efficiencies with TVS and MRI^{9,10}. Bazot et al. found the sensitivity and specificity of MRI for the diagnosis of adenomyosis to be 77.5% and 92.5%, respectively². Their results suggest that TVS and MRI have similar accuracy for the diagnosis of adenomyosis^{2,8,10,13}. However, in women with associated disorders, such as uterus fibroids, the diagnostic accuracy of TVS is lower than is that of MRI².

Table 4: Sensitivity, specificity, PPV and NPV of TVS for the diagnosis of adenomyosis

Reference	n	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Siedler et al. ¹⁷	80	63	97	71	-
Fedele et al. ⁷	43	80	84	73	81
Ascher et al. ⁸	17	52.9	66.6	90	20
Reinhold et al. ⁹	100	86	86	71	94
Brosens et al. ¹⁸	34	86.6	57.9	61.9	84.6
Atzori et al. ²⁰	175	86.6	96.2	68.4	98
Reinhold et al. ¹⁰	119	89	89	71	96
Vercellini et al. ¹³	102	82.7	67	50	90.7
Atri et al. ¹⁴	102	81	71	54	90
Bazot et al. ¹²	120	65	97.5	92.8	88.8
*Bazot et al. ¹²	23/106	80.9/38.4	100/97.5	100/83.3	40/82.9
Kepkep et al. ²¹	70	80.8	61.4	55.3	84.4
This Study	60	90.48	61.54	55.88	92.31

The sensitivity and specificity (90.48% and 61.54%, respectively) reported in our study were similar to some previous studies; the specificity obtained in our study being lower than that in other studies could be explained by the inclusion of patients with other diseases in addition to adenomyosis. It may also have resulted from inadequate sonographic resolution, or differences between the studies in the criteria used for adenomyosis. Bromley et al.¹⁹ reported that all patients with adenomyosis had a mottled heterogeneous uterus, 95% had a globular uterus, 82% had small myometrial lucent areas and 82% had an indistinct endometrial stripe. However, Bazot et al.^{2,12} found that among the sonographic criteria for diagnosis of adenomyosis, myometrial cyst was the most sensitive and specific finding for adenomyosis, and heterogeneous myometrial areas had poor accuracy.

Fedele et al.⁷ was the first to report the value of myometrial anechoic lakes for diagnosis of adenomyosis. In women without pelvic disease, they found the sensitivity and specificity of this sonographic finding to be 80 and 74%, respectively. Among all the ultrasound features evaluated by Atri et al.¹⁴, subendometrial echogenic linear striations, subendometrial echogenic nodules and asymmetrical myometrial thickness demonstrated the best specificity and PPVs in the diagnosis of adenomyosis. In our study, subendometrial linear striations had the highest specificity and PPV, and we consider this to be the most specific finding for differential diagnosis, although its detection on sonography is uncommon.

Restriction of the study population to only women due to be hysterectomized and the lack of exclusion of patients with associated uterine pathologies are main limitations of our study.

CONCLUSION

Our results suggest that subendometrial echogenic linear striations, globular configuration and myometrial cysts have the highest specificity and PPV, but have low sensitivity compared with heterogeneous myometrium, for the diagnosis of adenomyosis.

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