



ULTRASOUND EVALUATION OF ADENOMYOSIS AND ITS ASSOCIATION WITH ABNORMAL UTERINE BLEEDING

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Abstract

Background: Adenomyosis is a benign uterine disorder characterized by ectopic endometrial glands and stroma within the myometrium and is commonly associated with heavy menstrual bleeding, dysmenorrhea, chronic pelvic pain and subfertility. Transvaginal ultrasound (TVUS) is widely used for diagnosis because it is accessible, dynamic and capable of assessing characteristic myometrial changes.

Aim: To evaluate the sonographic features of adenomyosis and determine their association with abnormal uterine bleeding (AUB) in a 100-woman cohort.

Methods: One hundred women presenting with AUB were evaluated by standardized TVUS. Symptoms, uterine size and sonographic features including globular uterine configuration, myometrial heterogeneity, fan-shaped shadowing, myometrial cysts, hyperechoic islands, echogenic subendometrial lines/buds, junctional-zone abnormality, uterine wall asymmetry and vascularity were recorded. Histopathology was reviewed where uterine tissue was available. Descriptive statistics and cross-tabulation were used.

Results: Mean age was 41.2 ± 6.8 years. Heavy menstrual bleeding was present in 68%, dysmenorrhea in 61% and chronic pelvic pain in 32%. Adenomyosis was sonographically suspected in 72%. The commonest ultrasound features were heterogeneous myometrium (64%), globular uterus (58%), fan-shaped shadowing (51%), hyperechoic islands (42%) and myometrial cysts (39%). Histopathology was available in 52 cases and confirmed adenomyosis in 42 (80.8%).

Conclusion: Standardized TVUS demonstrates a useful constellation of features for identifying adenomyosis in women with AUB. Combining multiple direct and indirect signs is preferable to relying on a single feature. Clinical and pathological correlation strengthens diagnostic confidence.

Keywords: adenomyosis; abnormal uterine bleeding; transvaginal ultrasound; sonography; myometrium; dysmenorrhea; histopathology

1. Introduction

Adenomyosis is a benign gynecological condition in which endometrial glands and stroma are present within the myometrium, accompanied by surrounding smooth-muscle hypertrophy and variable uterine enlargement. It is increasingly recognized in women presenting with abnormal uterine bleeding, dysmenorrhea and chronic pelvic pain.[1–6]

The clinical presentation is heterogeneous and symptoms overlap with leiomyoma, endometriosis and endometrial pathology. Imaging therefore plays a major role in non-invasive diagnosis. Transvaginal ultrasound is particularly useful because it is widely available and permits dynamic assessment of the uterus.[3,7–12]

Consensus descriptions include heterogeneous myometrium, globular uterine shape, fan-shaped shadowing, myometrial cysts, hyperechoic islands, echogenic subendometrial lines/buds and an irregular or interrupted junctional zone. A combination of signs is generally more informative than a single finding.[7–12]

Abnormal uterine bleeding is classified within the FIGO PALM–COEIN framework. Adenomyosis is a structural cause of AUB (AUB-A) and may coexist with other uterine lesions.[13–16]

Histopathology remains an important reference when hysterectomy or uterine tissue is available, although distribution of adenomyosis can be heterogeneous and sampling may influence pathological confirmation.[1,5,17–20]

This Radiology–OBG–Pathology collaborative study evaluates sonographic features of adenomyosis and their relationship with AUB symptoms, with histopathological correlation where tissue was available.

2. Aim and Objectives

Aim: To evaluate the sonographic features of adenomyosis and study their association with abnormal uterine bleeding in women presenting to a tertiary-care hospital.

- Describe demographic and clinical profile.
- Determine frequency of sonographic adenomyosis.
- Document direct and indirect ultrasound features.
- Assess association between sonographic adenomyosis and heavy menstrual bleeding.
- Correlate ultrasound findings with dysmenorrhea, pelvic pain and uterine enlargement.
- Correlate ultrasound diagnosis with histopathology where available.
- Identify combinations of ultrasound features associated with stronger clinicopathological correlation.

3. Materials and Methods

3.1 Study design

Hospital-based prospective observational study done on 100 women presenting with AUB.

3.2 Study setting and period

Department of Radiology in collaboration with Obstetrics & Gynaecology and Pathology at Maheshwara Medical College and Hospital, Telangana, India from January 2019 – April 2019.

3.3 Sample size

100 women.

3.4 Inclusion criteria

Women aged ≥ 18 years presenting with AUB who underwent TVUS and had adequate clinical records.

3.5 Exclusion criteria

Pregnancy; active pelvic infection; known uterine malignancy at presentation; inability to undergo TVUS; grossly distorted anatomy preventing assessment; incomplete records.

3.6 Clinical assessment

Age, parity, BMI, menstrual pattern, heavy menstrual bleeding, dysmenorrhea, chronic pelvic pain, symptom duration, anemia, previous cesarean/curettage and hormonal treatment were recorded.

3.7 Ultrasound technique

TVUS was performed after bladder emptying using an endocavitary probe. Uterine position, dimensions, volume, endometrial thickness and myometrial appearance were assessed in sagittal and transverse planes. Color Doppler was used for myometrial vascularity.

3.8 Sonographic criteria

Features included globular uterus, heterogeneous myometrium, fan-shaped shadowing, myometrial cysts, hyperechoic islands, echogenic subendometrial lines/buds, irregular/interrupted junctional zone, wall asymmetry and increased/irregular vascularity. Overall diagnosis was based on a characteristic combination of findings.

3.9 Histopathology

Where hysterectomy or uterine tissue was obtained for clinical indications, pathology reports were reviewed. Confirmation required endometrial glands/stroma within myometrium with associated smooth-muscle hypertrophy or accepted histological features.

3.10 Statistical analysis

Continuous variables were summarized as mean $\pm$ SD and categorical variables as frequency and percentage. Cross-tabulation was used. chi-square/Fisher exact tests, odds ratios and diagnostic accuracy measures are calculated.

3.11 Ethics

Institutional Ethics Committee approval and appropriate informed consent/waiver which is permitted and documented as well.

4. Results

The cohort study consisted of 100 women with AUB. Mean age was 41.2 ± 6.8 years and mean parity 2.1 ± 1.0 . Heavy menstrual bleeding was the predominant symptom. Sonographic adenomyosis was suspected in 72%. Histopathological correlation was available in 52 cases and confirmed adenomyosis in 42.

Table 1. Demographic profile (n=100)

Variable	Number (%) / value
Mean age	41.2 ± 6.8 years
18–29 years	7 (7%)
30–39 years	31 (31%)
40–49 years	47 (47%)
≥ 50 years	15 (15%)
Mean parity	2.1 ± 1.0
Nulliparous	8 (8%)
Parous	92 (92%)
Mean BMI	26.4 ± 3.8 kg/m ²

Table 2. Clinical presentation

Clinical feature	Number (%)
Heavy menstrual bleeding	68 (68%)
Dysmenorrhea	61 (61%)
Chronic pelvic pain	32 (32%)
AUB >6 months	73 (73%)
Anemia (Hb <11 g/dL)	49 (49%)
Subfertility/infertility history	12 (12%)
Previous cesarean delivery	36 (36%)
Previous uterine curettage	28 (28%)

Table 3. Menstrual pattern

Pattern	Number (%)
Heavy/prolonged regular bleeding	42 (42%)
Heavy + irregular bleeding	26 (26%)
Intermenstrual bleeding	10 (10%)
Frequent/irregular cycles without heavy flow	8 (8%)
Prolonged bleeding with dysmenorrhea	14 (14%)

Table 4. Uterine and endometrial ultrasound measurements

Parameter	Value
Mean uterine length	9.4 ± 1.3 cm
Mean uterine width	6.1 ± 0.9 cm
Mean AP diameter	5.4 ± 0.8 cm
Mean uterine volume	164 ± 58 mL
Uterine volume >150 mL	58 (58%)
Mean endometrial thickness	9.1 ± 3.7 mm
Asymmetric uterine wall thickness	47 (47%)

Table 5. Sonographic features of adenomyosis

Feature	Number (%)
Heterogeneous myometrium	64 (64%)
Globular uterine configuration	58 (58%)
Fan-shaped shadowing	51 (51%)
Hyperechoic myometrial islands	42 (42%)
Myometrial cysts	39 (39%)
Echogenic subendometrial lines/buds	34 (34%)
Irregular/interrupted junctional zone	46 (46%)
Increased/irregular myometrial vascularity	44 (44%)
Adenomyosis suspected overall	72 (72%)

Table 6. Number of sonographic features versus overall impression

Feature count	Adenomyosis suspected	Not suspected	Total
0–1 feature	4	18	22
2–3 features	25	20	45
≥4 features	43	0	43
Total	72	28	100

Table 7. Sonographic adenomyosis versus heavy menstrual bleeding

HMB	US adenomyosis	No US adenomyosis	Total
Present	54	14	68
Absent	18	14	32
Total	72	28	100

Table 8. Sonographic adenomyosis versus dysmenorrhea

Dysmenorrhea	US adenomyosis	No US adenomyosis	Total
Present	50	11	61
Absent	22	17	39
Total	72	28	100

Table 9. Sonographic adenomyosis versus chronic pelvic pain

Pain	US adenomyosis	No US adenomyosis	Total
Present	27	5	32
Absent	45	23	68
Total	72	28	100

Table 10. Histopathological correlation (n=52)

Histopathology	US adenomyosis	No US adenomyosis	Total
Adenomyosis confirmed	40	2	42
No adenomyosis identified	4	6	10
Total	44	8	52

Table 11. Histopathological diagnoses among tissue-confirmed cases

Diagnosis	Number (%)
Adenomyosis	42 (80.8%)
Leiomyoma without adenomyosis	6 (11.5%)
Endometrial hyperplasia/polyp without adenomyosis	3 (5.8%)
Other benign pathology	1 (1.9%)
Total	52 (100%)

Table 12. Ultrasound features in histopathologically confirmed adenomyosis (n=42)

Feature	Number (%)
Heterogeneous myometrium	38 (90.5%)
Globular uterus	34 (81.0%)
Fan-shaped shadowing	32 (76.2%)
Myometrial cysts	27 (64.3%)
Hyperechoic islands	25 (59.5%)
Irregular/interrupted junctional zone	29 (69.0%)

Subendometrial lines/buds	23 (54.8%)
Increased/irregular vascularity	25 (59.5%)

Table 13. Clinicopathological/imaging concordance

Comparison	Concordant	Discordant	Concordance
Ultrasound vs histopathology (n=52)	46	6	88.5%
Ultrasound vs heavy menstrual bleeding	68	32	68.0%
Ultrasound vs dysmenorrhea	61	39	61.0%

Among women with heavy menstrual bleeding, 54/68 (79.4%) had sonographic adenomyosis, compared with 18/32 (56.3%) among women without heavy bleeding. Dysmenorrhea was present in 50/72 (69.4%) of women with sonographic adenomyosis. In the 52 women with tissue diagnosis, ultrasound and histopathology were concordant in 46 cases (88.5%).

5. Discussion

Adenomyosis is a recognized structural cause of AUB and pelvic pain. Its symptoms overlap with leiomyoma, endometriosis and endometrial disorders, making imaging particularly important in symptomatic women.[1–6]

TVUS is a practical first-line imaging method. The present done study identified heterogeneous myometrium, globular uterine configuration, fan-shaped shadowing, irregular junctional zone and myometrial cysts as recurring features, in keeping with the MUSA consensus terminology and published diagnostic studies.[7–12]

The use of multiple ultrasound signs is important. In this study, four or more characteristic features were strongly associated with the overall ultrasound impression of adenomyosis. This supports a pattern-recognition approach rather than reliance on one sign.

Heavy menstrual bleeding was common and was more frequently accompanied by sonographic adenomyosis. Nearly four-fifths of women with heavy menstrual bleeding had a sonographic diagnosis. However, adenomyosis may coexist with other structural causes of AUB.

Dysmenorrhea was also frequent in women with sonographic adenomyosis. This is compatible with proposed mechanisms involving myometrial inflammation, altered contractility and junctional-zone dysfunction, although these mechanisms were not directly studied.[4–6]

In the subset with tissue diagnosis, ultrasound–histopathology concordance was 88.5%. Histopathology remains valuable when tissue is available, but focal adenomyosis may be missed by limited sampling.

Radiologists should document the distribution and combination of signs, gynecologists should integrate imaging with the clinical AUB phenotype and alternative causes, and pathologists should be informed of the imaging impression when hysterectomy specimens are assessed.

Adenomyosis frequently coexists with leiomyoma and endometriosis. A structured report should therefore document coexisting lesions, uterine size, endometrial appearance and other relevant findings. Future studies should prospectively compare standardized ultrasound and MRI with blinded image review and standardized histopathological sampling in larger surgical cohorts.

6. Strengths

- Radiology–OBG–Pathology collaborative framework.
- Standardized assessment of multiple ultrasound signs.
- Direct analysis of clinically important AUB symptoms.
- Histopathological correlation in a subset.
- Practical template for prospective data collection and audit.

7. Limitations

- Histopathology was available only in a subset and was not performed solely for research.
- Ultrasound interpretation was not independently blinded/reviewed.
- No direct MRI comparison was included.
- Coexisting leiomyoma/endometriosis may confound symptom attribution.

8. Conclusion

Transvaginal ultrasound provides a practical non-invasive method for identifying adenomyosis in women presenting with AUB. In this 100-case cohort, heterogeneous myometrium, globular uterine configuration, fan-shaped shadowing, myometrial cysts and junctional-zone abnormalities were the predominant imaging features. Sonographic adenomyosis was frequently associated with heavy menstrual bleeding and dysmenorrhea, while ultrasound–histopathology concordance was high among women with available tissue diagnosis. A standardized multi-feature ultrasound approach interpreted in clinical context and supported by pathology when available can strengthen diagnosis and multidisciplinary management.

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