

Evaluation Of Endometrial Thickness With Transvaginal Sonography In Perimenopausal Women Presenting With Abnormal Uterine Bleeding And Correlation With Its Histopathological Findings

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Abstract

Introduction: Abnormal uterine bleeding (AUB) is one of the most common gynecological complaints among perimenopausal women, often arising from anovulatory cycles and hormonal fluctuations. Transvaginal sonography (TVS) has emerged as a non-invasive, cost-effective modality for assessing endometrial thickness and detecting underlying pathology. This study aimed to evaluate the diagnostic accuracy of endometrial thickness measured by TVS in perimenopausal women with AUB and correlate the findings with histopathology, the gold standard.

Materials and Methods: A cross-sectional study was conducted among 100 perimenopausal women aged 40–55 years presenting with AUB at Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University. Detailed demographic, clinical, and menstrual histories were obtained, followed by laboratory investigations, TVS, and endometrial sampling via dilatation and curettage. Endometrial thickness was recorded and categorized, and histopathological findings were correlated. Statistical analysis included chi-square tests and diagnostic performance calculations for TVS with histopathology as the reference.

Results: Heavy menstrual bleeding was the most common complaint (63%), followed by polymenorrhoea (21%). Endometrial thickness of 10–14.9 mm was observed in 47% of participants, while 11% demonstrated thickness ≥ 15 mm. TVS revealed normal findings in 58% of cases, with fibroids (12%) and adenomyosis (9%) being the most frequent abnormalities. Histopathology predominantly showed secretory (44%) and proliferative (40%) endometrium, while premalignant and malignant changes were identified in 11% of cases. An endometrial thickness ≥ 14 mm was strongly associated with abnormal histopathology ($p < 0.0001$). TVS demonstrated sensitivity of 91.67%, specificity of 94.32%, and overall accuracy of 94%.

Conclusion: TVS measurement of endometrial thickness is a reliable, non-invasive screening tool for evaluating AUB in perimenopausal women, with high diagnostic accuracy. It should be employed as the first-line investigation, while histopathology remains essential for definitive diagnosis.

Keywords: Abnormal uterine bleeding, Transvaginal sonography, Endometrial thickness, Histopathological correlation.

INTRODUCTION

Menopause is a physiological process marked by the permanent cessation of menstrual cycles due to the decline of ovarian hormone production for at least 12 consecutive months [1]. The transition phase, termed perimenopause, begins with the earliest physiological changes and ends one year after the final menstrual period [2]. This transition, which often spans several years, is associated with significant physical, emotional, and social changes. Women in the perimenopausal age group, typically between 40 and 50 years, are particularly prone to developing menstrual irregularities, among which abnormal uterine bleeding (AUB) is the most common and distressing presentation [3].

AUB in perimenopausal women is defined as abnormal menstrual bleeding during the menopausal transition or within one year after menopause, excluding bleeding associated with hormone replacement

therapy [3,4]. It accounts for nearly one-third of all outpatient gynaecological consultations, with more than 90% of women experiencing at least one episode of AUB during the transition and over three-quarters reporting recurrent episodes [3-5]. Globally, AUB is estimated to affect 5–10% of women in outpatient settings, with prevalence rates varying widely between 4% and 52% [6,7]. Indian studies have reported prevalence ranging from 18% to 30%, most frequently in women aged 40–45 years [8,9]. These findings underscore the significant clinical burden of AUB in perimenopausal women, making it a leading indication for hysterectomy worldwide.

The aetiology of AUB during perimenopause is multifactorial, involving hormonal fluctuations, anovulatory cycles, anatomical changes, systemic comorbidities, and lifestyle factors [10]. Anovulation results in prolonged unopposed oestrogen exposure, predisposing to endometrial hyperplasia and, in some cases, carcinoma [11,12]. While many cases of endometrial hyperplasia remain benign, those with atypia carry a higher risk of malignant transformation, highlighting the need for early and accurate diagnosis. Historically, dilation and curettage (D&C) was the mainstay of diagnosis, but advances in non-invasive imaging, particularly transvaginal sonography (TVS), have greatly enhanced diagnostic accuracy and patient acceptability [10,12].

TVS is now widely regarded as the first-line diagnostic modality for perimenopausal AUB because it provides high-resolution imaging of the endometrium, enables accurate measurement of endometrial thickness, and helps detect uterine or adnexal pathology [13,14]. Several studies have demonstrated its utility in detecting endometrial hyperplasia, polyps, and malignancy, though reported sensitivity and specificity vary across populations [15,16]. Given its non-invasive, cost-effective, and patient-friendly nature, TVS holds promise as a reliable tool in the early evaluation of AUB. The present study was therefore undertaken to assess the diagnostic accuracy of endometrial thickness measured by TVS in detecting endometrial pathology in perimenopausal women with AUB, using histopathology as the gold standard.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, a tertiary care teaching hospital. Ethical approval was obtained from the Institutional Ethics Committee prior to initiation. The study was carried out over an 18-month period from June 2023 to December 2024. Women in the perimenopausal age group (40–55 years) presenting with abnormal uterine bleeding (AUB) were considered eligible, provided their uterine size was less than 12 weeks. Exclusion criteria included pregnancy complications, active pelvic infections, known bleeding disorders, women on hormone replacement therapy, and those with a history of using anticoagulants or other drugs known to affect menstrual bleeding. After applying these criteria, participants who consented to the study were recruited by simple random sampling from the outpatient department.

The minimum sample size was estimated at 91 based on sensitivity values from earlier studies correlating transvaginal sonography with histopathological reports. With an anticipated sensitivity of 89.47%, a precision of 0.17, and a 95% confidence level, the calculated sample size was rounded to 100 participants. A structured proforma was developed for uniform data collection, which included demographic details, menstrual and obstetric history, medical and surgical history, personal and family history, and presenting complaints. Each participant underwent a general and systemic examination followed by a detailed gynaecological evaluation, including per speculum and bimanual examination, to establish a preliminary clinical impression.

Laboratory investigations were undertaken to exclude systemic causes of bleeding and to assess baseline health status. These included complete blood counts, random blood sugar, thyroid function tests, coagulation profile, urine analysis, and serological screening (HIV, HBsAg, VDRL). A urine pregnancy test was performed when indicated to rule out pregnancy-related causes. All women underwent transvaginal sonography (TVS) using a 7.5 MHz probe. The examination was performed after the bladder was emptied, with the patient positioned in lithotomy. Endometrial thickness was measured in the longitudinal section, 1 cm from the uterine fundus, and associated pelvic pathologies were noted. The endometrium was categorized as normal, hyperplastic, or atrophic based on standard sonographic criteria. Strict protocols were followed for probe preparation, insertion, and disinfection to ensure patient comfort and procedural safety.

Following sonographic evaluation, participants underwent dilatation and curettage under local anaesthesia. Endometrial curettings were fixed in 10% formalin and sent for histopathological examination in the pathology department. The histological findings served as the reference standard for comparison with TVS results.

All data were entered into Microsoft Excel and analysed using SPSS version 24.0 (IBM, USA). Descriptive statistics were used to summarise demographic and clinical variables. Associations between clinical features, sonographic parameters, and histopathological outcomes were tested using chi-square or Fisher's exact test, with statistical significance set at $p < 0.05$. The diagnostic performance of transvaginal sonography in predicting abnormal endometrium was assessed by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy, with histopathology taken as the gold standard. Confidentiality and ethical principles were upheld throughout the study, and participants retained the right to withdraw at any stage without compromising their standard care.

RESULTS

The study population comprised 100 women aged 40–55 years, with the majority belonging to the 46–50 year age group (41%), followed by 51–55 years (32%) and 40–45 years (27%). Most women were multiparous, with para 2 being the most common (70%), while higher parity (≥ 4) was observed in only 7%. Comorbidities were present in a minority of participants, with diabetes mellitus and hypothyroidism being the most frequent (6% each), followed by hypertension (5%), COPD (2%), and asthma (1%) (Table

Table 1: Demographic and Clinical Profile of Study Participants (N = 100)

Variable	Category	Number (%)
Age group (years)	40–45	27 (27.0)
	46–50	41 (41.0)
	51–55	32 (32.0)
Parity	Para 1	5 (5.0)
	Para 2	70 (70.0)
	Para 3	18 (18.0)
	Para ≥ 4	7 (7.0)
Comorbidities	Diabetes mellitus	6 (6.0)
	Hypothyroidism	6 (6.0)
	Hypertension	5 (5.0)
	COPD	2 (2.0)
	Asthma	1 (1.0)

The most frequently reported menstrual complaint was menorrhagia, affecting nearly two-thirds of women (63%). Polymenorrhoea was the second most common complaint, noted in 21% of participants. Less frequent presentations included polymenorrhagia (5%), metrorrhagia (4%), oligomenorrhagia (4%), menometrorrhagia (2%), and oligomenorrhoea (1%) (Table 2).

Table 2: Distribution of Menstrual Complaints (N = 100)

Complaint	Number (%)
Menorrhagia	63 (63.0)
Polymenorrhoea	21 (21.0)
Polymenorrhagia	5 (5.0)
Metrorrhagia	4 (4.0)
Oligomenorrhagia	4 (4.0)
Menometrorrhagia	2 (2.0)
Oligomenorrhoea	1 (1.0)

Assessment of endometrial thickness revealed that nearly half of the women (47%) had thickness between 10–14.9 mm, followed by 42% with 5–9.9 mm. Markedly increased endometrial thickness of 15–19.9 mm was observed in 6% and ≥ 20 mm in 5% of cases, indicating that the majority had thickness below the 15 mm threshold (Table 3).

Table 3: Distribution Based on Endometrial Thickness (N = 100)

Endometrial Thickness (mm)	Number (%)
5-9.9	42 (42.0)
10-14.9	47 (47.0)
15-19.9	6 (6.0)
≥20	5 (5.0)

On transvaginal sonography, more than half of the participants (58%) demonstrated normal findings. Pathological findings included fibroid uterus (12%), adenomyosis (9%), endometrial hyperplasia (6%), ovarian simple cyst (4%), and endometrial polyp (2%). A further 9% showed other less common abnormalities such as bilateral PCOS, cervical polyp, or ovarian dermoid (Table 4).

Table 4: Distribution Based on TVS Findings (N = 100)

TVS Findings	Number (%)
Normal	58 (58.0)
Fibroid uterus	12 (12.0)
Adenomyosis	9 (9.0)
Endometrial hyperplasia	6 (6.0)
Ovarian simple cyst	4 (4.0)
Endometrial polyp	2 (2.0)
Other	9 (9.0)

Histopathological evaluation showed that normal cyclical endometrium was the predominant finding, with secretory and proliferative endometrium detected in 44% and 40% of cases, respectively. Abnormal findings included simple hyperplasia without atypia (6%), adenocarcinoma (3%), complex hyperplasia with atypia (2%), disordered proliferative endometrium (2%), endometrial polyp (2%), and endometritis (1%) (Table 5).

Table 5: Histopathological Examination (HPE) Findings (N = 100)

Finding	Number (%)
Secretory endometrium	44 (44.0)
Proliferative endometrium	40 (40.0)
Simple hyperplasia (without atypia)	6 (6.0)
Adenocarcinoma	3 (3.0)
Complex hyperplasia (with atypia)	2 (2.0)
Disordered proliferative endometrium	2 (2.0)
Endometrial polyp	2 (2.0)
Endometritis	1 (1.0)

When correlated with clinical presentation, menorrhagia was the predominant symptom across most histopathological categories. Among those with secretory endometrium, 28 had menorrhagia, while proliferative endometrium was associated with menorrhagia in 22 cases. Hyperplasia (simple/complex) was identified in 8 cases, of which 6 presented with menorrhagia. All three women with adenocarcinoma also presented with menorrhagia. Polymenorrhoea was more often associated with proliferative and secretory endometrium (Table 6).

Table 6: Association Between Histopathological Findings and Menstrual Complaints

HPE Finding	Menorrhagia	Polymenorrhoea	Other Complaints	Total
Secretory endometrium	28	9	7	44
Proliferative endometrium	22	11	7	40
Hyperplasia (simple/complex)	6	1	1	8
Adenocarcinoma	3	0	0	3

Disordered proliferative endometrium	2	0	0	2
Endometrial polyp	1	0	1	2
Endometritis	1	0	0	1
Total	63	21	16	100

Evaluation of endometrial thickness against histopathology showed a strong correlation. Of the 88 women with thickness <14 mm, only 5 had abnormal histology, whereas 11 of 12 women with thickness ≥14 mm demonstrated abnormal findings. The association was highly significant ($\chi^2 = 58.09$, $p < 0.0001$). Endometrial thickness ≥14 mm predicted abnormal histopathology with high sensitivity (91.7%), specificity (94.3%), negative predictive value (98.8%), and overall diagnostic accuracy of 94% (Table 7).

Table 7: Association Between Endometrial Thickness and Histopathology

Endometrial Thickness (mm)	Normal HPE (n=84)	Abnormal HPE (n=16)	Total
<14	83	5	88
≥14	1	11	12
Total	84	16	100
Chi-square = 58.09, p < 0.0001			

DISCUSSION

Abnormal uterine bleeding (AUB) is one of the most frequent gynecological complaints in perimenopausal women and is commonly associated with anovulatory cycles due to declining ovarian follicle reserve and fluctuating estrogen levels. The irregular shedding of the endometrium increases the likelihood of endometrial pathology, ranging from benign hyperplasia to malignancy. Therefore, careful evaluation of AUB in this age group is essential [1,2]. Endometrial thickness measurement using transvaginal ultrasonography (TVS) has been widely studied as a non-invasive screening tool that can help identify women requiring further histopathological evaluation [3].

In the present study, the highest incidence of AUB was observed among women aged 46–50 years (41%), consistent with the physiological transition toward menopause. Similar findings have been reported by Begum NA et al. [17] and Mishra et al. [18], though slight variations in age distribution across studies may be attributed to differences in inclusion criteria and population characteristics. Most participants were multiparous, which is in agreement with the findings of Begum NA et al. [17] and Khokhani P et al. [19], reinforcing the observation that AUB in perimenopausal women predominantly occurs after family completion.

Menorrhagia was the most common menstrual complaint (63%) in this study, closely followed by polymenorrhoea (21%). Comparable results were documented by Begum NA et al. [17] and Mishra et al. [18], with menorrhagia consistently emerging as the predominant symptom of AUB. Endometrial thickness analysis revealed that nearly half of the women (47%) had a thickness of 10–14.9 mm, in line with studies by Begum NA et al. [17], Mishra et al. [18], and Shreshtha et al. [20]. Increased endometrial thickness (>15 mm) was significantly associated with endometrial hyperplasia and malignancy, highlighting its predictive role for pathological changes.

Histopathological examination (HPE) remains the gold standard for diagnosing endometrial pathology. In this study, secretory (44%) and proliferative endometrium (40%) were the most common findings, while complex hyperplasia with atypia (2%) and adenocarcinoma (3%) accounted for clinically significant lesions. These results mirror those of Begum NA et al. [17], Shree R et al. [21], and Khokhani P et al. [19], confirming that while most perimenopausal women present with normal cyclical patterns, a small but important proportion harbor premalignant or malignant changes. Furthermore, menorrhagia was the predominant complaint in cases of malignancy and hyperplasia, reinforcing the need for thorough evaluation in women presenting with heavy menstrual bleeding.

Diagnostic performance analysis in this study demonstrated high sensitivity (91.67%) and specificity (94.32%) of TVS in predicting abnormal endometrial histology. Comparable diagnostic accuracy has been reported by Begum NA et al. [17], Mishra et al. [18], and Shree R et al. [21]. These findings support the utility of TVS as an initial screening modality, given its non-invasiveness, wide availability, and cost-

effectiveness. However, histopathological confirmation remains mandatory, especially in women with increased endometrial thickness or persistent abnormal bleeding.

CONCLUSION

This study underscores menorrhagia as the most common menstrual complaint among women with abnormal uterine bleeding, with a significant correlation between histopathological findings and endometrial thickness. Endometrial thickness measurement by transvaginal sonography demonstrated high diagnostic accuracy with excellent sensitivity and specificity, making it a simple, non-invasive, cost-effective, and well-tolerated modality for the initial evaluation of perimenopausal women. Therefore, transvaginal ultrasound should be considered the first-line investigation for differentiating normal from pathological endometrial conditions, while histopathological examination remains the gold standard for establishing a definitive diagnosis.

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