Original Article

Diagnostic Accuracy of Increased Endometrial Thickness on Transvaginal Ultrasound in Predicting Uterine Pathology in Postmenopausal Bleeding

Shadia Shah, Ayesha Saif, Simone Rehan, Humaira Rasheed, Nabiha Iqbal and Nabeela Shami

ABSTRACT

Objective: To assess the precision of transvaginal ultrasound in identifying endometrial pathology in patients presenting with postmenopausal bleeding, using endometrial thickness >4mm, taking histopathology as the standard diagnostic tool.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Obstetrics & Gynaecology, Lahore Medical and Dental College/Ghurki Trust Hospital, Lahore from 28th July 2021 to 27th January 2022.

Methods: Fifty women aged 45-75 years with postmenopausal bleeding were included, while patients with other pathologies, bleeding disorders, or those taking hormone therapy were excluded. Endometrial thickness was measured via transvaginal ultrasound, followed by hysteroscopy and biopsy for histopathological evaluation.

Results: There were 22 cases as true positive, 2 were false positive, whereas 2 cases were found false negative, and 24 found to be true negative (*P*=0.0001). Accordingly, the performance indicators of a diagnostic test i.e., sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of transvaginal ultrasound were computed as 91.67%, 92.31%, 91.67%, 92.31%, and 92.0%, respectively.

Conclusion: Transvaginal ultrasound demonstrates diagnostic accuracy of high degree for prognosticating uterine pathology in patients with postmenopausal bleeding and can be an effective non-invasive diagnostic tool to rule out endometrial malignancy.

Key Words: Postmenopausal bleeding, Transvaginal ultrasound, Diagnostic accuracy, Endometrial thickness

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INTRODUCTION

Postmenopausal bleeding is vaginal bleeding that occurs a year or more after menopause. The prevalence of postmenopausal bleeding is reported to be 10% among females belonging to the general population. The aetiologies leading to postmenopausal bleeding are atrophic vaginitis (60-80%), hormonal replacement therapy (15-25%), uterine or cervical polyp (2-12%), endometrial carcinoma or hyperplasia (5-10%), endometrial cancers (10%) and idiopathic (10%).[1,2]

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Patients with postmenopausal bleeding necessitate to undergone complete investigations to rule out the presence of malignancy and to detect and manage high-risk patients like patients with endometrial hyperplasia.[3] Postmenopausal bleeding is mostly observed in older age. However, endometrial hyperplasia and also endometrial carcinoma are common in peri- and post-menopausal females, necessitating examinations including ultrasound and biopsy.[4] Endometrial pathologies like hyperplasia, carcinoma, and polyp can be present in about 50% of cases with postmenopausal bleeding.[5]

Strategies to investigate and manage females having postmenopausal bleeding have been improved since the early 1990s with the introduction of transvaginal ultrasonography and outpatient hysteroscopy. Biopsy is the gold standard method, having 100% sensitivity, 97% specificity, and 91% accuracy, but it is invasive and requires complete surgical methods, including anaesthesia, surgical expertise, and also histopathological evaluation.[4]

For transvaginal ultrasonography, the endometrial pathology was detected with 87.09% sensitivity and 75.86% specificity in patients with postmenopausal

bleeding.[6] Another study reported 96% sensitivity and 68% specificity of transvaginal ultrasonography in the detection of endometrial abnormalities (polyp, hyperplasia, and carcinoma) in patients with postmenopausal bleeding.[7]

The goal of the current study was to determine how well transvaginal ultrasonography can diagnose endometrial thickness and cause of postmenopausal bleeding, taking histopathology as the gold standard. Literature showed that ultrasound can help to detect endometrial disorders in patients with postmenopausal bleeding. Ultrasound is easily available in the outpatient's department and is an inexpensive investigation. However, varied accuracies of ultrasound have been reported in the literature stated above. Moreover, there is no local evidence available that can help to implement TVS in the assessment of endometrial pathologies in old age females. Therefore, there is a need to evaluate the diagnostic value of endometrial thickness >4mm on TVS in predicting uterine pathology related to postmenopausal bleeding taking histopathology as the gold standard to establish if TVS can be relied upon. This will help in enhancing the diagnostic pathways and support better management of patients with postmenopausal bleeding.

METHODS

A descriptive cross-sectional study was carried out at the department of Obstetrics and Gynaecology, Lahore Medical & Dental College/Ghurki Trust Teaching Hospital, Lahore from 28th July 2021 to 27th January 2022 after taking approval from the ethical review board of the institute. A total of 50 patients were computed using confidence interval of 95% according to the expected prevalence of endometrial pathology of 50%. The sensitivity of TVS was estimated at 87.09% with a 13.5% margin of error, and specificity was estimated at 75.86% with a 17.5% margin of error. Those who fulfilled the inclusion and exclusion criteria were invited to participate using a non-probability consecutive selection method. Patients with ages ranging between 45 years to 75 years with postmenopausal bleeding were recruited in this study after acquisition of informed consent. Patients with anemia (Hb <10 g/dL), patients with known pathologies such as malignancies, fibroids, or ovarian masses, or those already taking treatment for these conditions were excluded from this research. Additionally, patients with bleeding disorders (PT >15 seconds, APTT >20 seconds), bacterial vaginosis, pre-malignant or malignant lesions in the cervix, vagina, or vulva, or those taking tamoxifen or hormonal therapy were also excluded.

The age, marital status, parity, and body mass index (BMI) along with other demographic details of the patients were recorded. Each participant underwent a TVS performed by a senior radiologist. Endometrial thickness was measured, and participants were categorized as positive or negative for endometrial pathology (positive for ET >4mm, negative for ET <4mm). Subsequently, all participants underwent hysteroscopy under spinal anaesthesia, during which biopsy samples were obtained and sent for histopathological examination. Histopathology findings were considered the gold standard for confirming or excluding endometrial pathology. SPSS version 21 was used to analyze the data of the patients. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of transvaginal ultrasonography with reference to histopathology as the gold standard was analysed.

RESULTS

The patients' age in this research was in the range between 45 to 75 years, having a mean of 58.40±7.19 years. The majority (62%) aged between 45–60 years. The mean parity and BMI were 2.88±1.77 and 29.60±2.06 kg/m², respectively. Among the participants, 60% patients had a BMI of ≤30 kg/m², whereas 40% patients' BMI was >30 kg/m². Regarding marital status, 72% were married, and 70% had a parity of more than two (Table 1).

The endometrial pathology was assessed using transvaginal ultrasound in patients with postmenopausal bleeding. It demonstrated an overall diagnostic accuracy of 92%, bearing sensitivity of 91.67%, specificity of 92.31%, while positive predictive value (PPV) and negative predictive value (NPV) measured at 91.67%, and 92.31%, respectively. The values of above-said performance indicators were found statistically significant, with a consequential p-value of 0.0001, confirming the reliability of TVS as a diagnostic tool for uterine pathology. The diagnostic accuracy of TVS was further evaluated across subgroups. For patients aged 45–60 years, sensitivity was 87.50%, specificity 86.67%, PPV 87.50%, and NPV 86.67%, with an overall accuracy of 87.1%. In patients older than 60 years, TVS demonstrated perfect diagnostic performance, with 100% sensitivity, specificity, PPV, NPV, and accuracy. When stratified by BMI, patients with BMI ≤30 kg/m², the TVS had a sensitivity of 95.31%, specificity of 88.24%, while PPV, NPV and accuracy at 85.71%, 93.75%, and 90.0%, respectively. However, the TVS in patients with BMI >30 kg/m² exhibited a sensitivity of 90.91%, specificity 100%, PPV 100%, NPV 98.90%, and accuracy 99.01%. Further stratification by marital status showed that TVS in unmarried women had 100% sensitivity, specificity, PPV, NPV, and precision of diagnosis. In married women, sensitivity was 90.0%, specificity 89.47%, PPV 90.0%, NPV 89.47%, and accuracy 89.74%. Regarding parity, TVS in women with parity of 0–2 demonstrated sensitivity at 100.0%, specificity 85.71%, while PPV measured 88.89%, NPV 100%, and accuracy calculated to be 93.33%. Women

with parity >2 demonstrated a sensitivity of 90.0%, specificity 93.33%, PPV, NPV, and accuracy of 94.74%, 87.50%, and 91.43%, respectively (Table. 2)

Table No. 1: Distribution of patients based on other confounding variables (n=50)

Variable	No.	%
Body mass index (kg/m^2)		
≤30	30	60.0
>30	20	40.0
Marital status		
Unmarried	11	22.0
Married	39	78.0
Parity		
0-2	15	30.0
>2	35	70.0

Table 2: Classification of diagnostic accuracy with respect to different parameters on TVS

Parameter	A positive result on histopathology	A negative result on histopathology	P-value	Sensitivity	Specificity	PPV	NPV:	Diagnostic accuracy
Positive	22 (TP)*	2 (FP)***	0.0001	91.67%	92.31%	91.67%	92.31%	92.0%
Negative	2 (FN)**	24 (TN)****						
Diagnostic accuracy with respect to age 45-60 years (n=31)								
Positive	14 (TP)	2 (FP)	0.0001	87.50%	86.67%	87.50%	86.67%	87.10%
Negative	2 (FN)	13 (TN)						
Diagnostic accuracy in relation to age 25-40 years (n=19)								
Positive	8 (TP)	0 (FP)	0.001	100%	100%	100%	100%	100%
Negative	0 (FN)	11 (TN)						
Diagnostic accuracy with respect to BMI ≤30 kg/m^2 (n=30)								
Positive	12 (TP)	2 (FP)	0.001	95.31%	88.24%	85.71%	93.75%	90%
Negative	1 (FN)	15 (TN)						
Diagnostic accuracy with respect to BMI >30 kg/m^2 (n=20)								
Positive	10 (TP)	0 (FP)	0.001	90.91%	100%	100%	98.90%	99.01%
Negative	1 (FN)	9 (TN)						
Diagnostic accuracy with respect to unmarried women (n=11)								
Positive	4 (TP)	0 (FP)	0.001	100%	100%	100%	100%	100%
Negative	0 (FN)	7 (TN)						
Diagnostic accuracy with respect to married women (n=29)								
Positive	18 (TP)	2 (FP)	0.001	90%	89.47%	90%	89.47%	89.74%
Negative	2 (FN)	17 (TN)						
Diagnostic accuracy with respect to parity 0-2 (n=15)								
Positive	6 (TP)	1 (FP)	0.001	100%	85.71%	88.89%	100%	93.33%
Negative	0 (FN)	8 (TN)						
Diagnostic accuracy with respect to parity >2 (n=35)								
Positive	18 (TP)	1 (FP)	0.001	90%	93.33%	94.74%	87.50%	91.43%
Negative	2 (FN)	14 (TN)						

DISCUSSION

Endometrial polyps, submucosal leiomyomas, and endometrial hyperplasia are commonly reported in individuals presenting with irregular bleeding from the uterus. When evaluating abnormal uterine bleeding, TVS is used, specifically in postmenopausal women, the sensitivity ranged from 24–96% whereas specificity was found between 29-93%.[8-11] A few studies have examined the subtype disorders; most published studies compare transvaginal ultrasound with other approaches or examine the prognostic efficacy of TVS employed in intrauterine disorders generally. Sensitivity and specificity of transvaginal sonography for endometrial hyperplasia vary from the total reported performance indicators (sensitivity and specificity), as in several reports.

In this study, in patients with ET >4mm, 22 were found True Positive, and 2 False Positive. Among 26 patients who reported negative on TVS, 02 happened to be False Negative, in contrast 24 were found True Negative (p=0.0001). As a whole sensitivity, specificity, positive

predictive value, negative predictive value, and diagnostic accuracy of endometrial thickness >4mm on transvaginal ultrasound in predicting uterine pathology was 91.67%, 92.31%, 91.67%, 92.31%, and 92.0% respectively. For transvaginal ultrasonography, the sensitivity and specificity were 87.09% and 75.86% for identification of endometrial pathology in patients with postmenopausal bleeding.[6] Whereas, 96% sensitivity and 68% specificity of TVS to detect endometrial abnormalities (polyp, hyperplasia, and carcinoma) in patients with postmenopausal bleeding was reported by another study.[7]

88% sensitivity was reported by a researcher. On the contrary, Mukhopadhayayet al[10] revealed a lower sensitivity of 43.75% and a higher specificity of 95.65 % with PPV and NPV of 70% and 88%, respectively. This could be a result of differences in the population considered in the respective studies and years of undertaking these investigations. New scientific developments in transvaginal ultrasonography procedures have been made, which make it possible to improve the results of diagnostics. Bazot et al[11] discovered the sensitivity, specificity, positive and negative predictive values of TVS as 100% and 83.3%, and 40% and 82.9%, respectively, and the accuracy of TVS was 91.3%.

The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy (DA) of TVS for each case of endometrial hyperplasia (EH) were reported as 77%, 94.6%, 84.4%, 91.6%, and 89.8%, respectively. Among premenopausal patients, these values were 67.4%, 94.3%, 80.6%, 89.2%, and 87.3%, while in postmenopausal patients, they were 89.1%, 95.2%, 89.3%, 95.2%, and 93.3%, respectively.

Another study described sensitivity of TVS in premenopausal and postmenopausal women as 88% and 96% respectively, when assessing endometrial pathology in premenopausal females, the TVS had 88% sensitivity and 68% specificity. In an other study, researcher reported a sensitivity of 97.4%, specificity of 75.7%, PPV of 23.8%, and NPV of 99.7% for detecting endometrial disease among women having menopause. In contrast, Sousa et al[12] concluded values of 77.8% for sensitivity, 93.3% for specificity, 88.9% for PPV, and 98.3% for NPV. Similarly, Krampl et al[13] reported sensitivity, specificity, PPV, and NPV of 33.3%, 88.6%, 25%, and 92.1%, respectively. Giorda et al[14] reported an NPV of 96% and a PPV of 8% for TVS in detecting endometrial hyperplasia in postmenopausal patients.

Endometrial hyperplasia was reported in 22.6% patients by a researcher which is comparable to the results by Dangal et al[15] (23%). Doroiswami et al[16] (68%) noticed a high incidence of endometrial hyperplasia in the perimenopausal age group. In a study, the TVS conducted for the diagnosis of endometrial hyperplasia, carried sensitivity, specificity, PPV, and NPV of 81.81, 94.43%, 90%, and 95%, respectively.

However, for the women with irregular uterine bleeding especially those of premenopausal age with endometrial hyperplasia the accuracy, sensitivity, specificity, PPV and NPV were noted to be 88.25%, 90.7%, 84%, 97.7 and 84% respectively.[17]

Transvaginal sonography is a reliable technique to evaluate the endometrium in perimenopausal and postmenopausal women. It allows for clear visualization of the endometrium, with its thickness serving as an effective screening parameter. The endometrial thickness is evaluated by determining the length of the endometrial echo in millimetres in a long-axis transvaginal scan of the uterus. Previous studies comparing TVS with endometrial sampling provided evidence that an endometrial thickness of 4-5 mm or less in patients with post-menopausal bleeding effectively excludes endometrial cancer. Since then, several multicenter trials of confirmation have been performed. Based on the extremely high negative predictive value of TVS in postmenopausal patients with bleeding, the study justified the use of TVS as a first-line diagnostic method.

CONCLUSION

The sensitivity and specificity of transvaginal ultrasound in diagnosing uterine pathology in postmenopausal bleeding were much higher. It has not only increased the diagnostic precision of endometrial hyperplasia in women with postmenopausal bleeding but also assisted clinicians in making the right decision. Therefore, we suggest that transvaginal ultrasound should now be performed regularly in these patient population so that the pathologic condition can be diagnosed early and the patients are offered treatment and management early, intending to decrease the rates of hysterectomies as well as complications in our society.

Author's Contribution:

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REFERENCES

1. Breijer M, Mol B. Transvaginal ultrasound measurement of the endometrium remains the first line test for investigating postmenopausal bleeding. Integrating patient characteristics into testing may further improve diagnostic algorithms. BJOG 2016;123(3):447-.
2. Smith PP, O'Connor S, Gupta J, Clark TJ. Recurrent postmenopausal bleeding: a prospective cohort study. J Minimally Invasive Gynecol 2014; 21(5): 799-803.
3. Kothapally K, Bhashyakarla U. Postmenopausal bleeding: clinicopatholigic study in a teaching hospital of Andhra Pradesh. Int J Reprod Contracept Obstet Gynaecol 2013;2(3):344-8.
4. Otify M, Fuller J, Ross J, Shaikh H, Johns J. Endometrial pathology in the postmenopausal woman – an evidence-based approach to management. Obstet Gynaecol 2015;17(1):29-38.
5. Shrestha P, Shrestha S, Mahato V. Endometrial study by Ultrasonography and its correlation with Histopathology in Abnormal uterine bleeding. Asian J Med Sci 2018;9(2):31-5.
6. Singh P, Dwivedi P, Mendiratta S. Correlation of endometrial thickness with the histopathological pattern of endometrium in postmenopausal bleeding. J Obstet Gynecol India 2016;66(1):42-6.
7. Sur D, Chakravorty R. Correlation of Endometrial Thickness and Histopathology in Women with Abnormal Uterine Bleeding. Reprod System Sexual Disord 2016;5(4):1-3.
8. Davidson KG, Dubinsky TJ. Ultrasonographic evaluation of the endometrium in postmenopausal vaginal bleeding. Radiol Clin North Am 2003;41: 769-80.
9. Tabor A, Watt HC, Wald NJ. Endometrial thickness as a test for endometrial cancer in women with postmenopausal vaginal bleeding. Obstet Gynecol 2002;99:663-70.
10. Mukhopadhayay S, Bhattacharyya SK, Ganguly RP, Patra KK, Bhattacharya N, Barman SC. Comparative evaluation of perimenopausal abnormal uterine bleeding by transvaginal sonography, hysteroscopy and endometrial biopsy. J Ind Med Assoc 2007;105:624-8.
11. Bazot M, Darai E, Rouger J, Detchev R, Cortez A, Uzan S. Limitations of transvaginal sonography for the diagnosis of adenomyosis, with histopathological correlation. Ultrasound Obstet Gynecol 2002;20:605-611.
12. Sousa R, Silvestre M, Sousa L A, Falcao F, Dias I, Silva T, Oliveira C. Transvaginal ultrasonography and hysteroscopy in post menopausal bleeding : a prospective study. Acta Obstet Gynaecol Scand 2001; 80: 856-62.
13. Karampl E, Bourne T, Hurlen – Solbakken H, Istre O. Transvaginal ultrasonography, sonohysterography and operative Hysteroscopy for the evaluation of abnormal uterine bleeding. Acta Obstet Gynaecol Scand 2001; 80(7): 616-22.
14. Giorda G, Crivellari D, Verones A, Perin T, Campagunutta E, Carbone A, et al. Comparison of ultrasonography, hysteroscopy and biopsy in the diagnosis of endometrial lesions in postmenopausal Tamoxifen-treated patients. Acta Obstet Gynecol Scand 2002;81(10):975.
15. Dangal G. A study of endometrium of patients with abnormal uterine bleeding at Chitwan Valley. Kathmandu Univ Med J 2003;1(2):110-2.
16. Doraiswami S, Johnson T, Rao S, Rajkumar A, Vijayaraghavan J, Panicker VK. Study of endometrial pathology in abnormal uterine bleeding. J Obstet Gynecol Ind 2011;61(4):426.
17. Jain M, Chakraborty S. Evaluation of abnormal uterine bleeding with transvaginal sonography. Int J Reprod Contracept Obstet Gynecol 2017;6: 2794-9.