

Original Research Article

Role of ultrasonography and colour Doppler in assessment of endometrial thickness in postmenopausal bleeding patients

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Abstract :

Aim of work To assess the cut-off endometrial thickness and role of colour Doppler in differentiation between benign and malignant uterine condition in postmenopausal bleeding patients.

Results: In our study, 6 mm is the cut-off point of endometrial thickness for differentiating malignant from benign cases with sensitivity of 65.62% and specificity of 100%. There was a statistically significant difference in endometrial thickness measured by TVUS between benign and malignant lesions with a tendency towards a thicker endometrium in the malignant condition.

Conclusion: TVS with color doppler can ascertain the etiology of postmenopausal bleeding. With good specificity and high negative predictive value TVS can be employed as a first line screening test in females with postmenopausal bleeding.

Keywords: Postmenopausal bleeding, Transvaginal ultrasound, Histopathology.

1. INTRODUCTION

Postmenopausal bleeding (PMB) is defined as abnormal uterine bleeding occurring after one year of permanent cessation of menstruation resulting from loss of ovarian follicular activity. The prevalence of postmenopausal bleeding accounts for 10% of the postmenopausal females.

Postmenopausal bleeding is usually attributed to an intrauterine source, but may also arise from the cervix, vagina, vulva, fallopian tubes or be related to ovarian pathology. The intrauterine etiological spectrum of postmenopausal bleeding is wide, including endometrial hyperplasia, endometrial polyps, submucosal leiomyomas and endometrial cancer. It is estimated that 10-15% of the patients who present with postmenopausal bleeding is a sign of endometrial cancer.

Endometrial lining of uterus responds to circulating estrogen irrespective of the reproductive or postmenopausal status of female. Several risk factors such as obesity, tamoxifen use, increasing age, early menarche, late menopause, hypertension, diabetes and unopposed use of exogenous estrogens are strongly associated with increased risk of endometrial hyperplasia and cancer. Thus, the extent of endometrial thickness (ET) constitutes a potential biomarker of estrogen status even in postmenopausal women (**2). In women with postmenopausal bleeding, the thickened endometrium is the most

important criterion for any pathology implication detected on ultrasound ⁽²⁾.

In this study, we attempted to evaluate the thickness of the endometrium, using TVS imaging, and also to evaluate the role of color doppler for identifying different flow patterns in benign and malignant endometrial conditions, for improved diagnosis.

The cut-off value of endometrial thickness was also determined for identification of women with high risk of uterine pathologies. The aim of our study is to provide imaging features for early identification, characterization, and extent of uterine pathologies in post-menopausal females, as well as relevant information for clinicians to make an appropriate diagnosis. Moreover, findings of TVS were correlated with those of histopathological examination in order to test the accuracy of TVS in diagnosing malignancy.

2. MATERIAL AND METHOD

This was a hospital-based Prospective Observational study, conducted in our institution after getting approval from the Ethics and Scientific Review Committee of M.Y hospital and MGMMC Indore. The duration of the study was from April 2021 to September 2022. A total of 70 patients that fulfilled the inclusion criteria and were referred to our department for TVS examination. Final confirmation was done by histopathology examination of all the patients.

Inclusion criteria: Postmenopausal women who had bleeding an year after menopause, Patients who were not on drug therapy.

Exclusion criteria: Patient who have previously undergone endometrial resection/ablation, anticoagulation drugs, Patients suffering from PID, Patients unwilling to give consent.

Equipment and & Techniques: Ultrasonography examination was done by using a transvaginal probe after obtained consent. A 7.5 MHz transvaginal sector probe was used.

Study Protocol: Patient will be selected according to the inclusion criteria detailed history will be taken which include medical history, obstetrics history, past treatment history. Ultrasonography of pelvis was done on Ultrasound machine, using a high frequency transvaginal probe. Patient is examined in lithotomy position with an empty bladder. With their consent endometrium should be measured in sagittal plane or long axis ideally on transvaginal scanning. Thereafter, colour doppler study of the endometrium was carried out. According to colour doppler flow mapping three different vascular pattern were defined: multiple, single and scattered. Then diagnosis will be confirmed with histopathological examination.

3. RESULTS

Table 1: Age wise distribution of endometrial thickness

Age in years	1-5 mm	6-10 mm	11-15 mm	>15 mm	TOTAL
40-45 years	2	5	1	0	8
46-50 years	7	2	3	1	13
51-55 years	5	12	10	4	31

56-60 years	4	3	3	1	11
>60 years	2	1	2	2	7
Total	20(28.5%)	23(32.8%)	20(28.5%)	7(10%)	70(100%)

Maximum number of patients (12) were found to have an endometrial thickness of 6-10 mm in age group of 51-55 years.

Table 2: Characteristics of endometrium

	Characteristics	Number of patients	Percentage(%)
1	Echogenicity of Endometrium		
	Homogenous	39	55.7%
	Heterogenous	24	34.2%
2	Endometrial Cavity		
	Normal	51	72.85%
	Distended	17	24.3%
	Obliterated	2	2.9%
3	Type of Midline		
	Irregular	21	30%
	Linear	31	44.2%
	Non linear	11	15.7%
	Not defined	07	10%

On assessment of endometrial characteristics , we found homogenous echogenicity to be most common seen in 39 (55.7%) patients and 51(72.9%) had a normal endometrial cavity while 31 (44.2%) patients had linear endometrial midline.

TABLE 3: Distribution of patients according to Vascular pattern.

Vascular pattern	Number of Patients	Percentage
Single dominant vessel	21	30%
Multiple dominant vessel	20	28.5%
Scattered vessel	16	22.8%
No detectable color flow	8	11.4%
Other vascular pattern	5	7.14%

Out of the 70 patients, majority of patients 20 (28.5%) were found to have multiple dominant vessels followed by 16(22.8%) patients had scattered vessel.

TABLE 4: Benign vs Malignant etiology differentiation

Diagnosis	Number of Patients	Percentage
Benign	45	64.3
Malignant	25	35.7
Total	70	100

On the basis of TVS and Colour doppler imaging, 45 (64.3%) patients were found to have benign etiology and 25 (35.7%) cases were found to have malignant etiology.

TABLES 5: Summary of accuracy data for TVS findings in malignant condition in comparison to HPE findings

Parameter	Estimate(%)
Sensitivity	71.8%
Specificity	94.7%
Positive Predictive Value	92%
Negative Predictive Value	80%
Diagnostic Accuracy	84.3%

Considering HPE as gold standard, the sensitivity and specificity of TVS in malignant condition is 71.8% and 94.7% respectively. The positive predictive

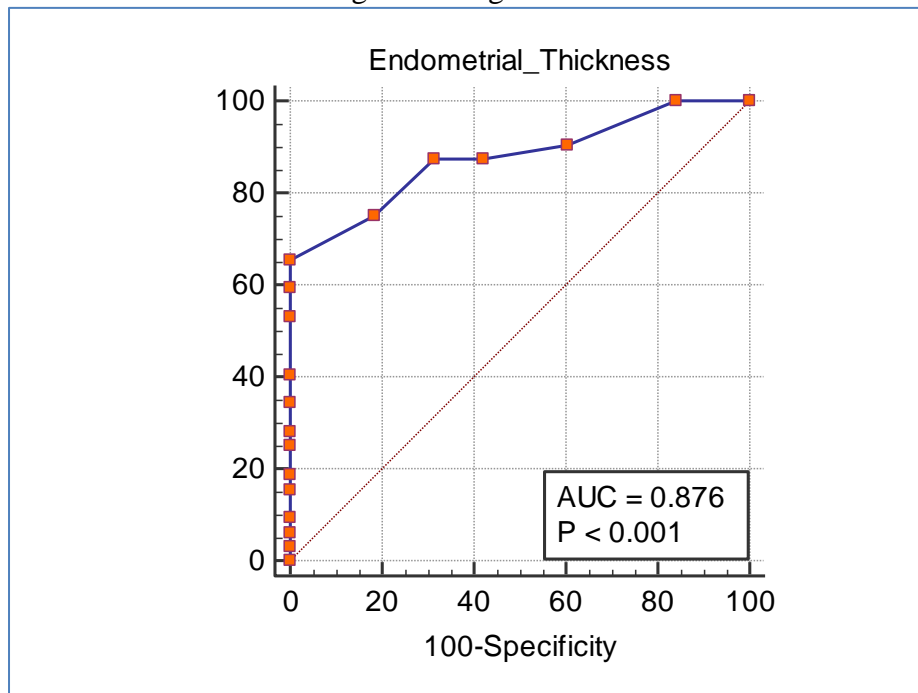
value is 92%, negative predictive value is 80% and diagnostic accuracy of TVS is 84.3%.

TABLE 6: Comparison of endometrial thickness between benign and malignant lesions

Endometrial thickness	BENIGN		MALIGNANT	
	Number	Percentage	Number	Percentage
1-5 mm	20	44.4%	0	0
6-10 mm	13	28.8%	10	40%
11-15 mm	10	22.2%	10	40%
>15 mm	2	4.4%	5	20%
TOTAL	45	100%	25	100%

Majority of malignant cases 14(56%) had endometrial thickness between 6-10mm and in benign cases majority of patients 20(44.4%) had endometrial thickness between 1-5 mm.

GRAPH 1: ROC CURVE – Benign vs Malignant



The area under the receiver-operating characteristic curve was 0.876(95%)confidence interval [CI], 0.776–0.943). The cut-off value for ET was 6.0 mm.

CASES:

CASE 1 : A 58 year old female with irregular uterine bleeding and weight loss.

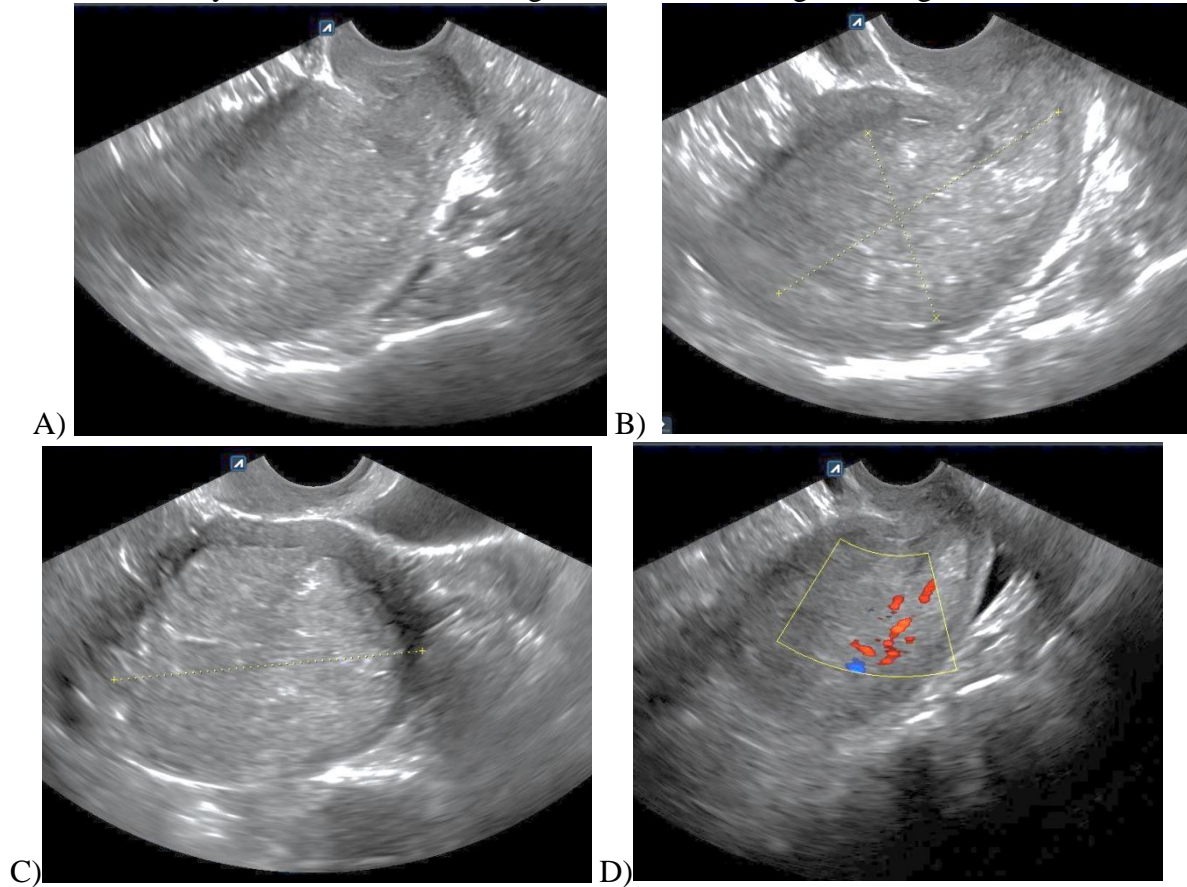
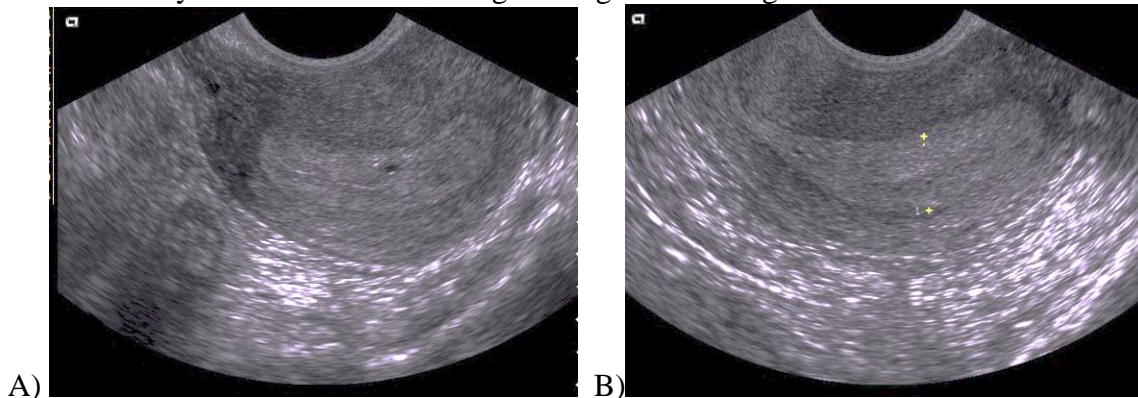
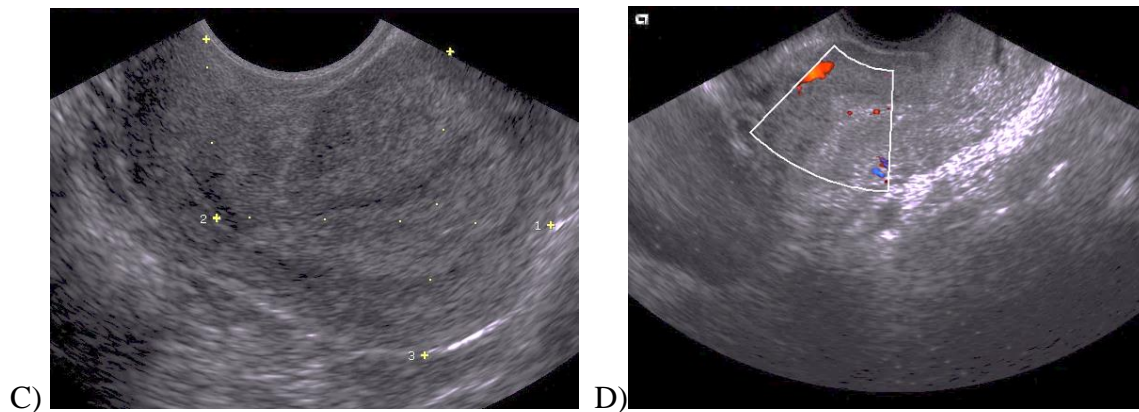


Figure (A), (B) and (C) - TVS images shows lobulated hyperechoic lesion in endometrial cavity, Figure (D) On colour doppler increased vascularity (multiple vascular pattern) is seen s/o neoplastic mass lesion.

Histopathological Diagnosis- Endometrial Carcinoma

CASE 2 : A 54 year old female with irregular vaginal bleeding.





C) D)
H Figure (A), (B) and (C) - TVS image depicting diffuse homogenous thickening of endometrium (11.3 mm) with few tiny cystic areas, Figure (D) - on colour doppler scattered vascular pattern is seen s/o endometrial hyperplasia.

4. DISCUSSION

Menopause is a crucial event in a females' life, heralding the reproductive phase. After menopause, further vaginal bleed is considered abnormal. Postmenopausal bleeding is a very common complaint, seen in about 69% of patients with a wide spectrum of PMB etiologies, varying from benign to malignant. Endometrial assessment is mandatory in all cases of PMB to identify their risk of endometrial cancer. As 90–95% of endometrial cancer cases report a vaginal bleeding experience whereas only 10% of symptomatic PMB reveal an intrauterine malignancy so it is important to quickly and accurately diagnose or exclude neoplasia in patients presenting with postmenopausal bleeding.

Early detection of endometrial malignancy is imperative to timely management as it can significantly reduce the mortality and morbidity burden.

In our study, postmenopausal females with more than 40 years age were studied with majority of the patients 31 (44.3%) belonging to age group of 51 - 55 years. This was similar to findings of the study conducted by Bala Bharathi et al (2020)⁽³⁾, Sreelatha et al (2017)⁽⁴⁾ and Sowmyanarayan et al (2020)⁽⁵⁾ where they found that maximum postmenopausal patients were in the age group 50 - 54 years, 50 – 54 years and 50 - 60 years respectively.

In our study, we included patients who presented with complaints of vaginal bleeding in postmenopausal female. Aside from bleeding, vaginal discharge (42.9%) and pelvic pain (34.3%) were two most common findings associated with postmenopausal bleeding followed by weight loss (18.6%). Decreased estrogen levels can cause the vagina to become thinner, drier, and more easily irritated making it prone to vaginal infections causing abnormal vaginal discharge. Our findings were in accordance with the study done by Manjit Singh Bal et al 2012 where they found discharge per vagina to be the most common presenting complaint in 177(59%) patients, apart from vaginal bleeding followed by pelvic pain in 58 (19.3%).

In our study, we found that 34 cases (48.5%) of our population were anemic. This could be explained by the excessive bleeding and high prevalence of iron deficiency anemia in females. While in the study conducted by Dr. Meena Jain et al. (2019)⁽⁶⁾, she found anemia in 63.36% patients in their study which is more as compared to our study.

Out of 70 patients, 23 patients (31.4%) had endometrial thickness between 6 - 10 mm followed by 20 patients (30%) with endometrial thickness between 11 - 15 mm, 20 patients (28.5%) had endometrial thickness between 1 to 5 mm and only 7 (10%) patients had endometrial thickness more than 15mm. Increase in endometrial thickness is the result of chronic exposure to estrogen along with relative deficiency of progesterone. These results were in concordance with the study done by Veena BT et al (2014)⁽⁷⁾.

In the study, on assessment of endometrial echogenicity we found homogenous echogenicity to be most common seen in 39 (55.7%) patients followed by heterogenous echogenicity in 24 (34.2%) and three-layer pattern in 7 (10%) patients. The normal appearance of the endometrium is smooth and regular. Study conducted by E. Epstein et al (2011)⁽⁸⁾ and L Valentin et al (2006) also found heterogeneous endometrium in 35.6% of the patients.

On evaluation with TVS, 17 (24.3%) had distended endometrial cavity, 2 (2.9%) had obliterated, and the rest 51 (72.9%) had a normal endometrial cavity. Almost all cases with distended endometrial cavity were associated with endometrial malignancy or polyp in our study. Wang et al (2011)⁽³⁸⁾ found distended endometrial cavity due to collection in endometrial cavity.

In our study, on evaluation with ultrasonography, 31 (44.2%) patients had linear endometrial midline, 21 (30%) patients showed irregular while 11 (15.7%) patients had non-linear and in 7 (10%) patients margins were not defined. On TVS, lesions with irregular or ill-defined margins were suspected of being malignant. This is in conjunction with the study of Madkour et al (2017) who found regular endometrium to be most common (50.8%) followed by irregular endometrium and not defined

In our study, the junctional zone was regular in 38 (54.2%) patients, irregular in 19 (27.1%) cases and interrupted in 9 (12.8%) cases, remaining cases 4 (5.7%) was not defined. These results were in accordance with the findings of Madkour et al (2017) study where he found regular endo-myometrial junction as most common followed by irregular junction.

Out of the 70 patients, endometrial power Doppler findings were positive in 62 (85.7%) patients and in rest 8 (11.4%) patients no color flow was detected. Majority of patients 21 (30%) showed single dominant vessels pattern followed by 20 (28.5%) patients with multiple dominant vessel pattern. 16 (22.8%) patients showed scattered vascular pattern and in 5 (7.1%) patients other vascular patterns were seen. Multiple dominant vessels is a vascular pattern of neoplastic etiologies mainly as new blood vessels are formed from existing ones following endothelial cell proliferation and migration.

On evaluation with TVS and color doppler, 25 (35.7%) patients were diagnosed with malignant etiology and rest 45 (64.3%) cases were of benign etiology. In our study, among benign cases endometrial polyp was most common seen in 20 (44.4%) patients followed by 13 (28.8%) patients were diagnosed with endometrial hyperplasia, 7 (15.5%) with adenomyosis and 5 (11.1%) patients had fibroid. Similar findings on TVS were seen in the study done by Dueholm et al where they found polyp to be most common etiology (30.1%) followed by endometrial hyperplasia (11.8%) and 40% cases were of malignant etiology. Cong et al (2007) and Opolskiene et al (2007)⁽¹⁶⁾ results were in accordance with our study.

TVS interpreted 25 (35.7%) patients as malignant, and rest 45 (64.3%) patients as benign.

While on histology, 32 (45.7%) cases were found to be malignant, whereas 38 (54.3%) were benign. Amongst benign cases 18 (47.3%) were diagnosed as polyp followed by 9 (23.6%) cases of endometrial hyperplasia. These findings on HPE were similar to the findings observed by Opolskiene et al (2007) and Dueholm et al on HPE.

In our study when we correlate between HPE and TVS it was seen that 51.4% cases were benign on both HPE and TVS while 32.8% cases were malignant on TVS as well as HPE. And p value <0.05 stating there is significant correlation between the two modalities. These findings on HPE were similar to the findings observed by Opolskiene et al (2007) on HPE.

Considering HPE as gold standard the sensitivity, specificity, PPV, and NPV of TVS in evaluation of malignant uterine lesions 71.8%, 94.7%, 92% and 80%, respectively. According to our study, the accuracy of TVS for detection of benign and malignant uterine lesions was 84.3%.

On comparing the endometrial thickness with benign and malignant etiology we found all the patient with endometrial thickness in range of 1-5 mm were diagnosed with benign condition. Out of 23 patients with ET in range of 6-10 mm, 13 were diagnosed with benign etiology and 10 with malignant; for 11-15 mm ET range, 10 patients were diagnosed with benign and malignant etiology each. Out of 7 patients with ET > 15 mm, 5 were diagnosed with malignant condition.

As regards the results of TVUS in our study, 6 mm is the cutoff point of endometrial thickness for differentiating malignant from benign cases with sensitivity of 71.8% and specificity of 94.7%. This was similar to study conducted Noha Mohamed et al (2014)⁽⁹⁾, also who found 5 mm is the cutoff point of endometrial thickness for differentiating malignant from benign cases. Studies by Jacobs et al. (2013) to assess the sensitivity of TVUS screening for endometrial cancer in postmenopausal women, they found that the endometrial thickness of 5 mm as the cutoff value in endometrial carcinoma with sensitivity of 77.1% and specificity of 85.8%.

The area under the receiver-operating characteristic curve was 0.876 (95% confidence interval [CI], 0.776-0.943). The cut-off value for ET was 6.0 mm, indicating that TVS ET had a fair accuracy in diagnosing carcinoma if the ET is more than 6.0 mm, which has a sensitivity of 65.62% and a specificity of 100%.

A significant proportion of females suffer from post-menopausal bleeding which can be attributed to various benign and malignant etiologies. Various investigations can be employed for diagnosing these etiologies. However, there is a need of a simple, safe and cost-effective modality which allows early detection and can guide towards appropriate management.

5. CONCLUSION

Trans vaginal ultrasound was found to be highly sensitive and specific in differentiating between benign and malignant conditions causing post-menopausal bleeding. Endometrial thickness was the main determinant factor for differentiating these conditions along with other B mode and color doppler characteristics. Thus, ultrasound can act as an effective diagnostic tool, obviating the need for histopathology in benign conditions and allows early intervention in malignant etiologies.

6. REFERENCES

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