ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF COLOR AND SPECTRAL DOPPLER IN PREDICTING ENDOMETRIAL CARCINOMA IN PATIENTS WITH POST MENOPAUSAL BLEEDING KEEPING HISTOPATHOLOGY AS GOLD STANDARD

Shaghaf Iqbal, Muhammad Wasim awan, Zunaira Rafique, Nasreen Bardai, Maryam Amjad, Fariha Shaukat

Department of Radiology, KRL Hospital, Islamabad, Pakistan.

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ABSTRACT

OBJECTIVE: To determine the diagnostic accuracy of color and spectral Doppler in predicting the endometrial carcinoma in patients with post-menopausal bleeding keeping histopathology as gold standard. **MATERIAL AND METHODS:** This cross-sectional validation study was conducted in Department of radiology, KRL Hospital sector G-9/1, Islamabad for 6 months from 15.12.18 to 15.06.19. A total of 112 women with post-menopausal bleeding were selected in this study. In all patients, color and spectral doppler USG was performed. After this, all patients underwent biopsy in the concerned ward and tissue was sent for histopathology. All data was noted on proforma. The data was analyzed by using the SPSS software version 17.0 while the results were analyzed by descriptive and inferential statistics. **RESULTS:** The average age was 53.58 – 7.28 years. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of color and spectral Doppler ultrasound in predicting the endometrial carcinoma in patients with post-menopausal bleeding was 92%, 88.7%, 86.8%, 93.2% and 90.2%. **CONCLUSION:** It is concluded thatthe use of Doppler ultrasonography in the diagnosis of endometrial carcinoma in patients presenting with post-menopausal bleeding is useful with good sensitivity, specificity, PPV and NPV.

Key Words: Post-menopausal bleeding, Endometrial carcinoma, Doppler ultrasonography

Introduction

Per vaginal bleeding occurring 12 months after the cessation of menses is referred to as post-menopausal bleeding.[1] It is an extremely common complaint accounting for approximately 10 % of the total gynecological complaints among them 10 % are diagnosed to be having a malignancy.[2] It can occur as a number of causes including endometrial carcinoma, endometrial polyp, cervicitis, carcinoma of cervix, atrophic vaginitis, carcinoma of vagina, any foreign body, vaginitis followed by radiation, estrogen secreting ovarian tumors including Brenner s tumor, hormone secreting granulosa tumors, vulvitis and other systemic causes like coagulopathies, use of antiplatelet drugs, raised B.P., few causes leading to bleeding per urethra or gastrointestinal tract. Post-menopausal bleeding may occur in patients receiving exogenous hormonal preparations including estrogens, or a combination of estrogen or progesterone as a hormone replacement therapy.[3] Atrophic vaginitis and atrophic endometritis is the commonest cause of bleeding following

Correspondence : Dr. Zunaira Rafique
Department of Radiology,
KRL Hospital,
Islamabad, Pakistan.
Email: drzunaira95@yahoo.com

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cessation of menstruation however the cause of post-menopausal bleeding that should be ruled out at priorty is endometrial carcinoma.[4] Of all the patients presenting with post-menopausal bleeding 36 % have malignancy and approximately 28 % have malignancy of endometrium.[5]

The post-menopausal bleeding is a very common phenomenon, the greatest risk associated with it is carcinoma of endometrium, and early diagnosis followed by radical hysterectomy provides a good prognosis. The accurate diagnosis is made by histo-pathology, which needs the patient to be subjected to invasive procedures, like Dilatation & Curettage. There should be an alternative to it, for giving a diagnosis, or at least a suspicion of the carcinoma. In general carcinoma leads to increased flow and decreased resistance within an organ. This can be measured by blood flow to that organ. If the RI values of spiral arteries < 0.7 & then there is a high suspicion of underlying carcinoma.In a local study, sensitivity and specificity of Doppler ultrasound findings was 86.96% and 90.7% respectively.[6] In another local study, specificity, sensitivity, positive predictive value and negative predictive value were found to be 97.16%, 76%, 89.56% and 76.92% respectively.[7] Another study has shown the prevalence of endo-metrial cancer as 52.4% and sensitivity, specificity and accuracy as 79.3%, 73.2% and 75.70% res-pectively.[8]

Post-menopausal bleeding is extremely common gynaecological complaint and carcinoma is very distressing for the patient associated with poor prognosis. In this clinical setting tissue sampling is advised to rule out malignancy. Pelvic ultrasound, color and power Doppler will add to experimental data base. It can be used as a noninvasive tool for prediction of carcinoma as a substitute of tissue sampling which obviously is invasive and subjects the patient to distress without any procedural complications.

Material and Methods

Total number of 112 women presented with post-menopausal bleeding and referred for pelvic ultrasonography to Department of Radiology, KRL Hospital, Islamabad were selected. Approval from ethical review committee was taken before conducting the study. After taking informed consent, pelvic ultrasound scan with full bladder, with colour and spectral Doppler was done. Ultrasonography of the spiral artery was performed in every patient by a consultant Radiologist (at least 3 years of post-fellowship experience) on logic P/6 3D machine and RI values were noted. Figure 1 shows the normal waveform of spiral artery Doppler with RI values above 0.7. After this, all patients were underwent biopsy in the concerned ward and tissue was sent for histopathology.

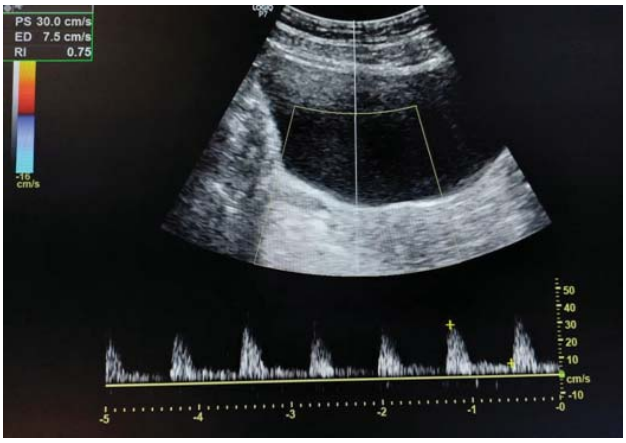

Figure 1: Normal uterine arterial waveform.

Doppler USG findings were compared with histopathology findings. All data (age, duration of menopause, marital status (married/unmarried), parity, endometrial carcinoma on USG and histo-pathology) was noted on proforma. Patients on Hormone replacement therapy, women with intrau-terine contraception device, patients with chronic liver disease and bleeding disorder and women with vaginal trauma were not included in the study. The 17th version of the SPSS was used to analyze the data and results were interpreted by differential and inferential statistics. 2 2 contingency table was used to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of color and spectral doppler ultrasonography in diagnosing endometrial cancer, taking histopathology as gold standard.

Results

A total of 112 women with post-menopausal bleeding were selected in this study. Age distribution of the patients is presented in (Fig.2). The average age was 53.58 – 7.28 years and average duration of symptoms were 2.46 – 0.94 years (Tab.1). There were 83 (74.11%) married and 29 (25.89%) unmarried (Fig.3). Most of the married women had 1 to 2 parity as presented in (Fig.4). Diagnostic accuracy of color and spectral Doppler ultrasound in predicting the endometrial carcinoma in patients with post-menopausal bleeding is reported in (Tab.2). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of color and spectral Doppler ultrasound in predicting the endometrial carcinoma in patients with post-menopausal bleeding was 92%, 88.7%, 86.8%, 93.2% and 90.2%. Stratification analysis was performed and observed that accuracy of color and spectral Doppler ultrasound in predicting the endometrial carcinoma in patients with post-menopausal bleeding was above 90%.

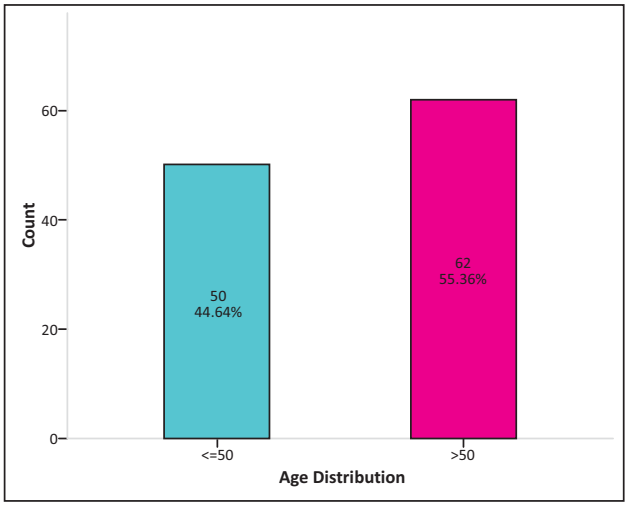

Figure 2: Age distrubution of the patients n=112

Statistics		Age (Years)	Duration of Symptoms
Mean		53.58	2.46
Std. Deviation		7.28	0.94
95% Confidence	Lower Bound	52.22	2.29
Interval for Mean	Upper Bound	54.95	2.64

Table 1: Descriptive statistics of patients

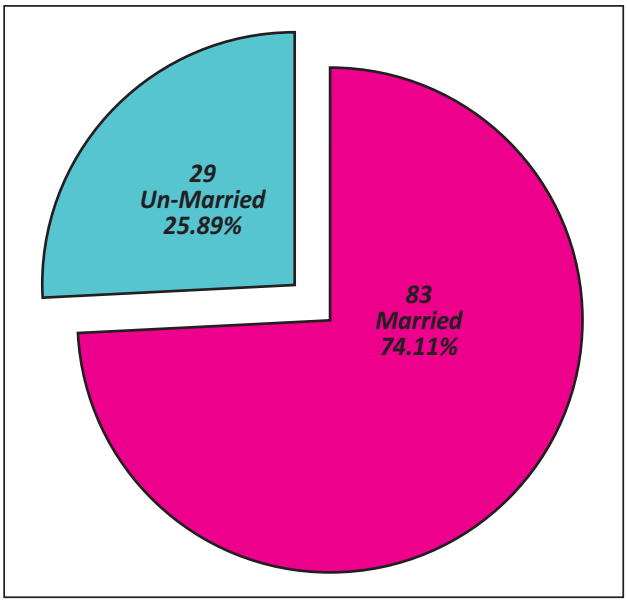

Figure 3: Marital status of the patients n=112

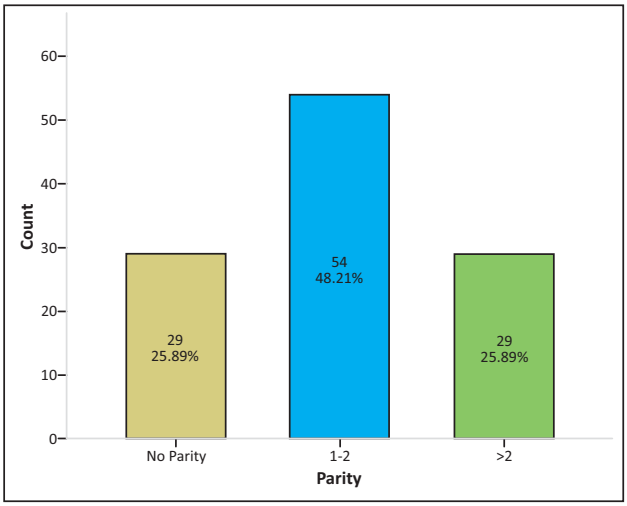

Figure 4: Parity status of the patients n=112

Color Doper USG	Endometrial cancer on HISTOPATHOLOGY		Total
	Positive	Negative	
Positive	46(TP)	7(FP)	**53**
Negative	4(FN)	55(TN)	**59**
Total	**50**	**62**	**112**

Sensitivity= 92.0%
Specificity= 88.7%
PPV = 86.8%
NPV = 93.2%
Accuracy = 90.2%

Table 2: Diagnostic accuracy of color doppler in predicting the endometrial carcinoma in patients with post-menopausal bleeding keeping histopathology as gold standard

Post-stratification 2 2 contingency table was used to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of color doppler ultrasonography in diagnosing endometrial cancer.

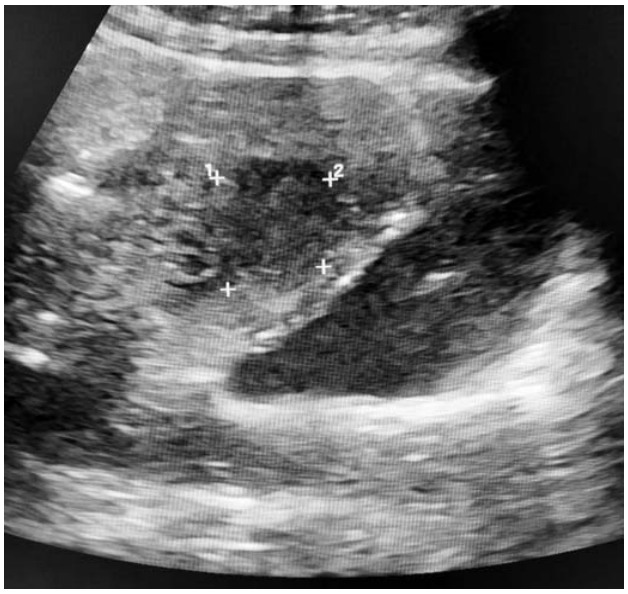

Figure 5: Ultrasound pelvis showing a mass lesion within the endometrial canal

In (Fig.5) we can appreciate a mass lesion within the endometrial canal in a patient who presented with post menopausal bleeding. In (Fig.6) we have obtained Doppler of spiral arteries from the same patient as shown in (Fig.5) which shows the RI values to be less than 0.7 raising high suspicion of malignancy. The patient was later diagnosed as endometrial carcinoma on histopathology.

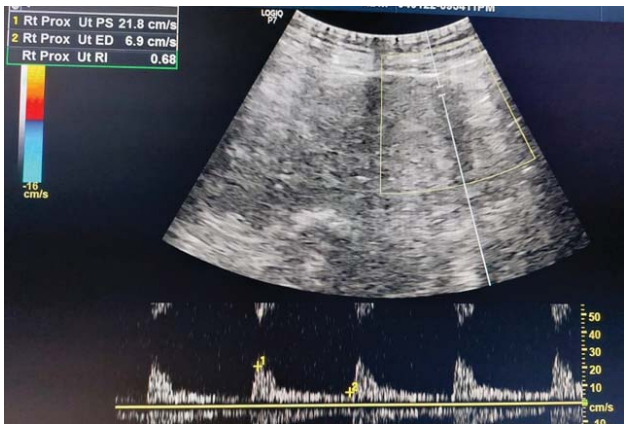

Figure 6: Doppler of spiral arteries obtained from the same patient as shown in figure 5

Discussion

Endometrial carcinoma is the most common malignancy of the female genital tract. According to the Surveillance Epidemiology and End Results (SEER) database the incidence of endometrial carcinoma in women aged 30 to 34 years is 2.3 / 100,000; increases to 6.1 / 100,000 between ages 35 and 40 years; and rises dramatically to 36.2 / 100,000 in women aged 40 to 49 years. In post-menopausal women not taking HRT, any bleeding is considered "cancer until proven otherwise," although the incidence of malignancy in such patients ranges from 2% to 10% depending on the risk factors.[9,10] Endometrial curettage, first described in 1843, is the most common operation performed on women across the world. As early as the 1950s, a review of 6907 curettage procedures found that the technique missed endometrial lesions in 10% of cases. Of these, 80% were polyps. In the 1970s, vacuum-suction curettage devices allowed sampling without anaesthesia in clinical setting.

The most popular was the Vabra aspirator (Berkeley Medevices, Berkeley, California). This device was found to be 86% accurate in diagnosing cancer.[11,13] Lately, less expensive, smaller, less painful plastic catheters with their own internal pistons to generate suction have become popular. One of these, the Pipelle device, was found to have similar efficacy but better patient acceptance compared with the Vabra aspirator.[14]

Transvaginal sonography currently is considered to be the first-step technique to be performed in women with postmenopausal bleeding because it may reliably rule out endometrial cancer when endometrial thickness is 5mm and because it is cost-effective. However, a thickened endometrium is a nonspecific finding, and additional tests are warranted. Most current protocols include the use of sonohysterography or endometrial office biopsy.[15]

In present study the average age was 53.58 – 7.28 years. In Batool et al[7] study the age of the 128 patients ranged from 51 to over 65 years, with 48 (37.5%) being in the 51-55 age group; 46 (35.93%) within 56-60 years; and 34 (26.57%) over 65 years. The mean age was 57.93 – 4.07 years.

Spectral and color Doppler energy is a new technology that has some advantages over conventional ultrasound. Spectral Doppler is based on the amplitude of the Doppler signal but not on the Doppler frequency shift. It make this technique advantageous for blood flow mapping by facilitating the detection of flow where present and depicting more clearly and reliably the vascular architecture. The advantages of the power Doppler technique have been demonstrated in adnexal masses by Guerriero et al. Another study has demonstrated a high correlation between microvessel density and power Doppler findings in breast carcinoma.[16,17]

Results of local study from CMH Lahore determined the accuracy of Doppler ultrasound in the diagnosis of endometrial carcinoma in patients presenting with post-menopausal bleeding while taking histopathological findings as the gold standard. Results showed that Specificity, sensitivity, positive predictive value and negative predictive value were found to be 97.16%, 76%, 89. 56% and 76.92% respectively.[18] Results of this study is consistent with the results reported by Shazia Batool from CMH Lahore. However a slight difference can be seen in sensitivity, specificity, PPV and NPV in both studies.

Mahmoud El-Morsi Aboul-Fotouh from Egypt evaluate the role of transvaginal power Doppler sonography in differentiation between benign and malignant endometrial conditions in women with postmenopausal bleeding. Results regarding predictive values for endometrial carcinoma was sensitivity: 85.71%, Specifcity: 97.26%, PPV:75% and NPV:98.61% respectively.[19] Mahmoud El-Morsi Aboul-Fotouh results are consistent with the results of this study however reported sensitivity, specificity, PPV and NPV was a bit lower in this study. But still results demonstrate that Doppler ultrasonography is still effective for the diagnosis of endometrial carcinoma in women with postmenopausal bleeding.

Alcazar et al. who reported a sensitivity, specificity, positive predictive value, and negative predictive values of power Doppler vascular pattern for endometrial carcinoma of 78.8%, 100%, 100%, and 89%, respectively.[16] Alcazar results are also in line with the results of this study.

The differences in results between studies are probably to be explained by differences in ultrasound equipment, machine settings, experience of the examiners, and by lack of standardized criteria for subjective evaluation of endometrial vascularity. Objective quantification of power Doppler signals using computer analysis has been used in the diagnosis of cervical carcinoma. Cheng and coworkers found that in women with cervical carcinoma a power Doppler vascularity index (defined as vascular area divided by tumor area, i.e. an index) showed a linear correlation with microvessel density and was significantly positively correlated to tumor size, depth of stromal invasion and the presence of lymph node metastases. These facts suggest that tumor vascularity as assessed by power Doppler ultrasound may be useful in the diagnosis and characterization of malignancy.[20]

Conclusion

The use of Doppler ultrasonography in the diagnosis of endometrial carcinoma in patients presenting with post-menopausal bleeding is useful with good sensitivity, specificity, PPV and NPV. Besides, there are no procedural complications. Unnecessary surgeries can be prevented in patients with the use of Doppler ultrasound.

Conflict of Interest: None

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