

DIAGNOSTIC UTILITY OF SONOGRAPHICALLY THICKENED ENDOMETRIUM AND COLOR DOPPLER IN POSTMENOPAUSAL BLEEDING

By

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ABSTRACT

Background: Abnormal uterine blood loss at any females' age is upsetting. Nevertheless, post-menopausal bleeding (PMB) is of superior distress because it is a clinical indication of the occurrence of endometrial malignancy. Trans-vaginal sonography (TVS) and Doppler velocimetry signify non- invasive techniques for screening of the endometrium.

Objective: To explore the relationship between endometrial thickness and color doppler by TVS and its implication to predict endometrial pathology in symptomatic and asymptomatic postmenopausal women.

Subjects and methods: A total of 50 symptomatic and asymptomatic postmenopausal ladies were recruited to this study during the period from February 2020 to September 2020 at Kafr El-Sheikh General Hospital, and Al-Sayed Galal Hospital of Al-Azhar University. TVS and Color Doppler were done to all of them, then fractional D & C to suspicious cases.

Results: Out of the 25 women with PMB, endometrial hyperplasia was seen in 10 women (40%), endometrial hyperplasia and polyps were detected in 4(16%) of patients, and multiple myoma in 3 (12%) of patients. In control group, multiple myoma was detected in only one case. Also, nabothian follicle was shown in another case, and there was one case diagnosed with solitary myoma. There was a statistically significant difference between the two studied groups regarding TVS findings. Endometrial thickness (6 mm or more) was found in all PMB cases, and 10(40%) of control cases, while endometrial thickness of 5-6 mm was detected in the other 15 (60%) of control cases. Approximately, half of the women with PMB (40%) had no abnormal vascularity. Sixteen percent had single-vessel, 32 percent had scattered-vessel, and 8 percent had multiple-vessel pattern. Also, iso or hypo-echogenic intracavitary nodule displayed a vascular ring was detected in only one PMB case. The cut of value of ET 7.75 mm had 93.8% sensitivity and with specificity, positive predictive value, negative predicted value and diagnostic accuracy (87.5%, 93.8%, 87.5% and, 91.7% respectively). Also, Roc curve analysis showed that all Doppler indices were not significant in the detection of the abnormal findings in biopsy.

Conclusion: Both tran-svaginal sonography and color doppler ultrasound were complementary in the post-menopausal bleeding investigation and endometrial biopsy yet residues as the gold standard for final diagnosis.

Keywords: Postmenopausal Bleeding, Endometrium thickness, Tran-svaginal Sonography, Color Doppler.

INTRODUCTION

Post-menopausal bleeding (PMB) is a frequent complaint (*Carugno, 2020*). It conveys the female to a gynecologic clinic throughout the post-menopausal period (*Lee et al., 2019*). A definitive diagnosis is extremely crucial for the cases management which can be established only by histopathological examination of the endometrium (*Neelgund and Hiremath, 2016*).

Abnormal uterine bleeding at any age in females' lifetime is upsetting and worrisome. Nevertheless, PMB is of superior distress because it is the only common clinical indication of the occurrence of endometrial carcinoma (*AbdelMaboud and Elsaid, 2015*).

The precise diagnosis of a woman with bleeding is the most significant step in management (*Patil et al., 2014*). The identification of such pathologies is important in terms of diagnostic accuracy and surgical decision-making (*Yenigul et al., 2019*).

The ideal diagnostic modality is still arguable. Formerly, the gold-standard clinical investigation of postmenopausal uterine bleeding was institution-based dilation and curettage (*Munro, 2014*). Screening approaches for instance cervical or vaginal cytology are not enough or precise for the endometrial carcinoma detection, and direct intrauterine cell sampling and hysteroscopy are not practical screening methods because of their invasive nature (*Sur and Chakravorty, 2016*).

To diminish the invasiveness of investigatory techniques, other screening methods have been applied for early

detection of endometrial abnormality, these comprise; Sonohysterography and Transvaginal sonography (TVS) with the measurement of endometrial thickness. The role of TVS for discriminating benign from malignant endometrial diseases has been assessed in several studies but with controversial results (*Abdelrhman and Eladl, 2015*).

Furthermore, Doppler velocimetry of the uterine artery proposes a non-invasive, effortless, and valued tool in screening women with PMB. Transvaginal color Doppler imaging permits the assessment of endometrial vascularization. A good correlation has been found between the uterine artery flow velocity waveform and the histopathological diagnosis in women with PMB (*Patil et al., 2014*).

The aim of this study was to explore the relationship between endometrial thickness and color Doppler by TVS and its implication to predict endometrial pathology in symptomatic and asymptomatic postmenopausal women.

SUBJECTS AND METHODS

The present study enrolled a total of 50 symptomatic and asymptomatic postmenopausal ladies during the period from February 2020 to September 2020 at Kafr El-Sheikh General Hospital and Al-Sayed Galal Hospital of Al-Azhar University. Selected cases were menopausal women with or without bleeding after menopause ≥ 12 months and with endometrial thickness by TVUS ≥ 5 mm and agreeing in participation in the present study with an informed consent.

Exclusion criteria: Patients were excluded from the study if they had any of the next: Bleeding after menopause before

passing 12 months, hormone-replacement therapy (HRT) and tamoxifen using, history of hematological disorders or anticoagulant therapy, and obvious causes of bleeding from cervix or vagina e.g. ulcer and Adnexal masses (with suspicious of malignancy) detected by TVUS.

The elected patients were subjected to thorough history taking complete general and abdominal examination. The ultrasound equipment used was (MINDRAY DC-N2, China) using a 3.5-5-MHz trans-abdominal probe and 5-9 MHz trans-vaginal probe at the ultrasound unit of the Obstetrics and Gynecology department at Kafr El- Shiekh General Hospital (Kafr El- Shiekh Government), Egypt. Transabdominal ultrasound (TAUS) was initially done for uterus and adnexa examination. Transvaginal ultrasound (TVUS) measurement for endometrial thickness was done by one sonographer to exclude bias. It was assessed at the thickest portion in the longitudinal plane and included both endometrial layers from one basalis to the contralateral basalis incorporating the uterine cavity. The power Doppler gate was activated (7.5 MHz) for blood flow mapping of the endometrium and endometrial-myometrial interface. Fraction curettage was carried out under

general anesthesia with Kevorkian-Younger Endocervical Curette, the obtained first samples was labeled as cervical samples without dilatation of the cervix then by 7-8 hegar dilator, dilation of the cervix was done and curettage carried out blindly of the anterior then posterior uterine walls then both lateral walls, followed by the uterine fundus, the gotten samples were labeled as uterine samples. Specimens were retained in formalin 10% awaiting histopathological examination.

Statistical analysis:

Statistical analyses of data were carried out using SPSS version 23. Shapiro – Wilks test was used to test normal distribution of variables. Numerical data were expressed as mean \pm standard deviation or median and range. Categorical data were summarized as percentages. The significance for the difference between groups was determined by using two-tailed Student's t test. Also Qualitative variables were assessed by chi-squared χ^2 test. The probability (P) values of ≤ 0.05 were considered statistically significant indicated. The Receiver Operating Characteristic (ROC) was constructed to obtain the most sensitive and specific cutoff value for ET and Doppler indices.

RESULTS

A total of 50 women having ET ≥ 5 mm with or without complaints of PMB were recruited to this study. The basic characteristics of the postmenopausal women. The results showed no significant differences with regard to age at

presentation, year since menopause, gravity, parity, and BMI ($P > 0.05$). About 32% (16/50) of the study participants were diabetic, 38% (19/50) were hypertensive, 3(6%) were on chemotherapy, and 72% (36/50) were obese (**Table 1**).

Table (1): Baseline characteristics of postmenopausal women with and without abnormal uterine bleeding

| Characteristics | Groups | Total (n = 50) | Controls (n = 25) | PMB (n = 25) | P |
|------------------------------|--------|-------------------|----------------------|-----------------|-------|
| Age, years | | 56.6± 6.76 | 56.76 ±6.55 | 56.44 ±7.1 | >0.05 |
| Gravity | | 3.98± 1.97 | 3.88 ±2.15 | 4.08 ±1.8 | >0.05 |
| Parity | | 3.56± 2.21 | 3.48 ±2.35 | 3.64 ±2.01 | >0.05 |
| BMI, kg/m ² | | 31.66 ±3.37 | 30.8 ±2.81 | 32.52 ±3.7 | >0.05 |
| Duration of menopause, years | | 6.69 ±6.33 | 6.84 ±7.08 | 6.54 ±5.63 | >0.05 |
| Endometrial thickness, mm | | 3.2 ±0.6 | 3.1 ±0.6 | 3.4 ±0.4 | <0.05 |
| Hypertension, n (%) | | 19 (38%) | 10(40%) | 9(36.0%) | >0.05 |
| Diabetes mellitus, n (%) | | 16(32%) | 6(24%) | 10(40%) | >0.05 |
| Chemotherapy, n (%) | | 3(6%) | 1(4%) | 2(8%) | >0.05 |
| Anemia, n (%) | | 1(2%) | 1(4%) | 0(0%) | >0.05 |

Data were presented as mean±SD or n (%).

Gravidity, parity, and duration of menopause are normally distributed using Mann-Whitney U test.

Majority of the women included in this study (62% (n=31) delivered priorly by vaginal delivery, caesarean section was conducted in 11 (22%) of women, while eight women (16%) had no history of previous delivery; 4 in each group. This

study showed that there was no statistical significant difference regarding mode of previous deliveries in both studied groups (P =1.000). Also, there was no statistical significant difference regarding method of contraception in both studied groups (P=0.483) as well as total number of years after menopause (P=0.930) (**Table 2**).

Table (2): Comparison between the two studied groups regarding mode of previous deliveries, method of contraception, and duration since menopause

| Characteristics | Groups | Total N=50 | Control group N=25 | Pt. with PMB group N=25 | P value |
|------------------------------------|--------|---------------|--------------------------|-------------------------------|------------|
| Mode of previous deliveries | | | | | |
| NVD | | 31(62%) | 15 (60%) | 16(64%) | >0.05 |
| CS | | 11 (22%) | 6(24%) | 5(20%) | |
| No previous delivery | | 8 (16%) | 4(16%) | 4(16%) | |
| Method of contraception | | | | | |
| No | | 13(26%) | 7(28.0%) | 6(24.0%) | >0.05 |
| COC | | 14 (28%) | 6(24.0%) | 8(32.0%) | |
| Injection | | 2 (4%) | 0(0%) | 2(8.0%) | |
| IUD | | 19 (38%) | 10(40%) | 9(36%) | |
| Implant | | 2 (4%) | 2(8%) | 0(0%) | |
| Years of menopause | | | | | |
| 1-5. | | 31(62%) | 15(60%) | 16(64%) | >0.05 |
| 6-10. | | 8(16%) | 5(20%) | 3(12%) | |
| 11-15 | | 7(14%) | 3(12%) | 4(16%) | |
| >15 | | 4(8%) | 2(8%) | 2(8%) | |

Pelvic examination revealed a bulky AVF uterus in (8/25) 32% of women with

postmenopausal bleeding whereas 10 out of 25 women with postmenopausal

bleeding (40%) and 17 (68%) of control cases had normal AVF uterus. Also, uterus not felt in 6 (24%) of patients with PMB and 8(32%) of controls. Additionally, only one woman with PMB had RVF uterus ($P = 0.005$). Local speculum examination showed that all studied cases had normal cervix.

TVS findings were divided into normal findings detected in 30 out of 50 studied cases (60%). In addition, the following abnormal findings were seen in 40% (20/50) of the studied cases. Of the 25 women with PMB, endometrial hyperplasia was seen in 10 women (40%), endometrial hyperplasia and polyps were detected in 4(16%) of patients, and multiple myoma in 3 (12%) of patients. In control group, multiple myoma was detected in only one case, also nabothian follicle was shown in another case, and there was one case diagnosed with solitary myoma. There was statistical significant difference between the two studied groups regarding TVS findings ($P < 0.001$).

Endometrial thickness 6 mm or more was found in all PMB cases and 10(40%) of control cases while endometrial

thickness 5-6 mm was detected in the other 15 (60%) of control cases. There was statistical significant difference between the two studied groups regarding endometrial thickness ($P < 0.001$).

The histopathological diagnosis using endometrial biopsy was considered as gold standard. The following normal finding including atrophy of endometrium, and proliferative endometrium seen in 8/25(32%) of PMB women. The most common abnormal findings were both endometrial hyperplasia and endometrial polyp detected in 7 PMB women (28%) in each category. There were also 2 cases of adenocarcinoma and one case of adenomyosis. Abnormal findings constituted 17/25 (68%) of the PMB cases. The 7 hyperplasias consisted of 4 simple hyperplasias, 1 complex hyperplasias without atypia, 1 complex hyperplasias with atypia and 1 complex endometrial hyperplasia with focal atypia and polyp. In control group, 1 abnormal finding (endometrial hyperplasia) was detected on endometrial biopsy of 3 cases (**Table 3**).

Table (3): Comparison between the two studied groups regarding transvaginal sonographic findings

| Characteristics | Control group N=25 | Pt. with PMB group N=25 | P value |
|--|-----------------------|----------------------------------|---------|
| Pelvic examination | | | |
| Bulky AVF | 0(0%) | 8(32%) | 0.005 |
| Normal AVF uterus | 17(68%) | 10(40%) | |
| Uterus not felt | 8(32%) | 6(24%) | |
| RVF uterus | 0(0%) | 1(4%) | |
| Local speculum examination | | | |
| Cervix normal | 25(100%) | 25(100%) | 0.05 |
| 2D-TVS findings | | | |
| Normal | 22(88%) | 8(32%) | <0.001 |
| Endometrial hyperplasia | 0(0%) | 10(40%) | |
| Endometrial hyperplasia and polyps | 0(0%) | 4(16%) | |
| Multiple Myoma | 1(4%) | 3(12%) | |
| Nabothian follicle | 1(4%) | 0(0%) | |
| Solitary Myoma | 1(4%) | 0(0%) | |
| Endometrial thickness | | | |
| 5-6mm | 15(60%) | 0(0%) | <0.001 |
| 6-9mm | 10(40%) | 10(40%) | |
| 10-14mm | 0(0%) | 4(16%) | |
| 15-19mm | 0(0%) | 7(28%) | |
| ≥20mm | 0(0%) | 4(16%) | |
| Endometrial Biopsy | | | |
| Simple Endometrial hyperplasia without atypia | 3(12%) | 4(16%) | <0.001 |
| Complex Endometrial hyperplasia without atypia | 0(0%) | 1(4%) | |
| Complex Endometrial hyperplasia with atypia | 0(0%) | 1(4%) | |
| Complex Endometrial hyperplasia with focal atypia and polyp | 0(0%) | 1(4%) | |
| Polyp without atypia | 0(0%) | 5(20%) | |
| Polyp with atypia | 0(0%) | 1(4%) | |
| Proliferative | 2(8%) | 2(8%) | |
| Adenomyosis | 0(0%) | 1(4%) | |
| Adenocarcinoma | 0(0%) | 2(8%) | |
| Atrophic | 0(0%) | 3(12%) | |
| Endometrial cystic atrophy | 0(0%) | 3(12%) | |
| No biopsy | 20(80%) | 1(4%) | |

The mean ET was higher in women with hyperplasia and multiple myoma when compared to others (Table 4).

Table (4): Endometrial thickness as measured by TVS in relation to TVS findings in all studied cases

| Endometrial thickness / TVS Findings | Total (%) | 5-6mm | 6-9mm | 10-14mm | 15-19mm | ≥20mm | Mean ± SD |
|--------------------------------------|-----------|-----------|----------|---------|----------|---------|-------------|
| Normal | 30(60%) | 14(93.3%) | 14(70%) | 1(25%) | 1(14.3%) | 0(0%) | 5.4 ± 2.8 |
| Endometrial hyperplasia | 10(20%) | 0(0%) | 2(10%) | 1(25%) | 6(85.7%) | 1(25%) | 15.1 ± 5.05 |
| Endometrial hyperplasia and polyps | 4(8%) | 0(0%) | 0(0%) | 2(50%) | 0(0%) | 2(50%) | 21.1 ± 11.5 |
| Multiple Myoma | 4(8%) | 0(0%) | 3(15%) | 0(0%) | 0(0%) | 1(25%) | 11.3 ± 7.3 |
| Nabothian follicle | 1(2%) | 1(6.7%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 5 |
| Solitary Myoma | 1(2%) | 0(0%) | 1(5%) | 0(0%) | 0(0%) | 0(0%) | 7 |
| Total | 50(100%) | 15(100%) | 20(100%) | 4(100%) | 7(100%) | 4(100%) | 9.04 ± 7.02 |

The present study indicated that the mean ET was higher (>20mm) in women with complex endometrium hyperplasia and carcinoma when compared to others. Furthermore, the majority of cases with

endometrial polyps (67%) had ET ranged from 15-19 mm. These results indicated that the greater the endometrial thickness, the higher the incidence of endometrial cancer was present (Table 5).

Table (5): Endometrial thickness as measured by TVS in relation to Endometrial biopsy in all studied cases

| Endometrial thickness / Endometrial biopsy | Total (%) | 5-6mm | 6-9mm | 10-14mm | 15-19mm | ≥20mm |
|---|-----------|----------|----------|---------|----------|---------|
| Simple Endometrial hyperplasia without atypia | 7(14%) | 0(0%) | 4(20%) | 1(25%) | 2(28.6%) | 0(0%) |
| Complex Endometrial hyperplasia | 3(6%) | 0(0%) | 1(5%) | 0(0%) | 0(0%) | 2(50%) |
| Polyp | 6(12%) | 0(0%) | 1(5%) | 1(25%) | 4(57.1%) | 0(0%) |
| Proliferative | 4(8%) | 0(0%) | 3(15%) | 0(0%) | 1(14.3%) | 0(0%) |
| Adenomyosis | 1(2%) | 0(0%) | 0(0%) | 1(25%) | 0(0%) | 0(0%) |
| Adenocarcinoma | 2(4%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 2(50%) |
| Atrophy | 6(12%) | 0(0%) | 6(30%) | 0(0%) | 0(0%) | 0(0%) |
| No Biopsy | 21(42%) | 15(100%) | 5(25%) | 1(25%) | 0(0%) | 0(0%) |
| Total | 50(100%) | 15(100%) | 20(100%) | 4(100%) | 7(100%) | 4(100%) |

The vascularity of endometrium was assessed using power Doppler. Approximately half of the women with PMB (40%) had no abnormal vascularity.

Among women who had vascularity, 16 percent had single-vessel, 32 percent had scattered-vessel and 8 percent had multiple-vessel pattern. Also, iso or hypo-

echogenic intracavitary nodule displayed a vascular ring was detected in only on PMB case (table 6). The current study showed that all the 4 women who had single-vessel pattern had polyp. In 8 women who had scattered-vessel pattern, the endometrium biopsy results were simple endometrium hyperplasia (3), complex endometrium hyperplasia (2),

polyp (1), and adenomyosis (1). In those who had multiple-vessel pattern, the final histopathological diagnoses were adenocarcinoma. Iso or hypo-echogenic intracavitary nodule displayed a vascular ring was detected in only one case with complex endometrium hyperplasia (**Table 6**).

Table (6): Comparison between the two studied groups regarding Color Doppler results

| Parameters | Groups | Control group N=25 | Pt. with PMB group N=25 | P value |
|---|--------|-----------------------|-------------------------------|---------|
| | | No.(%) | No.(%) | |
| <i>Color Doppler results</i> | | | | |
| Scanty vessels were identified scattered in the endometrium | | 0(0%) | 8(32%) | <0.001 |
| Single-vessel pattern vascular stalk in a hyperechogenic nodule | | 1(4%) | 4(16%) | |
| No endometrial thickness or lesions occupying this space either were seen in the gray scale and no vascularization nodule | | 24(96%) | 10(40%) | |
| Multiple-vessel pattern | | 0(0%) | 2(8%) | |
| Iso or hypo-echogenic intracavitary nodule displayed a vascular ring | | 0(0%) | 1(4%) | |

From the previous results we can detect that single-vessel, and scattered-vessel patterns could predict polyp, and

hyperplasia, respectively. In addition, multiple-vessel patterns could predict carcinoma (**Table 7**).

Table (7): Doppler results in relation to endometrial biopsy in all studied cases

| Endometrial biopsy | Doppler results | Total (%) | No vascularity | Scattered-vessel pattern | Single-vessel pattern | Multiple-vessel pattern | Nodule with vascular ring |
|---|-----------------|-----------|----------------|--------------------------|-----------------------|-------------------------|---------------------------|
| Simple endometrial hyperplasia without atypia | | 4(16%) | 1(10%) | 3(37.5%) | 0(0%) | 0(0%) | 0(0%) |
| Complex endometrial hyperplasia | | 3(12%) | 0(0%) | 2(25%) | 0(0%) | 0(0%) | 1(100%) |
| Polyp | | 6(24%) | 1(10%) | 1(12.5%) | 4(100%) | 0(0%) | 0(0%) |
| Proliferative | | 2(8%) | 2(20%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) |
| Adenocarcinoma | | 2(8%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) | 0(0%) |
| Adenomyosis | | 1(4%) | 0(0%) | 1(12.5%) | 0(0%) | 0(0%) | 0(0%) |
| Inadequate biopsy | | 1(4%) | 0(0%) | 1(12.5%) | 0(0%) | 0(0%) | 0(0%) |
| Atrophy | | 6(24%) | 6(60%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) |
| Total | | 25(100%) | 10(100%) | 8(100%) | 4(100%) | 2(100%) | 1(100%) |

Patients with PMB had statistically significant lower uterine RI and uterine PI (0.733±0.115 and 1.178±0.325, respectively) compared to control cases (0.93±0.083 and 1.889±0.26), (P<0.001) (Table 8).

Table (8): Comparison of uterine artery RI and PI between cases with PMB and control groups

| Parameters \ Groups | Total N=50 | Control group N=25 | Pt. with PMB group N=25 | P value |
|----------------------------------|-------------|--------------------|-------------------------|----------|
| Uterine RI Mean ± S.D. | 0.83±0.14 | 0.93±0.083 | 0.733±0.115 | <0.001** |
| Uterine PI Mean ± S.D. | 1.533±0.46 | 1.889±0.26 | 1.178±0.325 | <0.001** |
| Spiral RI Mean ± S.D. | 0.612±0.074 | - | 0.612±0.074 | - |
| Spiral PI Mean ± S.D. | 0.97±0.2 | - | 0.97±0.2 | - |

Taking endometrium biopsy as the gold standard, the diagnostic performance of endometrium thickness and uterine artery RI and PI for differentiating cases with abnormal finding in endometrium biopsy from those without was carried out using ROC curve. Atrophic endometrium and proliferative endometrium were considered normal diagnoses, while endometrial hyperplasia, endometrial polyp, and endometrial cancer were

considered abnormal diagnoses. In the present study all PMB cases with abnormal diagnosis had endometrial thickness of >6 mm. measured by TVS, so raising the cut of value to 7.75 mm had 93.8% sensitivity and with specificity, positive predictive value, negative predicted value and diagnostic accuracy (87.5%, 93.8%, 87.5% and, 91.7% respectively). The AUROC was 0.883 & P=0.003 (Figure 1).

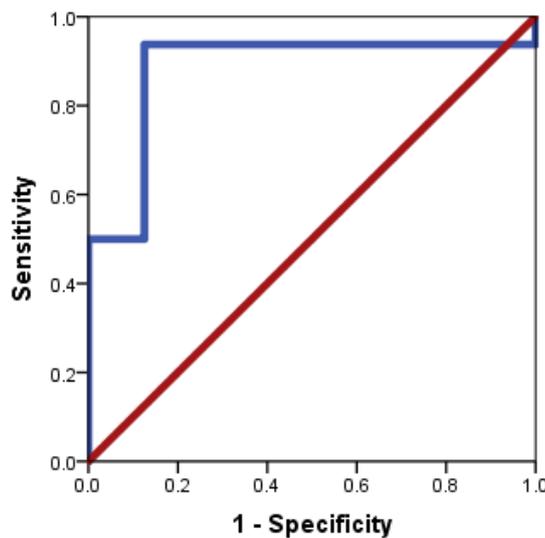


Figure (1): Roc curve analysis of ET in the detection of cases with abnormal findings in biopsy

Also, Roc curve analysis shows that all Doppler indices were not significant in the detection of the abnormal findings in biopsy. The best indices is uterine RI with cutoff value 0.729 and P=0.076 whereas

the AUROC for uterine PI, spiral RI and spiral PI was (0.52, P=0.872), and (0.467, P-value=0.796) and (0.483, P=0.796) (Figure 2).

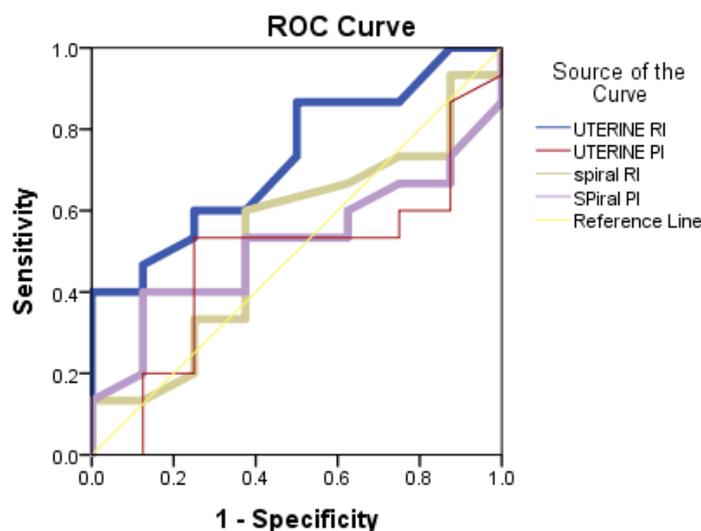


Figure (2): Roc curve analysis of all Doppler indices in the detection of cases with abnormal findings in biopsy

DISCUSSION

As regard TVS results, in line with our findings, *Patil et al. (2014)* reported that the most familiar endometrial pathology in their study was simple hyperplasia devoid of atypia (28%) followed by secretory endometrium (19%) and proliferative endometrium (16%). Furthermore, *El-khayat et al. (2011)* who paralleled trans-vaginal sonography and hysteroscopy for the revealing of pathological endometrial lesions in women with perimenopausal found that endometrial hyperplasia was the most frequent finding via TVS (32%) followed by endometrial polyp (26%).

Moreover, the present study indicated that the mean ET was 6 or less in normal patients and it was higher (>20mm) in women with complex endometrium hyperplasia and carcinoma when

compared to others. Furthermore, the majority of cases with endometrial polyps (67%) had ET ranged from 15-19 mm. These results indicated that the greater the endometrial thickness, the higher the incidence of endometrial cancer is present.

Ozelci and his Colleges (2019) reported that the mean endometrial thickness was 13.1 ± 7.1 mm in patients diagnosed with endometrial polyps and 12.0 ± 2.1 mm in endometrial cancer patients.

In the current study, all PMB cases with abnormal diagnosis had endometrial thickness of >6 mm. measured by TVUS, so raising the cut of value to 7.75 mm had 93.8% sensitivity and with specificity, positive predictive value, negative predicted value and diagnostic accuracy (87.5%, 93.8%, 87.5% and, 91.7% respectively). The AUROC was 0.883).

Krishnamoorthy and Shanthini (2014) stated that sensitivity and specificity of normal endometrium by TVS was low and for other benign endometrial lesions the sensitivity and specificity were 45.71% & 75.56% for endometrial hyperplasia, 56.25% & 91.67% for endometrial polyp and 50% & 94.95% for atrophic endometrium. In a study accomplished by *Jacobs et al. (2011)* on patients with PMB to judge the sensitivity of TVUS screening for endometrial cancer in postmenopausal women, they found that the 5 mm endometrial thickness is the cutoff value for endometrial carcinoma detection with sensitivity of 77.1% and specificity of 85.8%.

In our study, only 10 asymptomatic PM women had endometrial thickness from 6-9mm with only 3 cases with detected pathological lesions and no endometrial carcinoma cases. In contrast to our study, *Ozelci et al. (2019)* reported malignant cases in asymptomatic postmenopausal women with the optimal cutoff value for premalignant and malignant lesions was found to be 10.5 mm with 77% sensitivity and 62% specificity.

In *Breijer et al. (2012)* meta-analysis, the prevalence of endometrial carcinoma and atypical endometrial hyperplasia in asymptomatic women who were not on hormone replacement therapy (HRT) was found to be 0.62% and 0.59%, respectively, and they recommended the application of endometrial thickness as a predictor for premalignant and malignant lesions in women with vaginal bleeding.

Kim et al. (2015) stated that the positive cutoff value for the prediction of malignancy with an endometrial thickness

was 9.5 mm. This means that endometrial thickness of >5 mm necessitates extra evaluation with approaches such as endometrial biopsy, whole curettage, catheter sampling, or hysteroscopic guided biopsy. However, in their study, an endometrium thicker than 9.5 mm is of better attention and is should be suspiciously assessed with malignancy in attention.

Furthermore, our results revealed that 16 percent had single feeding vessel, 32 percent had scattered-vessels and 8 percent had multiple-vessel pattern. Also, iso or hypo-echogenic intracavitary nodule displayed a vascular ring was detected in only on PMB case all the 4 women who had single-vessel pattern had polyp. Moreover, Patients with PMB had statistically significant lower uterine artery resistance index (RI) and uterine artery pulsatility index (PI) compared to control cases. According to endometrium biopsy, RI was noticed to be the lowest in carcinoma, followed by that in cases with complex endometrial hyperplasia cases and polyp. The best indices is uterine RI with cutoff value 0.729 whereas the AUROC for uterine PI, spiral RI and spiral PI was (0.52,), and (0.467) and (0.483). There was a significant correlation between left and right uterine artery measurements so either can be used for screening

Our results were in accordance to *Aboul-Fotouh et al. (2012)* who reported that the manipulation of the triple vascular patterns as described by power Doppler is u beneficial to discriminate endometrial carcinoma from endometrial hyperplasia and endometrial polyps and that entire endometrial cancer people exhibited

endometrial vascularization (7 out of 7) cases (100%): 6 of them (85.7%) displayed the typical multi-vessel configuration and one case showed scattered-vessel form (14.2%).

In addition, *AbdelMaboud and Elsaid (2015)* reported a significant difference in RI of the uterine arteries in benign and malignant groups, with a tendency towards a lower RI in the malignant group, the best cutoff value for RI of uterine artery was 0.50, (0.50 or less was reported to forecast malignancy). They also found that there was also a significant lower in PI of the uterine arteries among malignant group with the best cutoff value is 0.64 compared to those with benign lesions. They reported also a significant lessen RI and PI of the spiral arteries for malignant groups with the best cutoff value for RI and of spiral arteries was 0.45. The diminution in RI values in malignancy is supposed to be a reflection of the neovascularization arising within and around the tumor tissue distal to the uterine artery sampling point .

In addition, *Kucur et al. (2013)* found that there was a significant correlation between spiral artery RI and PI and different endometrial histological findings, they mentioned that in patients with endometrial cancer spiral artery PI was found to be significantly lower than other groups: hyperplasia, submucous fibroid, and endometrial polyp. Spiral artery RI was also lower in endometrial polyp, hyperplasia and fibroid groups.

Razik and his Colleagues (2012) also published that uterine artery RI and PI were significantly lower in endometrial cancer compared to non -malignant endometrial pathologies.

In agreement with our results, *Appleton and Plavsic (2012)* stated that color Doppler is advantageous tool for detecting the presence of uterine cancer, as it determines angiogenesis nature. Thus, high resistance in either sub-or intraendometrial vessels considered by resistive and/or pulsatility indices designates benign pathology, while low resistance validates possible malignant pathology.

As regard the diagnostic values of uterine artery Doppler indices, *Razik et al. (2012)* reported that both indices were poor tests for differentiation between malignant and non-malignant endometrial pathologies as was indicated by the area under the ROC curves. These results agreed with former studies that color Doppler ultrasound was of restricted value for discrimination between benign and malignant endometrium.

In contrary to our results, *Shabana and his Co-workers (2019)* detected that Uterine artery PI and RI at cutoff value, sensitivity, specificity, PPV, NPV, and accuracy of 1.82, 70.8%, 92%, 94.9%, 69.9%, and 78% for PI and 0.575, 96.2%, 100%, 100%, 92.6%, and 97% for RI, respectively, were predictive of significant causes of AUB, including endometrial hyperplasia and endometrial carcinoma in their study.

The disparity between the results of the present study and those reported by the different authors previously mentioned, might be accredited to numerous variables that can influence the Doppler measurements such as discrepancy in the angle of insonation of the Doppler beam which cannot be standardized or strictly determined, patient cooperation during the

imaging, type of Doppler beam consumed, machine resolution, quality of formed image, and the sample size.

CONCLUSION

Both TVUS and Color Doppler ultrasound were considered complementary in the investigation of PMB.

Ethical approval: Approval of ethical committee was obtained from quality education assurance unit, Faculty of Medicine, Al-Azhar University Egypt.

Conflict of interest: The authors declare that they have no conflicts of interest.

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دراسة لتقييم دور سمك بطانة الرحم والدوبلر الملون بواسطة الموجات فوق الصوتية عبر المهبل في تشخيص نزيف ما بعد إنقطاع الطمث

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خلفية البحث: يعد النزيف المهبل بعد إنقطاع الطمث هو الشكوى الأكثر شيوعاً في عيادة أمراض النساء لتلك الفئة العمرية والتي قد تكون بمثابة نذير بحدوث سرطان بطانة الرحم أثناء فترة ما بعد إنقطاع الطمث. ويعد سرطان بطانة الرحم من أكثر أمراض النساء شيوعاً في البلدان المتقدمة، ويستأثر بحوالي 5% من حالات السرطان، وأكثر من 2% من الوفيات بسبب السرطان في النساء في جميع أنحاء العالم. ومع أن معدل إنتشار سرطان بطانة الرحم منخفض في النساء بدون نزيف مهبل فان مزايا الإكتشاف المبكر لمثل تلك الأورام في السيدات بدون نزيف يمثل فائدة عظيمة للعلاج المبكر.

الهدف من البحث: إستكشاف العلاقة بين سمك بطانة الرحم والدوبلر الملون عن طريق الموجات فوق الصوتية عبر المهبل وأهميتها للتنبؤ بأمراض بطانة الرحم عند النساء بعد إنقطاع الطمث العرضي وبدون أعراض.

المريضات وطرق البحث: تم اجراء هذه الدراسة في قسم التوليد وأمراض النساء فى مستشفى كفر الشيخ العام ومستشفى السيد جلال على 50 سيدة من السيدات بعد إنقطاع الطمث العرضي وبدون أعراض خلال الفترة من فبراير 2020 إلى سبتمبر 2020 وتم تقسيم الحالات إلى مجموعتين متساويتين : المجموعة (1): عانت من نزيف ما بعد إنقطاع الطمث والمجموعة (2): بعد إنقطاع الطمث دون نزيف ما بعد إنقطاع الطمث.

النتائج: فيما يتعلق بنتائج نتائج الموجات الصوتية عبر المهبل، تم الكشف عن النتائج الطبيعية في 30 من أصل 50 حالة مدروسة (60%). ولوحظت النتائج غير الطبيعية التالية في 40% (50/20) من الحالات المدروسة. من بين 25 امرأة

مصابة بنزيف ما بعد إنقطاع الطمث ولو حظ تضخم بطانة الرحم في 10 نساء (40%) وتم الكشف عن تضخم بطانة الرحم والزوائد اللحمية في 4 (16%) من المرضى، والورم العضلي المتعدد في 3 (12%) من المرضى. وفي المجموعة الضابطة، تم إكتشاف ورم عضلي متعدد في حالة واحدة فقط، كما تم تشخيص حالة واحدة بالورم العضلي الانفرادي. وكان هناك فرق ذو دلالة إحصائية بين المجموعتين. وقد وجد أن سمك بطانة الرحم 6 ملم أو أكثر وجد في جميع حالات نزيف ما بعد إنقطاع الطمث و 10 (40%) من حالات التحكم بينما كان سمك بطانة الرحم 5-6 ملم في 15 (60%) أخرى من حالات الضبط. وكانت هناك فروق ذات دلالة إحصائية بين المجموعتين المدروسة فيما يتعلق بسمك بطانة الرحم. وقد كان لدى الموجات الصوتية عبر المهبل في الكشف عن تضخم بطانة الرحم البسيط حساسية 42.9% وخصوصية 30% وقيمة تنبؤية إيجابية 100% وقيمة تنبؤية سلبية 97.4% ودقة 97.9%. بينما في الكشف عن تضخم بطانة الرحم المعقد كان لديه حساسية 33.3% وخصوصية 97.8% وقيمة تنبؤية إيجابية 50% و 95.7% قيمة تنبؤية سلبية و 93.75% دقة. في الكشف عن الورم الحميد والسرطان الغدي كان لديه حساسية 100%، خصوصية 100%، قيمة تنبؤية إيجابية 100%، قيمة تنبؤية سلبية 100%، دقة 100%. حيث كان في العضال الغدي حساسية 33.3%، وخصوصية 100%، وقيمة تنبؤية إيجابية 100%، وقيمة تنبؤية سلبية 97.8%، ودقة 95.8%.

الإستنتاج: التصوير بالموجات فوق الصوتية عبر المهبل والموجات فوق الصوتية دوبلر الملونة مكملين في فحص نزيف ما بعد إنقطاع الطمث.