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Original Article

Diagnostic Accuracy of Transvaginal Strain Sonoelastography in Differentiating Between Endometrial Hyperplasia versus Carcinoma Among Postmenopausal Women

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ABSTRACT

Objective: To assess the diagnostic accuracy of transvaginal strain sonelastography in being able to differentiate between endometrial hyperplasia and endometrial carcinoma in postmenopausal women.

Study Design: Cross sectional study.

Place and Duration of Study: Mayo Hospital, Lahore, Pakistan, from Jul 2019 to May 2021.

Methodology: We enrolled 113 patients in our study, after obtaining informed consent. Transvaginal ultrasound was performed by the researcher, and endometrial echo complex thickness was taken, excluding any fluid present in endometrial cavity while strain elastography was also performed. During elastography, repetitive mild compressions and decompressions were given, and measurements were taken at times when bar was green. ELX2/ELX1 readings were calculated and noted on a pre-designed data collection tool. Patients were referred to gynecologist for endometrial sampling after which histopathology reports were obtained, and results were recoded as either benign or malignant.

Results: Out of 113 patients, 82 were found to have benign endometrial pathologies with mean ELX2/ELX1 of 0.94±0.65 while 31 patients, with malignant endometrial carcinoma, had mean ELX2/ELX1 of 2.34±1.41. Transvaginal strain sonoelastography was found to have a sensitivity of 90.32%, specificity of 75.61%, positive predictive value of 58.33%, and negative predictive value of 95.35% with an overall diagnostic accuracy of 79.65% in being able to differentiate between benign and malignant endometrial pathologies.

Conclusion: Transvaginal strain sonoelastography was found to be a useful investigation for differentiation between endometrial hyperplasia and carcinoma in postmenopausal women and can be used as a complementary investigation to conventional transvaginal ultrasound.

Keywords: Endometrial Carcinoma, Postmenopausal Bleeding, Sonoelastography.

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INTRODUCTION

Postmenopausal bleeding (PMB), defined as the occurrence of bleeding twelve months after cessation of menstrual cycle, is quite common,[1] effecting up to 10% of all postmenopausal women and accounting for almost 5% of all outpatient visits to the gynecologist.[2,3] Many conditions, such as endometrial hyperplasia, atrophic endometrium, uterine polyp, leiomyoma as well as endometrial cancer, can be the cause of postmenopausal bleeding,[3,4] but it is commonly caused by benign lesions, however, endometrial carcinoma, which can be malignant, accounts for 10% of all cases and warrants immediate investigation.[5] Endometrial carcinoma is 6th most common cancer among women globally with an even higher incidence in Pakistan,[6,7] with frequency of endometrial carcinoma among women with postmenopausal bleeding, visiting Khyber Teaching Hospital, Peshawar, Pakistan, reported to be 30.5%.[8] Many investigations are presently available to evaluate women presenting with postmenopausal bleeding including Transvaginal Ultrasonography (TVUS), Contrast Ultrasonography, also known as Saline Infusion Sonography (SIS), Hysteroscopy and Endometrial Sampling. TVUS remains the first-line investigation to evaluate postmenopausal bleeding, in which endometrial echo complex thickness of less than 5 mm has fairly low probability of endometrial carcinoma, however, more than 5 mm endometrial thickness has a higher probability of endometrial carcinoma and warrants further evaluation by histopathology of endometrial sampling as TVUS alone cannot adequately differentiate between endometrial hyperplasia and carcinoma.[9-11] Thus, this study was planned with the aim of assessing the diagnostic accuracy of transvaginal strain sonoelastography in being able to differentiate between endometrial hyperplasia and endometrial carcinoma in postmenopausal women.

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METHODOLOGY

This cross-sectional study commenced at Mayo Hospital, Lahore, Pakistan, along with other allied hospitals of King Edward Medical University, these being, Lady Atchison Hospital, Lahore, Pakistan, and Lady Willington Hospital, Lahore, Pakistan, from January 2020 to July 2022, after obtaining approval of Institutional Review Board, King Edward Medical University through letter no. 2165/RC/KEMU, dated 11 December 2019. Our sample size of 113 patients was estimated by using 95 % confidence level with expected frequency of endometrial carcinoma among Pakistani women set at 30.5 %, as reported in literature.[8]

Inclusion Criteria: Women who presented to Gynecology OPD with per vaginal bleeding after 12 months of cessation of menstrual cycle and had endometrial echo complex thickness of >5mm on transvaginal ultrasound were included.

Exclusion Criteria: Women on hormone replacement therapy, diagnosed cases of endometrial carcinoma or hyperplasia and on whom endometrial sampling had already been done were excluded.

Informed consent was taken after explanation of procedure and study. B mode ultrasound was performed using transvaginal probe by female researcher and pelvic ultrasound examination was performed, where endometrial echo complex thickness was taken in sagittal and axial plane. If fluid was present in endometrial cavity, then its thickness was subtracted from total thickness of echogenic endometrium. Among patients having endometrial echo complex thickness of more than 5 mm, strain elastography was performed where repetitive mild compressions and decompressions were applied, and measurements were taken when the bar was green. Sonographically normal myometrium (ELX1) and thickened endometrium (ELX2) were measured inside the box by inserting region of interest (ROI) on trans-sagittal plane. The area of ROI was kept the same to avoid bias. ELX2/ELX1 ratio was calculated and recorded for each woman as shown in Figure-1 and Figure-2. Patients were referred to a senior gynecologist for endometrial sampling and histopathology reports of endometrial sampling were obtained. These reports were recorded as endometrial hyperplasia (Benign) or carcinoma (Malignant). All data was recorded on pre-designed proforma, which was then entered and analyzed in Statistical Package for Social Sciences (SPSS) version 23.0. Sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) of sonoelastography were calculated taking histopathology as gold standard.

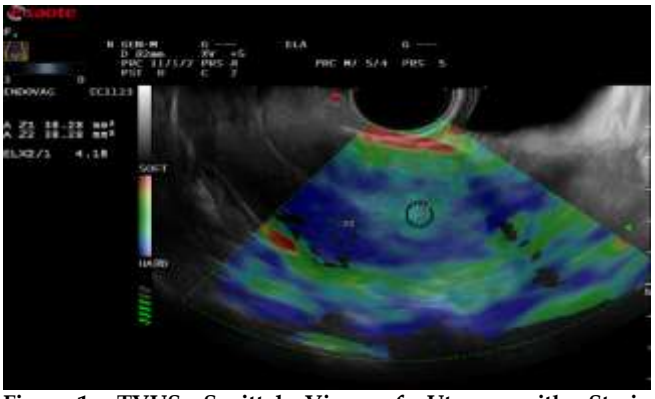

Figure-1: TVUS Sagittal View of Uterus with Strain Sonoelastography. ROI for ELX 1 (Z1) is Placed on Normal Myometrium Adjacent to Endometrium and ROI for ELX2 is Placed at Endometrium. Areas of Both ROI are kept Equal, Final ratio Calculated=4.18. This Proved to be a Case of Endometrial Carcinoma on Histopathology, (n=113)

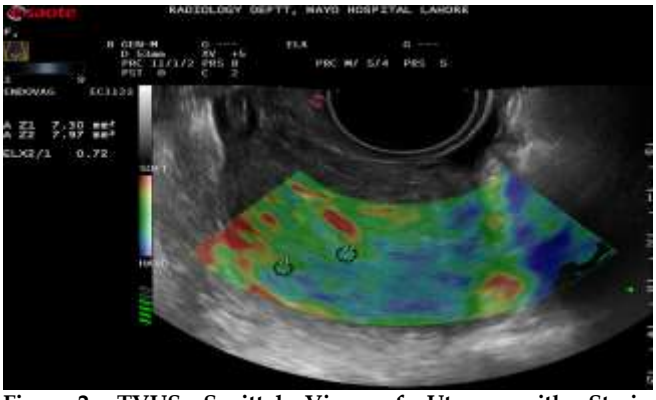

Figure-2: TVUS Sagittal View of Uterus with Strain Sonoelastography. ELX2/ELX1 Ratio in this Case was 0.72 and it was a case of Endometrial Hyperplasia on Histopathology, (n=113)

RESULTS

A total of 113 patients were included in our study, aged between 45 years to 72 years with mean age being 57.05±6.42 years. On histopathology, 82 patients were found to have endometrial hyperplasia and 31 were diagnosed with endometrial carcinoma. Patients with endometrial hyperplasia on histopathology were found to have an endometrial thickness ranging from 6.00 to 20.00 mm with mean thickness of 8.51±3.21 mm, while those with endometrial carcinoma had endometrial thickness ranging from 7.00 to 23.00 mm with mean thickness of 11.48±4.53 mm. Patients with endometrial hyperplasia on histopathology had ELX2/EL1 ratio ranging from

0.10 to 4.55 with mean of 0.94±0.65, while those with endometrial carcinoma had ELX2/EL1 ratio ranging from 0.70 to 5.52 with mean of 2.34±1.41. Using ELX2/ELX1 ratio cut off value of 1.05, transvaginal strain sonoelastography was found to have sensitivity of 90.32%, specificity of 75.61%, PPV of 58.33%, NPV of 95.38% and overall diagnostic accuracy of 79.65% as shown in Table-I.

Table-I: Diagnostic Performance Metrics (n=113)

	Benign on Histopathology	Malignant on Histopathology
Endometrial hyperplasia on Elastography	62 (54.87 %)	3 (2.65 %)
Endometrial carcinoma on Elastography	20 (17.70 %)	28 (24.78 %)

*Sensitivity= TP/(TP+FN) = 28/ (28+3) *100=90.32 %*
*Specificity= TN/(TN+FP) = 62/ (62+20) *100=75.61 %*
*Positive Predictive Value= TP/(TP+FP) *100= 28/ (28+20) = 58.33 %*
*Negative Predictive Value= TN/(TN+FN) *100=62/ (62+3) = 95.38 %Diagnostic Accuracy=(TP+TN)/All patients*100 = (28+62)/113=79.65 %*

DISCUSSION

Rationale for this study was to establish diagnostic accuracy of strain sonoelastography to differentiate between endometrial hyperplasia and carcinoma in postmenopausal women. Despite extensive research done on sonoelastography, establishing its utility in diagnostic imaging of breast, thyroid and lymph nodes, only a few studies have been done on application of sonoelastography for evaluation of endometrial pathologies and studies targeting postmenopausal women. In our setting, endometrial sampling is performed using piston suction devices as an OPD procedure while Dilation and Curettage is preferred as a second line procedure,[12] even though hysteroscopy has been found to be more accurate than both TVUS and endometrial sampling in being able to detect local pathologies like polyp and leiomyoma but it cannot differentiate between endometrial carcinoma and hyperplasia without endometrial sampling for histopathological assessment.[9,13] As sonoelastography is an ultrasound technique which quantifies the elasticity of tissues, indicating their stiffness, it can be instrumental in determining many factors including type of the cells and their organization, especially as pathology in a solid tissue can alter its elasticity, which forms the basis for the use of sonoelastography in these cases, particularly, strain sonoelastography, which uses external manual compressions as a source of stress to asses tissue deformability or hardness,[14] and can, thus, be used to differentiate benign from malignant lesions, especially those occurring in breast, thyroid, prostate and lymph nodes,[15,16] as malignant lesions are often harder than benign ones,[17,18] According to one study, sensitivity of 92.9%, specificity of 71.9%, positive predictive value of 59.1% and negative predictive value of 95.8% was found using Strain Index as a tool to differentiate endometrial hyperplasia from carcinoma in post-menopausal women.[19] These differences in stiffness of normal versus pathological tissues due to different architectural configuration form the basis for use of sonoelastography in diagnostic imaging.[20,21] Another study done on perimenopausal women, found 92.3% sensitivity and 100% specificity in diagnosing endometrial carcinoma.[22] While there is a difference in specificity of sonoelastography reported by these studies, both concluded that transvaginal sonoelastography can be used as an adjunct to conventional ultrasound and can aid in establishing diagnosis of endometrial pathologies.

LIMITATIONS OF STUDY

As only postmenopausal women were included in our study, broader enrollment of patients is needed in future studies, as endometrial carcinoma can occur in premenopausal women. Furthermore, we only studied differentiation between endometrial carcinoma and hyperplasia with no consideration made to evaluate the ability of elastography to differentiate between typical and atypical hyperplasia, as the latter is a premalignant condition, requiring different management.

CONCLUSION

Transvaginal strain sonoelastography is a safe investigation for differentiation between endometrial hyperplasia and carcinoma in postmenopausal women which can be used as a complementary investigation to conventional transvaginal ultrasound as it can aid in reducing the need for invasive endometrial sampling in women presenting with postmenopausal bleeding.

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Authors' Contribution

The following authors have made substantial contributions to the manuscript as under:

ABR & MJM: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AA & AM: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

AA & SA: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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