Role of Transvaginal Ultrasonography in Assessing Depth of Myometrial Invasion among Patients with Uterine Cancer

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ABSTRACT

BACKGROUND

In some parts of world endometrial cancer (En-Ca) accounts for 4-8% of all cancers, fourth most common cancer after breast, colon and lung cancers. In others it is less common, lowest rates in India and south-east Asia. Morbidity and mortality are low because most patients present at early stage for abnormal bleeding though pain also could be there. Recently there is an increase in the incidence in India due to changing lifestyles and food habits.

METHODS

This prospective study has been conducted in the Department of Radiodiagnosis, GSL General Hospital and Medical College, Rajahmundry, from January 2016 to June 2017. A total of 33 consecutive histologically proven early stages of endometrial carcinoma patients were included in the study. Transvaginal ultrasound examinations were performed by a radiologist using Philips HD7XE machine with 5.0 to 7.5 MHz curvilinear array transducer probe.

RESULTS

Transvaginal ultrasonography was found to have a sensitivity of 93.75%, specificity of 88.23%, positive predictive value of 88.23% and negative predictive value of 93.75% in diagnosis of stage 1a. On the other hand, sensitivity of 88.23%, specificity of 93.75%, positive predictive value of 93.75% and negative predictive value of 88.23% in diagnosing stage 1b.

CONCLUSIONS

Transvaginal sonography has high sensitivity, specificity, PPV and NPV in detecting depth of myometrial invasion of early stages of uterine cancer. Transvaginal sonography is much more operator dependent, but is less expensive and more widely available.

KEYWORDS

Endometrial Cancer, Transvaginal Ultrasonography, Sensitivity, Specificity, Myometrial Invasion

BACKGROUND

In some parts of world, endometrial cancer (En-Ca) accounts for 4-8% of all cancers, fourth position after breast, colon and lung cancers. In others it is less common with lowest rates in India and southeast Asia. Morbidity, mortality are low because most patients present at early stage for abnormal bleeding though pain also could be there.[1] Carcinoma of the endometrium is the most common invasive carcinoma of the female genital tract, accounting for almost one half of all gynaecological cancers in the United States Recently there is an increase in the incidence in India due to changing lifestyles and food.[2,3,4] The depth of myometrial invasion (DMI) is one of the most important prognostic indicators and determinants of therapy in endometrial cancer. Since the prevalence of pelvic and lumboaortic nodal metastases is directly related to this parameter which determines the mode of treatment, If the myometrium is not invaded, nodal metastasis is present in only about 3% of patients and If the invasion is deep nodal metastasis is present in about 40% of cases. So selective pelvic and para-aortic lymph node dissection should be done in all patients with deep myometrial invasion. Survival also decreases with increasing depth of myometrial invasion. Patients with noninvasive or superficially invasive tumors have an 80%-90% 5-year survival rate, whereas those with deeply invasive tumours have a 60% survival rate.[5,6]

Transvaginal sonography has greatly improved the diagnostic accuracy of this technique, allowing a more detailed evaluation. Previous studies have reported the concordance with histologic examination of transvaginal sonography for determining the depth of myometrial involvement by endometrial carcinoma to be 80-84%.[7] Multitude of these studies were conducted in western population and this study is conducted to establish the role of Transvaginal ultrasonography in the assessment of myometrial invasion by endometrial carcinoma compared to histological diagnosis.

METHODS

This prospective study has been carried in the department of Radio diagnosis, GSL general hospital and medical college, Rajahmundry from January 2016 to June 2017. A total of 33 consecutive histologically proven endometrial carcinoma patients were included in the study. The study period was from January 2016 to June 2017. All of the patients referred were inpatients in the Department of Obstetrics and Gynaecology, GSL general hospital and medical college, with early stage endometrial carcinoma. The protocol of the study was approved by the research council and ethical committee of the institute. Informed consent was taken from all patients who participated in the study.

Patients with histologically proved endometrial carcinoma who were undergoing surgicopathological staging were included in the study. Patients with advanced disease who are not for surgicopathological staging were excluded from the study.

Histologic Staging[8]
All specimens obtained from the suspected cases through fractional curettage were subjected to histological examination and staging was done as per the following criteria-

Stage 1a- Limited to the endometrium and invading less than 50% of the myometrium.

Stage 1b- Invading more than 50% of the myometrium.

Staging Using Trans Vaginal Ultrasonography
Transvaginal ultrasound examinations were performed by a radiologist using Philips HD7XE machine with 5.0 to 7.5 MHz curvilinear array transducer probe. All patients were asked to empty their bladder before performing TVS. The longitudinal, transverse and anteroposterior diameters of the uterus were imaged, and the depth of myometrial invasion was estimated.

Stage 1a- The presence and intact hypoechoic halo that surrounds the outer layer of the endometrium or partial or complete interruption of the subendometrial halo and the abnormal echo extends into the inner half of the myometrium.

Stage 1b- In addition to 1a findings the residual myometrium is thin, but the outer stripe of the myometrium is preserved.[9]

Statistical Analysis
All statistical analysis was performed by using SPSS software 16.0 and MS excel-2007. Descriptive statistical data was presented as mean and percentages. Sensitivity, specificity, positive and negative predictive values were calculated between TVS and histological findings.

RESULTS

Among 33 histologically confirmed cases of early stage endometrial carcinoma included in the present study majority 51.51% were belonging to 60-69 age group and the least (12.12%) belonged to the 40 49 age group. The mean age of subjects was 57.5 ± 12.5 years. Majority (78.80%) of the patients were postmenopausal and three (21.20%) were premenopausal. Seventeen (57.5%) of the patients were diabetics and fifteen (48.4%) were obese. Nine (30%) of the patients had both diabetes and obesity. Three (9%) of the patients were nulliparous. None of the patients took hormone replacement therapy. (Table-1)

Histologically majority 32 (96.96%) of the patients had endometrioid adenocarcinoma. One (3.03%) patient had squamous cell carcinoma. As per depth of invasion is concerned 16 (48.5%) patients were in stage 1a and 17 (51.5%) were classified as stage 1b. Among 16 subjects diagnosed as stage 1a by histology, 15 (93.7%) were diagnosed as stage 1a and 1 (6.3%) was found to be stage 1b by TVS respectively. Thus, one patient with stage 1a was

over diagnosed as 1b by TVS. Out of 17 subjects diagnosed to be in stage 1b by histology, 15 (88.2%) subjects were classified as 1b and 2 (11.8%) were classified as 1a by TVS respectively. Thus, two of the patients were under diagnosed as 1a by TVS. (Table 2)

Parameter	Number of Patients (%)
Age in Years	
40-49	4 (12.12%)
50-59	12 (36.36)
60-69	17 (51.15)
Menopausal Status	
Premenopausal	7 (21.20%)
Postmenopausal	26 (78.80%)
Risk Factors	
Nulliparity	3 (9%)
Obesity	16 (48.4%)
Diabetes	19 (57.5%)
Table 1. General Characteristics of Study Subjects	

Histology		TVS
Stage 1a (n=16)	1a	15 (93.7%)
	1b	1 (6.3%)
Stage 1b (n=17)	1a	15 (88.2%)
	1b	2 (11.8%)
Table 2. Comparison of Invasion Staging between Histology and TVS		

Stage	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Stage 1a	93.75%	88.23%	88.23%	93.75%
Stage 1b	88.23%	93.75%	93.75%	88.23%
Table 3. Sensitivity, Specificity, Positive and Negative Predictive Values of TVS Compared to Histology				

Image 1. Prepubertal Uterus, Mid Sagittal View Showing Gross Tubular Anatomy with Thin Endometrium

Image 2. Premenopausal Uterus, Mid Sagittal View Showing Thicker and Proliferative Endometrium

Image 3. Postpartum Uterus USG, Mid Sagittal View

Image 4. Post-Menopausal Uterus, Mid Sagittal View Showing Thin Atrophied Endometrium

Transvaginal ultrasonography was found to have sensitivity of 93.75%, specificity of 88.23%, positive predictive value of 88.23% and negative predictive value of 93.75% in diagnosis of stage 1a. On the other hand, sensitivity of 88.23%, specificity of 93.75%, positive predictive value of 93.75% and negative predictive value of 88.23% in diagnosing stage 1b. (Table-3).
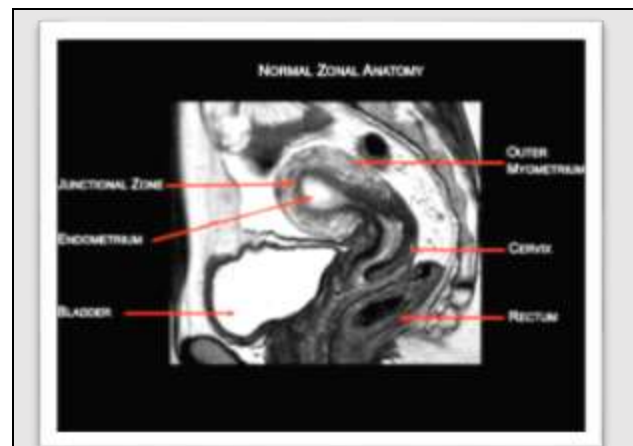

Image 5. T2 Weighted MRI, Mid Sagittal View Showing Zonal Anatomy

Image 6. Transvaginal Sonogram Obtained in Short Axis of Endometrium Shows Bulky Tumour with Deep Myometrial Invasion
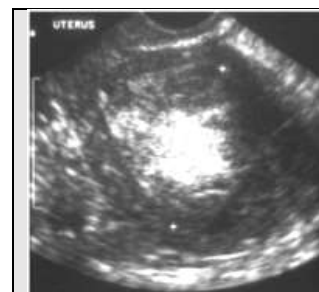

Image 7. Transvaginal Sonogram Obtained in Short Axis of Endometrium Shows Bulky Tumour with Deep Myometrial Invasion

Image 8. Long Axis Transvaginal Sonogram Image Shows Polypoid Endometrial Carcinoma with Superficial Myometrial Invasion with Associated Endometrial Fluid Collection

Image 9. Transvaginal Sonogram Obtained in Long Axis of Endometrium Shows Bulky Tumour with Deep Myometrial Invasion

Image 10. Transvaginal Sonogram Obtained Long Axis of Endometrium Shows Tumour with Superficial Myometrial Invasion
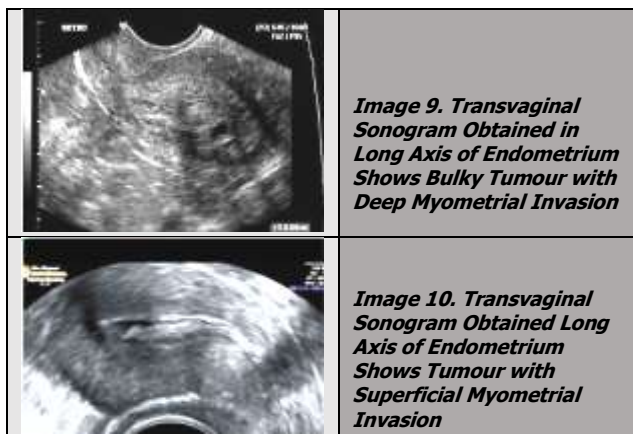
DISCUSSION

In recent years, endometrial carcinoma has become the most common gynaecologic malignancy. In most series, about 80% of patients are first seen with early-stage disease. In these cases, preoperative knowledge of myometrial tumor extension, which is a reliable index of lymphatic spread, could play an important role in planning treatment.[10,11] According to Lewitet al Targeted scanning of the uterus and its adjacent structures is made possible by high-resolution transvaginal sonography. By scanning the endometrium, a reflection of the hormonal status of the patient under both normal (e.g., the menstrual cycle) and abnormal conditions may be obtained. More sinister lesions, such as endometrial hyperplasia and carcinoma, can be suspected based on the sonographic appearance of the endometrium. In hydatidiform mole, a typical sonographic picture directs the sonographer to the diagnosis. The study showed the utility of transvaginal sonography with high-frequency probes in the evaluation of gynaecologic neoplasms.[12]

Similarly, in a study by Higgins et al among 506 asymptomatic patients 40 years or older underwent screening vaginal sonography at the University of Kentucky Medical Center. Each ovary was measured in three planes and ovarian volume was calculated using the prolate ellipsoid formula. Ovarian morphology was classified as uniformly hypoechogenic, cystic, solid, or complex. With respect to these criteria, 12 patients (2.4%) were noted to have abnormal sonograms, and 10 agreed to surgery. All 10 patients had ovarian tumours with dimensions equal to those predicted by ultrasound. Vaginal sonography is a relatively simple test that can detect subtle changes in ovarian size and morphology. Further evaluation of this test as a screening method for ovarian cancer should be performed in the setting of controlled clinical trials that emphasize cost control and strict patient follow-up.[13]

Whereas in Tessler et al Transabdominal and endovaginal pelvic sonograms were obtained in 108 nonpregnant patients referred for pelvic sonography. Overall, the endovaginal study was judged superior in 65 cases (60.2%), equal in 39 (36.1%), and inferior in four (3.7%). The authors conclude that the endovaginal

examination can effectively replace the transabdominal examination as the initial approach for routine pelvic sonography. Transvaginal sonography has a number of potential advantages, including increased resolution, especially in obese women and in women with uterine retroversion. Depiction of the endometrium is significantly better than with the transabdominal approach.[14]

CONCLUSIONS

Transvaginal sonography has high sensitivity, specificity, PPV and NPV in detecting depth of myometrial invasion of early stages of uterine cancer. Transvaginal sonography is much more operator dependent, but is less expensive and more widely available.

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