



**ORIGINAL RESEARCH PAPER**

**Radiodiagnosis**

**CORRELATIVE STUDY OF ENDOMETRIAL LESIONS BY TRANSVAGINAL ULTRASOUND AND MAGNETIC RESONANCE IMAGING**

**KEY WORDS:** Endometrium, transvaginal, MRI

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**ABSTRACT**  
 Introduction: Endometrial abnormalities are one of the most common diagnostic challenges. Imaging holds an important role in diagnosis of the lesions and differentiating them into benign and malignant. Aims: To assess the role of TVS and MRI in characterization of benign and malignant endometrial lesions and to assess the diagnostic potential of TVS & MRI by correlating with histopathology. Methods and Material: 65 patients with abnormal uterine bleeding underwent transvaginal ultrasound and subsequently pelvic MRI. Diagnosis was confirmed by Histopathology. Results: Sensitivity of TVS in detecting malignant lesions was 59% and specificity was 93 %. Sensitivity of MRI in detecting malignant lesions was 95% and specificity was 98 %. Conclusion: TVS should be used as the primary imaging modality in endometrial lesions. All patients with even slight suspicion of malignancy should be subjected to pelvic MRI.

**INTRODUCTION:**

Endometrial abnormalities are one of the most common diagnostic challenges faced by the radiologist and gynecologist. Most common presenting symptom is abnormal vaginal bleeding and the causes could be varied in premenopausal women, perimenopausal and postmenopausal women. Judicious evaluation and early detection of endometrial lesions and ascertaining whether it is benign or malignant becomes crucial as it determines the treatment strategy and the final clinical outcome.

Ultrasound is the first-line imaging modality to detect and differentiate endometrial lesions as benign, malignant or premalignant conditions. High resolution imaging of transvaginal ultrasound provides diagnostic accuracy for endometrial lesions. However this modality has shortcomings such as limited field of view, obscuration of pelvic organs by bowel gas or position of the uterus, limitations dependent on patient size, and its dependence on the skill and experience of the operator.

MRI with its excellent soft tissue contrast, larger field of view, and its multiplanar imaging capabilities, and being noninvasive, is used to evaluate female pelvis as it delineate and characterize normal female pelvic anatomy and pathology as either benign or malignant.

Study intends to provide adequate imaging features for characterization of endometrial lesions and aid the clinicians in their further management, reducing the need of invasive operative procedures for differentiating between benign and malignant lesions of the endometrium.

**AIMS AND OBJECTIVES ARE TO ASSESS:**

1. The role of TVS and MRI in characterization of benign and malignant endometrial lesions and to correlate their findings.
2. To assess the diagnostic potential of TVS & MRI in the terms of sensitivity and specificity by correlating with histopathology.

**MATERIAL AND METHODS:**

This prospective study was done in the Department of Radio diagnosis, MGMM C & M. Y. Hospital, Indore from April 2017 to

April 2018 after getting approval by Institutional Scientific Review Board. Total of 65 patients with abnormal uterine bleeding underwent transvaginal ultrasound on Siemens Ultrasound equipment and subsequently pelvic MRI on Signora 3 T scanner. Diagnosis was confirmed by Histopathology. The data was analyzed statistically.

**RESULTS:**

The majority of patients in the study belonged to the age group of 50 to 59 years (46%). The most common presenting complaint was abnormal vaginal bleeding (94%). 43% cases had an endometrial thickness ranging from 11 to 15 mm and 28% had an endometrial thickness of 6 to 10 mm. 52 % cases showed heterogeneous endometrial echotexture and 48 % showed homogenous echogenicity. Majority (66%) of the lesions were iso-intense, 29% were hypo-intense, 2 % were hyper-intense and 3% were heterogeneous on T1WI. Majority (57%) of the lesions were hypo-intense, 29% were iso-intense and 11% hyper-intense on T2WI.

Majority (62%) of cases had regular endometrial margins and rest of the cases had ill-defined (20%) or irregular (18%) margins on TVS. However on MRI 60% cases had regular endometrial margin and 29 % had irregular margin.

22% cases presented as mass-lesion and 78% as non-mass lesion in TVS. On MRI, 18 % cases appeared as mass lesion and 82% as non-mass lesions. Out of mass lesions, 6 cases (43%) showed presence of peduncle.

On colour doppler 60% cases showed increased vascularity. 30% lesions had RI value less than 0.7 and 8% cases showed presence of vascular pedicle.

On contrast enhanced MRI, 38% cases showed faint enhancement, 51 % showed heterogeneous enhancement.

32% cases showed ill-defined junctional zone on TVS, while 42% cases were detected with junctional zone involvement on MRI. Myometrial invasion was detected in 20% cases on TVS and 28% on MRI. Adjacent organ involvement was seen in 4% cases on TVS and in 14% cases on MRI. 8% cases were detected with lymphatic metastasis on MRI. On DWI benign lesions showed no diffusion restriction while malignant

lesions showed restriction.

The mean ADC value of benign lesions was found to be  $1.39 \times 10^{-3} \text{mm}^2/\text{sec}$  and that of malignant lesions was found to be  $0.8 \times 10^{-3} \text{mm}^2/\text{sec}$ .

**Table 1: Diagnostic Outcomes of Various Modalities**

Modality/Diagnosis	TVS	MRI with DWI	HPE
Synechiae	2	2	2
Endometritis	10	7	7
Polyp	6	4	4
Endometrial Hyperplasia	19	18	18
Malignancy	16	22	22
Submucosal Fibroid	7	6	6
Adenomyosis	5	6	6
Total	65	65	65

**Table 2: Benign Vs Malignant Differentiation**

Modality/Diagnosis	TVS	MRI with DWI	HPE
Benign	49	43	43
Malignant	16	22	22
Total	65	65	65

**DISCUSSION:**

Well defined regular marginated pedunculated focal mass lesion with vascular pedicle, with no junctional zone, myometrial or adjacent organ involvement were identified as endometrial polyp. On MRI, T1 isointense, T2 hypointense with regular well defined margins and intense enhancement were diagnosed as endometrial polyp. Presence of a stalk and of fibrous core was specific for endometrial polyp [2]. It was concluded that MR images can help to distinguish most polyps from endometrial carcinomas on the basis of morphologic features. However accuracy does not appear to be sufficient to obviate biopsy. 2 out of 6 cases, which were identified as polyps showed heterogeneous intensity on T1 and T2, had irregular margins, showed presence of necrosis within, on MRI were identified as malignant lesions. On DWI these 2 lesions showed diffusion restriction.

A heterogeneous diffuse endometrial thickening with irregular margin air foci / calcification / endometrial collection with no myometrial changes, no junctional zone involvement was suggestive of endometritis on TVS. On MRI, they were T1 isointense, T2 hyperintense with irregular margins and showing heterogeneous contrast enhancement. DWI shows no restriction and mean ADC value was  $1.45 \times 10^{-3} \text{mm}^2/\text{sec}$ .

A focal homogenous endometrial thickening with regular margins and evidence of underlying hypoechoic myometrial mass with no / minimal vascularity on colour doppler were defined as submucosal fibroid on TVS[3]. Calcification may or may not be seen. There was absence of junctional zone invasion. On MRI, T1 hypointense, T2 isointense mass lesions with regular margins and no evidence of junctional zone involvement were defined as submucosal fibroid. They showed faint enhancement on MRI. DWI showed no restriction and the mean ADC value was  $1.4 \times 10^{-3} \text{mm}^2/\text{sec}$ . 1 out of 7 cases diagnosed as submucosal fibroid on TVS presented with irregular margins heterogeneous enhancement and junctional zone involvement on MRI. This lesion showed diffusion restriction. Mean ADC value was  $0.93 \times 10^{-3} \text{mm}^2/\text{sec}$ .

Homogenous focal band like thickening of endometrium with regular margin and no internal vascularity on colour doppler were identified as endometrial synechiae on TVS. There was maintained junctional zone and absence of myometrial involvement. On MRI, T1 isointense T2 hypointense non-mass lesion with well-defined regular margin, no contrast enhancement was identified as synechiae. There was no

diffusion restriction on DWI and the mean ADC value was  $1.3 \times 10^{-3} \text{mm}^2/\text{sec}$ .

Homogenous diffuse endometrial thickening, with irregular margin and no internal vascularity with evidence of myometrial changes like myometrial cyst, echogenic myometrial nodules, myometrial heterogeneity and junctional zone involvement in the form of loss of endomyometrial interphase were identified as adenomyosis[4]. They showed no surrounding structure involvement. On MRI, T1 isointense, T2 hypointense non-mass lesions with faint enhancement and junctional zone involvement were identified as adenomyosis. No restriction was seen on DWI and mean ADC value was  $1.4 \times 10^{-3} \text{mm}^2/\text{sec}$ .

Homogenous / heterogeneous echogenicity, diffuse/ focal endometrial thickening with regular margins were defined as endometrial hyperplasia on TVS. Cystic changes were seen and there was increased vascularity seen on colour doppler. There was no junctional zone or myometrial invasion. T1 isointense, T2 isointense/hypointense non-mass lesions showing well defined margins and heterogeneous contrast enhancement were identified as endometrial hyperplasia. DWI showed no restriction and the mean ADC value was  $1.3 \times 10^{-3} \text{mm}^2/\text{sec}$ .

Heterogeneous diffuse/ focal thickening of endometrium with irregular or ill-defined margins were identified as carcinoma endometrium.[5] They had associated cystic changes or endometrial collection. There was increased vascularity and the RI value was less than  $0.7 \times 10^{-3} \text{mm}^2/\text{sec}$ . These lesions showed hypoechoic ill-defined junctional zone. 20% cases showed myometrial invasion. 2 cases showed cervical invasion, 2 cases showed parametrial invasion, 3 of them showed ovarian and adenexal involvement and 2 showed bowel and bladder involvement. On MR, T1 heterogeneously isointense/hypointense, T2 heterogeneously hypointense non-mass/ mass lesion with irregular ill-defined margins were identified as endometrial malignancy. Junctional zone invasion was present. Myometrium, cervix and s parametrial invasion was seen. Adenexal and ovarian involvement were seen in 9 cases, bowel and bladder was involved in 7 cases. Lymph node metastasis was found in 5 cases. DWI showed diffusion restriction. ADC values were lower than that of normal myometrium. Mean ADC value was  $0.9 \times 10^{-3} \text{mm}^2/\text{sec}$ .

Overall TVS had a sensitivity of 93% and specificity of 59% in diagnosis of benign endometrial conditions and sensitivity and specificity of 59% and 93% respectively in the diagnosis of endometrial Carcinoma.

When the morphological characteristics of T1W and T2W images a and contrast enhanced imaging were considered alone, the sensitivity and NPV of the MRI morphology in predicting malignant lesions turned out to be 86% and 93% respectively. The specificity and PPV were 98% and 95% respectively. When DWI is added there is marked increase in sensitivity, specificity, PPV and NPV. Therefore in conjunction with conventional sequences, DW MRI, provide qualitative and quantitative information which helps in confident and accurate diagnosis of malignant lesions of endometrium.

**CONCLUSION:**

TVS and MRI, both hold unique role in the imaging workup of endometrial lesions.

TVS should be used as the primary imaging modality in endometrial lesions as it is dynamic, widely available and less expensive. But it is less sensitive in diagnosing malignant endometrial lesions and their extend. Accuracy of TVS is 82% in detecting malignant endometrial lesions.

MRI has very high sensitivity and specificity and is almost as accurate as histopathology in differentiating benign from malignant lesions. Addition of DWI with ADC mapping to conventional MRI increases its accuracy even more

All patients with even slight suspicion of malignancy based on clinical features, age and TVS findings should be subjected to pelvic MRI with all sequences including DWI and ADC as it can detect, differentiate and characterize the lesion as benign and malignant with highest precision.

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