

Diagnostic Accuracy of Ultrasonography Versus Magnetic Resonance Imaging in the Detection of Endometrial Carcinoma Keeping Histopathology as Gold Standard

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ABSTRACT

Objective: To calculate the diagnostic accuracy of Ultrasonography versus Magnetic Resonance Imaging in detecting endometrial carcinoma with histopathology kept as a gold standard.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Diagnostic Radiology, Pakistan Institute of Medical Sciences Hospital, Islamabad Pakistan, from Apr 2019 to Apr 2020.

Methodology: This study included patients of perimenopausal and post-menopausal age groups with abnormal uterine bleeding having a high index of suspicion for endometrial malignancy referred from the Gynecology department for an ultrasound examination. Patients having high suspicion for malignancy or inconclusive evidence on ultrasound were considered for Magnetic Resonance Imaging (MRI). All of them were followed for histopathological reports after surgical exploration. Clinical, sonological and Magnetic Resonance Imaging (MRI) findings, along with histopathological diagnosis, were documented.

Results: Mean age of the patients was 56.58±10.28. Of these eight patients, 8(21.1%) did not have carcinoma upon histopathology. The most common type of carcinoma was poorly differentiated endometrial adenocarcinoma. The diagnostic accuracy of ultrasound was found to be 47.35%, while that for Magnetic Resonance Imaging (MRI) was 71.05%. Sensitivity and specificity for Ultrasound versus Magnetic Resonance Imaging (MRI) were 53.33% versus 66.67% and 75% versus 87.50%, respectively. The mean endometrial thickness on ultrasound was 15.97±5.64 mm, while on MRI was 15.42±6.9 mm.

Conclusion: Magnetic Resonance Imaging (MRI) is a more accurate and sensitive modality in detecting endometrial carcinoma in patients with abnormal uterine bleeding.

Keywords: Abnormal uterine bleeding, Endometrial carcinoma, Magnetic resonance imaging (MRI).

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INTRODUCTION

Endometrial carcinoma is the second most prevalent gynaecological malignancy among females, with high morbidity and mortality. It is the most commonest recognized genital tract malignancy in the United States.^{1,2} however is the third most frequent malignancy in developing countries, after ovarian and cervical cancer.³ Prompt diagnosis and early detection of endometrial malignancies are of prime importance in evaluating the prognosis of such patients.⁴ Timely detection also aids in selecting an appropriate treatment regimen, thus intercepting needless and undesirable hysterectomies and surgery.⁵

Ultrasound is a procurable, economically modest, and beneficial imaging modality without risk of hazardous radiations.^{6,7} A transabdominal ultrasound scan is done for the primary evaluation and is routinely performed on almost every patient coming to the

hospital with complaints of abnormal uterine bleeding. In addition, transvaginal scans are offered when there is a limitation of visualization of pelvic viscera due to obesity or for patients who cannot distend the bladder adequately.⁸ The second important modality for pelvic evaluation is magnetic resonance imaging. It is performed in all patients with a high index of suspicion of endometrial malignancy, considering their clinical history and examination and positive sonological findings. It is considered the most benefitting and applicable technique in detecting endometrial malignancies, preoperative evaluation, its staging and local invasion, thus abetting decision making regarding treatment regimen so that the threat of unnecessary surgery could be waived.^{9,10}

In our country, due to the lack of availability of MRI, diagnosis is solely made on ultrasound. Very few studies are focused on comparing the accuracy between MRI and ultrasound in detecting endometrial carcinoma. This article aims to estimate the diagnostic

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precision of ultrasound versus MRI for detecting endometrial malignancies in patients with complaints of abnormal uterine bleeding.

METHODOLOGY

The cross-sectional study was conducted at the Department of Diagnostic Radiology, PIMS hospital, in consortium with the Gynecology Department Islamabad Pakistan, from April 2019 to April 2020. Approval from the ERC was taken (No. F.1-1/2015/ERB/SZ ABMU/631). Non probability consecutive sampling technique was used. The sample size was calculated by keeping a sensitivity of 67% and specificity of 75%.¹¹

Inclusion Criteria: Patients of perimenopausal and post-menopausal age groups with abnormal uterine bleeding having a high index of suspicion for endometrial malignancy referred from the Gynecology department for an ultrasound examination were included in the study. Patients having high suspicion for malignancy or inconclusive evidence on ultrasound were considered for MRI.

Exclusion Criteria: Patients with known severe claustrophobia and metallic implants contraindicated for MRI were excluded.

Thirty-eight patients fulfilling the inclusion criteria were enrolled in the study. MRI was performed on a 1.5T superconducting magnet (Philips) MR scanner using a pelvic coil by a chief MR technician in the PIMS radiology department. Standard MR imaging protocols, including T1 and T2, were obtained in axial, sagittal and coronal planes. Post-gadolinium imaging was also done. Images were interpreted on an MR console by a single consultant radiologist having at least ten years of experience in women's MR imaging. The images were evaluated for endometrial thickness, junctional zone, endometrial mass and post-contrast enhancement. All of them were followed for histopathological reports after surgical exploration.

SPSS ver 25.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Diagnostic accuracy, sensitivity and specificity were calculated for both ultrasound and MRI, keeping histopathology the gold standard.

RESULTS

The mean age of the patients was 56.58±10.28. Most n=26(68.4%) patients presented with postmenopausal bleeding. Mostly n=14(36.8%) had complaints for one year. Out of 38 patients, 8 patients, 8(21.1%) did not have carcinoma upon histopathology. The

most common type of carcinoma was poorly differentiated endometrial adenocarcinoma n=9(23.7%) (Figure).

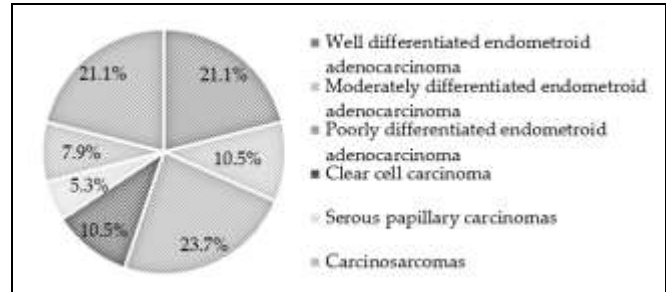


Figure: Histopathological Diagnosis (n=38)

Upon ultrasound examination, 20(52.6%) had normal size, 14(36.8%) had bulky, and 4(10.5%) had atrophic uterus. The mean endometrial thickness on ultrasound was 15.97±5.64mm. About 25(65.8%) showed heterogeneous echo texture, 22 patients (57.9%) had a mass on ultrasound (Table-I).

Table-I: Endometrial carcinoma on Ultrasonography and MRI with Comparison to Histopathological Diagnosis (n=38)

	Positive on Histopathology	Negative on Histopathology
Ultrasonography		
Positive	16(42.1%)	6(15.7%)
Negative	14(36.9%)	2(5.3%)
Magnetic Resonance Imaging (MRI)		
Positive	20(52.6%)	1(2.6%)
Negative	10(26.4%)	7(18.4%)

Upon MRI findings, 20(52.6%) had mass. 19(50%) had myometrial invasion; eleven had a loss of normal signals in the cervical stroma; 19(50%) masses showed low post-contrast enhancement than endometrium; 12 (31.6) had equal enhancement, while 7(18.4%) masses did not show post-contrast enhancement. The mean endometrial thickness on MRI was 15.42±6.9 mm. The diagnostic accuracy of ultrasound was found to be 47.35%, while that for MRI was 71.05%. Sensitivity and specificity for Ultrasound vs MRI was 53.33% vs 66.67%, 75% vs 87.50%.

Table-II: Diagnostic Parameters of Ultrasonography & MRI (n=38)

Diagnostic Parameters	Ultrasonography	MRI
Sensitivity=True Positive/(True Positive+False Negative)	53.33%	66.67%
Specificity=True Negative/(True Negative+False Positive)	75%	87.50%
Positive Predictive Value=True Positive/(True Positive+False Positive)	72.72%	95.24%
Negative Predictive Value=True Negative/(True Negative+False Negative)	30.3%	41.18%
Diagnostic Accuracy=(True Positive +True Negative)/ All Patients	47.36%	71.05%

DISCUSSION

Endometrial carcinoma is widely known as one of the most prevalent female genital tract invasive neoplasms, with high morbidity and mortality potential if not timely diagnosed and treated.^{12,13} Patients coming to the Gynaecology department for abnormal uterine bleeding, specifically in the post-menopausal age group, usually suffer from endometrial neoplasms, for which early detection and timely diagnosis are of key importance to increase the longevity and quality of life of such patients. Researchers worldwide suggest that it is commoner in the elderly population, but young people either are not immune. This has been linked to family history, Lynch syndrome, or it could be sporadic.^{14,15} The youngest patient in our study was of 38 years and had a family history of endometrial carcinoma in her maternal relations.

Ultrasound is considered the primary investigation in evaluating abnormal uterine bleeding as it excellently defines endometrial characteristics. The thickness of the endometrium not in correspondence to the menstrual cycle and age-related variation of the patient is considered pathological.¹⁶ In our study, almost all patients had abnormally increased endometrial thickness according to their age group. Studies also reveal that the heterogeneity of endometrial echotexture is also associated with an increased risk of development of endometrial carcinoma. This also includes loss of the normal endometrial-myometrial interface.¹⁷ Our study is concordant with these findings.

Magnetic Resonance imaging holds an important prime place in the detection of endometrial carcinoma. It predicts the prognosis of the patients with special regard to the future treatment strategy to be employed. It is deemed to be the most accurate investigation in detection and staging.¹⁸ On MRI images, malignant endometrial transformation is appreciated as a hypointense to isointense signal intensity area on T1 and T2, showing hyperenhancement compared to the adjacent normal myometrium. Invasion of the myometrium is one of the most important factors in predicting the prognosis of such patients. Besides, MRI can also show the invasion of the cervix, vagina and adjacent structures to accurately stage the patient and help decide the treatment regimen accordingly.^{16,18} Internationally, MRI is considered a preferred imaging modality in overall disease staging and thus aids in treatment planning. According to the American College of Radiology (ACR) appropriateness criteria, "MRI should be the preferred imaging modality for treatment

planning, when available", as it allows the best overall assessment of the disease.¹⁸ Histopathologically, there are two main broad types of endometrial carcinoma, with the most prevalent one being the endometrioid type, well known to be associated with hyperestrogenic states and morbid obesity and have a poor prognosis. In our study majority of the patients presented late, which showed advanced disease or poor differentiation of the histological grade.

CONCLUSION

Though ultrasound is among the first line of investigation for detecting malignant proliferation of endometrium in suspected and high-risk patients but suffers from low sensitivity and specificity, MRI should be considered in all patients as it is more accurate and sensitive, not only in the detection of the pathology but also aids in staging the disease and thus predicting prognosis.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

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

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

MEUH & RR: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

AE: & ME: Conception, study design, drafting the manuscript, 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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