



MRI IMAGING IN EVALUATION OF FEMALE PELVIC DISEASES WITH ULTRASOUND OR CYTO HISTOPATHOLOGICAL CORRELATION

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ABSTRACT

Background: Female pelvic masses pose a diagnostic challenge because of their diverse etiologies and overlapping clinical manifestations. Although ultrasonography (USG) is widely used as the initial imaging tool, its diagnostic performance decreases in complex or deeply located lesions. Magnetic Resonance Imaging (MRI) provides superior soft-tissue contrast and multiplanar capability, enabling more reliable lesion characterization.

Aim: To compare the diagnostic performance of MRI and USG in identifying the origin of pelvic lesions, characterizing adnexal masses, and staging gynecologic malignancies, using cyto-histopathology as the reference standard.

Methods: Fifty women with clinically suspected pelvic masses underwent USG followed by MRI. Imaging findings were correlated with surgical or histopathological outcomes to determine diagnostic accuracy.

Results: MRI demonstrated significantly higher diagnostic accuracy than USG across all evaluated parameters. MRI identified the organ of origin correctly in 96% of cases (USG: 74%), differentiated benign from malignant masses with 92% accuracy (USG: 68%), and staged malignancies with 93% accuracy (USG: 52%). MRI also exhibited greater sensitivity in detecting solid components, septations, lymphadenopathy, ascites, and peritoneal deposits.

Conclusion: MRI provides enhanced diagnostic precision in the evaluation of female pelvic pathology and should be the preferred modality when USG findings are inconclusive or when malignancy is suspected.

INTRODUCTION

Radiologists evaluate wide variety of pelvic masses/lesions routinely. Ultrasonography (USG) is the first investigation for female pelvis mass evaluation, as it is relatively safe and of lower cost.

However USG has shortcomings like limited field of view, bowel gases obscuring the pelvic organs, and body habitus of the patients. Large pelvic masses (>5 cm in size) are difficult to be evaluated by USG alone and it is inadequate in staging pelvic malignancies.

MRI is considered the next step in the imaging assessment of diseases of the uterus and adnexa and is becoming the primary imaging modality for evaluating gynaecologic malignancies. MRI gives multi-planer imaging and thus provides superior soft tissue contrast and large field of view offer distinct advantages over both USG and CT in the assessment of gynaecologic diseases. MRI is also safer because it has no radiation exposure like USG; while CT has risk of radiation. With its high contrast resolution, its ability to provide good tissue characterization, and its multiplanar imaging capabilities, MRI is increasingly used to evaluate pelvic pathology.

The pelvic diseases most commonly masses arise from the genital system (ovaries, fallopian tubes, uterus and cervix). In addition, they may arise from the urinary system, adjacent soft tissues, gastrointestinal system, and metastases. MRI is used in defining these lesions, their location, origin, local extent, peritoneal involvement, lymph nodes, and pelvic wall involvement.

MRI is routinely used in staging uterine, cervical cancer, characterizing adnexal/uterine masses, Mullerian duct anomaly and in follow-up for recurrence. Functional imaging using diffusion-weighted imaging and dynamic contrast enhancement helps overcome limitations of conventional MRI.

Although ultrasonography remains the initial modality used in evaluating clinically suspected gynecologic disease, MRI provides supplemental diagnostic information where ultrasound examination is equivocal or suboptimal.

RESEARCH QUESTION

1. Is MRI better than Ultrasound in determining the origin of female pelvic masses?
2. Is MRI more accurate in classifying adnexal masses into benign and malignant?
3. Is MRI more accurate in pre-treatment assessment of malignancies, invasion of surrounding structures, encasement, lymphadenopathy, peritoneal implant, ascites and distant metastases?

AIMS AND OBJECTIVES

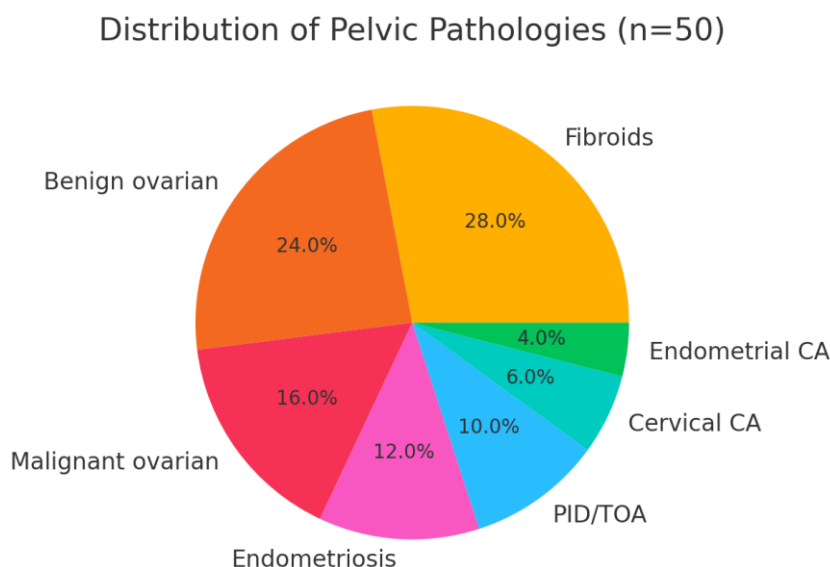
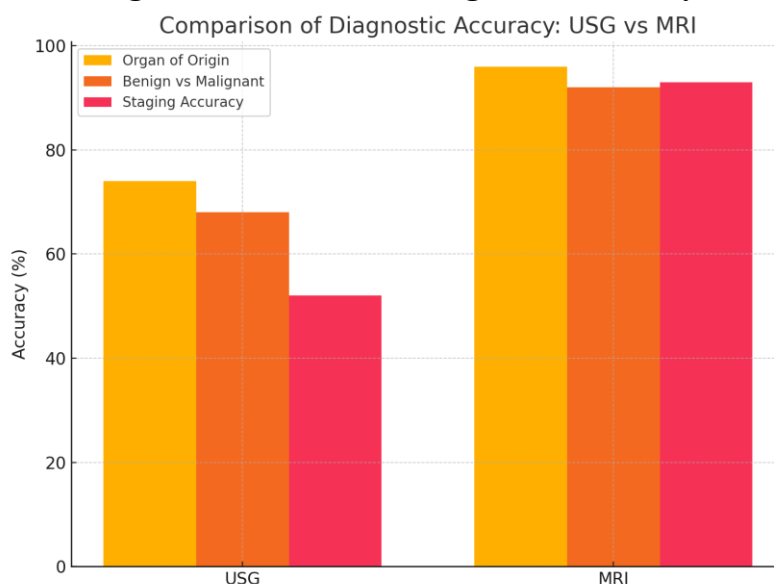
1. Role of MRI in female pelvis in comparison to USG.
2. Role of MRI in the evaluation of the tumor extension, myometrial invasion, detection of lymph nodes, parametrial involvement and in follow up for recurrence in comparison to USG.

MATERIALS AND METHODS

A prospective study of 50 patients referred to the Radiology Department, Rajshree Medical Research Institute, Bareilly. All patients underwent USG followed by MRI. Findings were compared with cyto-histopathology or postoperative diagnosis. MRI was performed using a Siemens 1.5T system with T1, T2, DWI, ADC, and contrast-enhanced sequences.

RESULTS

MRI outperformed USG across key diagnostic parameters. MRI correctly identified the organ of origin in 96% of cases compared with 74% using USG. It achieved 92% accuracy in differentiating benign from malignant adnexal masses (USG: 68%). In staging pelvic malignancies, MRI reached 93% accuracy versus 52% for USG. MRI also demonstrated higher sensitivity for identifying septations, solid components, papillary projections, lymphadenopathy, ascites, and peritoneal metastases.

Figure 1: Distribution of Pelvic Pathologies**Figure 2: USG vs MRI Diagnostic Accuracy**

DISCUSSION

The present study underscores the critical role of MRI as a comprehensive imaging modality in the evaluation of female pelvic diseases. While ultrasonography remains indispensable as an initial screening tool, its diagnostic limitations become evident in patients with obesity, extensive bowel gas, or complex adnexal lesions. MRI, with its superior spatial resolution and tissue contrast, provides a more detailed assessment that significantly improves diagnostic confidence.

Our findings mirror those of established international literature, reaffirming MRI's superior capability in defining lesion origin, characterizing complex adnexal masses, and differentiating

benign from malignant pathology. The advanced contrast resolution of MRI allows precise identification of solid and cystic components, blood products, fat, necrosis, and infiltrative patterns—features that are essential for accurate diagnosis. Moreover, diffusion-weighted imaging adds functional information that enhances the detection of hypercellular malignant tissue.

MRI's contribution to oncologic staging is particularly noteworthy. It offers excellent accuracy in assessment of myometrial invasion, parametrial extension, pelvic sidewall involvement, lymph nodal disease, and peritoneal metastasis. These parameters are crucial for tailoring patient-specific management, guiding therapeutic decisions, and predicting prognosis. In comparison, USG lacks the capability to evaluate deeper pelvic structures and metastatic spread comprehensively.

Overall, MRI emerges as a highly robust, non-invasive modality that bridges the diagnostic gaps left by ultrasound, ensuring comprehensive evaluation and optimal patient care.

CONCLUSION

MRI provides markedly superior diagnostic performance compared to ultrasonography in the evaluation of female pelvic masses. It offers precise lesion characterization, accurate determination of the organ of origin, and reliable assessment of local and distant disease spread. Given its high diagnostic accuracy and ability to guide clinical management, MRI should be strongly considered in cases where USG findings are inconclusive, when complex adnexal masses are present, or when detailed staging of malignancy is required for appropriate therapeutic planning.

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