

Role of Magnetic Resonance Imaging in Characterization of Female Adnexal Pathology

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ABSTRACT

Adnexal lesions are very common in both pre- and post-menopausal women. Most of these lesions are benign (80%) with cystic, solid and mixed characteristics and have favorable diagnosis. The rest of (20%) masses are malignant, so we need diagnostic means which permits accurate classified adnexal lesions before surgery and other treatment.

USG is the primary imaging modality for both detection and characterization of adnexal lesions because it is widely available and relatively inexpensive. However, there are some shortcomings with this modality, such as the limited field of view, obscuration of pelvic organs by the presence of bowel gas, and it is operator dependent.

Magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, it is becoming a useful tool for the evaluation and characterization of female adnexal lesions.

MRI has been shown to have a 91–93% overall accuracy for differentiating benign from malignant adnexal tumors.

This study aims to review the key differentiating MRI features of adnexal masses by correlating the MR appearances with the findings at histopathology.

In this prospective study, a total of 100 patients who were referred to department of radio diagnosis from department of obstetrics and gynecology with clinically suspected adnexal pathology were included in the study. Lesions were characterized based on their location, size, margins and appearance on T1, T2, STIR, T1-fat suppressed, and diffusion weighted imaging and apparent diffusion coefficient. MRI

diagnoses were further correlated with histopathological nature of the pathology.

Among benign ovarian lesions most cases were of functional cysts (simple +hemorrhagic) and 2nd most common is dermoid cyst-(10), one of surprising cases of ovarian torsion (6) which are more common in younger patients particularly less than 18. Among the 22 lesions identified as malignant on MRI, 16 were of epithelial origin, 10 being serous cystadenoma and 5 being mucinous cystadenoma.

Among the 22 lesions diagnosed as malignant on MRI, 21 lesions were identified as malignant on histopathology and 1 was designated as benign and among the 78 lesions diagnosed as benign on MRI 77 were confirmed to benign on histopathology and 1 was identified as malignant. Sensitivity of MRI in identification of malignant adnexal lesions was 95.45% and the specificity was 98.7% and positive predictive value was 95.45% and negative predictive value 98.7%.

Key words: Adnexal lesions, MRI, Obstetrics and gynecology, Women's health.

INTRODUCTION

Adnexal lesions are common in both pre- and post-menopausal women. Most of these lesions are benign (80%) with cystic, solid and mixed characteristics and have favorable diagnosis. The rest of (20 %) masses are malignant, this necessitates diagnostic imaging which permits accurate classified adnexal lesions before surgery and other treatment. [1] although USG remains the primary imaging modality for both detection and characterization of

adnexal lesions because it is widely available” and is relatively inexpensive. However, there are some shortcomings with this modality, such as the limited field of view, obscuration of pelvic organs by the presence of bowel gas, inherent limitations dependent on patient size, and its dependence on the skill and experience of the operator.

Magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, and is capable of multiplanar imaging capabilities; it is becoming a useful tool for the evaluation and characterization of female adnexal lesions.

MRI has been shown to have a 91-93% overall accuracy for differentiating benign from malignant adnexal tumors. [2] This study aims to study the key differentiating MRI features of adnexal masses by correlating the MR appearances with the findings at histopathology.

METHODS

This study was conducted over 2years (2018-2020) of 100 patients in Department of Radio diagnosis, Guru Govind Singh hospital, Jamnagar.

Inclusion criteria

The study included all patients with clinically suspected pelvic pathology who were referred to department of Radio-diagnosis

Exclusion criteria

1. All Patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic implants.
2. Patients having history of claustrophobia.

Equipment used:

**MRI: 1.5 TESLA SIEMENS
MEGNATOM ESSENZA (GERMANY)**

Technique:

Standard MRI of the female pelvis at our institution included sagittal T2 weighted TSE (TR/TE(ms)- 4090/78, slice thickness-3mm), T1 TIRM coronal (TR/TE(ms)-2900/34, slice thickness- 4mm) axial T2WI

TSE (TR/TE(ms)- 3300/78, slice thickness- 3 mm), Axial T1WI TSE (TR/TE(ms)- 530/12, slice thickness- 3mm), axial or coronal fat suppressed T1WI (TR/TE(ms)- 637/9, slice thickness- 4mm)axial T2gradient-recalled echo (GRE) (TR/TE(ms)- 800/86, slice thickness- 4mm) and axial T1-weighted FSE post contrast (in a selected patient) and rarely saggital T1WI (TR/TE(ms)- 340/10, slice thickness-4mm)sequences utilizing a dedicated pelvic phased-array coil.

Technical description:

Patients undergoing MRI examination for evaluating an adnexal mass were asked to fast for 3-4 hours and receive an antispasmodic drug, intramuscularly, 10 minutes before MRI, in order to reduce bowel peristalsis to improve visualization of the adnexa and peritoneal surfaces.

Then patients were asked to remove metals, artificial prosthesis and taken to MRI room and were asked to sleep in supine position, then 10 ml ultrasound gel was injected into vagina by syringe, then dedicated pelvis coil was placed over patient’s pelvic region. Then patient was passed into MRI gentry, and patients details were entered in the console and standard pelvis sequences were taken.

Statistical Methods:

Descriptive statistical analysis was carried out in this study. Results on continuous measurements were presented on Mean 1: SD (Min-Max) and results on categorical measurements are presented in Number (%), Diagnostic statistics viz. Sensitivity, Specificity, PPV, NPV and Accuracy were computed to find the correlation of MRI with pathological findings.

RESULTS

Our study included patients from various age groups and youngest patient in the study was of 18 years age and eldest was 80 year old, among 100 patients in our study majority of patients were from the age group of 20-30 years and accounted for 42%. Mean age of patients in our study was

36.22 years.

Out of 100 patients 78 patients were diagnosed with benign lesions on MRI and 22 were diagnosed with malignant mass lesions, among the 78 patients diagnosed with benign lesions on MRI, 40 were in the age group of 21 to 30 years.

Among the 22 patients diagnosed with malignant lesions, 15 patients (68%) were above 40 years of age, majority of them belonged to 51-60 years' age group.

Among the 100 patients diagnosed with adnexal lesions on MRI, 82 % were of ovarian origin, 12% of fallopian tube origin and 6% broad ligament.

Out of 78 benign cases 64 were in premenopausal group and 14 are in post-menopausal group and out of 22 malignant cases 6 patients are in pre-menopausal group and 16 were in post- menopausal group. (Chi square value of above distribution is 21.98, df=1, p=0.000, statistically significant) .

In our study out of 100 cases 70 were unilateral and 30 were bilateral. The most benign and malignant cases were unilateral, however frequency of bilateral lesions are more in malignant lesions which are 10 in number.

Among benign ovarian lesions most common lesions were functional cysts (simple + hemorrhagic) and were 17 in number and 2nd most common was dermoid cyst , 10 in number, one surprising case of

ovarian torsion was also noted, which are usually more common in younger patients particularly less than 18 years.

Among of 18 non ovarian benign lesions 12 were of fallopian tube origin and 6 were broad ligament fibroids and among fallopian tube lesions 7 were of pelvic inflammatory disease in which 4 were pyogenic and 3 were of tuberculosis etiology, and among the rest of the 5, 3 ectopic pregnancies accounted for 3 cases.

Out of 22 malignant ovarian lesions majority were of epithelial in origin and accounted for 16 lesions, among which 10 were of serous cyst adenocarcinoma and 5 were mucinous cyst adenocarcinoma and 1 was undifferentiated epithelial carcinoma

In our study among the 78 lesions diagnosed as benign on MRI, 77 lesions were confirmed to be benign on histopathology and 1 lesion was found to be malignant.

Out of 22 malignant lesions detected on MRI, 21 lesions were confirmed to malignant on histopathological examination and 1 lesion was identified as a benign lesion.

Our study showed the 95.4% sensitivity, 98.7 % specificity, 95.4% positive predictive value and 98.7 % negative predictive value in characterizing adnexal pathology as benign and malignant lesions by MRI.

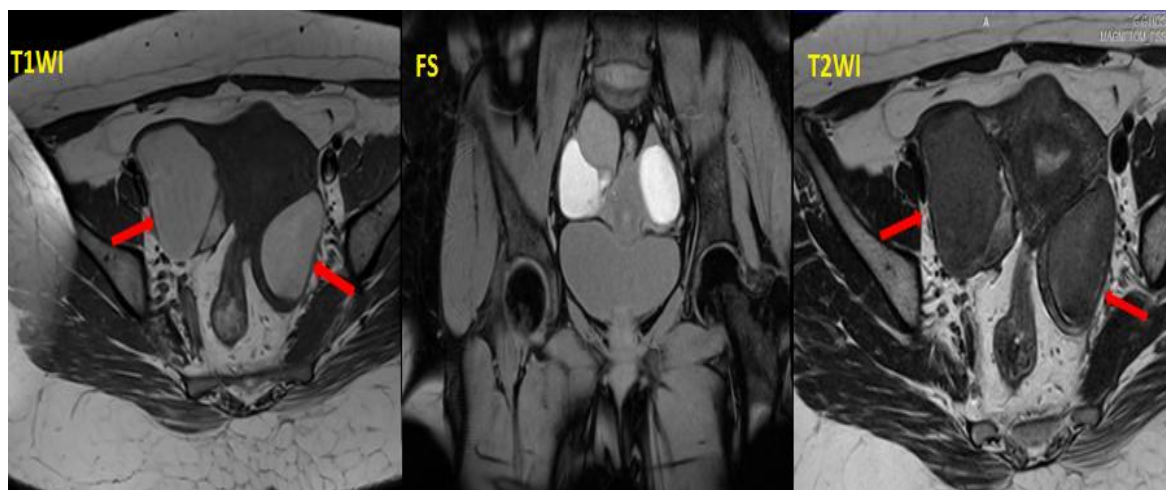


FIG 1: ENDOMETRIOMA-Altered signal intensity lesion appearing hyperintense on T1WI, hypointense on T2WI giving shading sign and hyperintense on FS is noted involving bilateral ovaries.

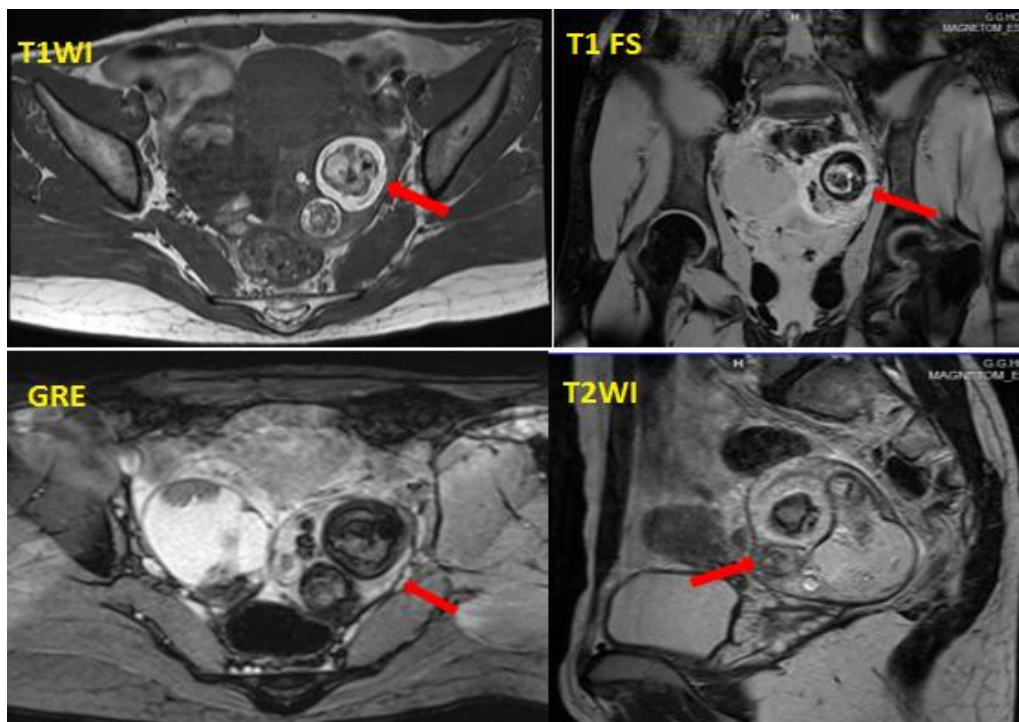


FIG 2: DERMOID CYST - Altered signal intensity lesion appearing heterogeneously hyperintense on T1WI, heterogeneously hyperintense on T2WI, suppression on FS and internal calcification is noted involving left ovary.

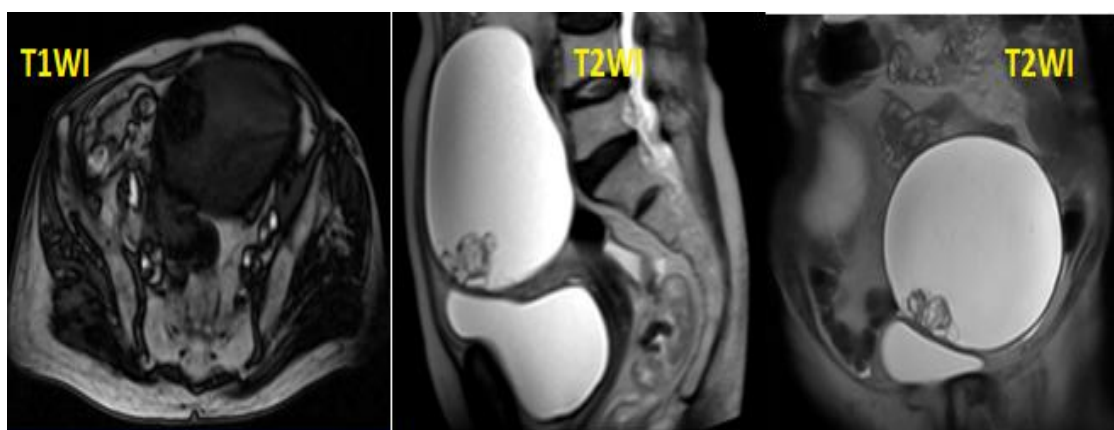


FIG 2: SEROUS CYSTADENOMA - Altered signal intensity cystic lesion appearing hypointense on T1WI and hyperintense on T2WI with internal solid componentis noted involving left ovary.

DISCUSSION

In this present study consisting of 100 patients with adnexal pathology diagnosed by MRI, evaluation was done to assess the efficacy of MR imaging in identifying and characterizing the benign and malignant lesions and to correlate of the MR imaging findings with histopathological diagnosis which is considered as gold standard.

In this study most patients belonged to the age group of 21-30 years, most benign cases (84.6%) were found in this age group, most malignant cases (68.2 %) were

found in patients above 40 years. The mean age of patients is mean \pm SD, 36.22 ± 15.55 years. This is comparable to study was done in Tribhuvan University Teaching Hospital (2004-2006) in which total 161 patients with adnexal lesions. 135 of these tumors (83.9%) were benign and 16.1% (26/161) were malignant.

Our study demonstrates most common benign lesion of adnexa is functional cyst (most commonly simple and hemorrhagic cyst) followed by mature teratoma, which is similar to with S.A Sohaib et al study with total 163 lesions in

which 94 benign lesions detected and functional cyst predominant followed by endometrioma and matured teratoma. [3]

Our study shows most common malignant mass lesion of ovary are epithelial carcinoma in which majority are of serous variety which is comparable to Siegfried A. Thurnher (1992) with total 94 lesions in which 12 were malignant lesions, 6 of them were serous variety [4]

Our study showed that out of 18 broad ligament and fallopian tube pathologies, 12 were fallopian tube lesions, and out them 6 were of hydrosalpinx and 3 were of ectopic pregnancy. In 3 lesions were given as chronic pelvic inflammatory disease and came out as tuberculous etiology. The 6 broad ligament lesions were diagnosed as fibroids, it similar to study by Siegfried A. Thurnher et al (1992), with a total 97 patients in which there were 11 fallopian tube lesion and 8 broad ligament lesion identified. Majority of tube lesion were of Hydrosalpinx making 5 in number followed by 3 ectopic pregnancy. The broad ligament leiomyoma were 8 in number.

Our study with total 100 patients out of which were 78 benign lesions and 22 malignant lesions showed that MRI has a sensitivity and PPV of 95.45% and specificity and NPV of 98.7% in characterisation of adnexal lesions as benign or malignant, which is similar to study by Sohaib et al studied the accuracy of MRI in the detection and characterization of adnexal masses and to determine which imaging features are predictive of malignancy and had a sensitivity of 95%, specificity 88%, PPV of 86% and NPV of

96 %. Out of 163 cases 94 benign 69 malignant lesions were examined.

CONCLUSION

Our study established that MRI has a sensitivity and PPV of 95.45% and specificity and NPV of 98.7% in characterisation of adnexal lesions as benign or malignant.

MR imaging is an excellent technique for the detection and accurate characterization of adnexal pathology, when sonographic examination is indeterminate.

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