Diagnosis of Adnexal Masses –Using Ultrasound and Magnetic Resonance Imaging for Proper Management

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ABSTRACT

Introduction: Adnexal masses are considered one of the most common disorders in gynecology practice. Primary goal of imaging in the evaluation of an adnexal mass is to differentiate malignant and benign lesions in order to direct patients to the appropriate treatment algorithm. Magnetic resonance imaging (MRI) helps to delineate normal anatomical structures and elucidate the pathological lesions. It has high sensitivity and specificity for differentiating benign pelvic masses from malignant ones **Aim:** To assess the relative role of ultrasound (USG) and MRI in the evaluation of adnexal mass lesions and compare them with clinical outcome or operative findings. **Materials and methods:** Prospective evaluation of 50 patients suspected to have adnexal masses was subjected to ultrasonography followed by MRI and the results were noted. **Results:** Most commonly affected age group was 21-40yrs. The major presenting complaints were lower abdominal pain and lump in the lower abdomen. In our study, most common origin of adnexal lesions was from ovaries. On USG, 50 % were cystic in consistency, 86 % and 14 % were reported as benign and malignant respectively. On MRI, 56 % were cystic, 88% and 12 % were reported as benign and malignant respectively. **Conclusion:** USG is recommended as a primary modality for diagnosing pelvic adnexal masses. MRI is superior to ultrasound and can be used in the assessment of problematic cases. The multiplanar imaging capability allows accurate identification of origin and characterisation of adnexal masses.

Key words: Cronbach Alpha, Likert format, Reliability, Validity, Measurement Error

Introduction

Adnexal masses are considered one of the most common disorders in gynecology. Adnexal region is composed of ovary, fallopian tube, broad ligament, and associated blood vessels and nerve structures. Ovarian tumors alone represent two thirds of these cases. They represent an increasing challenge to the gynaecologists. Ovarian cancers are one of the most lethal of all gynecological cancers, as they are characterized by late presentation and poor response to treatment. [1] The primary goal of imaging in the evaluation of an adnexal mass is to differentiate malignant and benign lesions in order to direct patients to the appropriate treatment algorithm. Management options include radical staging surgery for suspected ovarian malignancy and less invasive surgery (i.e., laparoscopy) for potentially benign neoplasms. Sonography is the initial choice for imaging study in the evaluation of women with suspected adnexal masses. However, sonography is limited by its decreased specificity for the diagnosis of benignity. [2] Main disadvantage of ultrasound is that the field of view is limited and also sometimes the presence of bowel gas obscures proper visualization of the pelvic organs. Magnetic resonance imaging has demonstrated considerable potential in pelvic imaging. Soft tissue contrast is inherently better in magnetic resonance imaging than in ultrasound and can be improved by the use of varying pulse sequences. It has high sensitivity and specificity for differentiating benign pelvic masses from malignant ones.To study the spectrum of female adnexal mass lesions and to assess the role of Ultrasound and Magnetic Resonance Imaging in their evaluation and compare them with clinical outcome or operative findings.

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Materials and methods

The present study was a prospective hospital based study carried out in the department of Obstetrics and Gynecology and department of Radiodiagnosis, Modern Government Maternity Hospital, Petlaburz, Osmania Medical College, Hyderabad. The study was carried out over a period of two years and comprised of 50 patients.

Inclusion criteria: All cases clinically suspected as having adnexal mass lesions, adnexal mass lesions found incidentally on USG .

Exclusion criteria: All midline uterine mass lesions, all patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic implants, patients having history of claustrophobia .All clinically thoroughly examined female patients with adnexal masses referred to the Department of Radio-diagnosis were evaluated. These patients were first subjected to Ultrasonography followed by MRI (plain and contrast where ever required). MRI findings were compared with those of Ultrasonography. These findings were then compared with the operative findings and histo pathological findings wherever the surgery and histopathology were performed. USG studies were performed by using multifrequency linear, curvilinear and transvaginal transducers.USG studies were performed on ESAOTE MY LAB CLASS C.MRI studies were performed with 1.5 Tesla electromagnet (GE Company). The primary pulse sequences included T1 and T2WI using spin echo techniques. Images were obtained with a multi-slice technique using a slice thickness of 3mm, inter-slice gap of 6mm, FOV of 220 – 240mmand a matrix size of 512 ∗512. Gadolinium-enhanced MR imaging using high resolution fat – suppressed, axial, coronal, saggital T1 FSE were done. Gadolinium contrast (Omniscan, GE health care, 0.1 mmol/kg body weight) was used.All patients detected with adnexal masses on USG, either when referred to the department of Radiodiagnosis or when detected incidentally were examined with transabdominal USG, transvaginal USG and a 1.5 tesla MRI using abdominal surface coils. Contrast enhancement was given as and when necessary. The patients were followed up to correlate the findings with clinical outcome or operative findings. Among 50 cases, 30 cases underwent surgical procedures and the excised tissue was subjected to histopathological examination.

Results

Table 1: Age distribution

Age in years	Number of cases	Percentage
0-20	14	28 %
21-40	27	54 %
41-60	8	16 %
61-80	1	2 %

Majority of the patients were in 21-40year age group (54%).

Table 2: Distributions of complaints of patients with adnexal masses

Presenting complaint	Number of patients	Percentage (%)
Pain in lower abdomen	44	88%
Lump in lower abdomen	16	32%
Irregular menstrual cycles	5	10%
Primary amenorrhea	2	4%
Bloody vaginal discharge	2	4%
Primary infertility	2	4%

Most common presenting complaints were of pain and lump in lower abdomen. Some of the patients had a combination of the above presenting complaints.

Table 3: Anatomical distribution of the lesions on USG and MRI

Origin of the lesion	On USG	On MRI
	No of patients (%)	No of patients (%)
Ovary	30(60%)	34 (68 %)
Fallopian tube	4(8%)	7(14 %)

Broad ligament	2(4%)	2(4 %)
Uterus	-	6(12 %)
Inconclusive	14(30%)	1 (2 %)
Total	50	50

Majority of the lesions on MRI were ovarian in origin (68%)

Distribution of laterality of adnexal masses: Masses on right side were 21 cases (42%), on left side were 20 cases (40%) and 9 cases (18%) were bilateral.

Distribution of consistency of adnexal masses on USG and MRI: On USG, 50% of the adnexal masses were cystic, 18% were solid and 32% were complex. On MRI, 56 % were cystic, 18% were solid and 26% were complex. Most of the lesions were cystic on both USG (50%) and MRI (56%)

Table 4: Distribution of types of adnexal lesions on USG and MRI

Type of lesion	USG	MRI
Indeterminate	14 (28%)	2(4%)
Hemorrhagic cyst	10(20%)	7(14%)
Endometriotic cyst	4(8%)	4(8%)
Serous cystadenoma	2(4%)	2(4%)
Torsion	2(4%)	2(4%)
Dermoid cyst	1(2%)	3(6%)
Hydrosalpinx	3(6%)	3(6%)
Hematometra with hematosalpinx	1(2%)	5(10%)
Mucinous cystadenocarcinoma	2(4%)	1(2%)
Broad ligament fibroid	1(2%)	-
Theca lutein cyst	2(4%)	2(4%)
Ectopic pregnancy	1(2%)	-
Ovarian edema	1(2%)	-
Broad ligament hematoma	1(2%)	1(2%)
Serous cystadenocarcinoma	1(2%)	2(4%)
Subserosal fibroid	-	5(10%)
Pelvic ectopic kidney	-	1(2%)
Pyosalpinx	-	2(4%)
Congenital uterine anomalies	-	3(6%)
Dysgerminoma	-	2(4%)
Mucinous cystadenoma	-	2(4%)
Yolk sac tumor	-	1(2%)
Highly suggestive of malignancy	4(8%)	-

The indeterminate lesions on USG were 28%, whereas, on MRI they were only 4%.

On USG 43 (86%) were reported as benign and 7 cases (14%) were reported as malignant. On MRI, 44 (88%) were reported as benign and 6 cases (12%) were reported as malignant.

Table 5: Sensitivity and specificity of USG and MRI

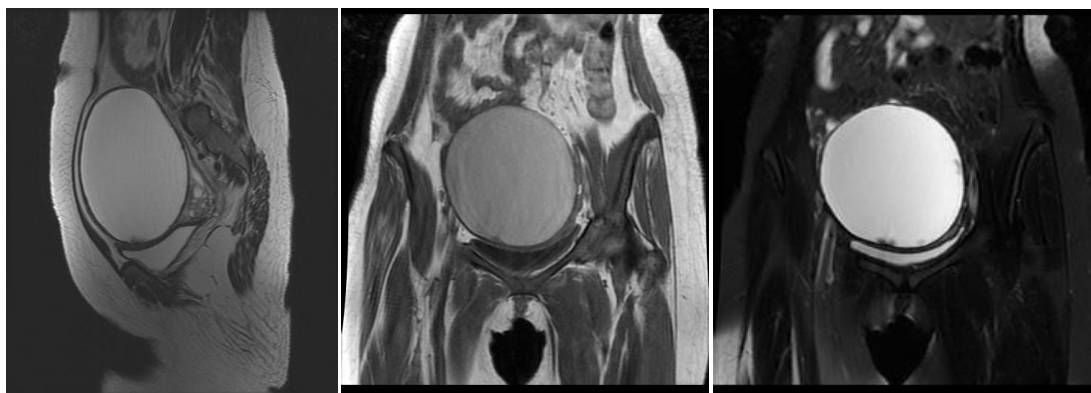| Variable	USG	MRI
Sensitivity	80%	100%
Specificity	95.5%	97.7%
Positive predictive value	66%	83%
Negative predictive value	97%	100%

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Fig 1: Sagittal T2WI and Coronal T1WI demonstrating homogenous high signal intensity of lesion.Coronal STIR – high signal intensity of lesion – Ovarian Hemorrhagic Cyst
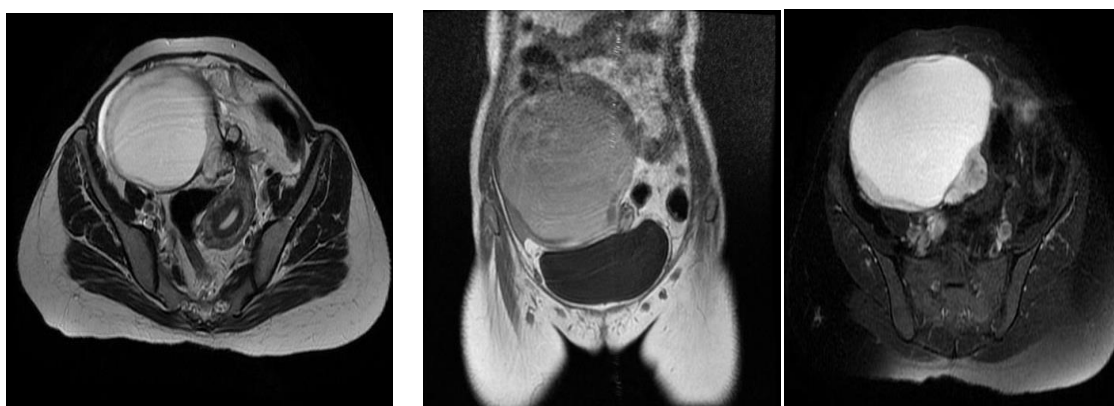

Fig 2: Axial T2WI – hyperintense lesion seen in left ovary with twisted ovarian pedicle. Coronal T1WI – lesion is hyperintense. Axial T1 Fat sat – no suppression of hyperintense signal intensity of lesion. – ovarian torsion with hemorrhagic cyst

Discussion

Evaluation of adnexal masses prior to surgery has important implications as it enables the surgeon to perform the most appropriate surgical procedure. Especially in premenopausal age group there are no specific clinical or laboratory data to point towards definite malignant nature of a lesion. [3] Hence, US and MRI have become very useful modalities of imaging for the assessment of pelvic adnexal lesions in women.[4] The present study was conducted on 50 female patients with adnexal masses which were studied by USG and MRI modalities. Among 50 cases, 30 cases underwent surgical procedures and the excised tissue was subjected to histopathological examination for final diagnosis and the remaining cases were managed conservatively. In the present study, most commonly affected age group was 21-40 years and the mean age was 30 years. The mean age group in a study done by Al-Shukri et al was 29 years. [5] Adnexal cysts are more common in the reproductive age group,

whereas, the risk of malignancy increases as the patient age increases and malignant lesions are more common in the postmenopausal age group.[2]In the present study, the most common presenting complaints of patients with adnexal masses were lower abdominal pain in 88% cases and lump in the lower abdomen in 32% cases. Our findings are similar to those of Guzel Al et al where the initial compliant was abdominal pain in 77.5% cases, vaginal bleeding in 20% of the patients and 12.5% of their patients were asymptomatic. [6] In the study by Al-Shukri et al[5] the presenting symptom was of lower abdominal pain in 98% cases. However, their study was based on various adnexal masses presenting with acute symptoms.Anatomical site of adnexal masses: In the present study, maximum number of cases (68%) were seen arising from the ovaries. Adusumilli et al [7]in their study have also observed ovarian masses to be most common (56%) of all the adnexal masses. Unlike sonography, excellent

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agreement was seen between MRI and the final proven origin of a mass. This stresses the importance of MRI as the best next step in evaluating such a mass before subjecting a patient to surgery that might be unnecessary. Comparison of consistency of lesions: In the study by Prabha et al,[8] they found 0%, 66% and 42% lesions on USG to be cystic, solid and complex respectively.Whereas, the MRI showed 27%, 37% and 31%, cystic, solid and complex lesions respectively. These findings compare well with our study.Guerra et al [9] observed in their study of 161 patients that MRI had high accuracy of 95% to differentiate between malignant and non-malignant adnexal lesions. Other authors[4, 10] have reported accuracies ranging from 83 to 94%. Dodge et al [11] in their recent meta-analysis found that the sensitivity and specificity of MRI for correct detection of malignancy can reach 92% and 88%, respectively. However, MRI studies are expensive and may not be available in all the hospitals. In actual clinical practice, the initial ultrasound exam done by an experienced sonographer gives adequate information about the nature of the mass lesion. [2](Smorgick N)In the present study, we found that MR imaging in the detection and characterization of adnexal masses had a sensitivity of 100% and specificity of 97.7% which signifies that MR imaging is highly accurate in the characterization of adnexal mass lesions. In a study done by Sohaib et al,[12] accuracy of MR imaging in the detection and characterization of adnexal mass lesions was reported to have a sensitivity of 95% and specificity of 88%.Guerra et al[9] have observed the MRI sensitivity and specificity for detecting malignancy as 98% and 93%, respectively (6) which is comparable with our findings of 100%sensitivity and 97.7% specificity respectively. The sensitivity of gray scale USG in adnexal masses in a study conducted by Madan et al [13] was 92.5% as comparable to 80% in the present study. To characterize adnexal masses first step is site, tissue of origin and second step is tissue characterization and both are well delineated by MRI. Unenhanced T1- and T2-weighted imaging is important for accurate tissue characterization.MRI offers supplemental diagnostic information in cases of a suboptimal or equivocal ultrasound examination and in patients in whom there is discrepancy between sonographic findings and physical examination. MRI has high sensitivity and specificity which will help in staging of cancers, patient selection for treatment, and detection of disease recurrence.

Conclusion

Pelvic masses are more common in the reproductive age group and are most often of ovarian origin. Benign masses are more common as compared to malignant lesions. In practice USG is the primary modality for diagnosing pelvic masses. MRI is superior to ultrasound and can be used in difficult or equivocal cases. The multiplanar imaging capability allows accurate identification of origin of mass, and also the tissue characterisation. This may obviate surgery or significantly contribute to the preoperative planning of sonographically detected mass.

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