



Original Research Article

Role of ultrasonography, magnetic resonance imaging in evaluation of female pelvic masses with histopathological correlation

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ABSTRACT

Background: Adnexal mass that can be suspected as malignant with ultrasonography can be diagnosed as benign lesion at magnetic resonance imaging (MRI). This will help in preventing inappropriate surgery. MRI gives additional information on composition of soft-tissue masses using differences in MR relaxation properties in various tissue, which is not seen in ultrasonography.

Objective: To evaluate pelvic pathology by ultrasound and MRI for differentiating malignant and benign tumors in adnexal masses compared with histopathology

Materials and Methods: Prospective comparative study was carried out among 30 patients with suspected pelvic masses. Thorough clinical history was taken followed by physical examination. Clinically or ultrasonographically detected suspicious pelvic masses were subjected to MRI and correlated histopathologically. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated for ultrasonography and MRI with histopathology as gold standard

Results: Majority were <50 years. Bleeding per vaginum and pain abdomen were most common symptoms in 20% each. As per ultrasonography, most common diagnosis was adnexal mass in 36%. As per MRI, most common diagnosis was ovarian pathology in 47%. As per histopathology, most common diagnosis was cervical cancer, fibroids and benign ovarian pathologies in 20% of cases each. Sensitivity, specificity, PPV and NPV of USG compared to histopathology was 88.2%; 61.5%; 75% and 80% respectively. Sensitivity, specificity, PPV and NPV of MRI compared to histopathology was 100%; 92.8%; 84.1% and 100% respectively. On comparison, MRI had better diagnostic accuracy than USG

Conclusion: MRI is a very sensitive imaging modality for the evaluation of female patients with suspected or confirmed adnexal masses and disease extent is better evaluated than ultrasonography.

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1. Introduction

Among the gynecology conditions, adnexal masses are common. They can be seen at any age. Adnexal mass usually involves the ovary or fallopian tube. Adnexal masses are typically found as an abnormality of the pelvic examination. Female pelvic masses are mainly caused by gynecological diseases. Adnexal mass includes benign and

malignant etiologies. Hence, diagnosis of adnexal mass is important to differentiate its etiology. For classification, it is important to know the origin of the disease but it is often difficult and hence another classification that is malignant and benign is used.¹

Ovarian cancer is the most serious condition after the adnexal tumors. It has been estimated that the ovarian cancer incidence was 1.7% to 8.7% from India as per Indian Council of Medical Research.² Another important condition from adnexal mass after ovarian cancer is cervical cancer.

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India contributes about one fifth of the world burden for the cervical cancer.³ During the period of 1982-89, about 4304 cervical cancer cases were registered. In 1990, 6100 women died due to cervical cancer in India which constituted 20% of all cancer deaths.⁴ Fallopian tube carcinoma is another type of cancer, which is included in the adnexal masses with an incidence of 0.14 to 1.8% and constitutes about 20-30% of the new cases.⁵

Histopathology diagnosis of tissue biopsy for adnexal mass or tumor serves as a gold standard for diagnosis and staging. For the prediction of tumor aggressiveness the grading systems has been developed. These grades helps in differentiating the adnexal masses as benign and malignant. Several grading system for ovarian cancer are been currently used which includes histo-type specific system or universal grading system.⁶ “Predominantly used grading system is Federation of Gynecology and obstetrics grading system (FIGO).”⁷ Frequently intra and inter observer variability is associated with this type of technique. Discordance between biopsies and resected specimen may also occur with this technique.⁸

After pelvic examination, the primary indication for surgical assessment of an adnexal mass is imaging. Pathologic findings serve as reference standards for the assessment of accuracy of image findings.⁹ The imaging diagnoses in adnexal masses used are ultrasonography, Magnetic resonance imaging (MRI), Computed tomography.

Ultrasonography plays an important role in the diagnosis of adnexal masses. It is a preferred for diagnosis of adnexal lesions. It is used to confirm the presence of mass. It is considered as the first line imaging technique for differentiating benign and malignant pelvic masses.¹⁰ Currently transvaginal ultrasonography is considered to be highly accurate method for investigating adnexal masses and ovarian cyst.¹¹ Sonographic features helps in identification of type of mass. It can also differentiate between benign and malignant types.¹²

Magnetic Resonance imaging (MRI) an important diagnostic tool for detection of pelvic masses. It is a non-invasive technique and has no risk of radiation. However, this technique is not the first line for diagnosis but it shows high sensitivity with 97% for depicting malignant adnexal masses.¹³ Hence the adnexal mass that can be suspected as malignant with ultra-sonography can be diagnosed as benign lesion at MR imaging. This will help in preventing inappropriate surgery. It shows advantages over ultrasonography or computed tomography by providing large field of view and multiplanar imaging capabilities. It also proved to be less operator dependent.¹⁴

Hence, present study was carried out to evaluate pelvic pathology by ultrasound and MRI for differentiating malignant and benign tumors in adnexal masses, which was confirmed by histological correlation. Thus, the study

may show that MRI of pelvis can be considered as a frontline investigation, which can overcome the limitations of ultrasonography. This correlative study may also help in reducing the biopsy frequency for detection of tumor by proving MRI as a first choice for diagnosis.

2. Materials and Methods

A prospective comparative study was carried out among 30 patients with suspected pelvic masses and incidentally detected pelvic masses on ultrasonography, presenting to radio diagnosis departments of SS Institute of Medical Sciences & Research Centre during November 2013 to May 2015

2.1. Inclusion criteria

1. Clinical suspected cases of cervical, uterine, adnexal and fallopian tube masses.
2. Patients with incidental detection of cervical, uterine, adnexal and fallopian tube masses on USG.
3. Patients of all age groups

2.2. Exclusion criteria

1. Having bladder carcinoma, rectal carcinoma
2. Underwent treatment of pelvic mass
3. Having any kind of implants
4. Claustrophobic patients

2.3. Methodology

Institution Ethics Committee permission was obtained. Informed written consent was taken from each patient. History was recorded as per the study questionnaire. Thorough clinical examination was carried out. Clinically or ultrasonographically detected suspicious pelvic masses were subjected to MRI and correlated histopathologically.

Ultrasonography of pelvis was done in GE Voluson 730 equipment, using a high frequency endocavitary probe as well as curvilinear Trans abdominal probe. “Pelvic transabdominal ultrasonography (TAUS) was performed using a wide-band 2-to 4-MHz transducer, and transvaginal ultrasonography (TVUS) examination with a wide-band 5-to 9-MHz transducer.” “Each examination was interpreted in real time and videotaped.” “During each sonographic examination, the uterine borders (regular or irregular), uterine size, myometrial echo texture and the presence of associated abnormalities were noted.” “Morphologic features including thick, irregular walls and septa, papillary projections, and solid, moderately echogenic loculi were noted.” “An ultrasound carries no risks.” “Unlike X-rays or CT scans, ultrasounds use no radiation. This all was explained to patients.”

All 30 patients underwent MRI of the Pelvis on GE SignaHDxt 1.5 T system. The following sequences

was performed as a part of MR evaluation. "Axial T1 Fast Recovery Fast Spin Echo, Sagittal T2, Coronal Short Time Inversion Recovery, Axial 2 Dimensional Fast Imaging Employing Steady State Acquisition, Coronal 2 Dimensional Fast Imaging Employing Steady State Acquisition and Diffusion Weighted Imaging. Contrast agent was used in patients wherever required for better tissue delineation". "Using abdomen compression, MRI sections were acquired for every patient data". "Therefore, MRI examination was done in two planes to make it an adequate examination."

2.4. Statistical analysis

Sensitivity, specificity, positive predictive value, negative predictive value were calculated for USG and MRI keeping histopathology as gold standard.

3. Results

Table 1: Distribution of patients according to demographic and clinical characteristics

Characteristics	Number	%	
Age (years)	< 30	7	23.3
	31-40	7	23.3
	41-50	7	23.3
	51-60	4	13.3
	> 60	5	16.7
Chief complaints	Bleeding per vagina	6	20
	Infertility	1	3.3
	Lower abdominal pain	4	13.3
	Menorrhagia	3	10
	Pain abdomen	6	20
	Pain abdomen with distension	4	13.3
	Post-menopausal bleeding	3	10
	White discharge per vaginum	2	6.7
	1-2 days	2	6.7
	Duration of symptoms	< 1 month	12
1-3 months	6	20	
4-6 months	8	26.7	
> 6 months	2	6.7	

Majority i.e. 21 cases out of 30 studied were <50 years of age. Bleeding per vaginum and pain abdomen were most common symptoms in 20% each. 14 cases (47%) had symptoms of less than one month. Only two cases had symptoms for more than six months (Table 1).

As per ultrasonography, the most common diagnosis was adnexal mass in 36% of the cases followed by pelvic mass in 20% of the cases. As per MRI, the most common diagnosis was ovarian pathology in 47% of the cases followed by cervical pathology in 20% of the cases. As per

Table 2: Diagnosis as per different modalities

Diagnostic modality	Number	%	
USG	Cervical pathology	5	17
	Uterine pathology	3	10
	Vaginal pathology	2	7
	Adnexal mass	11	36
	Pelvic mass	6	20
	Endometrial pathology	3	30
MRI	Cervical pathology	6	20
	Ovarian pathology	14	47
	Uterine pathology	3	10
	Vaginal pathology	2	7
	Endometrial pathology	4	13
	Other	1	3
	Broad ligament fibroid with degenerative changes	1	3.3
Histopathology	Ca cervix	6	20
	Ca endometrium	5	16.7
	Ca vagina	2	6.7
	Ca ovaries	2	6.7
	Fibroids	6	20
	Benign ovarian pathologies	6	20
	Torsion ovaries	4	13.3

histopathology, the most common diagnosis was cervical cancer, fibroids and benign ovarian pathologies in 20% of cases each (Table 2).

Table 3: Comparison of USG classification with pathologic findings in 30 pelvic lesions.

USG finding	Histopathology findings		Total
	Benign	Malignant	
Benign	8	2	10
Malignant	5	15	20
Total	13	17	30
Sensitivity		88.2	
Specificity		61.5	
Positive predictive value		75	
Negative predictive value		80	

The sensitivity, specificity, PPV and NPV of USG compared to histopathology was 88.2%; 61.5%; 75% and 80% respectively (Table 3).

The sensitivity, specificity, PPV and NPV of MRI compared to histopathology was 100%; 92.8%; 84.1% and 100% respectively (Table 4)

On comparison of sensitivity, specificity, PPV and NPV between USG and MRI, it was observed that MRI had better diagnostic accuracy than USG (Table 5)

Table 4: Comparison of MRI classification with pathologic findings in 30 pelvic lesions

USG finding	Histopathology findings		Total
	Benign	Malignant	
Benign	13	0	13
Malignant	1	16	17
Total	14	16	30
Sensitivity		100	
Specificity		92.8	
Positive predictive value		94.1	
Negative predictive value		100	

Table 5: Comparison of sensitivity, specificity, PPV and NPV of US and MRI

	USG	MRI
Sensitivity	88.2	100
Specificity	61.5	92.8
Positive predictive value	75	94.1
Negative predictive value	80	100

4. Discussion

Ljubic et al¹⁵ concluded that the evaluation of the pelvic mass can be done with USG even though it may not be able to give diagnosis compared to histopathology. USG definitely helps to decide whether the pelvic mass is present or not. It helps in the clinical decision as certain details like size, shape etc. and relation of the pelvic mass with other surrounding organs are available with the help of USG.¹⁵

We did this study to find out the role of ultrasonography, MRI in evaluation of female pelvic masses with histopathological correlation. Age less than 50 years was found to be more affected. Thereafter the frequency of adnexal mass seems less. The study findings were found to be comparable to previously published articles. A study done by Dwivedi A et al¹⁶ also reported similar findings as per the present study about the age groups.¹⁶

In this study, the most common presenting complaint was seen as bleeding per vagina and pain in abdomen. It was observed that about 20% of the women in this study had bleeding per vagina and 20% had pain abdomen. In addition, majority of patients in our study found to have symptoms for less than a month. About 40% of the women had symptoms since less than a month. Patients with more than 3 months were less in proportion as compared to patients with less than 3 months of symptoms history. Other published literature had shown difference in the prevalence especially in cases of acute presenting complaints. A study done by Al-Shukri M et al in 2014 has shown that maximum number of females with adnexal masses came with complaints of abdominal pain with 98% of females had acute symptoms. The next common symptoms were nausea and vomiting.¹⁷ Ovarian tumors remain the most common type of adnexal masses detected on radiological investigations like ultrasonography. Generally, for cystic

masses ultrasonography is preferred. In our study, we observed that about 13.3% of the women had cervical mass sonographically. Followed by various type of ovarian and uterine masses. The finding is different from already published literature.¹⁸

In a study of evaluation of pelvic mass when clinical examination was found out to be having 50% sensitivity in the diagnosis of the type of the pelvic mass, USG had 80% sensitivity. But PPV for clinical examination was more than that of USG (71.4% vs. 66.6%).¹⁹

The most common finding on MRI was lymphadenopathy. It was observed that about 6.7% of the women in this study had bilateral iliac, obturator and inguinal lymph node enlargement upon magnetic resonance imaging examination. In the present study, On comparison of sensitivity, specificity, PPV and NPV between USG and MRI, it was observed that MRI had better diagnostic accuracy than USG. Sohaib SA et al in 2005¹⁴ also found that sensitivity, specificity and accuracy of USG was lower compared to MRI (100% vs. 96.6%; 39.5% vs. 83.7% and 63.9% vs. 88.9% respectively).

The sensitivity, specificity, of MRI in the present was compared to one study was 100% vs. 76.5% and 92.8% vs. 100%.¹⁶ Scoutt LM et al²⁰ reported that for pedunculated leiomyomas MRI was 96% sensitive and 100% specific; for dermoid cyst it was 100% sensitive and 99% specific; for endometriomas, it was 92% sensitive and 91% specific.

5. Conclusion

MRI is a very sensitive imaging modality for the evaluation of female patients with suspected or confirmed adnexal masses and the disease extent is better evaluated than ultrasonography. It also detects ultrasonographically occult lesions. Thus, it is concluded that pre-operative MRI can be preferred as a non-invasive non-radiation method for female patients with suspected or confirmed pelvic masses.

6. Conflict of Interest

None.

7. Source of Funding

None.

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