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Study of Role of Sonography and MRI in Diagnosing Ovarian Masses at a Tertiary Center

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Abstract

Background: Ovarian masses are considered one of the common disorders in gynaecology. Ovarian masses pose a special dilemma to the gynaecologist because the differential diagnosis is difficult and complex. Causes of ovarian masses may be benign or malignant. Present study was aimed to study role of sonography & MRI in diagnosing ovarian masses at a tertiary center. **Material and Methods:** Present study was single-center, prospective, comparative study, conducted women, referred to radiology department with suspected ovarian masses diagnosed on ultrasound, underwent further MRI evaluation, followed by surgery & histopathological diagnosis was available. **Results:** In present study, among 42 participants, majority were from 30-49 years of age group (64.28 %), came with complaints of pain (66.67 %) & menstrual irregularity (57.14 %). Size of ovarian mass was 6-10 cm in majority (50 %) followed by 11-15 cm (30.95 %). According to final Histopathological diagnosis, majority of masses were benign (83.33 %) as compared to malignant lesions (16.67 %). Among benign lesions, common lesions were hemorrhagic cyst (16.67 %), dermoid (11.90 %), simple cyst (11.90 %), endometrioma (9.52 %), mucinous cystadenoma (7.14 %) & fibroma (7.14 %). While among malignant lesions, common lesions were mucinous cystadenoma (7.14 %), serous cystadenocarcinoma (4.76 %) & papillary serous cystadenoma (2.38 %). On comparison of USG diagnosis vs HPE diagnosis, we noted sensitivity (89.19 %), specificity (100 %), positive predictive value (100 %), negative predictive value (55.56 %) & accuracy (90.48 %) of USG in diagnosing ovarian masses. On comparison of MRI diagnosis vs HPE diagnosis, we noted sensitivity (97.56 %), specificity (100 %), positive predictive value (100 %), negative predictive value (50 %) & accuracy (97.62 %) of MRI in diagnosing ovarian masses. **Conclusion:** MRI is a superior diagnostic modality in establishing the diagnosis of ovarian masses, for lesions that are indeterminate on ultrasound.

Keywords: Ultrasound, MRI, Diagnostic Modality, Ovarian Masses

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Introduction

Ovarian masses are considered one of the common disorders in gynaecology. Ovarian masses pose a special dilemma to the gynaecologist because the differential diagnosis is difficult and complex. Causes of ovarian masses may be benign or malignant.

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Radiological evaluation of suspected ovarian masses is of paramount importance and a diagnostic tool with high degree of precision helps treating physician in planning appropriate management, if required surgery and in cases of high suspicion of malignancy also neoadjuvant chemo therapy followed by surgery.[1]

Ultrasound of pelvis (transabdominal or transvaginal) is used as first imaging study in evaluating women with suspected ovarian masses, due to its easy availability, relatively cheap and high sensitivity in the detection of lesions.[2,3] MRI is considered for the evaluation of adnexal pathology when sonographic characteristics are not definitive to determine the origin of the mass and to determine the likelihood of malignancy.[4] MRI gives a better spatial and contrast resolution in delineation of anatomical structures as well as characterization of pathological lesions. Present study was aimed to study role of sonography & MRI in diagnosing ovarian masses at a tertiary center

Material And Methods

Present study was single-center, prospective, comparative study, conducted in department of Radiology, at XXX medical college & hospital, XXX, India. Study duration was of 2 years (January 2021 to December 2021). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Women, referred to radiology department with suspected ovarian masses diagnosed on ultrasound, underwent further MRI evaluation, followed by surgery & histopathological diagnosis was available, willing to participate in present study.

Exclusion criteria

- Subjects with metallic fixations or with cardiac pacemakers.
- Claustrophobic patients.
- All patients where surgery was not done or lost to follow up.

Study was explained to patients in local language & written consent was taken for participation & study. Demographical, clinical history, examination findings were noted in proforma.

Ultrasound imaging was performed using GE logic F8 ultrasound machine. Transabdominal ultrasound was done with full bladder, using a probe of 3.5-5 MHz. Transvaginal ultrasound was done with an empty bladder, using a probe of 10 MHz. Findings noted were ovarian size and echo texture, bilateral adnexa, and fallopian tubes. Number, size, and characterization (solid, cystic, complex solid cystic) of ovarian mass was noted.

MRI was performed using 1.5 Tesla Siemens machine. The following sequences were done including T1 WI, T1 WI fat saturation, T2 WI, T2WI fat saturation and STIR in axial plane, T2 WI fat saturation and STIR in coronal plane and T2 WI in sagittal plane. Contrast and other special sequences like diffusion and gradient imaging were used as and when required. Apart from findings mentioned in ultrasound, signal characteristics of lesions in both T1 and T2W were noted for presence of fat, hemorrhage, fluid and solid components. Extent of lesion was noted in case of ovarian carcinoma along with presence of peritoneal deposits, lymph nodes and ascites. The findings including thick enhancing wall, solid lesion enhancement, thick enhancing or non-enhancing septations, and mural nodules were used to characterize a mass as malignant. Final correlation with histopathology was done.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Descriptive analysis such as frequency, percentage were used to describe the data and inferential statistics such as chi-square test, sensitivity, specificity, accuracy, positive and negative predictive value were used to analyze the data.

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Results

In present study, among 42 participants, majority were from 30-49 years of age group (64.28 %), came with complaints of pain (66.67 %), menstrual irregularity (57.14 %), dysmenorrhea (54.76 %), back ache (42.86 %), & mass (35.71 %). Size of ovarian mass was 6-10 cm in majority (50 %) followed by 11-15 cm (30.95 %).

Table 1: General characteristics

	No. of patients	**Percentage**
Age groups (in years)		
10-19	1	2.38%
20-29	3	7.14%
30-39	15	35.71%
40-49	12	28.57%
50-59	7	16.67%
60-69	3	7.14%
≥70	1	2.38%
Complaints		
Pain	28	66.67%
Menstrual irregularity	24	57.14%
Dysmenorrhea	23	54.76%
Back ache	18	42.86%
Mass	15	35.71%
Wt. Loss	9	21.43%
Infertility	5	11.90%
Size (in cms)		
1 – 5	5	11.90%
6 – 10	21	50.00%
11 – 15	13	30.95%
>15	3	7.14%

According to final Histopathological diagnosis, majority of masses were benign (83.33 %) as compared to malignant lesions (16.67 %). Among benign lesions, common lesions were hemorrhagic cyst (16.67 %), dermoid (11.90 %), simple cyst (11.90 %), endometrioma (9.52 %), mucinous cystadenoma (7.14 %) & fibroma (7.14 %). While among malignant lesions, common lesions were mucinous cystadenoma (7.14 %), serous cystadenocarcinoma (4.76 %) & papillary serous cystadenoma (2.38 %).

Table 2: Histopathological diagnosis

	No. of patients	**Percentage**
Benign lesions		
Hemorrhagic cyst	7	16.67%
Dermoid	5	11.90%
Simple cyst	5	11.90%
Endometrioma	4	9.52%
Mucinous Cystadenoma	3	7.14%
Fibroma	3	7.14%
Serous Cystadenoma	2	4.76%
Corpus leuteal cyst	2	4.76%
Benign papillary serous cystadenoma	2	4.76%

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Dysgerminoma	1	2.38%
Fibrothecoma	1	2.38%
Total	35	83.33%
Malignant lesions		
Mucinous cystadenoma	3	7.14%
Serous cystadenocarcinoma	2	4.76%
Papillary serous cystadenoma	1	2.38%
Metastatic	1	2.38%
Total	7	16.67%

On comparison of USG diagnosis vs HPE diagnosis, we noted sensitivity (89.19 %), specificity (100 %), positive predictive value (100 %), negative predictive value (55.56 %) & accuracy (90.48 %) of USG in diagnosing ovarian masses.

Table 3: USG diagnosis vs HPE diagnosis

		USG diagnosis		**Total**
		+ ve	- ve	
HPE diagnosis	+ ve	33	0	33
	- ve	4	5	9
Total		37	5	42

Sensitivity	89.19
Specificity	100.00
Positive Predictive Value	100.00
Negative Predictive Value	55.56
Accuracy	90.48

On comparison of MRI diagnosis vs HPE diagnosis, we noted sensitivity (97.56 %), specificity (100 %), positive predictive value (100 %), negative predictive value (50 %) & accuracy (97.62 %) of MRI in diagnosing ovarian masses.

Table 4: MRI diagnosis vs HPE diagnosis

		MRI diagnosis		**Total**
		+ ve	**- ve**	
HPE diagnosis	+ ve	40	0	40
	- ve	1	1	2
Total		41	1	42

Sensitivity	97.56
Specificity	100.00
Positive Predictive Value	100.00
Negative Predictive Value	50.00
Accuracy	97.62

Discussion

Ovarian cysts larger than 7 cm need further imaging, either as a prelude to intervention, or for better characterization. Among various ovarian masses, benign lesions are simple functional cyst, serous cystadenoma, mucinous cystadenoma, endometriotic cyst, fibroma, thecoma, Brenner tumour tuboovarian cyst or hydrosalphinx. Malignant lesions are serous

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cystadenoarcinoma, mucinous cystadenocarcinoma, endometrotic carcinoma immature teratoma, dysgerminoma, krukenbergs tumor. Cause of adnexal mass lesion varies with different age group.[5]

Tumors arising from the surface epithelium account for 90% of ovarian cancers and are pathologically designated as serous, mucinous, clear cell, endometrioid, or Brenner (transitional) tumors based on the cell type. Each histologic type is further classified as benign, borderline malignant (tumors of low malignant potential), or malignant, reflecting differences in clinical behavior.[6]

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.[7]

MRI has become an important modality on the evaluation of a female pelvis. MRI because of its excellent soft tissue contrast, larger Field Of View (FOV) and direct multiplanar capabilities, can better delineate and characterise normal pelvic anatomy and adnexal pathology.[8] MRI usually shows signals suggestive of clear fluid, similar to serous cystadenomas, while mucinous cystadenomas present as multilocular (honeycomb-like locules) lesions with thin regular walls with septae.[9] Features such as wall thickening, septa, and multilocularity are less reliable indicators of malignancy because they are frequently seen in benign neoplasms, particularly cystadenoma- fibromas, mucinous cystadenomas, and endometriomas.[10]

In study by Santosh K Dasar et al.,[11] both Ultrasonography and Magnetic Resonance Imaging correctly diagnosed 22 cases (55%) as benign and 6 cases (15%) as malignant. MRI correctly diagnosed 2 cases (5%) with benign lesion, which were thought to be malignant on ultrasonography and also correctly diagnosed 3 cases (7.5%) with malignant lesion which on ultrasonography were thought to be benign. Both USG and MRI incorrectly diagnosed 1 case (2.5%) as benign. Among 6 indeterminate cases (15%), 5 cases were correctly diagnosed by MRI, whereas MRI could not give a conclusive diagnosis in one case (2.5%). MRI was proved to be better than USG in characterising the adnexal lesions as benign or malignant because of its higher soft tissue resolution and multiplanar imaging. MRI has better accuracy and specificity in recognising the malignant potential of the lesion which are 95% and 96.6% respectively.

Reddy GM et al.,[12] noted that application of Sassone sonomorphologic score >9 was identified in 8 masses, out of which 7 were malignant and 1 was a benign lesion. The colour flow was detected in 38 out of 50 masses. The presence of flow, type of flow, vessel arrangement, morphology and location were noted and on pulsed Doppler the RI and PI values were calculated. Out of 8 malignant cases, 5 were diagnosed as malignant according to the Caruso score. The overall sensitivity 100 %, specificity is 97.6% and diagnostic accuracy is 98% of MRI which is higher than that of ultrasound and CDS.

In study by Bakshi VK,[13] sensitivity, specificity, positive predictive value, negative predictive value, diagnostic accuracy, compared to HPE, of ultrasonography were 70%, 100%, 100%, 88.4%, 100%, respectively and of MRI were 87.5% , 100% , 100%, 95.8% , and 96.6%, respectively. In study by Nosova JV et al.,[14] when used for further evaluation of an indeterminate mass seen on ultrasound, contrast-enhanced MRI showed sensitivity and specificity of 100% and 94%, respectively, in diagnosis of malignancy.

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

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inherently better in magnetic resonance imaging than in ultrasound and can be improved by the use of varying pulse sequences.[15]

Conclusion

Ultrasound is the study of choice for primary evaluation of ovarian masses, and MRI and CT are useful for further workup and to define extent of disease. MRI is a superior diagnostic modality in establishing the diagnosis of ovarian masses, for lesions that are indeterminate on ultrasound.

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