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DIAGNOSTIC ACCURACY OF ADNEXAL MASSES THROUGH MAGNETIC RESONANCE IMAGING IN CORRELATION WITH HISTOPATHOLOGY

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Introduction:. The present study was conducted with an aim to assess the role of MRI for evaluation of adnexal masses and to find out the diagnostic accuracy of MRI in the diagnosis of adnexal masses against the gold standard test 'histopathology'.

Materials and Methods: This is a prospective comparative study conducted in the Department of Radio Diagnosis, Index medical college hospital and research centre.50 women were taken in our study. These patients were first referred for ultrasonography with history of adnexal masses from gynaecological department. The magnetic resonance imaging was done using 1.5 Tesla MRI machine with patient in supine position.Then the lesion sample was taken and sent for histopathological examination. The results obtained on the MRI were evaluated against the histopathology results and the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI was calculated.

Results: Out of 50 patients, 33 (66%) adnexal masses were benign, 15 (30%) were malignant and 2 (4%) were inconclusive on ultrasonography, 35 (70%) adnexal masses were benign, 15 (30%) were malignant on magnetic resonance imaging. 37 (74%) adnexal masses were benign, 13 (26%) were malignant on histopathology. The sensitivity of MRI in the diagnosis of malignant / benign adnexal masses against the histopathology was found to be 92.31%, specificity was 91.89%, positive predictive value was 80.00%, negative predictive value was 97.14% and diagnostic accuracy was 92.00%.

Conclusion: Ultrasound is unable to differentiate adnexal masses into malignant and benign in some cases and gives inconclusive results. While MRI provides better spatial and contrast resolution in delineation of the anatomical structures as well as characterization of pathological lesions. It is highly accurate in identifying the origin of a mass, characterization and staging and helps in the treatment planning. These parameters have been found quite in agreement with the findings of histopathology

Keywords: Magnetic Resonance Imaging, Ultrasound, Adnexal Pathologies

INTRODUCTION

An adnexal mass is a tumour that develops in or around the uterus, ovaries, fallopian tubes, and connective tissues. They're normally harmless, but they can also be malignant.[1] Adnexal masses can occur at any age. Women with adnexal masses experience pain in pelvic region, bleeding at site of mass, irregular menstrual cycles, difficult micturition, frequent urination, constipation and gastrointestinal disorders. In case of small adnexal masses, women may not experience the symptoms.

The ovaries are the source of the majority of adnexal mass lesions. Ovarian lesions can range from benign to cancerous. One of the most common causes of death from gynecologic cancers is ovarian malignancy. Ovarian neoplasm is rarely found in its early stages, and by the time it is

diagnosed, it has progressed significantly. When an ovarian tumour is discovered at an advanced stage, therapy becomes extremely challenging[1].

Some of the cause of adnexal masses may be ectopic pregnancy, endometrioma, leiomyoma, ovarian cancer, pelvic inflammatory disease, tubo-ovarian abscess or ovarian torsion. Adnexal mass may be benign or malignant. Simple functional cysts, serous cystadenoma, mucinous cystadenoma, endometriotic cyst, fibroma, thecoma, Brenner tumourtuboovarian cyst, or hydrosalphinx are all benign lesions. Serous cystadenoarcinoma, mucinous cystadenocarcinoma, endometrotic carcinoma ,immature teratoma, dysgerminoma, and Krukenbergs tumour are all cancerous lesions[2].

Ovarian carcinoma makes about 3.6 percent of all cancer cases and has a mortality rate of 4.3 percent. The "American Cancer Society" and the "National Cancer Institute" estimate that 21,980 new cases of ovarian cancer will be diagnosed each year, with 14,270 women dying as a result of the disease's effects.

Ultrasonography (US), Computed Tomography (CT), and the Magnetic Resonance Imaging (MRI) are the imaging modalities used for the evaluation of adnexal masses. Ultrasonogram is the first imaging modality used to diagnose adnexal mass lesions. Because it provides superior spatial and contrast resolution in delineating anatomical structures as well as characterisation of pathological lesions, MRI is the investigation of choice for adnexal mass[3].Myomas, ovarian mass lesions, adenomyosis, cervical lesions, endometrial malignancy, and other female reproductive organ illnesses are well-delineated by MRI. And histopathology is the gold standard for the confirmation of the diagnosis.

The present study was conducted with an aim to assess the role of MRI for evaluation of adnexal masses and to find out the diagnostic accuracy of MRI in the diagnosis of adnexal masses against the gold standard test ‘histopathology.

1. MATERIAL & METHOD

This is a prospective comparative study conducted in the Department of Radio Diagnosis, Index medical college hospital and research centre. 50 women suspicion of adnexal masses were included in the study from Jan. 2020 to Aug. 2021.

METHOD OF COLLECTION OF DATA:

All the patients and her legally acceptable representative were explained about the study in detail including risks/benefits, outcome, procedure, etc. in their own language. After obtaining their verbal consent to participate in the study, a voluntary written informed consent was obtained from them. All the study related procedures were conducted after obtaining the consent. These patients were first referred for ultrasonography with clinical history of adnexal masses from gynaecological department. These patients were then subjected to MRI and the following imaging features were evaluated, viz. lesion size, content of lesion (solid only, mainly solid, solid– cystic, mainly cystic, and cystic only), wall thickness, nodularity, septal thickness, early arterial phase enhancement, ascites, omental deposits and lymphadenopathy. The magnetic resonance imaging was done using 1.5 Tesla MRI machine with patient in supine position. T1 axial, T2 sagittal, coronal; STIR coronal, T2 Fat sat and T1 contrast axial and coronal sequences were taken. Then the lesion sample was taken and sent for histopathological examination. The results obtained on the MRI were evaluated against the histopathology results and the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI was calculated.

T1 weighted axial images were obtained using spin echo technique and T2 weighted images were obtained in sagittal, axial and coronal planes using fast spin echo technique because T2 weighted

sequences are workhorse of pelvic MRI they yield excellent soft tissue contrast of the pelvic organs,as for delineating uterine zonal anatomy and ovarian stroma from follicles(5). Additional sequences like diffusion weighted and fat suppression seqences were tailored depending upon the abnormal features on initial imaging sequences. Fat suppression sequences were obtained for characterizing fat containing lesions.

To characterize adnexal mass, MRI uses primary findings predictive of malignancy were papillary projections or solid components in a cystic lesion, necrosis in a solid lesion, wall or septa thicker than 3 mm. In addition to this primary criteria, the presence of the ancillary findings such as ascites or peritoneal metastasis further increases likely hood of malignancy. Contrast enhanced T1W MR images better allow identification of solid portions in cystic lesions, or necrosis in solid lesions.

INCLUSION CRITERIA

a) Adnexal mass lesions found incidentally on USG in age group of 18- 70 years.
b) Clinically suspected cases of adnexal mass lesions of age group 18-70 years.
c) Patients who will give the written consent form.

EXCLUSION CRITERIA

a) All patients less than 18 years and more than 70 years.
b) All uterine mass lesions
c) Clinically and sonologically proven cases of ectopic pregnancy.
d) All Patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic implants.
e) Patients having history of claustrophobia.
f) Patient who are not willing to give consent.

OBSERVATIONS AND RESULTS

Table No. 3 Distribution of women according to age

Age	Number	Percentage
<=20 years	4	8.0
21-40 years	18	36.0
41-60 years	27	54.0
>60 years	1	2.0
Total	50	100.0

The above table shows the distribution of women according to age.
4 (8%) women were in the age group <=20 years, 18 (36%) were in the age group 21-40 years, 27 (54%) were in the age group 41-60 years and 1 (2%) was in the age group more than 60 years. Majority of the women were in the age group 41-60 years.

Table No. 4 Distribution of women according to clinical findings

Clinical Findings	Number	Percentage
Pain in lower abdomen	40	80.0
Pain in lower abdomen with distension	5	10.0
Pain in abdomen	2	4.0
Abdominal distension	1	2.0
Pain in lower abdomen with distension with bleeding	1	2.0
Pain in lower abdomen with irregular cycles	1	2.0
Total	50	100.0

The above table shows the distribution of women according to clinical findings.
Pain in lower abdomen was seen in 40(80%) women, pain in lower abdomen with distension in 5 (10%) women, pain in abdomen alone in 2 (4%) women, abdominal distension in 1 (2%) woman, pain in lower abdomen with distension with bleeding in 1 (2%) woman and pain in lower abdomen with irregular cycles in 1 (2%) woman.

Table No. 5 Characterization of adnexal masses on basis of morphological criteria on ultrasonography

Morphological Criteria on Ultrasonography	Number	Percentage
Cystic:		
Purely cystic	9	18.0 14.0
Lace like septations or clot within	7	4.0 8.0
Homogeneous low levels echoes	2	12.0
With internal septations	4	
Incomplete septa	6	
Solid only:	3	6.0
Mixed:		
Cystic + solid+septations(+/-)	13	26.0

Cystic + solid +Calcifications	6	12.0
Ascites:		
Present	9	18.0
Absent	41	82.0
Vascularity:		
Absent	17	34.0
Central in solid component	11	22.0
Peripheral	17	34.0
In septations	5	10.0
Total	50	100.0

The above table shows the characterization of adnexal masses on basis of morphological criteria on ultrasonography.

Cystic: Pale cystic morphology was seen in 9 (18%) patients, lace like internal septations / clot within seen in 7 (14%) patients, homogeneous low level echoes seen in 2 (4%) patients, with septations seen in 4 (8%) patients and incomplete septa was seen in 3 (6%) patients.

Solid only: Solid was seen in 3 (6%) patients.

Mixed: Cystic + solid was seen in 13 (26%) patients and calcifications were seen in 6 (12%) patients

Table No. 6 Classification of adnexal masses on the basis of morphological characterization of ultrasonography

Morphology	Number	Percentage
Benign	33	66.0
Malignant	15	30.0
Inconclusive	2	4.0
Total	50	100.0

The above table shows the classification of adnexal masses on the basis of morphological characterization of ultrasonography. 33 (66%) adnexal masses were benign, 15 (30%) were malignant and 2 (4%) were inconclusive on ultrasonography.

Table No. 7 Distribution according to CA-125 level

CA-125 level	Number	Percentage
Normal(0-35 U/ml)	37	74.0
Raised	13	36.0
Total	50	100.0

The above table shows the distribution according to CA-125 level. In 37 (74%) women the CA-125 level was within normal value and in 13 (36%) women it was raised (>35 U/ml).

Table No.8 Characterization of adnexal masses on basis of magnetic resonance imaging

No. of Patient s	T1W	T2W	Fat suppressed	dWI	T1+C	Provisional diagnosis
6	Hyper	Hyper	+	Restriction in cystic component	Contrast + if solid	Teratoma (Immature/ Mature)
7	Hyper	Hyper	No fat suppresse d	Present	Absent	nmorhagic cyst
5	Hypo	Hyper	No fat suppresse d	Absent	Absent	Simple cyst
7	Hypo	Hyper with incomplete septa	No fat suppressed	nt/present	Absent	Hydro- salphinx/ haemato- salphinx
4	Hypo	Multilocular Cystic high SI with mass with thin / thick septations	No fat suppresse d	Absent	Absent	Cystadenoma
2	Isointense	Isointense	No fat suppresse d	Absent	Absent	Fibroid
15	Intermediate solid cystic SI/with papillary projection	Intermediate solid cystic SI /with papillary projection	Absent	Restriction in solid component	Contrast enhance d in solid part	iocarcino ma
2	Hyper	Hypo	Absent	Present	Absent	Endo- metrioma

2	T1 low SI if increased SI (stromal haemorrhag e)	T2 bulky ovary with increased edematous stroma with peripheral displaced follicles	Absent	Focal restriction in edematous stroma	Absent	Ovarian torsion

Table No. 9 Characterization of adnexal masses on basis of morphological criteria on magnetic resonance imaging

Morphologic Criteria on MRI	**Number**	**Percentage**
Size:		
< 4 cm	19	38.0
> 4cm	31	62.0
Unilateral / Bilateral:		
Bilateral	9	18.0
Unilateral	41	82.0
Solid component:		
No	35	70.0
Solid part with heterogeneous Enhancement	15	30.0
**** Some of this solid part shows necrosis within***	6	
Cystic mass:		
Simple	37	74.0
With vegetations structures and internal	13	26.0
Cystic +solid + fat and Calcification within	6	12.0
Thickness of wall/septation with enhancing septa:	35	70.0
< 3mm	15	30.0
> 3mm		
Ascites:		

Present	13	26.0
Absent	37	74.0

Morphologic Criteria on MRI	Number	Percentage
Lymph nodes:		
Normal (<1 cm shortaxis)	41	82.0
Enlarged (>1 cm shortaxis)	9	18.0
Peritoneal implants:		
No	47	94.0
Yes	3	6.0
Papillary projections:		
Absent	37	74.0
♦ Present with heterogeneous enhancement	13	26.0
Total	50	100.0

The above table shows the characterization of adnexal masses on basis of morphological criteria on magnetic resonance.

Size: 19 (38%) patients were less than 4 cm in size, 31 (62%) were more than 4 cm in size.

Solid component: Solid component was present in only 15(30%) patients. Cystic mass: Simple cystic mass was seen in 37 (74%) patients and in 13(26%) patients there was internal septation and papillary projection.

Thickness of wall septa: In 35 (70%) patients, the thickness of wall septa was less than 3 mm and in 15 (30%) patients it was more than 3 mm.

Ascites: In 13 (26%) patients ascites was present and in 37 (74%) patients ascites was absent.

Lymph nodes: Lymph nodes were normal (< 1 cm) in 41 (82%) patients and was enlarged in 9 (18%) patients.

Peritoneal deposits: Peritoneal deposits were present in 3 (6%) patients and in rest it was absent.

Laterality: In 9 (18%) patients, there was bilateral involvement and in 41 (82%) patients there was unilateral involvement

Table No. 10 Characterization of adnexal masses on basis of magnetic resonance imaging

MRI Findings	Number	Percentage
Benign:		
Simple ovarian cyst	6	12.0
Hemorrhagiccyst	7	14.0
Ovarian torsion	2	4.0
Endometrioma	2	4.0
Hydrosalpinx	7	14.0
Dermoid cyst	6	12.0
Ovarian cystadenoma	3	6.0
Broad ligamentfibroid	2	4.0
Malignant: Carcinomaovary	15	30.0
Total	50	100.0

The above table shows the characterization of adnexal masses on basis of magnetic resonance imaging.

Benign: 6 (12%) were simple ovarian cysts, 7 (14%) were hemorrhagic cysts, 2 (4%) were ovarian torsion, 2 (4%) were endometrioma, 7 (14%) were hydrosalpinx, 6 (12%) were dermoid cyst, 3 (6%) were ovarian cystadenoma and 2 (4%) were broad ligament fibroids. Malignant: 15 (30%) were carcinoma ovary

Table No. 11 Classification of adnexal masses on the basis of morphological characterization on Magnetic resonance imaging

Morphology	Number	Percentage
Benign	35	70.0
Malignant	15	30.0
Total	50	100.0

The above table shows the classification of adnexal masses on the basis of morphological characterization on magnetic resonance imaging. 35 (70%) adnexal masses were benign, 15 (30%) were malignant on magnetic resonance imaging.

Table No.12 Characterization of adnexal masses on basis of histopathological examination

Histopathological Findings	Number	Percentage
Benign:		
Simple ovarian cyst	6	12.0
Hemorrhagiccyst	7	14.0
Ovariantorsion	2	4.0
Endometrioma	2	4.0
Hydrosalpinx	9	18.0
Dermoid cyst	6	12.0
Ovarian cystadenoma	3	6.0
Broad ligamentfibroid Ovarian fibroma	1 1	2.0 2.0
Malignant: Carcinoma ovary	13	26.0
Total	50	100.0

The above table shows the characterization of adnexal masses on basis of histopathology examination.

Benign: 6 (12%) were simple ovarian cysts, 7 (14%) were hemorrhagic cysts, 2 (4%) were ovarian torsion, 2 (4%) were endometrioma, 9 (18%) were hydrosalpinx, 6 (12%) were dermoid cyst, 3 (6%) were ovarian cystadenoma and 1 (2%) were broad ligament fibroids and 1 (2%) was ovarian fibroma.

Malignant: 13 (26%) were carcinoma ovary.

Table No. 13 Classification of adnexal masses on the basis of morphological characterization on histopathology

Classification of adnexal masses	Number	Percentage
Benign	37	74.0
Malignant	13	26.0
Total	50	100.0

The above table shows the classification of adnexal masses on the basis of morphological characterization on histopathology. 37 (74%) adnexal masses were benign, 13 (26%) were malignant on histopathology.

Table No. 14 Statistical Analysis of MRI against HPE in the diagnosis of malignant and benign lesions

		HPE		Total
		Benign	Malignant	
MRI	Benign	34(TN)	1(FN)	35
	Malignant	3(FP)	12(TP)	15
	Total	37	13	50

Pearson chi-square test applied. Chi-square value = 32.477, df=1, P value = 0.001, Significant

The above table shows the association between MRI and HPE in the diagnosis of malignant / benign adnexal lesions. There was a statistically significant association between MRI findings and the HPE findings (P=0.001) for the diagnosis of malignant and benign lesions. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI against HPE in the diagnosis of malignant and benign lesions is shown as below:

True Positive	True Negative	False Positive	False Negative
12	34	3	1

Sensitivity	92.31%
Specificity	91.81%
Positive predictive value	80.00%
Negative predictive value	97.14%
Diagnostic accuracy	92.00%

The sensitivity of MRI in the diagnosis of malignant / benign adnexal masses against the histopathology was found to be 92.31%, specificity was 91.89%, positive predictive value was 80.00%, negative predictive value was 97.14% and diagnostic accuracy was 92.00%. The MRI has high sensitivity, specificity, positive and negative predictive values and

diagnostic accuracy. So MRI can be independently used as an imaging modality for the diagnosis of adnexal masses

DISCUSSION

Adnexal masses are commonly seen in women of all ages. Management of these masses are based on the imaging findings, therefore, accurate characterization of adnexal pathology is very important which guides the treatment.

Ultrasound is the first imaging modality for the diagnosis of adnexal masses as it provides spatial and contrast resolution in delineating anatomical structures as well as characterization of pathological lesions. But in many cases it has been found to be inconclusive in differentiating benign from malignant adnexal masses and in such cases, Magnetic resonance imaging has been found to be more accurate in the diagnosis of adnexal masses.

In the present study we had included 50 women with adnexal masses. Adnexal masses were more commonly seen in the women of age group 41-60 years and followed by 21-40 years. Most common presenting complaint was pain in lower abdomen (80%), other less common complaints were abdominal distension and irregular cycles. CA-125 level was raised (>35 U/ml) in 36% women. CA-125 measures the protein CA-125 in the blood and is used as a screening tool for the diagnosis of ovarian cancer in high risk women. A level of more than 35 U/ml indicates a higher risk of having ovarian carcinoma.

Adnexal masses evaluation on ultrasonography was done on various features. Cystic nature of the lesion was seen in 56%, solid in 6% and mixed in 38%. On ultrasonography, ascites was seen in 18%. Vascularity was absent in 34%, central in solid component in 22%, peripheral in 34% and in septations in 10%. Morphologically 66% lesions were benign, 30% malignant and 4% inconclusive on ultrasonography. In ultrasonography, characterization of adnexal mass lesions, septal thickness, nodularity, central and peripheral vascularity of the lesion are highly suggestive of malignancy.

Malignant lesions on magnetic resonance imaging were seen as intermediate solid cystic SI /with papillary projections on both T1W and T2W. Teratoma and hemorrhagic cyst was seen as hyperintense on both T1W and T2W. Simple cyst was seen as hypointense on T1W and hyperintense on T2W. Hydrosalpinx / hematosalpinx was seen as hypointense on T1W and hyperintense with incomplete septa on T2W. Cystadenoma was seen as hypointense on T1W and multilocular cystic high SI with mass with thin / thick septations on T2W. Fibroid was seen as isointense on both T1W and T2W. Endometrioma was seen as hyperintense on T1W and hypointense on T2W. Ovarian torsion on T1W was seen as low SI and on T2W as bulky ovary with increased edematous stroma with peripheral displaced follicles.

According to the MR imaging criteria for malignant adnexal masses, lesions >4 cm (62%), bilaterality (18%), solid lesions with heterogeneous enhancement (30%), necrosis within the solid part (12%), septal thickness >3 mm (30%) and papillary projections were present with heterogeneous enhancement in 26% lesions. On MR imaging, enlarged lymph nodes (>1 cm on the short axis) were seen in 18%. 6% had peritoneal implants.

Sohaib et al.(2003)[4] in their study reported that ascites and vegetations in the cystic lesions were the significant factors that lead to the diagnosis of malignancy. Hricak et al.[5] found that necrosis in solid lesion and vegetations in the cystic lesions were significant factors for detection of malignant lesion.

Final characterization on magnetic resonance imaging showed simple ovarian cyst in 12%, hemorrhagic cyst in 14%, ovarian torsion in 4%, endometrioma in 4%, hydrosalpinx / hematosalpinx in 14%, dermoid cyst in 12%, ovarian cystadenoma in 6% and broad ligament fibroid in 4%. Carcinoma ovary was diagnosed in 30% cases. Magnetic resonance morphological characterization showed benign lesion in 70% and malignant lesions in 30% cases. Chen et al.[6] reported that magnetic resonance imaging identified 37 as malignant and

33 as benign ovarian masses of the total 70 ovarian masses. In MRI characterization of adnexal mass lesions, enhancement of lesion, septal thickness >3 mm, nodularity of the lesion and ascites are highly suggestive of malignant nature of the lesions.

Histopathological examination confirmed simple ovarian cyst in 12%, hemorrhagic cyst in 14%, ovarian torsion in 4%, endometrioma in 4%, hydrosalpinx / hematosalpinx in 18%, dermoid cyst in 12%, ovarian cystadenoma in 6%, broad ligament fibroid in 2% and ovarian fibroma in 2%. Carcinoma ovary was diagnosed in 26% cases.

On histopathology 26% lesions were confirmed as malignant and 74% as benign. Magnetic resonance imaging missed 4% hydrosalpinx / hematosalpinx and over diagnosed 4% of ovarian carcinomas. Ovarian fibroma was completely missed on magnetic resonance imaging, which was confirmed on histopathology. For the diagnosis of malignant lesions, the sensitivity of magnetic resonance imaging was 92.31%, positive predictive value was 80% and diagnostic accuracy was 92% against histopathology. For the diagnosis of benign lesions, the specificity of magnetic resonance imaging was 91.81%, negative predictive value was 97.14% and diagnostic accuracy was 92% against histopathology. Sohaib et al(2005)[7] reported a sensitivity of 96.6% and specificity of 83.7% in identifying the malignant lesions on magnetic resonance imaging. Our sensitivity is slightly lower than reported by Sohaib, but the specificity is higher. Sohaib et al. (2003)[4] reported that magnetic resonance imaging was able to identify 95% of the adnexal masses properly, having a diagnostic accuracy of 91%. We also found a similar diagnostic accuracy of magnetic resonance imaging in the diagnosis of malignant lesions. Similarly, another study done by Hricak et al.[5] found diagnostic accuracy of magnetic resonance imaging to be 93% in the diagnosis of malignancy, which is comparable to our study findings. Chen et al.[6] reported a diagnostic accuracy of 87% for magnetic resonance imaging in diagnosing malignant lesions from benign lesions. The sensitivity was 86%, specificity was 88%, positive predictive value was 89% and negative predictive value was 85%. Our results are slightly higher than that reported by Chen. Guerra et al.[8] reported an MRI sensitivity of 98% and specificity of 93% in the diagnosis of malignant lesions, with a diagnostic accuracy of 95%. The positive predictive value was 92% and negative predictive value was 98%. They found an agreement of 0.906 between MRI and histological results. The results of Guerra are higher than that seen in our study. Haggerty et al.[9] reported a sensitivity of 95% and specificity of 94.1% of pelvic magnetic resonance imaging in the diagnosis of malignant lesions, which is higher than that reported in our study. Zhang et al.[10] in their study reported an accuracy of 90.3 %, sensitivity of 92.7 %, specificity of 89.3 %, PPV of 77.6 % and NPV of 96.8% of magnetic resonance imaging in differentiating malignancies from non-malignant lesions. The results are quite comparable to that seen in our study. Bazot et al.[11] in their study reported an sensitivity of 89.7%, specificity of 91.4%, positive predictive value of 86.7% and negative predictive value of 93.4% in the diagnosis of malignant adnexal masses. The results of Bazot are quite comparable to our study findings. Adusumilli et al.[12] in their study reported an excellent agreement between the magnetic resonance imaging and the histopathology findings (Cohen Kappa 0.98). Murtaza et al.[13] in their study reported that the diagnostic accuracy of magnetic resonance imaging in differentiating indeterminate adnexal lesions into benign and malignant lesions was 79.65%. However, we did not include sonographic analysis in our study. Magnetic resonance imaging had a very high sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy, so can be independently used as a diagnostic modality for the differentiation between benign and malignant adnexal masses.

CONCLUSION

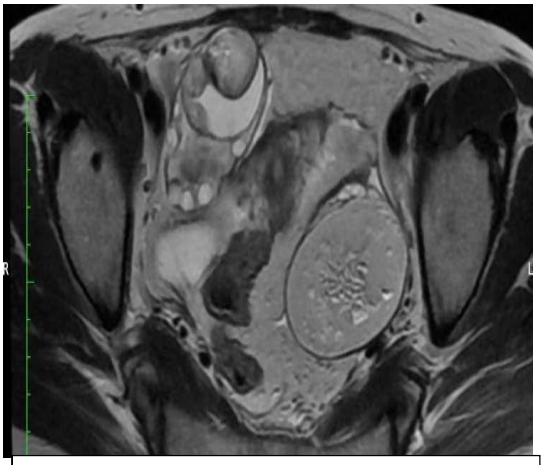
Ovarian carcinoma is one of the leading cause of death in women. Treatment and prognosis of this disease depends on the risk stratification based on imaging modalities. Ultrasound is the primary modality for the evaluation of the adnexal masses. But it has been observed that ultrasound is unable to differentiate adnexal masses into malignant and benign in some cases and gives inconclusive results. On the other hand magnetic resonance imaging provides better spatial and contrast resolution in delineation of the anatomical structures as well as characterization of pathological lesions. It is highly accurate in identifying the origin of a mass, characterization and staging and helps in the treatment planning. We found a very good sensitivity, specificity, positive and negative predictive value and diagnostic accuracy in the differentiation of malignant and benign adnexal masses. These parameters have been found quite in agreement with the findings of histopathology. Hence, magnetic resonance imaging can be used in evaluation, characterization and staging of the adnexal masses.

CASES ANDILLUSTRATIONS

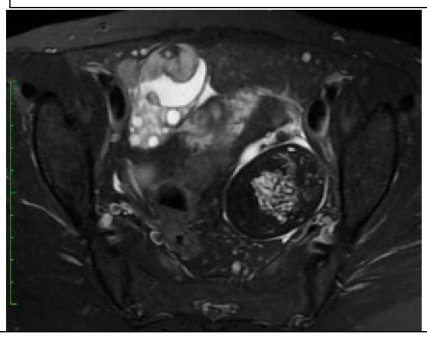
1) 20 years,female

Chief Complaints: Pain in abdomen with irregular cycles

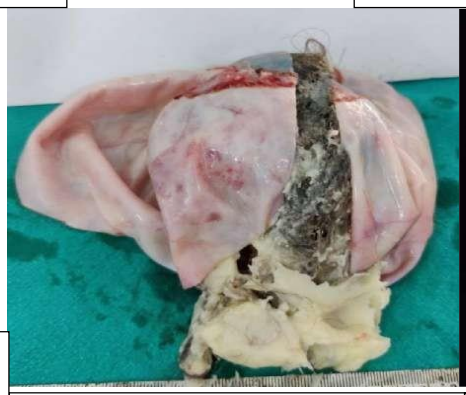
USG showing large cystic lesion with solid and hyperechoic fat components



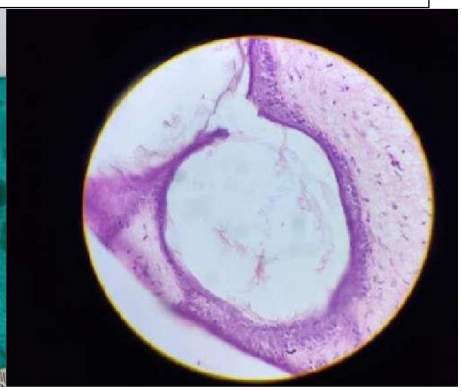
MRI showing Axial T2 images shows bilateral ovary containing fat, solid and cystic component



Axial T1W image, showing well encapsulated lesion with fat components which were darker on fat suppression images in left ovary. Right ovary contains cystic lesion with soft tissue, fat and calcifications within



Gross specimen contains hair follicles with fat lobules and cystic areas



Cystic mass containing heterogeneous component

Diagnosis: TERATOMA OF BILATERAL OVARY

2) 60 years,female

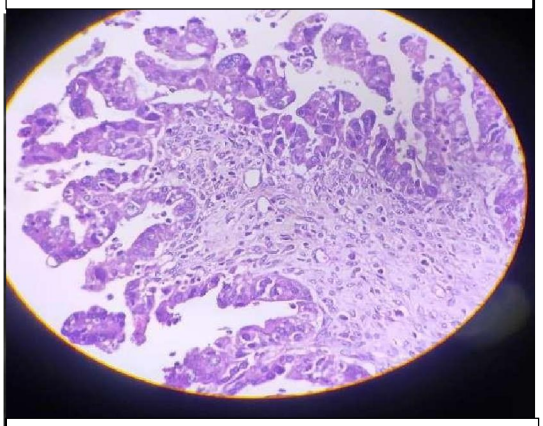
Chief complaints: pain in abdomen with distension

USG shows solid cystic lesion with internal septations within

.Solid component also shows vascularity on color Doppler

Biloculated cyst with solid components

Cor t2 mri shows cystic mass with solid component withing and septations measuring 1-2mm



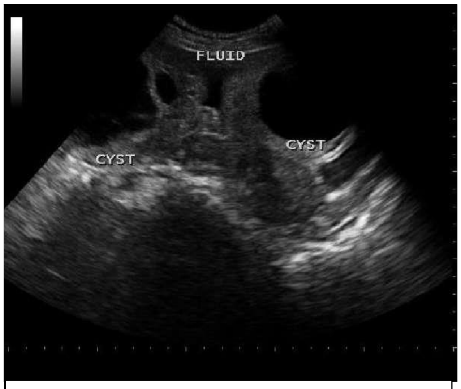
Solid cystic lesion with tumor cells arranged in papillary, slit like, solid, cribiform and glandular pattern

Diagnosis: SEROUS CYSTADENOCARCINOMA

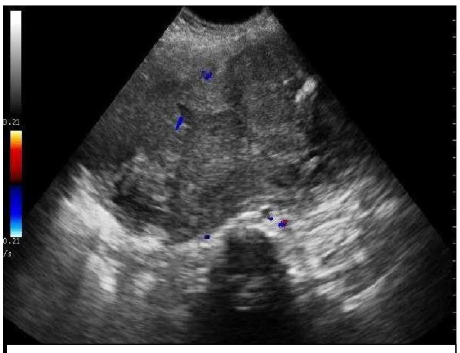
3) 38 years,female

Chief complaints: pain in abdomen

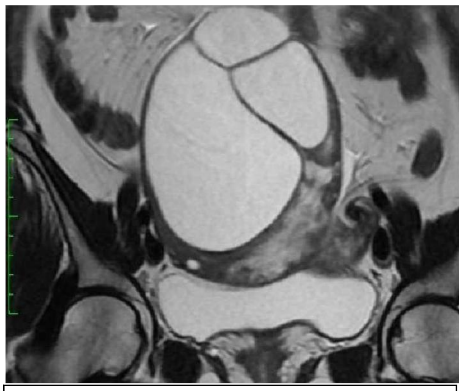
USG image showing enlarged rt ovary with large follicles



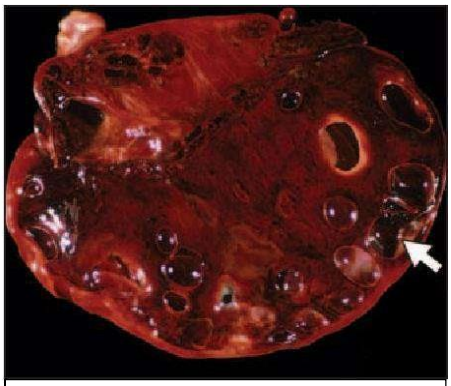
USG image showing enlarged right ovary with multiple large peripheral follicles and periovarian free fluid



Colour Doppler image showing no evidence of vascularity within the lesion



MRI showing coronal T2 weighted MR image showing enlarged right ovary with multiple peripheral follicles and hyperintense stroma



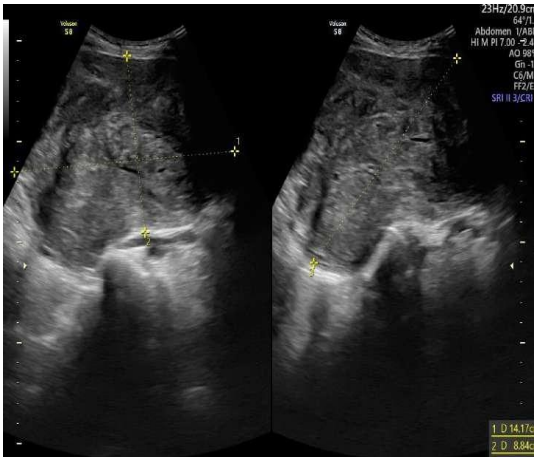
Gross pathologic examination reveals central stromal edema and hemorrhage (arrow) with peripheral displacement of follicles

Microscopic: Hematoxylin and eosin (H&E) stained histologic specimen demonstrates perifollicular hemorrhage (arrowheads) separating the theca interna and externa layers

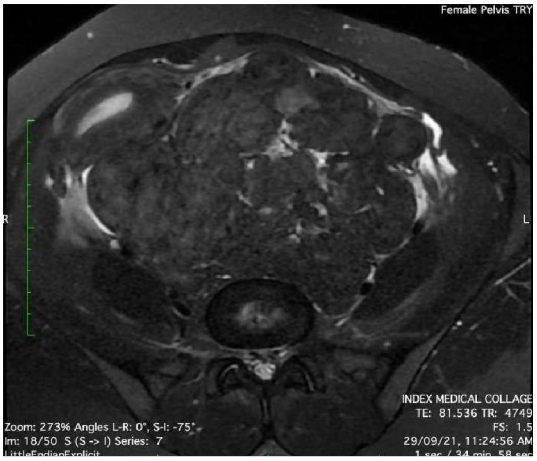
Diagnosis: TORSION RIGHT OVARY

4) 25 years,female

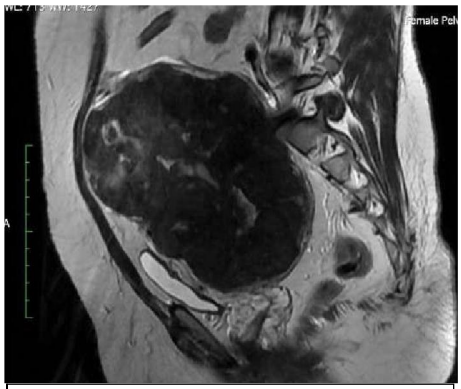
Chief complaints: Pain in abdomen with distension



*USG shows heterogeneous solid hyperechoic lesion with non-*visualisation of both ovaries

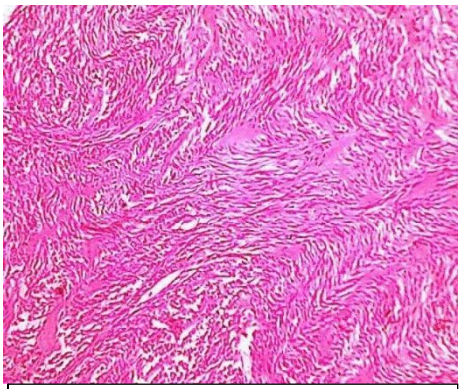


Saggital T2w MRI shows heterogeneous mass isointense to muscle originating from right broad ligament



MRI - Axial T2w MRI shows heterogeneous mass isointense to muscle originating from right broad ligament

Histopathology specimen shows broad ligament fibroid attached to uterus

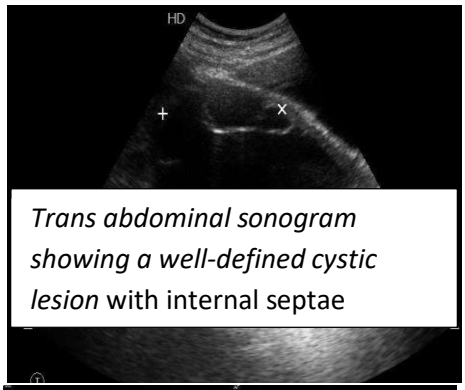


Histopathology smear showing increased collagenous tissue

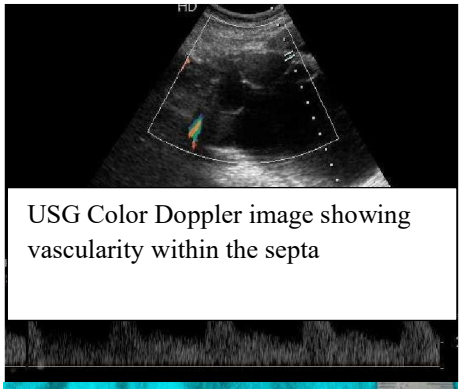
Diagnosis: BROAD LIGAMENT FIBROID

5) 42 years,female

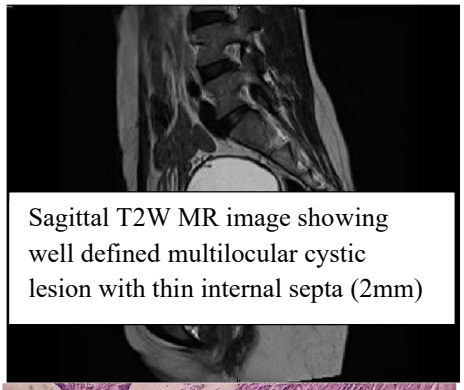
Chief complaints: Pain in abdomen



Trans abdominal sonogram showing a well-defined cystic lesion with internal septae



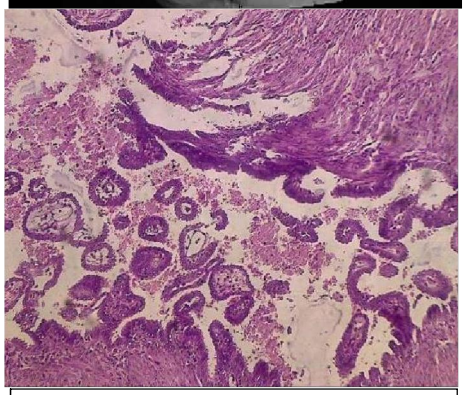
USG Color Doppler image showing vascularity within the septa



Sagittal T2W MR image showing well defined multilocular cystic lesion with thin internal septa (2mm)

Axial T1W MR image multilocular cystic lesion with internal septae

Gross specimen showing cystic lesion with incomplete septa

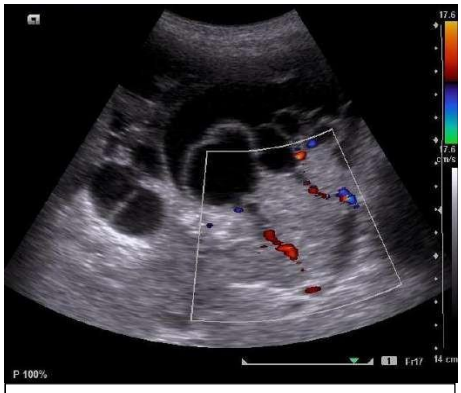


Ovarian cyst wall with serous components

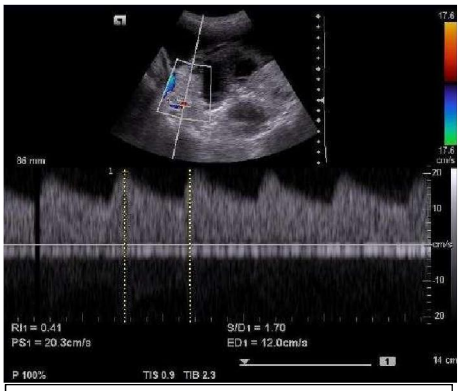
Diagnosis: SEROUS CYSTADENOMA

6) 42 years,female

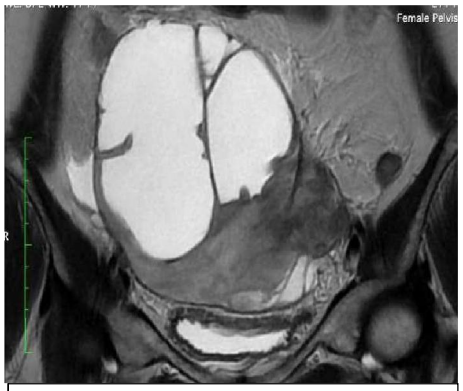
Chief complaints: Pain in abdomen with distension



USG colour Doppler image showing multilocular cystic lesion with internal vascularity in the solid component



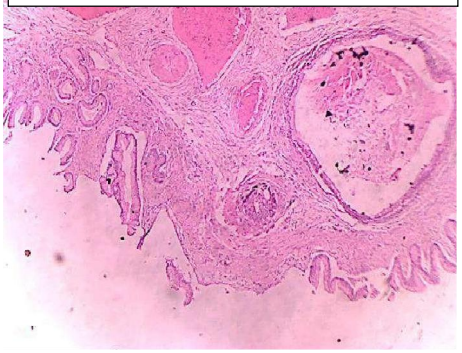
USG colour Doppler image with spectrum showing low resistance flow(RI:0.4) within the solid component



MRI - Coronal T2 weighted MR image showing multilocular cystic lesion with solid intermediate Si component and internal septations within

MRI - Cor T1 + contrast show wall enhancement with enhancement of solid component

Histopathology showing ovarian cyst wall with mucin

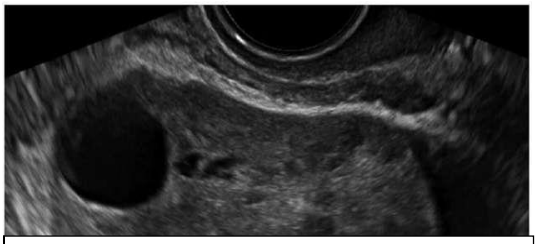


Histopathology showing ovarian cyst wall with mucin

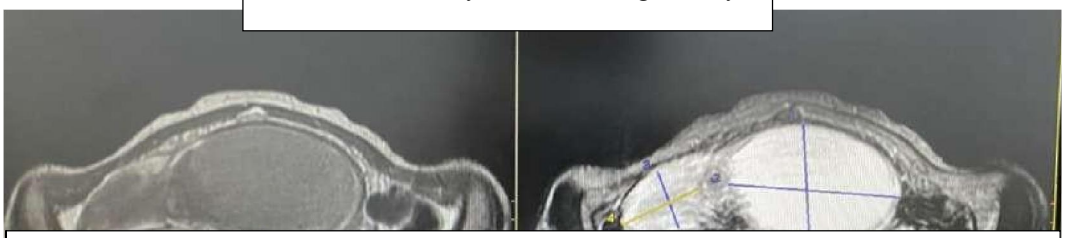
Diagnosis: MUCINOUS CYSTADENOCARCINOMA

7) 25 years,female

Chief complaints: Pain in abdomen with distension

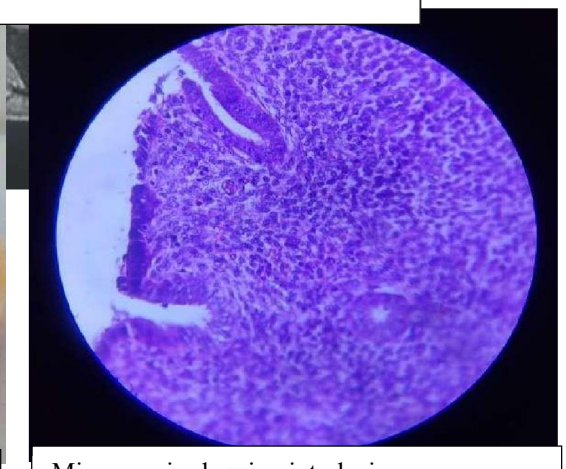


USG shows solid cystic lesion in right ovary



Axial T2 MRI Bilobed cystic mass with solid component within

Histopathology - Gross bi-loculated with solid portion filled with clotted blood. The other smaller cyst was filled with serous fluid



Microscopic showing interlacing bundles and storiform areas of spindle cells which are showing mild anisonucleosis with mild atypia.

Mitotic figures are also seen though very infrequent. These cells are showing diffuse Vimentin positivity

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