DOI: 10.7860/IJARS/2021/46607:2629

Original Article

Radiology Section

A Study on Validity of Ultrasonography and Magnetic Resonance Imaging in Assessment of Uterine Adnexal Masses

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ABSTRACT

Introduction: Adnexal mass lesions are common among women which has a prevalence of 0.17%-5.9% in asymptomatic women and 7.1%-12% in symptomatic women of all ages. Making a differential diagnosis among adnexal masses is difficult and complex. Recognising the severity of the problem, appropriate and timely evaluation and treatment with good outcome is the goal.

Aim: To find out the validity of Ultrasonography (USG) and Magnetic Resonance Imaging (MRI) in evaluation of uterine adnexal masses.

Materials and Methods: A cross-sectional study of 50 subjects with suspected various adnexal masses has been conducted over a period of two years from November 2017 to November 2019 in the Department of Radiodiagnosis and Pathology, for USG were included. All patients later underwent surgery and biopsy specimens were sent for Histopathological Examination (HPE). The data was entered in master chart then mean, Standard Deviation (SD) and other statistical tests was applied and analysed using Statistical Package for the Social Sciences (SPSS) 16 statistical package, Chi-square test has been used to compare the sensitivity of Transabdominal Ultrasound (TAUS) and MRI scan with level of significance of <0.05. The results were expressed in form of tables, charts, graphs, figures and photographs.

Results: The subjects age ranged from 9 to 84 years with a mean age of 40.36. Ovary was the most common site of origin of adnexal masses was (right 44% and left 30%), main symptoms was lump followed by pain abdomen. Most common adnexal masses on HPE were papillary followed by serious cystadenocarcinoma in malignant cases. USG showed an overall sensitivity of 88.9%, specificity of 81.3% PPV-72.7% and NPV-92.9% in comparison to the histopathological findings benign cases had peripheral vascularity (65.62%) and had 59.4% cases with more than 0.8 resistive index. Among malignant cases (88.9%) had central vascularity with 83.3% cases having resistive index less than 0.8. Sensitivity, Specificity, PPV, NPV of MRI was 94.4%, 93.8%, 89.5% and 96.8%, respectively.

Conclusion: USG is the initial choice of imaging modality for evaluation of adnexal mass lesions. But imaging with MRI has high accuracy in identifying the origin of a mass, characterising its tissue content and staging and preoperative plan. But still the HPE of specimen obtained from laparotomy of adnexal mass is the gold standard for confirming the diagnosis.

Keywords: Benign, Histopathological examination, Malignancy, Vascularity

INTRODUCTION

In gynaecology, adnexal masses are considered among the most common disorders. The lesions of adnexal origin constitute one of the leading cause of female morbidity, a less common cause of mortality and a frequent reason for gynaecologic surgery. Adnexal region is composed of ovary, fallopian tube, broad ligament, and associated blood vessels and nerve structures. Ovarian tumours alone represent two thirds of these cases. Ovarian cancers are one of the most lethal of all gynaecological cancers, as they are characterised by late presentation and poor response to treatment. The main challenge to the radiologist is to differentiate benign from malignant adnexal lesions in order to direct patients to the appropriate treatment algorithm. Determining whether a clinically diagnosed adnexal lesion is benign or malignant is frequently not possible until surgical exploration and histological examination are performed [1]. The prevalence of ovarian masses is 7.8% in pre-menopausal patients and 2.5% prevalence in the post-menopausal women [2].

Though bimanual palpation of the adnexal masses may not allow a very specific diagnosis but clinically useful information can usually be obtained. So, it is very useful as a first step in assessment of adnexal masses and as an adjunct to morphological assessment of ovarian lesions. Ultrasound is an important non-invasive imaging modality which is helpful in diagnosing most of the cases, but histopathological examination of specimen obtained from laparotomy of adnexal mass is the gold standard for confirming the diagnosis [3]. Ultrasound is the most common initial approach for diagnosis of adnexal mass with doppler flow to rule out torsion. There are many reports on the role of various imaging modalities like ultrasound, Computed Tomography (CT) and MRI in the diagnosis and management of acute adnexal pathologies like torsion, haemorrhage, cyst rupture etc., but clinicopathological studies are few [4]. With recent advances in the field of MRI, it 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.

MRI has been found to be highly accurate in the characterisation of adnexal masses. MRI is non-invasive, has no risk of radiation, requires no anaesthesia and is less operator dependent. MRI is considered as the next step in assessment of sonologically indeterminate masses and as the primary modality for evaluating gynaecological malignancies. Morbidity due to unnecessary surgeries of advanced cases of ovarian carcinoma can be prevented by prior preoperative staging by imaging modalities. Neoadjuvant chemotherapy which is ideal for patients with advanced carcinoma which helps in optimal tumour debulking during interval cytoreductive surgeries can be guided by accurate staging using imaging modalities [5].

In year 2012, ovarian cancer occurred in 239,000 women worldwide (new 26,834 cases in India) and resulted in 152,000 deaths (GLOBOCAN 2012) [6]. Benign adnexal masses are more common in younger age groups [7] however, 4-24% masses in pre-menopausal patients are malignant. 39-63% masses found in post-menopausal patients are malignant [8,9].

As adnexal masses constitute one of the leading causes of female morbidity and mortality, it is necessary to differentiate more precisely between benign and malignant lesions. In this regards, USG has decreased specificity for diagnosis of benignity. So, the early introduction of MRI in the treatment algorithm may greatly influence the outcome, to determine the sensitivity, specificity, PPV and NPV of USG and MRI in patients with adnexal masses and to compare USG and MRI findings of adnexal masses with HPE. To ascertain the advantage of MRI over USG in the diagnosis of malignant HPE will be used as gold standard test. The aim of the present study was to find out the validity of USG and MRI in evaluation of uterine adnexal masses. The objective was to determine the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of USG and MRI in patients with adnexal masses in a Tertiary Care Teaching Hospital. Also, to compare USG and MRI findings of adnexal masses with HPE.

MATERIALS AND METHODS

The present study was cross-sectional study which included 50 patients who were referred to Radiology Department with suspected uterine pathologies. The study was conducted after getting approval from the Institution's Ethical Committee as per ethical number ECR/937/Inst/TR/2017 issued under rule 122DD of the drugs and cosmetics rules 1945 under Government of India and after obtaining written informed consent from the patients. The study was conducted for two years, from period of November 2017 to November 2019, in the Department of Radiodiagnosis and Pathology. Study population were patients with clinically suspected uterine adnexal masses referred to the Radiodiagnosis Department for USG. Those patients who had positive or suspicious findings in USG were subjected to MRI examination. Final correlation with histopathology was done in available subjects.

Study tools: Siemens acusonx 300, Medison sonoacexusg machine, Siemens 3.0 tesla MRI, model magneto skyra and clinical proforma.

Inclusion criteria: Clinically suspected cases of uterine adnexal mass lesions and adnexal mass lesions found incidentally on USG.

Exclusion criteria: All midline uterine mass lesions. Clinically and sonologically proved cases of ectopic pregnancy. All patients having cardiac pacemakers, prosthetic heartvalves, cochlear implants or any metallic implants. Patients having history of claustrophobia. Patients not willing to do the study.

Sample size calculation: In an equation,

$$\text{Sample size (n) based on specificity} = \frac{Z^2_{1-\alpha/2} \times S_N \times (1 - S_N)}{L^2}$$

Where, L (error)=10% of sensitivity=10% of 91=9.1$Z^2_{1-\alpha}$=$(1.96)^2$=3.84

Sensitivity of MRI for adnexal mass=91% [10]

Applying the above values in this formula, n=3.84×91×(100-91)=3144.96/9.12=37.97=40. Considering, 10% nonresponse rate=10% of 40=4

Therefore, total patients=40+4~44

Considering, 44 cases to be the minimum number for statistical significance, it was decided that 50 cases will be examined during this period.

In an equation n=$Z^2_{1-\alpha}$ (sensitivity) (1-sensitivity)/L^2 where, L (error)=10% of sensitivity=10% of 90=9$Z^2$1-α=$(1.96)^2$=3.84

Sensitivity of USG for adnexal mass=90% [11].

Applying the above values in this formula, n=3.84×90×(100-90)=3110.40/92=44.44; Considering, 10% non response rate=10% of 44=4.4. Therefore, total Patients=44+4~48.

Considering 48 cases to be the minimum number for statistical significance, it was decided that 50 cases will be examined during this period. Systematic random sampling was adopted as sampling technique in the present study to select the eligible patients. Considering the records at USG clinic and Pathology Department for last two years, on an average 150 patients presented with adnexal mass. Hence, considering this, every third patient was sufficient to give the minimum required sample of 50 will be selected for the present study.

Procedure of the study: All the patients in the study were clinically evaluated by taking detailed history and clinical examination as per the clinical proforma. Selected cases fulfilling the criteria included in the study once after their consent had been taken. All the cases were done with ultasonographic evaluation to determine the aetiology of the adnexal masses and the findings were incorporated as per the proforma guidelines. All the patients then underwent MRI to assess the aetiology of the disease process and the findings were incorporated in the proforma. The need of surgical treatment was evaluated among the patients. The data was recorded during the investigation procedure and compared with the operative and FNAC findings or HPE. Final result was compared with any relevant study done in this topic if any.

STATISTICAL ANALYSIS

The data was entered in master chart and proportion, mean, SD and other statistical tests were applied as per necessity and analysed using appropriate statistical software. SPSS 16 statistical package and Chi-square test was used to compare the sensitivity of Transabdominal ultrasound and MRI scan with level of significance of <0.05. The results were expressed in form of tables, charts, graphs, figures and photographs.

RESULTS

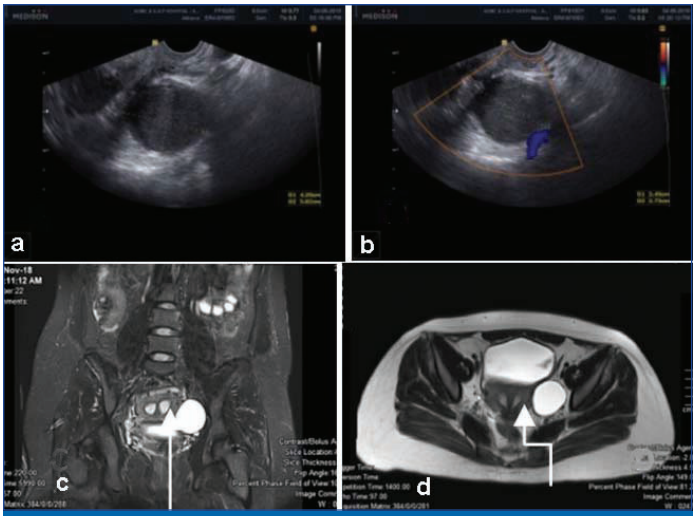
This study consisted of total 50 patients with age range from 9 years to 84 years with mean age of 40.36 years and standard deviation of 16.992. Maximum numbers of patients were above 50 years representing 30% of the study sample. Patients from 30 to 39 years represented 24%, age group from 40 to 49 years represented 20%, age group from 9 to 19 years and 20-29 years were the least representing 14% and 12%, respectively.

Among the 50 patients, most patients were multipara and the lesions were located bilaterally in 13 (36%) patients, on right-side 22 (44%) patients followed by 15 patients (30%) on left side. Most of the patients 18 (36%) presented with a lump followed by pain abdomen 15 patients (30%).

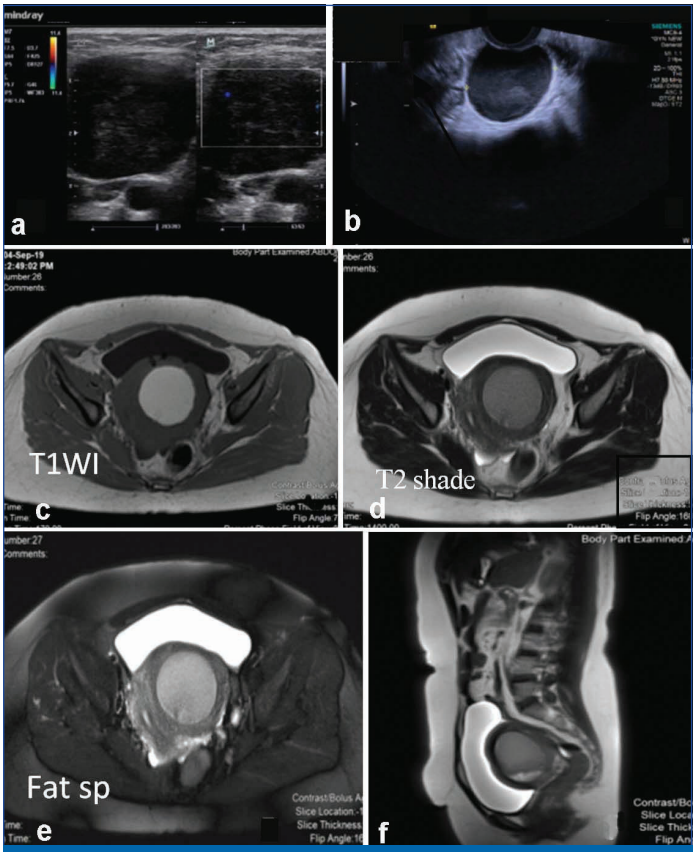
One case of paraovarian cyst was found with bicornuate uterus seen as a cyst clearly separate from the normal ovary [Table/Fig-1]. In present study, an unmarried female patient with history of primary amenorrhea was diagnosed as Hydrosalpinx with hydrometra which showed homogeneous T1 hypointensity and T2 hyperintensity of simple fluid. Endometriomas typically appeared as unilocular, ground glass appearance, diffuse, homogeneous, hypo to intermediate signal echoes USG and on MRI shown as hypointense on T1WI and fat suppressed T1WI but on T2WI seen as a T2 shading sign were noted [Table/Fig-2].

A well-defined heterogeneously hyperechoic lesion with fat-fluid level within it and showed dermoid mesh, dermoid plug. The lesion did not show vascularity on colour doppler. On MRI, calcification showed hypointense on SWI and on T1W fat suppressed image, the areas within the lesion which appeared hyperintense were suppressed suggesting fat components [Table/Fig-3].

Transvaginal Sonography (TVS) showed complete echogenicity of the masses. Exact location of two cysts was unclear on Tranabdominal Sonography (TAS). On TVS, "beak" sign was seen in the mass



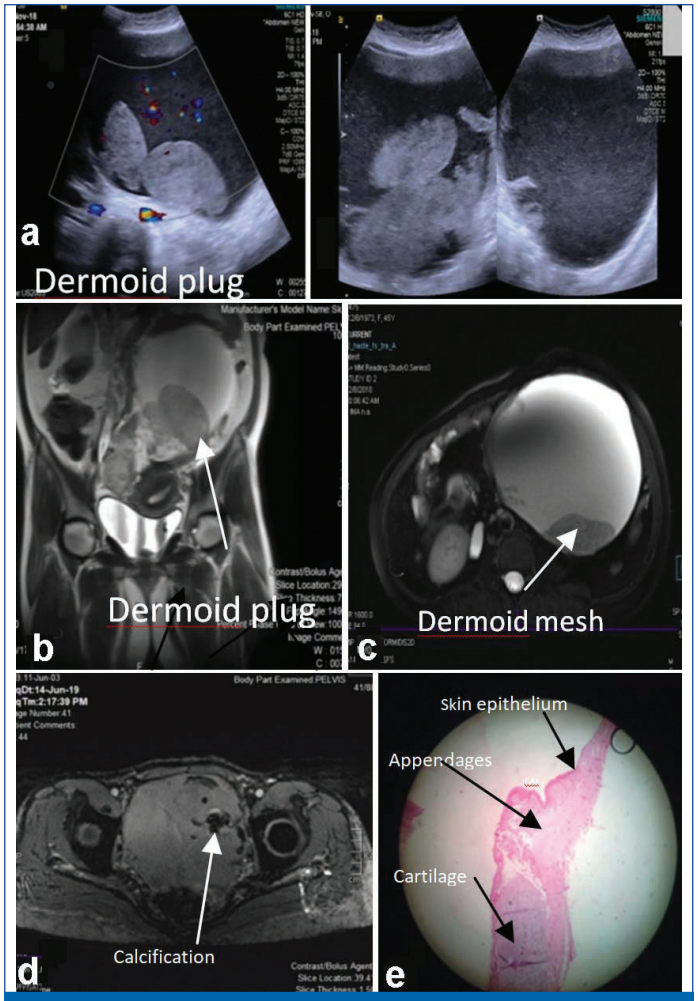
[Table/Fig-1]: Left paraovarian cyst with bicornuate uterus in a 27 years old woman a. TA USG; b. TVS c. Coronal; d. Axial T2 weighted image.



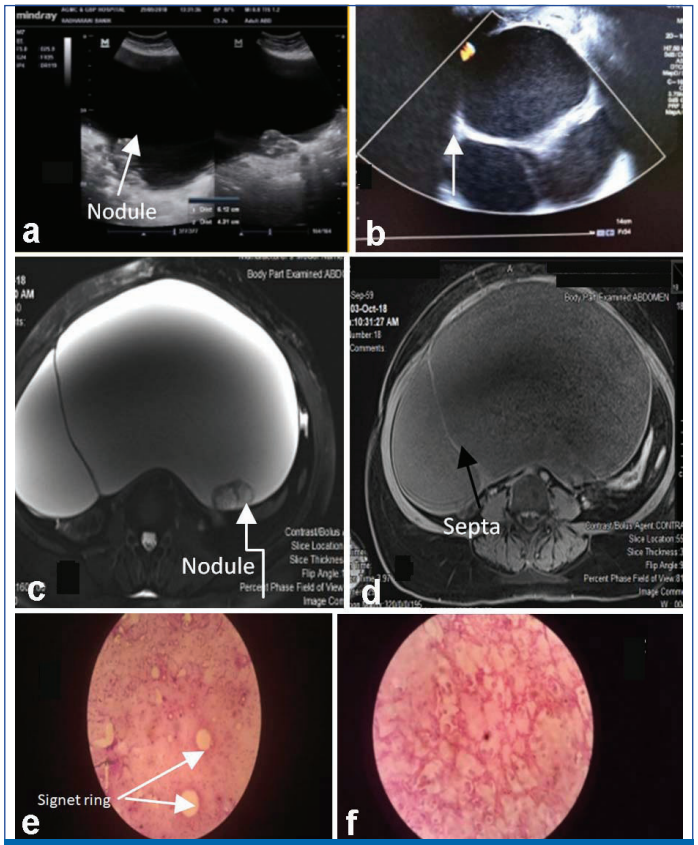
[Table/Fig-2]: Endometrioma in a 37 years old female. a,b)-TAS and TVS showing well-defined loculated predominantly cyctic mass with diffuse homogenous low level internal echoes. c-f) Axial T1 Hyperintense, T2 and T2 TIRM intermediate SI and Sagital T2WI with hypointense rim, Low T2 signal intensity in dependent portion s/o T2 dark spot and shading sign.

suggesting their intraovarian location. In the chocolate cysts, TVS demonstrated characteristic diffuse low level internal echoes which were missed on TAS. Two cystadenocarcinomas could be detected only by TVS since they showed small irregular mural nodules and local thickening of septae on TVS but not on TAS. If only TAS was done, would have labeled them as benign cysts or cyst adenomas. On TAS, the cystadenoma which was misdiagnosed had appeared as a completely echofree cystic lesion. On TVS, few of those septae were noted. If TVS was not done, the sonographic diagnosis would have been an ovarian simple cyst. So, combined approach using both TAS and TVS gave the best results [Table/Fig-4].

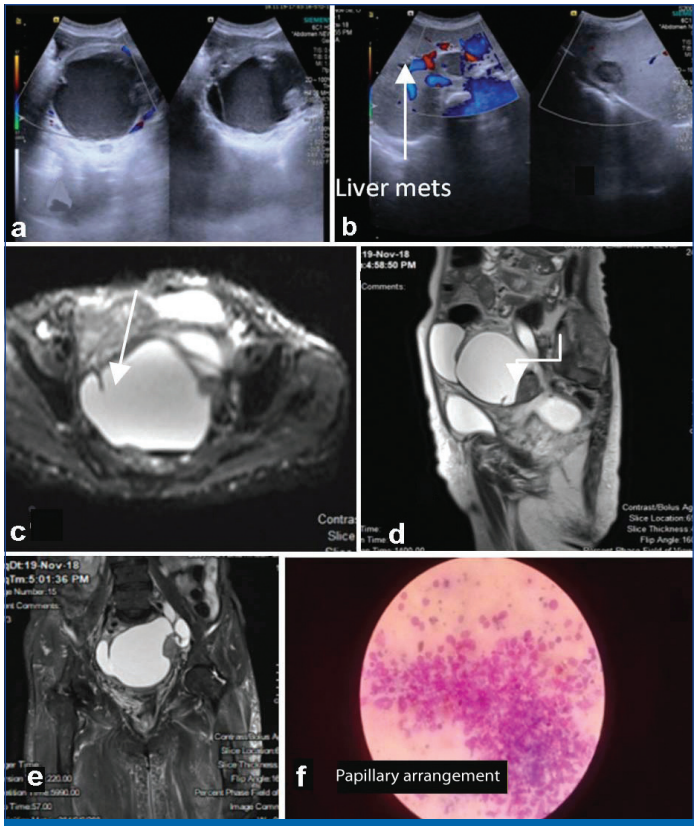
More frequently multiloculated, with loculi of different signal intensity that had a "stained-glass appearance" as well as a high number of septa (>10), which were commonly described as irregular and thickened seen in mucinous adenocarcinoma [Table/Fig-5].



[Table/Fig-3]: Mature teratoma in a 40years old woman; a.TAS-Dermoid plug; b. Coronal WI; c. Axial T2WI- arrow shows dermoid mesh; d. SWI- arrow shows calcification; e. Photomicrograph (H&E X10) show locules of fat, together with skin and appendages (hair follicles, cartilage).

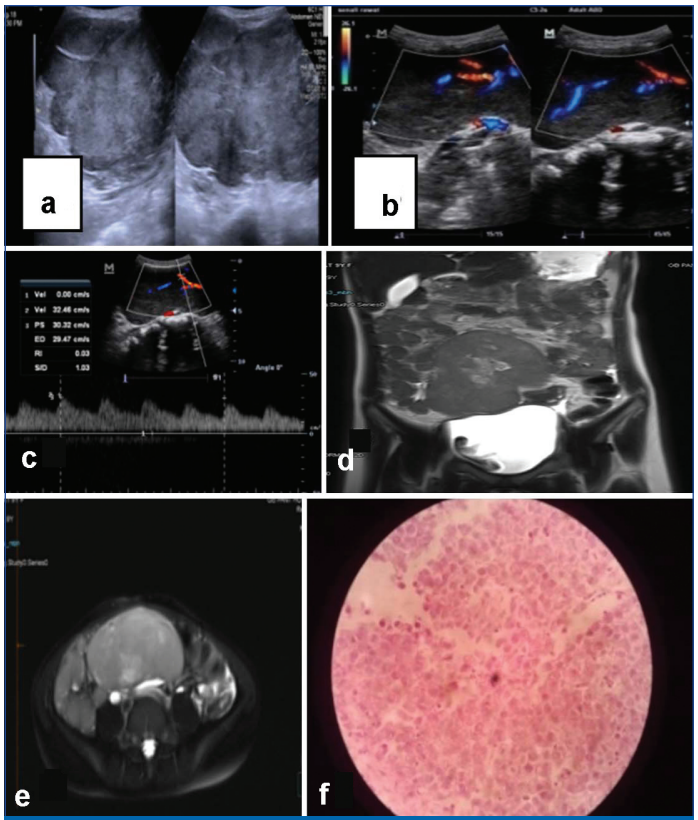


[Table/Fig-4]: Mucinous adenocarcinoma in a 38 years old female; a,b TAS and TVS- cystic mass with multiple septation and solid nodule, c,d-T1WI and T2WI-MRI-well-defined cystic septated mass with internal nodule (Arrow), e,f-photomicrograph of signet ring cell mucinous adenocarcinoma (10X and 40X H&E).



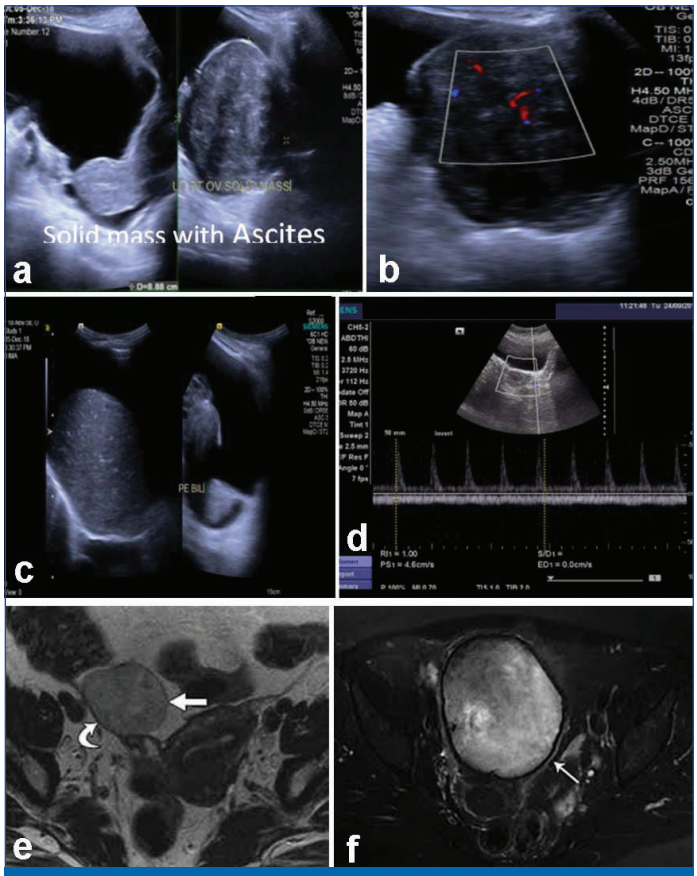
[Table/Fig-5]: Serous papillary Adenocarcinoma in a 48-year-old woman a and b USG anechoic cystic mass with internal septation, papillary projection, enlarged lymph node and liver metastasis seg-VI; c. Axial T2WI; d. Sagital; e. Coronal weighted image showing papillary projection and internal septa f. Photomicrography (H&E-40X) papillary arrangement of malignant cells.

An ill-defined solid ovarian mass with multilobulated appearance separated by septa was noted on USG with central vascularity (RI<0.8) was noted. On MRI multilobulated heterogenous mass with hypointense septa on T1WI and marked enhancement to IV contrast media was seen and diagnosed as a dysgerminoma [Table/Fig-6].



[Table/Fig-6]: Dysgerminoma in a 9 years old female; a-c TAS- solid lobulated mass lesion with internal vascularity and RI value –0.03, d. Coronal MRI e. Axial T2WI f. Photomicrograph (H&E stain-40x) shows variably sized nests of cells that resemble primordial germ cells and are separated by fibrous septa and contain mature lymphocytes.

Fibroma was found as a well-circumscribed solid mass hypoechoic lesion with pleural effusion and ascites and on MRI it appeared as a hypointense to intermediate on T1-weighted and hypointense on T2-weighted images and it is suggestive of Meigs syndrome [Table/Fig-7].



[Table/Fig-7]: Fibroma in a 45 years old women showing. a-d - solid tumour with vascularity, ascites and bilateral pleural effusion; e,f Axial images T1 and T2 WI (Meigs syndrome).

Benignity vs Malignancy: In present study, it was observed that most of the benign masses were less than 4 cm (65.6%) and masses more than 4 cm were 34.4%. Among the malignant masses less than 4cm were 16.7% and more than 4 cm was 83.3% respectively. Internal septa were more than 3 mm seen in malignant cases. In this study, mostly complex adnexal masses were seen (68%) which comprised 50% and 100% of benign and malignant cases respectively. It was followed by cystic masses (28%) and solid adnexal masses were all benign. In this study, acoustic shadow was present in10 (20%) cases and out of these 6 (18.8%) was benign and 4 (22.2%) was malignant. Maximum cases with calcification were benign cases and maximum malignant cases had pleural effusion and pelvic extension [Table/Fig-8].

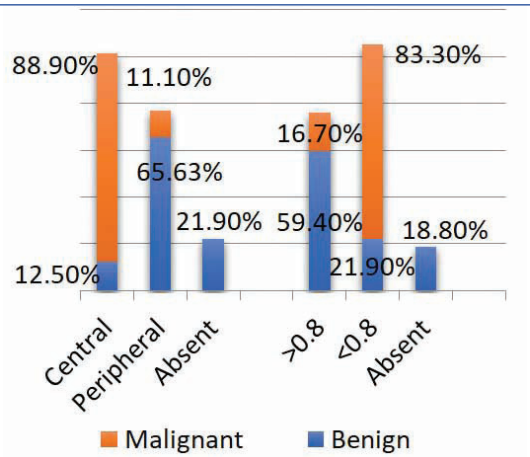
On colour flow, maximum malignant cases had with central vascularity and RI<0.8 where maximum benign cases were peripheral vascularity and RI>0.8 and all were statistically significant at 1% level (p<0.05) [Table/Fig-9].

Most common adnexal masses were serous cystadenoma in the age group of 30-39 years followed by dermoid in above 50 years of age and in malignant cases commonest was the papillary type of adenocarcinoma. Serous cystadenoma was found to be the most common benign histological type representing 31.2% of the study group [Table/Fig-10] and 38.3% of the malignant lesions were serous cystadenocarcinoma [Table/Fig-11].

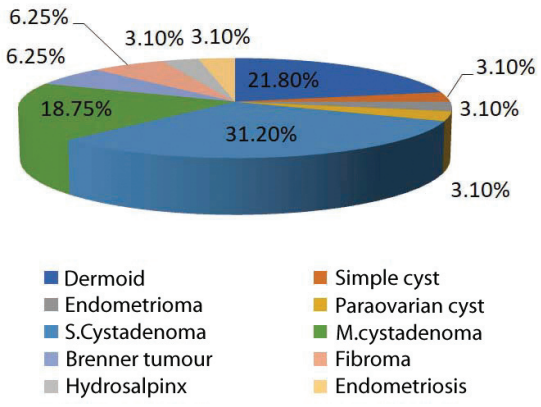
Characteristic of mucinous cystadenoma was a cystic lesion with multiple, smooth, thin septa and absence of nodules. Solid component within a cystic mass indicated malignancy whereas malignancy was unlikely in the absence of a solid component. In dermoid tumour typically solid area is more hyperechoic in comparision to the cyst wall which often had acoustic shadowing.

US features	Frequency	Benign	Malignant	p-value*
Size				
<4 cm	24	21 (65.6%)	3 (16.7%)	0.001
>4 cm	26	11 (34.4%)	15 (83.3%)	
Shape				
Round	14	10 (31.3%)	4 (22.2%)	<0.001
Lobulated	10	8 (25%)	2 (11.1%)	
Multilobulated	26	14 (43.8%)	12 (66.7%)	
Margin				
Regular	24	22 (68.8%)	2 (11.1%)	0.004
Irregular	26	10 (31.3%)	16 (88.9%)	
Composition				
Solid	2	2 (6.3%)	0 (0%)	<0.001
Cystic	14	14 (43.8%)	0 (0%)	
Complex	34	16 (50%)	18 (100%)	
Septa				
Thin	18	16 (50%)	2 (11.1%)	<0.001
Thick	15	2 (6.3%)	13 (72.2%)	
Absent	17	14 (43.8%)	3 (16.7%)	
Calcification				
Present	10	6 (18.8)	4 (22.2%)	0.003
Absent	40	26 (81.3%)	14 (77.8%)	
Pleural effusion				
Present	16	5 (15.6%)	11 (61.1%)	<0.001
Absent	34	7 (38.9%)	27 (84.4%)	
Pelvic extension				
Present	9	2 (6.3%)	7 (38.9%)	0.004
Absent	41	30 (93.8%)	11 (61.1%)	

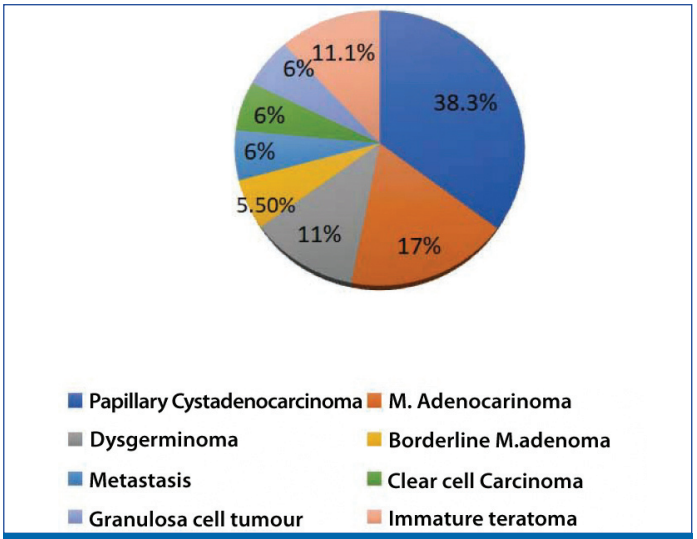
[Table/Fig-8]: Characters of benign and malignant lesions on USG and MRI.
*Significant at 1% level (p<0.05)



[Table/Fig-9]: Vascularity and Resistive Index of adnexal masses.



[Table/Fig-10]: HPE diagnosis of benign cases.



[Table/Fig-11]: HPE diagnosis of malignant cases.

In other malignant lesion, the mural nodule usually has same echogenicity to that of the cyst wall.

Final results showed that out of 50 patients on HPE 18 patients had malignant lesion and 32 patients had benign lesion. Out of 18 malignant patients, MRI correctly diagnosed 17 cases and one patient as falsely diagnosed as having benign lesion. USG correctly diagnosed 16 cases out of 18 malignant cases and two cases were falsely diagnosed as having benign cases. Thirty two cases were diagnosed as benign lesion on HPE, MRI correctly diagnosed 30 cases as benign and two cases were falsely diagnosed as having malignant lesion. Among 32 benign cases, USG correctly diagnosed 26 cases as benign and falsely diagnosed six cases as malignant. In present study, MRI had Sensitivity-94.4%, Specificity-93.8%, PPV-89.5%, NPV-96.8% and USG had Sensitivity-88.9%, Specificity-81.3%, PPV-72.7% and NPV-92.9% [Table/Fig-12,13].

MRI	HPE diagnosis		Statistical significant
	Malignant	Benign	
Malignant	17 (94.4%)	2 (6.3%)	p<0.05
Benign	1 (5.6%)	30 (93.8%)	
Total	18 (100%)	32(100%)	

[Table/Fig-12]: Comparison of the results of MRI with histopathology.
Sensitivity 94.4%, Specificity-93.8%,- PPV-89.5%, NPV-96.8%; p<0.05 is considered as statistically significant

USG	Histopathological diagnosis		Statistical significant
	Malignant	Benign	
Malignant	16 (88.9%)	6 (18.8%)	p<0.05
Benign	2 (11.1%)	26 (81.3%)	
Total	18 (100%)	32 (100%)	

[Table/Fig-13]: Comparison of the results of USG with histopathology
Sensitivity- 88.9%, Specificity-81.3 %,-PPV-72.7%, NPV-92.9%; p<0.05 is considered as statistically significant

DISCUSSION

It is very essential to characterise an ovarian mass in the preoperative evaluation of an ovarian neoplasm. It enables to anticipate an ovarian carcinoma which helps in planning and appropriate surgical procedure. In cases of benign cystic lesions usg guided aspiration can be done so that multiple surgeries can be avoided, especially in young women in whom multiple operations can lead to adhesions and infertility.

In present study, 50 patients presented with 63 adnexal masses. The lesions were more common on right side (44%) as compared to left (30%) which was similar to the study by Bhagde AD et al., [3].

Most of the patients presented with a lump (36%) followed by pain abdomen (30%). According to Jamal S et al., the commonest

mode of presentation was bleeding per vaginum, followed by pain abdomen, pelvic mass and gastrointestinal symptoms. In the present study, sizes of the lesions was not significantly different between benign and malignant masses [12].

Kim JS et al., stated that paraovarian or parafallopian cysts were common developmental variants arising from mesonephric or paramesonephric duct remnants in the broad ligament. Multiple unilocular cysts arose from the fimbriated end of the tube and some were large measuring upto 28 cm in diameter, though they were usually single. On MRI, they were typically homogeneously T1-hypointense and T2-hyperintense lesions with no solid components but might sometimes appear complex from prior haemorrhage or infection [13]. In the present study, a case of endometriomas was typically light bulb-bright lesions on fat suppressed T1-weighted images and hypointense signal intensity, on T2 weighted image due to the T2 shading sign. Iyer VR and Lee SI, stated that cyclic bleeding was the cause for accumulation of blood products of different ages within the cysts which contained very high concentrations of paramagnetic products of haemoglobin breakdown [14].

In present cases, mature teratoma were similar to the findings described by other studies where three manifestations occured most commonly, cystic lesion with a densely echogenic tubercle (Rokitansky nodule) projecting into the cyst lumen was the most common manifestation. A diffusely or partially echogenic mass with the echogenic area usually demonstrating sound attenuation due to sebaceous material and hair within the cyst cavity was the second manifestation which was followed by findings of multiple thin, echogenic bands caused by hair in the cyst cavity. Pure sebum within the cyst may be hypoechoic or anechoic [15,16].

Brown DL et al., stated that on the basis of location and configuration a hydrosalpinx should be suspected. Characteristically, it had tubular shaped cystic structure that is separate from the ipsilateral ovary. The pathognomonic findings of a hydrosalpinx was waist sign with a tubular-shaped cystic mass [17].

Size, septa and margin: Ultrasonographic findings of adnexal mass lesion with increased septal thickness, nodularity, central vascularity of the lesion was an indication of malignancy.

One case of papillary serous cystadenocarcinoma was not detected in dynamic which did not show septal enhancement in post-contrast study. Two cases of immature teratoma were not detected on USG in which septal thickness was less than 3mm and no nodularity.

Sohaib SA et al., showed that from the analysis of the MRI features, the most predictive characteristics of malignancy were vegetations/nodule in a cystic lesion, presence of ascites, a maximal diameter greater than 6cm, and necrosis in a solid lesion [18]. Similarly, in the present study the presence of nodules in a cystic lesion,ascites and size more than 4 cm were found suggestive of malignancy as per [Table/Fig-4].

Vascularity: Brown DL et al., stated that Colour Doppler US should be used to look for flow within a solid component or septum. Increased flow was observed in malignant lesion, though many benign neoplasms would also have detectable flow [17].

In present study, most of the benign cases had peripheral vascularity (65.62%) and had 59.4% cases with more than 0.8 resistive index. Most of the malignant cases (88.9%) had central vascularity with 83.3% cases having resistive index less than 0.8 [Table/Fig-9].

According to Hussain F et al., with the cut-off of <0.5 Resistance Index is found to be capable of detecting 92% of malignant cases (sensitivity 91.7), and could detect 89% (specificity 88.9) of benign cases correctly which translates in to 90% accuracy in the diagnosis of ovarian tumor [19].

Components: Valentini AL et al., suggested the criteria for characterisation of suspicious adnexal lesions in which features suggestive of malignancy were "solid, solid/cystic enhancing masses (greater than 4 cm in maximum diameter) with papillary projections and irregular thick wall and septa greater than 3 mm in a cystic lesion" as well as a "heterogeneous and early enhancement pattern [20]. The above mentioned features were found similar to the present study who had positivity for malignancy in histopathological examination [Table/Fig-4,5].

Sohaib SA et al., study found an overall diagnostic accuracy of 91% for distinguishing MR imaging features of benign from malignant adnexal lesions [18]. In the present study, the diagnostic accuracy was 94.4% for distinguishing benign from malignant adnexal lesions [Table/Fig-12,13].

Histopathological patterns: In present study, serous cystadenoma was found to be the most common benign histological type representing 31.2% of the study group. According to Arora M et al., Serous cystadenocarcinoma was the single most common histological entity with 36.53% prevalence and a striking predominance in post-menopausal patients [21].

Brown DL et al., stated that a completely solid ovarian mass, particularly in a middle-aged woman is usually a fibroma. With fibromas, the acoustic shadowing does not originate from an area of increased echogenicity due to calcification or from the hyperechoic nodule of a dermoid. Instead, the shadowing occurs because of marked attenuation of sound by the hypoechoic mass of the fi broma [17].

A study was conducted by Mugheri FN and Majeed AI, to compare the diagnostic accuracy of doppler USG and contrast enhanced MRI, to characterise the adnexal masses into benign and malignant [22]. The study showed that contrast enhanced MRI was more accurate investigation as compared to transabdominal doppler USG for differentiating the malignant and benign adnexal masses. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of transabdominal USG in assessing adnexal masses were 85.18%, 80.56%, 86.79%, 78.38% and 83.33% respectively while for contrast enhanced MRI were 94.83%, 87.50%, 93.22%, and 92.22% respectively which were similar with Kasim A, [23].

Sultana N et al., studied and found that the sensitivity, specificity, PPV and NPV of transabdominal USG in assessing adnexal masses was 100%, 54%, 58.5% and 100%, respectively while for contrast enhanced MRI, was 95.8%, 86.4%, 82.1% and 96.9% respectively [24]. According to Abbas TR et al., Transabdominal ultrasound had a sensitivity of 77%, specificity of 86.8%, and PPV of 85.3% and NPV of 81.9% [25].

Limitation(s)

The current study was carried out in a demographic location where economic and availability issues prevented MRI to be a routine radiological modality for pelvic imaging. TVS was found to be superior in diagnosing adnexal masses as compared to TAS, with more accurate delineation of internal architectural features as wall thickness and complexity, nodules, septae, papillary projections, internal echoes. However, major disadvantage of the TVS were need for higher frequency which cause limited FOV. Very limited sample size and MRI is very expensive. Dangerous for patients with metallic devices placed within the body; difficult to be performed on claustrophobic patients. RF transmitters can cause severe burns if mishandled.

CONCLUSION(S)

In spite of advanced chemotherapy regimens and improved surgical approaches, ovarian carcinomas continue to be one of the leading causes of death among gynaecological malignancies. For the treatment of adnexal mass lesion, stratification of risk based on appearance of the mass on imaging is needed. USG is the initial imaging modality of choice for evaluation of adnexal mass lesions. But evaluation with MRI is highly accurate for identifying the origin of a mass, tissue characteristic with its content, staging

and preoperative planning. MRI is more accurate than USG. MRI is superior to ultrasonogram in diagnosing and characterising adnexal mass lesions. Due to high accuracy of MRI, it can be used in preoperative planning of a sonographically indeterminate mass. Incidence of benign tumours was much higher than malignant tumours with benign serous cystadenoma being the most common benign tumour and serous cystadenocarcinoma being the most common malignant tumour. There was significant increase in incidence of malignancy in tumours with complex or solid morphology. Also age more than 50 years, post-menopausal age group, solid and complex tumour morphology, presence of ascites and bilaterality of tumours significantly increased incidence of malignancy and thus, these parameters can be used to predict the risk of malignancy in ovarian tumours.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Sep 24, 2020
- Manual Googling: Nov 07, 2020
- iThenticate Software: Jan 27, 2021 (22%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Sep 06, 2020**
Date of Peer Review: **Oct 16, 2020**
Date of Acceptance: **Nov 28, 2020**
Date of Publishing: **Apr 01, 2021**