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Original Research Article

Correlation of Ultrasound Findings with Histopathology of Pelvic Masses in a Tertiary Care Hospital

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ABSTRACT

Background: Benign and malignant pelvic masses can occur in different age groups, primary diagnosis and choosing appropriate surgical procedure is of utmost importance. Nowhere else in the body is it more perilous to interpret imaging studies in a void of clinical information than in the pelvis. USG is the diagnostic test of choice in evaluating pelvic masses and may diagnose majority of pelvic masses (highly operator dependent, however). Because of considerable overlap in the morphologic pattern of different pelvic masses, diagnosis should be supplemented by histopathological findings.
Aims and Objectives: This study aims in detection of clinically suspected pelvic mass, its site of origin and relationship to other nearby organs and to correlate the ultrasound findings of malignant masses with definitive histopathological or Laboratory findings.
Material and Methods: The present cross sectional observational follow up study consisted of 31 cases and 40 masses were carried out in department of Radiodiagnosis & Imaging at Rajindra Hospital & Government Medical College, Patiala from December 2014 to September 2015.Study was conducted to assess the efficacy of ultrasonography (USG) in diagnosing malignancy in pelvic masses and correlating their findings with histopathology.
Results: 31 patients with clinical suspicion of pelvic masses, attending the outpatient department or admitted to wards of Rajindra hospital, Patiala, were included in this study. Some of these patients had presented with more than one mass hence the total number of masses were 40. After taking the detailed history all the patients were subjected to thorough clinical history& clinical findings and bio-chemical investigations were recorded. Patients were then subjected to ultrasonography and the findings were finally correlated with the histopathological findings.
Conclusion: Because of inherent advantages of easy availability, lower cost, and no patient radiation exposure, USG is imaging modality of choice as first line investigation of pelvic masses, with supplementation of histopathology.

Keywords: USG- ultrasonography, histopathology, pelvic masses.

INTRODUCTION

Venturing out into the complex anatomical region of pelvis has always been difficult. Pelvic masses are hence not easy to evaluate clinically. Despite the need for a thorough examination, studies have shown that the physical examination is not reliable as a diagnostic tool in and of itself. [(1)]

A wide plethora of clinical conditions may present as pelvic mass. They are more common in females with majority of masses arising from the reproductive

tract. It is important to determine if the mass is intraovarian or extraovarian, which often can be accomplished by visualizing the ipsilateral ovary. The distinction is important because most extraovarian masses are benign. [(2)] In males prostatic masses constitute the major group. It includes benign hypertrophy as well as prostatic cancers. Rhabdomyosarcomas form the bulk of malignant masses in children.

Ultrasound: This procedure is the diagnostic test of choice in evaluating pelvic masses and may diagnose > 90% of pelvic masses (highly operator dependent, however). Despite the considerable overlap in the morphologic pattern of different pelvic masses, a characteristic sonographic appearance frequently allows at least a narrow differential diagnosis and sometimes a specific diagnosis, particularly when the imaging findings are coupled with sufficient clinical data. For any patient presenting with a pelvic mass after clinical examination, pelvic ultrasound is the first-line examination, it can classify most ovarian tumors. In case of pure liquid unilocular mass smaller than 7cm, ultrasound is sufficient to characterize the mass. In case of indeterminate or complex ovarian mass on ultrasound, MRI is useful to characterize the mass. Beyond 7cm, the diagnostic performance of ultrasound decreases. [(3)]

Our study aims at detection of clinically suspected pelvic mass, its site of origin and relationship to other nearby organs to differentiate between Benign and Malignant pelvic pathology. Also we correlate the findings of ultrasound scan with histopathology to determine its diagnostic accuracy.

MATERIALS AND METHODS

The study was designed as cross sectional observational follow up study with each subjects being enrolled after ensuring that they met the inclusion criteria.

31 patients from OPD and Indoor in Department of Radio-Diagnosis, Government Medical College and Rajindra Hospital, Patiala. With clinical suspicion of pelvic pathology either by physical examination or by sign and symptoms was evaluated sonographically. Patients presenting with pelvic mass that were diagnosed clinically or on USG examination.

Inclusion criteria:

1. Patients with clinically suspected pelvic mass
2. Patients with sonologically diagnosed pelvic mass

Exclusion criteria:

1. Pregnant patients
2. Patients with deranged RFT (Renal Function Test).

Ultrasound: Ultrasound was performed with Philips Envisor or Philips US unit HD3 and Wipro GE Logic 200 alpha machines. Ultrasound scanning was carried out with the patient in supine position. Urinary bladder was physiologically distended to provide an acoustic window in the pelvis for TAS. TVS & TRUS was performed on empty bladder. Evaluation was limited to transabdominal sonography of the pelvis in virgins and for large masses which exceed the maximum field of view of the transvaginal transducer.

Morphological characterization of mass was done based upon the visualization of inner wall structure, wall thickness, septae and solid part echogenicity and classified as low or high risk masses.

Patient Preparation

No specific preparation was given prior to examination as the study was done on emergency basis. Very uncooperative patients (Mostly of pediatric age group) were studied after giving mild sedation to patient.

Statistical Analysis

Data was tabulated using MS Excel and was analyzed using SPSS 16 software. P value was calculated using Chi square test and a p value of <0.05 was considered statistically significant. Sensitivity, Specificity, positive predictive value (PPV) and negative

predictive value (NPV) were also calculated. For finding level of agreement between USG scan and Histopathology Kappa
Statistic was applied.
Study outcome was considered in following ways:
True positive (TP): A mass with ultrasound findings or CT findings of malignancy getting confirmed on histopathology
False positive (FP): A mass with ultrasound findings or CT scan diagnosis of malignancy turned out to be benign in nature on histopathology.
True negative(TN): A mass which was described as benign on USG or CT scan, proved to be benign on histopathology
False negative (FN): A mass which was diagnosed as benign on ultrasound or CT scan was diagnosed as malignant on histopathology.
Sensitivity was calculated as TP/TP+FN
Specificity was calculated as TN/TN+FP
Positive predictive value was calculated as TP/TP+FP
Negative predictive value was calculated as TN/TN+FN

RESULTS

Table 1: Prevalence of pelvic masses according age group

Age group	FINAL DIAGNOSIS			
	BENIGN		MALIGNANT	
	N	%	N	%
<20	5	16.6	0	0
20-39	15	50	2	20
40-59	10	33.4	3	30
>60	0	0	5	50
TOTAL	30	100	10	100

N=Number

The youngest patient in the present study was 2 years old male and the eldest was 82 years old female, the mean age (SD) was 38.9(17.91) years. The above table shows that the most of the benign pelvic masses (50%) were seen in age group of 20-39 years while malignant pelvic masses (50%) were more common in age group of 60 & above.

Table 2: Distribution of cases according to sex

SEX	NO. OF CASES	PERCENTAGE
MALE	3	9.6
FEMALE	28	90.4
TOTAL	31	100

Females presented with most (90.4%) of the pelvic masses while male represented only 9.6% of study population

Table 3: Incidence of mass according to parity

PARITY	N	%
NULLIPARITY	2	6.5
1-3	18	58
>3	6	29
UNMARRIED	2	6.5
TOTAL	28	100

The above table shows that largest number of cases i.e. 18 (58%) belonged to Para 1-3 group. Six patients (29%) belongs to Para >3 group. Two patients (6.5%) were seen each in Nullipara & Unmarried group.

Table 4: Description of the mass

DESCRIPTION OF MASS	N	%
PELVIC	32	80
PELVI-ABDOMINAL	8	20

Thirty two cases (80%) presented with pelvic mass while 8 cases (20%) had pelvi-abdominal masses.

Table 5: Final histopathological characterisation of mass into benign and malignant

FINAL DIAGNOSIS	N	%
BENIGN	30	75
MALIGNANT	10	25

On Histopathology most of the masses proved to be benign (75%) in nature while 25% masses were found to be malignant.

Table 6: USG diagnosis of pelvic masses

SERIAL NO	MASS	N	%
I.	UTERINE MASSES	15	37.5
	-LEIOMYOMA	13	32.5
	-ENDOMETRIAL CARCINOMA	1	2.5
	-CARCINOMA CERVIX	1	2.5
	-RHABDOMYOSARCOMA UTERUS	0	0
II.	EXTRA UTERINE MASSES	24	60
A.	ADNEXAL MASSES	22	55
	SEROUS CYSTADENOMA	6	15
	MUCINOUS CYSTADENOMA	1	2.5
	OVARIAN CYST	3	7.5
	BENIGN OVARIAN TERATOMA	1	2.5
	ENDOMETRIOMA	2	5.0
	OVARIAN CARCINOMA	9	22.5
B.	MISCELLANEOUS	2	5.0
	CARCINOMA URINARY BLADDER	1	2.5
	PELVIC ABSCESS	1	2.5
III.	INDETERMINATE	1	2.5
	TOTAL	40	100

USG diagnosed 30 cases of uterine masses amongst which there were 13cases of uterine leiomyoma, 1 case of carcinoma

cervix. 22 adnexal masses were detected on USG which included 6 cases of serous cystadenoma, 1 cases of mucinous cystadenoma, 3 cases of ovarian cyst, 1 cases of benign ovarian teratoma, 2 endometriomas & 9 cases of ovarian carcinoma. There was 1 case of pelvic abscess and 1 case of carcinoma urinary bladder. The masses which remained indeterminate were 1.These masses remained indeterminate about their origin however USG characterized them as malignant

Table 7: Consistency of mass in benign and malignant group based on USG findings

CONSISTENCY	BENIGN		MALIGNANT	
	NO	%	NO	%
CYSTIC	7	43.7	2	33.3
MIXED PREDOMINANTLY CYSTIC	6	37.5	1	16.7
MIXED PREDOMINANTLY SOLID	3	18.8	2	33.3
SOLID	0	0	1	16.7
TOTAL	16	100	6	100
p- VALUE 0.28, Chi square-3.76				

NS= Not Significant

USG finding of Benign masses showed majority being Cystic (43.7%) or predominantly cystic (37.5%). Malignant group showed that overall the most common mass was predominantly solid and cystic mass (33%) but predominantly cystic masses were more 16.7%. So the difference among the Benign & Malignant group regarding consistency of masses were insignificant (p>0.05) on USG.

Table 8: Septal thickness on ultrasound in benign and malignant adnexal masses

Septa(mm)	No of cases			%age
No septae	10	Benign	9	41
		Malignant	1	4.5
Thin (≤3mm)	4	Benign	3	13.6
		Malignant	1	4.5
Thick (>3mm)	8	Benign	2	9.1
		Malignant	6	27.3
p value-0.01,chi 8.38				

S = significant

Above table shows septa of 22 adnexal masses on ultrasound. No septae were seen in 10 cases out of which 9(41%) are benign masses and 1 (4.5%) of malignant masses. Thin ≤3mm septa were seen in 3 (13.6%) benign masses and 1 (4.5%) malignant masses. Thick septa (>3mm) were seen in 2(9.1%) benign masses and 6(27.3%) malignant masses.

Table 9: Ascites on usg

Ascites	Benign		Malignant	
	No.	%	No.	%
Absent	23	76.7	2	20
Present	7	23.3	8	80
Total	30	100	10	100
p value 0.00,chi-10.27				

S = significant

USG showed 23.3% of benign group presented with ascites while in malignant group 80% presented with ascites which was statistically significant(p<0.05).

Table 10: Metastasis on usg scan

	MALIGNANT	
	No	%
ABSENT	9	90
PRESENT	1	10
TOTAL	10	100

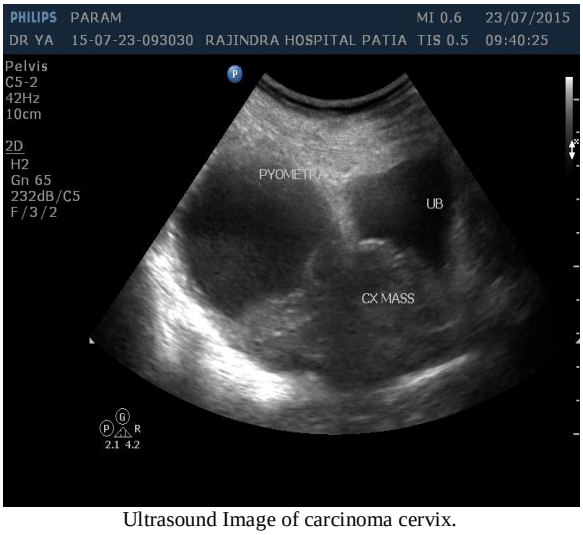
Metastasis detected by USG in Malignant group was only in 1 case.

Table 11: Sensitivity and specificity of USG scan (With histopathological findings)

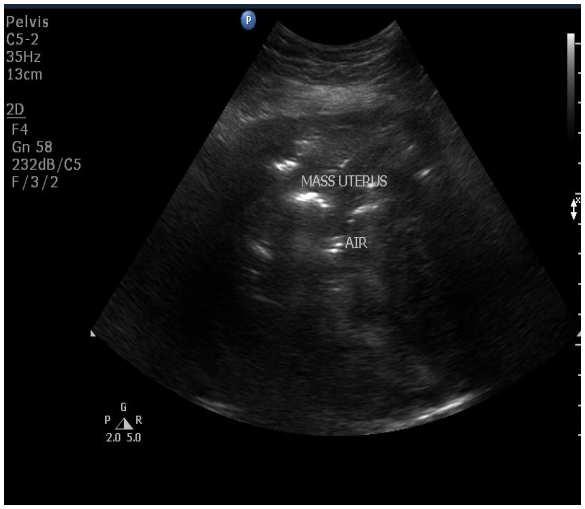
Nature of mass	USG	HPE
Benign	27	30
Malignant	13	10

SENSITIVITY-70%, SPECIFICITY-80%,PPV-53.8%,NPV-88.8%

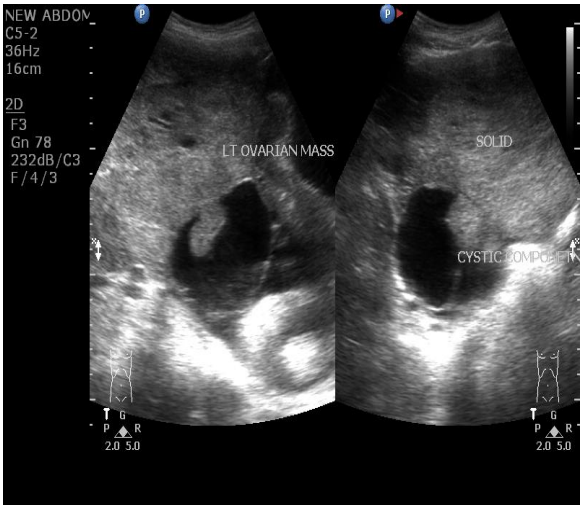
Kappa statistics showed moderate level of agreement between USG & Histopathological findings & it was statistically significant (K= 0.47, p = 0.017).



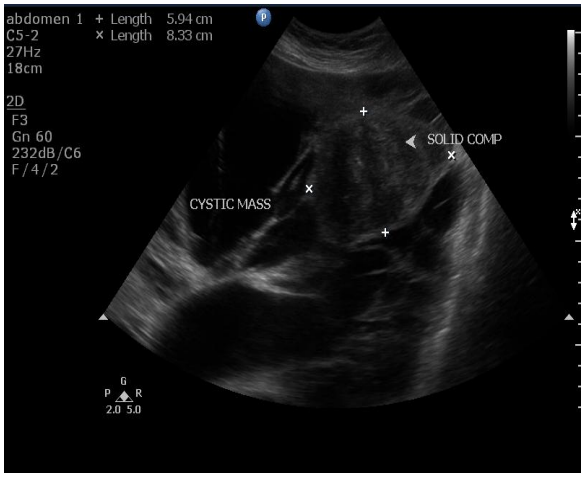
Ultrasound Image of carcinoma cervix.



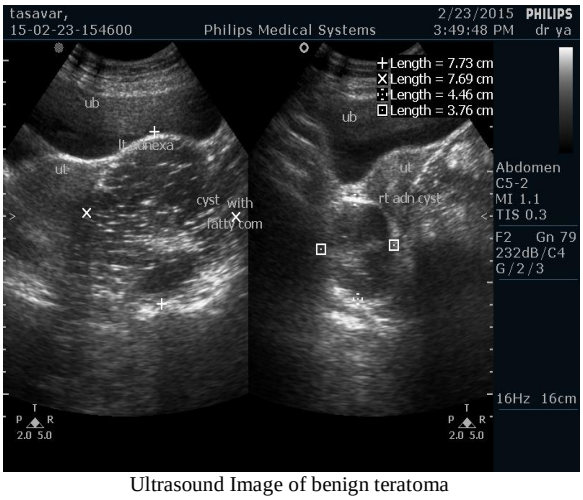
Ultrasound Image of leiomyoma



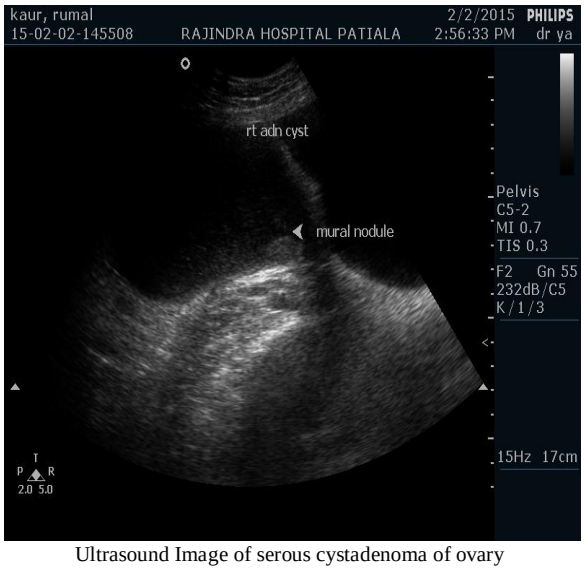
Ultrasound Image of endometroid carcinoma



Ultrasound Image of cystadenocarcinoma of ovary



Ultrasound Image of benign teratoma



Ultrasound Image of serous cystadenoma of ovary

DISCUSSION

A definite preoperative diagnosis of pelvic mass assumes great significance for the patient as well as for treating surgeon as the management of benign pathology is quite different from that of malignant one. Inspite of all the clinical acumen that a clinician can exercise there remain instances where it is difficult to determine the site of origin as well as the nature of the lesion. This is the situation where a radiologist has lot to offer, thanks to addition of newer diagnostic modalities like ultrasound, Doppler, magnetic resonance imaging and computed tomography to the armamentarium having arsenals like plane X-Ray and contrast studies like Barium studies & hysterosalpingography. Nezhat F et al (1992) [(3)] reported that the vast majority of adnexal masses (80%) seen in women under age 55 are hormone

dependent, such as functional cysts and endometriomas; approximately 8% are benign neoplasms, such asteratomas, cystadenomas, and leiomyomas; and 0.4% are malignant tumors. The age of the patient should always be kept in mind in the differential diagnosis of adnexal masses, because the incidence of ovarian cancer increases from 15.7 to 54/100 000 at the age of 40 to 65.

In our study (Table 1) the analysis of age distribution shows a very wide range with maximum number of cases i.e. 17 (42.5%) in 20-39 age group. This wide variability was because of varying nature of pelvic masses included in present study. The youngest patient in the present study was 2 years old male and the eldest was 82 years old female, the mean age (SD) was 38.91(17.9) yrs.

Similarly the age range in patients in study by Firoozabadi et al (2011) [(4)] and Alcazar et al (1999) [(5)] were 17-75 and 17-79 respectively and mean age in studies by Gatreh-Samani et al (2011), [(6)] Hafeez et al(2013), [(7)] Mubarak F et al (2011) [(8)] were 48.63 yrs, 40.95 yrs and 60 yrs respectively.

On analysing the incidence of pelvic masses according to parity it was found that maximum number of patients with pelvic masses in the present study belonged to Para 1-3 (Table 3). Another study done by Razia M. Abbasi et al (2009) [(9)] showed similar findings where 75% of women with pelvic mass were multiparous. In a study conducted by Prabha T et al (2014) [(10)] showed that multiparity was associated with high incidence of pelvic masses & most of the malignant pelvic masses are seen in multipara above the age of 45 years.

In the present study 30 (75%) masses prove to be benign on histopathology while 10 (25%) masses were malignant [Table 5]. Similar, findings were reported by Stein SM et al, [(11)] where 123 (71.8%) cases were found to be benign and 46 (28.2%) were malignant masses. Rehn et al [(12)] found 259masses to be benign in their study while 51 cases were proved to be malignant.

However, Firoozabadi et al [(4)] found 44% of cases to be benign while 55.4%cases were malignant. This difference maybe because we included many uterine masses in our study who were mostly benign.

On USG 12 Mixed solid-cystic masses were seen out of which 7 were predominantly cystic and 5 were predominantly solid. Our study findings is supported by the work of Wani S et al [(13)] who stated that it is possible to suspect malignancy on the basis of ultrasonic image but a definite diagnosis cannot be always made. Mixed solid and cystic ovarian masses on sonography make it more likely to be malignant, especially if it is associated with ascites.

In our study we measured the septal thickness of adnexal masses on USG [Table 8] and found that 27.6% malignant adnexal masses showed thick septae & 72.4% showed thin septae or no septa. 90.9% of the benign adnexal masses showed thin septae or no septae while only 9.1% showed thick septae. Kinkel K et al [(14)] concluded that both TAUS and TVUS, have low specificity for detecting malignancy, owing to overlap in the imaging appearances of benign, borderline and malignant diseases.

The sensitivity and specificity of ultrasound in predicting malignancy were 70% and 80% respectively. USG has a positive predictive value (PPV) of 53.8% and negative predictive value (NPV) of 88.8%. However Buy et al (1996) [(15)] showed a sensitivity of 83%, specificity of 88% and accuracy of 83% in detecting ovarian masses. Similarly, Jacobs et al (1997) [(16)] showed a sensitivity and specificity of 85% and 97%respectively. Alcazar et al (1999) [(5)] got a sensitivity of 85.7% specificity of 100%, PPV 100%, NPV 95.5%. Madan et al (2004) [(17)] showed a sensitivity of 92.5%specificity of 55.36%, PPV 54.3%, NPV 92.8% and accuracy of 69.9%. Van Calster et al (2007) [(18)] and United Kingdom collaborative Trial of ovarian Cancer screening (UKCTOCS). Menon et al (2009) [(19)] showed sensitivity of 93% and 84.9% respectively.

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