Sonographic morphological features of ovarian tumours

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ABSTRACT

Fourty five patients with ovarian tumours were studied for their sonographic morphological characteristics and were followed up with histopathological report for correlation between most important sonographic features of benign and malignant ovarian tumours. Among different features, thin wall, smooth inner wall structure and anechogenicity or low echogenicity of the lesions were more important features of benign tumours. Complex mass without demonstrable wall, indistinct inner wall structure and highly echogenic lesion with solid component were predictors of malignancy.

Keywords: Ultrasonography, ovarian tumours, benign, malignant

INTRODUCTION

Most of the patients with ovarian cancers remain asymptomatic till late stage or present only with vague abdominal complaints, and, by the time the diagnosis is made, the malignancy has already metastasized or is in advanced stage when nothing much can be done to improve the prognosis. In such clinical scenario, there is a need for a reliable diagnostic technique for early detection of ovarian tumours and for distinguishing benign from malignant lesions.

Ovarian tumour may be cystic or solid and can be benign or malignant.[1] Cystic ovarian masses have a smooth wall, no internal echoes, and demonstrate enhanced through transmission. But cystic masses often contain low-level echoes representing blood, pus, or cellular debris.[2] Solid tumours are highly, but irregularly, echogenic masses. Solid ovarian tumours are relatively uncommon, forming 7.8% of all the ovarian tumours, but tend to be ore often malignant (51.7%). They could present with varied pictures of solid-cystic areas, complex masses or truly solid tumours. If more than 80.0% of the tumour have solid areas, they will be classified as solid and carry a risk of malignancy which can be 40.0% or more.[3,4]

Ovarian cancer is the leading cause of death of all cancers in women.[5] It is seen in 14.0% of women, accounting for 25.0% of all gynaecological cancers.[6] The ovary is the third most common site of gynaecological malignancy.[7] The ovary is a common site of metastasis from a variety of other cancers.[8] In Tribhuvan University Teaching Hospital, a total of 143 cases of ovarian tumours were admitted during 2047 to 2055. Among these, 41.3% were malignant and 58.7% were benign.[9]

Ultrasonography is an easily available and accessible non-invasive invaluable diagnostic tool. Its cost is also relatively much less as compared to other imaging modalities like CT scan or MRI. Ultrasonography can therefore be of immense help in detecting and evaluating different types of ovarian tumours. Also non-neoplastic ovarian lesions requiring simple or no treatment can be differentiated from those neoplastic ones requiring prompt surgical intervention or other modalities of management. Based on the precise pre-operative judgement, exploratory laparotomy can be avoided in 67.2% of the ovarian pathologies which are replaced by either conservative operative laparoscopies or expectant management.[10]

The prognosis of women suffering from malignant ovarian tumour is not so good. Therefore, if any ovarian tumour can be detected and characterized at an earlier stage, early and proper plan of management could be decided. Thus, ultrasonography as a diagnostic tool alone can play a very vital role in patient management and consequently indirectly in improving the prognosis of malignant ovarian tumours which otherwise would go undetected and remain untreated until very last stages. Also, screening of ovarian cancer by using ultrasound can help in early detection of ovarian cancers, so that timely management could be undertaken before the tumour has metastasized.[11]

MATERIALS AND METHODS

Fourty five patients with ovarian tumours who attended the Department of Radiology of Tribhuvan University Teaching Hospital were included in the study. These patients underwent transabdominal and transvaginal sonography for evaluation of ovarian tumours. The abdominal ultrasound was performed by

commercially available real time sonographic unit with a 4 MHz probe (Digital GAIA MT Sonoace 8800 Medison Company Ltd.). Transvaginal ultrasound was also performed with the some ultrasound unit that performed the transabdominal ultrasound, but with a transvaginal probe of 6.5 M Hz.

Based on previous studies, clinical experience and reports of other investigators, 6 major morphological features:[5,12-15] tumour volume, wall thickness, inner wall structure, septations, echogenicity and ascites were studied and sonographic features tabulated as per the different findings (Table-1). Volume of the ovarian tumour was calculated from ovarian dimensions obtained by USG.[16]

All these patients underwent surgery after ultrasonography. The histopathological reports were followed up and noted down. The association between the sonographic features and benign and malignant ovarian tumours were studied and the most important features of benign and malignant ovarian tumours were described.

RESULTS

Age ranged from as young as 11 years to the age of 73 years, with a mean age of 43.4 years. Majority of the patients (18) were in the age group 40-49 years (40.0%). Younger women below 40 years constituted only 26.7%, among them only one patient (35 years) had malignant tumour. There was only one (11 years) adolescent patient (teratoma). Fourty patients were married women, and the rest 5 were unmarried. Postmenopausal women constituted 28.9% of the total.

People of different ethnic groups, occupations and socio-economic status were included in the study. Most were housewives (88.9%) and from low socio-economic class (60.0%).

All of these 45 patients underwent laparotomy within one month after sonographic evaluation. Histopathological reports showed 14 malignant and 31 benign ovarian tumours: serous cystadenoma (18:45.0%), teratoma (8:17.8%), mucinous cystadenoma (5:11.1%), serous cystadenocarcinoma (3:6.7%), mucinous cystadenocarcinoma (5:11.1%), metastatic adenocarcinoma (4:8.9%), clear cell carcinoma (1:2.2%) and carcinosarcoma (1:2.2%).

The smallest ovarian tumour was 7 ml (serous cystadenoma) and the largest measurable one was of 7168 ml (mucinous cystadenoma). It was found that volume of 7 out of 8 teratomas (87.5%) were of less than 500 ml. Majority of the cases (15 out of 18) of serous cystadenomas (83.3%) had tumoral volume of less than 500 ml where as all 5 mucinous cystadenoma (100.0%) were large tumours with volume larger than 500 ml. The largest tumour having a volume of 7168 ml was also mucinous cystadenoma. Serous cystadenocarcinomas also were of smaller volume as compared to the mucinous cystadenocarcinomas (Table-2). Tumour volume did not contribute to the prediction of benign and malignant ovarian tumours.

The most reliable USG features for predicting benignity were smooth inner wall structure and sonolucent or anechoeic content of the lesion. Low echogenic cystic lesions or thin walled (<3mm) lesions were other features which were reliable predictors of benignity. On the other hand, high echogenicity of the lesion was the most reliable USG feature to predict malignancy. Other features suggesting malignancy were mostly solid like mass without measurable wall thickness or without clearly visible inner wall structure. Ascites was seen in 11 out of 14 malignant cases. Though benign, ascites was found in 2 out of 31 benign cases. The exact cause of ascites in these benign cases is not known (Table-3).

DISCUSSION

Incidence of ovarian tumour (both benign and malignant) was seen more in women above the age of 40 years, as they constituted 73.3% of the total patients. Benign disease was prevalent in all age groups. Malignancy was definitely found related to increased age (92.9% of all malignant cases were in above 40 years).

Though volume of the lesion is an unpredictive feature of tumour type,[17] 70.9% of benign tumours were smaller than 500ml and 57.1% of the malignant were larger than 500ml. And 78.6% of the lesions less than 500ml were benign and 47.0% of those above 500ml were malignant. Findings suggest that smaller ovarian lesions are more likely to be benign.

The findings of this present study are close to the findings of another study carried out by Granberg *et al* in 1990.[13] In his study of 180 women, it was found that none of the unilocular tumours were malignant and any papillary excrescences on the inside of the cyst wall indicated an increased chance of tumour being malignant. This finding is also similar to the findings of the present study.[13] Presence of papillary excrescences and thick and irregular septae or solid areas are regarded as features suggesting malignancy in yet another study.[18] Occasionally papillary formations may be discerned, even though they are more common in the malignant variety. Papillary structures and solid areas are more often seen in borderline

tumours, and malignant tumours have increased papillary formations, thick septations and solid areas.[19] Present study also showed that among the multiple USG features, thin wall of the lesion, low echogenicity and smooth inner wall structure were more reliable characteristics in predicting benignity. Presence of solid components and lesion without measurable wall thickness and demonstrable inner wall structure suggested malignancy. In their study, there was a positive correlation between the sizes of the tumour with malignancy. Unilocular tumours less than 10 cm in diameter and without papillary formations had a low probability of malignancy - irrespective of the woman's age. This finding does not correlate with the findings of the present study. In the present study, it was found that even large tumours (of volume more than 500 ml) were constituted by benign tumours (3 cases of serous cystadenomas and all 5 cases of the mucinous cystadenomas) and smaller ones (as small as less than 100 ml) by malignant tumour (metastatic adenocarcinoma). Present study also showed that serous cystadenomas were generally small in size. On the other hand, mucinous cystadenomas and their malignant counterpart mucinous cystadenocarcinomas were usually large. Most of the teratomas were also small with tumour volume less than 500 ml. Absence of ascites favoured benign lesions and its presence meant more chance of the lesion being malignant.

In a study carried out by Moyle *et al* in 1983, 106 ovarian neoplasms were evaluated with respect to size, ecohogenic characteristics, and percentage of echogenic material.[5] The study indicated that anechogenic lesions had high likelihood of being benign tumours, usually mucinous cystadenomas or serous cystadenomas. As the percentage of echogenic material increased, the likelihood of malignancy also increased. There were two exceptions to this rule. The first was lesions with very echogenic foci, which were virtually always benign teratomas. The second was groups of tumours that were totally or near-totally echogenic. These were actually less likely to be malignancies than mixed-density tumours that had a large anehoeic component. In mixed-echogenic tumours that were not teratomas, there was no way of distinguishing between benign and malignant lesions with an acceptable degree of accuracy in an individual case. These findings were similar to the findings of the present study. In the present study, most of the benign tumours having malignant sonographic morphology were the benign teratomas. One case of mucinous cystadenoma also had sonographic appearance of malignancy.

A specific pathologic diagnosis of teratoma can be made from USG when a highly echogenic focus is demonstrated within the tumour mass. This corresponds to the fat and hair-containing semisolid material that fills many of these teratomas. These lesions are virtually always benign, although in the pathologic literature there are reports that 0.3% to 2.0% may undergo malignant degeneration. Therefore it would be valuable to identify a particular sonographic characteristic that would better distinguish teratoma from malignant disease.[20] Complex ovarian masses are lesions that contain both cystic and solid components and the most common one of these are the dermoid cysts.[21,22]

The contribution of 2 malignant cases mimicking benign ovarian tumours in this study was from mucinous cystadenocarcinoma and metastatic adenocarcinoma. This mucinous cystadenocarcinoma had no ascites and had thin wall (<3mm). Metastatic adenocarcinoma also had thin wall and showed low echogenicity with echogenic core only. In both cases, the sonographic features were in support of the benign lesion.

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Table-1: Six sonographic morphological features.

USG Feature	**Criteria**
Inner wall structure	Smooth
	Irregular ≤3 mm
	Papillarities >3 mm
	Not applicable, mostly solid
Wall thickness	Thin ≤3 mm
	Thick >3 mm
	Not applicable, mostly solid
Septa	No septa
	Thin ≤3 mm
	Thick >3 mm
Echogenicity	Sonolucent
	Low echogenicity
	Low echo with echogenic core
	Mixed echogenicity
	High echogenicity
Ascites	Absent
	Present
Volume	Less than 500 ml
	More than 500 ml

Table-2: Ovarian volumes in different types of ovarian tumours.

Volume **Tumour**	**< 20 ml**	**20-100 ml**	**100-500 ml**	**500-1000 ml**	**1000 - 2000 ml**	**2000 - 5000 ml**	**>5000 ml**	**Total**
Teratoma		1	6			1		8
Serous cystadenoma	5	4	6			2	1	18
Mucinous cystadenoma				3	1		1	5
Serous cystadenocarcinoma			1	2				3
Mucinous cystadenocarcinoma			1		3	1		5
Metastatic adenocarcinoma	1	1	1		1			4
Clear cell carcinoma			1					1
Carcinosarcoma				1				1
Total	6	6	16	6	5	4	2	45

Table-3: Most important sonographic morphological features suggesting benignity and malignancy.

USG Feature	**Criteria**	**Benign (%)**	**Malignant (%)**	**Total**
Inner wall structure	Smooth	6 (100.0)	0 (0.0)	6
	Irregular ≤3 mm	21 (91.3)	2 (8.7)	23
	Papillarities >3 mm	3 (33.3)	6 (66.7)	9
	Not applicable, mostly solid	1 (14.3)	6 (85.7)	7
Wall thickness	Thin ≤3 mm	20 (90.9)	2 (9.1)	22
	Thick >3 mm	10 (66.7)	5 (33.3)	15
	Not applicable, mostly solid	1 (12.5)	7 (87.5)	8
Septa	No septa	19 (82.6)	4 (17.4)	23
	Thin ≤3 mm	9 (81.8)	2 (18.2)	11
	Thick >3 mm	3 (27.3)	8 (72.7)	11
Echogenicity	Sonolucent	10 (100.0)	0 (0.0)	10
	Low echogenicity	12 (92.3)	1 (7.7)	13
	Low echo with echogenic core	5 (83.3)	1 (16.7)	6
	Mixed echogenicity	4 (30.8)	9 (69.2)	13
	High echogenicity	0 (0.0)	3 (100.0)	3
Ascites	Absent	29 (90.6)	3 (9.40)	32
	Present	2 (15.4)	1 (8.6)	13
Volume	Less than 500 ml	22 (70.9)	9 (29.1)	31
	More than 500 ml	6 (42.9)	8 (57.1)	14