ACCURACY OF SONOGRAPHIC FEATURES TO DIAGNOSE MALIGNANCY IN OVARIAN CYSTS – IN A TERTIARY CARE HOSPITAL BAHAWALPUR – PAKISTAN

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ABSTRACT

Introduction: Ovarian mass is a common clinical problem in reproductive age women, and ovarian malignancy presents late and thus at an advanced stage. That is the reason for its poor 5 year survival despite all advances in gynaecological surgery and oncological chemotherapeutics. It is extremely essential to estimate the risk of malignancy before deciding on the type of surgery for a patient with an ovarian cyst or mass.

Objective was determine the sensitivity and specificity of individual sonographic features to predict malignancy in ovarian tumours.

Methods: It was a cross – sectional study. Clinical and sonographic evaluation of 220 patients presenting with ovarian cysts to Department of Gynaecology, Bahawal Victoria Hospital Bahawalpur was followed by histological examination at Department of Pathology, Quaid-e-Azam Medical College Bahawalpur.

Results: We analysed 220 cases of ovarian masses. Mean age of patients was 47.3 ± 3.8 years. Most common (57.3%) presenting complaint among these patients was abdominal pain followed by distension and palpable mass (21.8% and 19.1% respectively). On ultrasonography, ecogenicity, papillary projections and multilocularity were commonly observed in malignant cases. Colour Doppler was used to estimate the blood flow. On histopathology, 207 (94.1%) were diagnosed as benign and only 13 (5.9%) as malignant. Among benign, most common diagnoses were follicular / luteal cysts (34.8%) followed by serous cystadenoma (24.6%) and serous cysts (15.4%). Among malignant, 6 (46.2%) were serous cystadenocarcinoma, 3 (23.1%) were mucinous adenocarcinoma and 2 (15.4%) were granulose cell tumor.

Conclusion: Most of ovarian masses are diagnosed as benign. Sonographic features especially increased ecogenicity, solid component, papillary projections, multilocularity and increased blood flow do predict malignant behavior but their sensitivity is low.

Key words: Ovarian cyst, cystadenoma, ovarian malignancy, adenocarcinoma, sonographic features.

INTRODUCTION

Ovarian mass is a common clinical problem in reproductive age women, and ovarian malignancy presents late and thus at an advanced stage. That is the reason for its poor 5 year survival despite all advances in gynaecological surgery and oncological chemotherapeutics.[1,2] It is extremely essential to estimate the risk of malignancy before deciding on the type of surgery for a patient with an ovarian cyst or mass. Benign cysts / masses can be managed conservatively or with laparoscopy, avoiding unnecessary hospital stay, delayed mobility, other morbidities and costs. On the other hand, peri-operative rupture of an early stage ovarian malignancy may worsen the outcome.[3,4]

Granberg and coworkers reported in 1989 that the gross morphology of adnexal tumours could be used to predict the probability of malignancy. They also found that ultrasound images of tumours envisage their gross morphology, and they proposed that therefore it should be possible to estimate the risk of malignancy on the basis of ultrasonography.[5] Indeed, this has proven to be true, and subjective evaluation of ultrasound findings (pattern recognition) by an experienced ultrasound expert is an excellent method for discriminating between benign and malignant adnexal tumours.[6]

A prospective, European multicenter study including nine centers from five countries (the UK, Belgium, France, Italy and Sweden) was set up, called International Ovarian Tumour Analysis (IOTA) study in 1999.[7] Its aim was evaluation of previous

work by collecting the history and ultrasound findings of larger number of patients of adnexal masses. They collected information on more than 50 variables and a logistic regression model with 12 variables was created to calculate the risk of malignancy. It has a sensitivity of 93% and a specificity of 76%.[8]

However, the things kept on changing with time and in 2009, the IOTA research group has concluded that in experienced hands, the subgroup scoring system for diagnosing malignancy has a similar performance as pattern recognition, the latter method being the best diagnostic method currently available.[9] The IOTA group has also concluded that adding information about CA – 125 levels does not improve discrimination of mathematical models between benign and malignant adnexal masses.[10] The IOTA models have been externally validated to have clear advantages over non-IOTA models for differentiating malignant and benign adnexal masses.[11]

Considering the recent trends, we conducted this study to determine the sensitivity and specificity of ultrasonographic differentiation between benign and malignant ovarian masses.

Table 1: *Clinical presentation of ovarian cysts.*

Symptoms / Signs	*Biological Behaviour of Tumours*		*Total*
	Benign (n = 207)	*Malignant (n = 13)*	
Asymptomatic	27 (13.0%)	0	27 (12.3%)
Abdominal pain	117 (56.5%)	09 (69.2%)	126 (57.3%)
Palpable mass	32 (15.5%)	10 (76.9%)	42 (19.1%)
Abdominal enlargement	38 (18.4%)	10 (76.9%)	48 (21.8%)
Bowel symptoms	23 (11.1%)	03 (23.1%)	26 (11.8%)
Menstrual problems	33 (15.9%)	02 (15.4%)	35 (15.9%)
Ascites	03 (1.4%)	05 (46.2%)	08 (3.6%)

Table 2: *Comparison of sonographic features of benign ovarian tumours.*

Sonographic Features	*Biological Behaviour of Tumours*		*P-value*
	Benign (n = 207)	*Malignant (n = 13)*	
Echogenicity			
– Normal	204	03	0.0001
– Increased	03	10	
Solid component			
– Absent	026	06	0.0001
– Present	01	07	
Papillary projections			
– Absent	200	05	0.0001
– Present	07	08	
Loculations			
– Unilocular	199	05	0.0001
– Multilocular	08	08	
Blood flow			
– Low	203	04	0.0001
– High	03	09	

PATIENTS AND METHODS

Study Design and Setting

It was a prospective study conducted at the Department of Obsterics and Gynaecology, in collaboration with Department of Pathology and Department of Radiology, Bahawal Victoria Hospital / Quaid-e-Azam Medical College Bahawalpur, Pakistan. It was carried out from May 2010 to October 2012.

Patients

All patients presenting with one or more adnexal masses and undergoing surgery for the removal of that mass or total abdominal hysterectomy with bilateral or unilateral salpingo-oophorectomy were included in the study. The patients not consenting, pregnant or not otherwise willing to undergo surgical removal of the mass within next 4 months from the date of presentation were excluded.

Clinical Information

Age, marital status, menstrual history, presenting complaints and family history of ovarian malignancy were inquired from all patients.

Ultrasound Examination

Experienced radiologist and gynaecologist performed trans-abdominal ultrasound examination in all patients. They used gray scale and colour Doppler to study the morphology and blood flow of the adnexal masses. Gray scale ultrasonography was used to determine the solid component, paplilations, locularity i.e. to differentiate unilocular and mutlilocular cysts, and to take the measurement s. e.g. diameter of cyst/ mass, diameter of solid component. Colour Doppler was used to estimate the blood flow.

Histopathology

Formalin fixed tissues were grossly assessed to confirm the ultrasonographic features. The re-presenta-

tive sections were taken for processing. Haematoxylin and Eosin stained sections were examined microscopically to determine the histological diagnosis by experienced Histopathologists.

Data Analysis

Data regarding clinical, sonographic, gross and histological features was entered and analysed with the help of SPSS 17.0. Fisher's exact was applied to determine significance. Sensitivity, specificity, positive and negative predictive values were calculated by Med Cal online statistical software available at URL: http://www.medcalc.org/calec/diagnostic_test.php

RESULTS

The study included 230 patients who presented with one or more ovarian masses. Mean age of patients was 47.3 ± 3.8 years. Most common (57.3%) presenting complaint among these patients was abdominal pain followed by distension and palpable mass (21.8% and 19.1% respectively). These symptoms and ascites were more frequent among the patients who had malignant ovarian tumours. Some of the patients (13.0%) with benign ovarian cysts were asymptomatic at the time of presentation where none of the patients having malignant tumours were symptoms free. Other presenting symptoms with their frequencies and percentages are given in Table 1.

Ultrasonography was performed to assess four sonographic features i.e. ecogenicity, papillary projections, presence of solid component and locularity in all cases, frequencies for which are shown in Table 2. Increased ecogenicity, presence of papillary projections, presence of solid component, multi-locularity and high blood flow on Doppler were significantly associated with malignancy.

The histopathological examination shows that 207 (94.1) were diagnosed as benign and only 13 (5.9%) as malignant. Among benign, most common diagnoses were follicular / luteal cysts (n = 72, 34.8%) followed by serous cystadenoma (n = 51, 24.6%) and simple serous cysts (n=33, 15.4%). Among malignant, 6 (46.2%) were serous cystadenocarcinoma, 3 (23.1%) were mucinous adenocarcinoma and 2 (15.4%) were granulose cell tumour as shown in Table 3.

Table 3: *Histopathology of ovarian masses.*

Malignant tumours	*Frequency*	*Benign tumours / cysts*	*Frequency*
Serous cystadenocarcinoma	06 (46.2%)	Follicular luteal cysts	72 (34.8%)
Mucinous cystadenocarcinoma	03 (23.1%)	Serous cystadenoma	51 (24.6%)
Granulosa cell tumour	02 (15.4%)	Serous cysts	33 (15.4%)
Dysgerminoma	01 (7.6%)	Mature teratoma	26 (12.6%)
Immature teratoma	01 (7.6%)	Endometriotic cysts	15 (7.2%)
		Mucinous cysts	06 (2.9%)
		Fibrothecoma	02 (1.0%)
		Fibroma	01 (0.5%)
		Benign Brenner tumour	01 (0.5%)

Table 4: *Individual sonographic features as predictor of malignant ovarian tumours.*

Sonographic Features	*Sensitivity*	*Specificity*	*Positive Predictive Value*	*Negative Predictive Value*
Echogenecity	76.92%	98.55%	76.92%	98.55%
Solid component	53.85%	99.52%	87.50%	97.17%
Papillary projections	61.54%	96.62%	53.33%	97.56%
Multiloculation	61.54%	96.14%	50.00%	97.55%
High blood flow	69.23%	98.55%	75.00%	98.08%

Sensitivity of enhanced ecogenicity within an ovarian cyst / mass to predict malignancy was 76.92% while its specificity was 98.5% as shown in Table 4. Sensitivity of presence of a solid component to predict malignant tumour was very low (53.85%) but on the other hand, its specificity was excellent (99.52%). Presence of papillary projections within an ovarian cyst / mass was found to be an insensitive (61.54%) but quite specific (96.62%) predictor of malignancy. Multilocularity was also found to be insensitive (61.14%) but specific (96.14%) predictor of malignancy in ovarian masses. Lastly, high blood flow measured with Doppler was fond to be 69.23% sensitive and 98.55% specific in determining the malignant nature of ovarian masses in our study.

DISCUSSION

Our study showed that 6% of all ovarian cysts / masses were cancerous. Riaz et al. [1] reported a higher rate of malignancy (13.3%) in adnexal cysts as compared to current study. However, a study from same center has already discussed the reasons behind such lower frequency of cancerous ovarian lesions.[12] This study highlights the ultrasound features of benign and malignant ovarian masses and determines their sensitivity and specificity as predictor of malignancy.

In our study it was observed that abdominal, bowel symptoms and ascites were more frequent in cancerous tumours as compared to benign ones. This is consistent with the previous studies from within the country.[13-18]

In the present study, the surface epithelial malignant tumours including serous and mucinous cystadenocarcinomas were found to be the commonest group of malignant ovarian tumours. Similar findings have been documented by other investigators in past. Among benign tumours, serous cysts and serous cyst-adenoma which are histologically the same but differ on the basis on their gross sizes, cumulatively constitute the most frequent group followed by follicular / luteal cysts which is again consistent with previous studies.[19-20]

As shown in Table 2, increased ecogenicity, presence of papillary projections, solid component, multiloculations and high blood flow were all associatd with malignancy. But none of these sonographic features alone carries high sensitivity to predict a canocerous tumour because of high percentage of false negatives. Although most of these features carry high specificity yet taking into consideration the low sensitivity, none is found to be useful as independent predictor of malignancy in ovarian tumours. Similar association of sonographic features with histopathological diadgnosis of ovarian tumours have been documented by Riaz et al. however they didn't calculated the sensitivity and specificity of each sonographic features.[1]

From this study it is clear that individual sonographic features are poor predictors of malignancy in ovarian masses thus necessitate the formulation of some scoring system by combining various sonographic features with each other to enhance their sensitivity. Many of such scoring systems, mathematically models, risk of malignancy indexes have been put forth by leading research groups in the field like the IOTA study group. These models do enhance the sensitivity and specificity of ultrasound in detecting ovarian cancer before surgery.[3,9] However, despite all such efforts, about 7% of adnexal masses that are considered appropriate for surgical removal cannot be classified as benign or malignant by experienced ultrasound examiners using subjective assessment, logistic regression models to estimate the risk of malignancy, CA_{125} measurements and the risk of malignancy are not helpful in these masses.

It is ***concluded*** that most of ovarian masses are diagnosed as benign. Individual sonographic features especially increased ecogeniciy, presence of solid component and papillary projections, multilocularity and increased blood flow do predict malignancy in ovarian tumours but their sensitivity is low. Combinations of these sonographic features may be used to formulate scoring indexes with better predictive value and enhanced sensitivity for malignant ovarian tumours.

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