Ultrasonographic Evaluation of the Adenxal Masses Using the Ovarian-Adenxal Reporting and Data Systems (ORADS)

Original Article

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ABSTRACT

Background: Adnxal lesions represent an important health problem which leads to clinical workload and needs diagnostic imaging, surgery, and pathological evaluation. Classifying adnexal lesions is essential to allow decision making regarding the optimal management plan and to eliminate unnecessary patient anxiety.

Aim: To evaluate the diagnostic performance of US using the ORADS scoring system in distinguishing between benign and malignant adnexal masses

Methods: A prospective study including 77 paients with 94 adenxal masses. The lesions were cateogorized based on ORADS scorning system and were histopathologically evaluated . The diagnostic performances of ultrasound was measured by assessing receiver-operating characteristic curve, sensitivity , specificity, positive and negative predictive values

Results: Of 77 paients 94 adnexal lesions were detected. The mean (S.D.) age of the patients was 33.96±14.38 years, and 64 of 77 (83.1%) were premenopausal. The overall frequency of malignant tumours was 18.1% (17 of 94 adnexal lesions). The optimal cutoff value for diagnosing malignancy was > O-RADS US 3 with a high sensitivity of 94.12%, specificity of 83.11%, and accuracy of 85.1% with 55.2% PPV and 98.5% NPV.

Conclusion: The O-RADS US classification system was an effective non-invasive diagnostic tool for adnexal masses with high reliability for gynaecologists and high sensitivity for suspicion of malignancy.

Key Words: Adnexal masses, malignancy risk, O-RADS, ultrasound.

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INTRODUCTION

Adnexal lesions are frequent health issues that increase clinical strains and need diagnostic imaging, surgery, and pathological evaluation. They can be caused by functional aetiology, inflammatory alterations, benign and malignant neoplasms[1,2]. Ovarian cancer represents the 7th most common cancer among women worldwide[3]. Malignancy risk encourages clinicians to make an early and precise diagnosis to reduce mortality and morbidity[4].

Adenxal lesions should be classified in order to determine the level of malignancy suspicion and to make the proper decision for management[5,6]. For the purpose of identifying and characterizing ovarian lesions, ultrasound (US) is a noninvasive and a simple diagnostic method[7].

Several approaches have been used to characterize adnexal lesions, including simple scoring systems, subjective assessment, probability predictors based on logistic regression analysis, or statistically derived scoring systems[8].

The most recent system, The Ovarian-Adnexal Reporting and Data System (O-RADS) U.S. risk stratification and management system, was designed to provide radiologists and clinicians with consistent interpretations to decrease or eliminate ambiguity in U.S. reports, resulting in higher accuracy in estimating the risk of malignancy to adnexal masses[9].

A number of studies were conducted to evaluate the validation of ORADS system and all were retrospective, 3 of them used static ultrasound images[10-12] and one used cine loops through the ovarian lesios[13].

The aim of this study is to evaluate the diagnostic accuracy of ORADS US system in discriminating between malignant and bengin adnexal masses.

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METHODS

This prospective study study was conducted over a period of one year from March 2021 to March 2022 including 77 patients (with 94 adenxal masses) (64 premenopausal and 13 postmenopausal) . All patients were admitted to the Gynecology ward of Mansoura University Hospital. Study ethics committee approvals were obtained for this work. (Code Number: MS.20.10.24).

Patients with O-RADS score 0-1, those who refused surgery, or those with previous bilateral oophorectomy were excluded from the study

A detailed history of each patient was taken with an explanation of the study protocol, and then informed consent was obtained. General, abdominal, and pelvic examinations were performed . Real time US (abdominal or vaginal or both) was performed using Samsung H60 and, Samsung Korea with multiple frequency transabdominal 2-5 MHZ and high-resolution transvaginal probe 5-9MHZ. Color or power Doppler US was used to assess lesion vascularity.The US examination was done by experienced sonographer (more than 10 years of experience in gynecological US).

Each lesion was evaluated and scored according to the O-RADS Ultrasound Risk Stratification and Management System[9]. The color scoring was done according to the IOTA consensus. ultrasound findings with the O-RADS US score were correlated with surgical findings and histopathologic results for all patients (77 patients with 94 adnexal lesions). for more than one adnexal lesion, we selected the one with the most suspicious US features.Borderline ovarian lesions were considered in the malignant group.

Statistical analysis

Data analysis was performed by SPSS software, version 18 (SPSS Inc., PASW Statistics for Windows version 18. Chicago: SPSS Inc.). Qualitative data were described using numbers and percentages. Quantitative data were described using median (minimum and maximum) for non-normally distributed data and mean± Standard deviation for normally distributed data after testing normality using the Kolmogorov-Smirnov test. The significance of the obtained results was judged at the (0.05) level. The diagnostic performances of ultrasound was measured by assessing receiver-operating characteristic curves, sensitivity, specificity, positive and negative predictive values,

RESULTS

Our study included 77 patients (with 94 adnexal lesions); of them, 64 (83.1%) women were premenopausal, and 13 (16.9%) were postmenopausal, with the mean age being 33.96±14.38 SD . shown in (Table 1). Pelvic pain was the main complaint (71.4% of patients) as shown in (Table 2)

Table 1: Comparison between benign and malignant lesions according to age and menopausal state

Age (years)	Total (n=77)		Benign (n=66)		Malignant (n=11)		Test of sig.	*p-value*
	No.	%	No.	%	No.	%		
Premenopausal	64	83.1	56	84.8	8	72.7		
Postmenopausal	13	16.9	10	15.2	3	27.3	$\chi 2$=0.987	0.320
Mean ± S.D.	33.96±14.38		34.15±14.06		32.82±16.83			

Table 2: clinical presentation among the studed population (n=77)

Main clinical presentation	No=77	%
Pelvic pain	55	71.4
Irregular menstruation	6	7.8
Inability to conceive	7	9.1
Accidental	3	3.9
Abdominal enlargement	6	7.8

Overall, 77 (81.9%) lesions wre bengin, and 17(18.1%) were malignant. The most common bengin lesion was dermoid cyst while papillary serous carcinoma was the most common malignant lesion shown in (Table 3)

Table 3: Distribution of the studied ovarian lesions according to Histopathology diagnosis (n=94)

Histopathological diagnoses	No.	%
Mature Cystic teratoma	15	16
Serous cystadenoma	14	14.9
Serous cyst	12	12.8
Mucinous cystadenoma	12	12.8
Endometrioma	10	10.6
Papillary serous carcinoma	6	6.4
Fibroma	5	5.3
Serous carcinoma	5	5.3
Borderline serous tumour	4	4.2
Papillary serous cystadenofibroma	3	3.2
Hemorrhagic cyst	3	3.2
Mixed germ cell tumour	2	2.1
Para ovarian cyst	2	2.1
Sclerosing tumour	1	1.1

The colour score ranged from 1 to 4 with a mean of 1.59±0.95 for all lesions. It ranges from 1 to 3 with a mean of 1.18±0.42 among the benign lesions, and from 2 to 4 with a mean of 3.29±0.59 among the malignant lesions. Most benign lesions have a colour score (1), while most malignant lesions have a colour score (3). There was a high statistically significant difference between benign and malignant lesions regarding colour score (P<0.001). (Figures 1,2, Table 4)

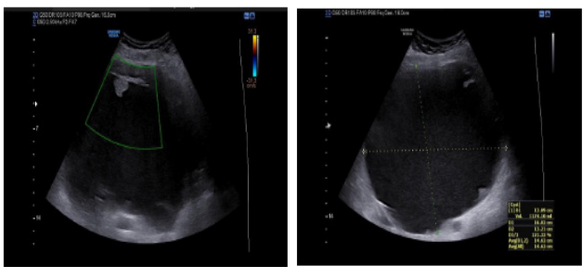

Fig. 1: O-RADS US description: Unilocular cyst with solid component.
O-RADS US score 4
Histopathology: Borderline serous tumour.

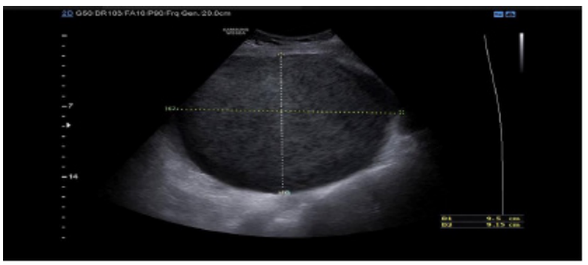

Fig. 2: O-RADS US Description: Ovarian cyst with ground glass appearance ≤10cm
O-RADS US score 3
Histopathology: Endometrioma

Table 4: Comparison between benign and malignant lesions according to colour score

Colour score	Total (n=94)		Benign (n=77)		Malignant (n=17)		Test of Sig.	*P*
	No.	%	No.	%	No.	%		
Score 1	65	69.1	65	83.1	0	0.0	X2MC= 76.2	<0.001*
Score 2	12	12.8	11	15.5	1	5.9		
Score 3	11	11.7	1	1.4	10	58.8		
Score 4	6	6.4	0	0.0	6	35.3		
Min. – Max.	1-4		1.0-3.0		2.0-4.0			
Mean ± S.D.	1.59±0.95		1.18±0.42		3.29±0.59		U= 21.50*	<0.001*
Median (IQR)	1(1-2)		1.0(1.0-1.0)		3.0(3.0-4.0)			

The propotion of malignancy in in individual ORADS scores was 0 for ORADS 2, 1(5.9%) for ORADS 3, 2(11.8) for ORADS 4 and 14(82.3%) for ORADS 5. There was a high statistically significant difference between benign and malignant lesions regarding the O-RADS US score (P<0.001). (Table 5)

Table 5: Comparison between benign and malignant lesions according to O-RADS score

O-RADS score	Total (n=94)		Benign (n=77)		Malignant (n=17)		Test of Sig.	*P*
	No.	%	No.	%	No.	%		
Score 2	30	32.0	30	39.0	0	0.0		
Score 3	35	37.2	34	44.2	1	5.9		
Score 4	10	10.6	8	10.4	2	11.8		
Score 5	19	20.2	5	6.4	14	82.3		
Mean ± S.D.	3.19 ± 1.1		2.84 ± 0.859		4.76 ± 0.562			

The cut off value for predicting malignancy with > O-RADS 3 show a very good performace . (AUC of 0.886) showed a sensitivity of 94.1%, a specificity of 83.1%, PPV of 55.2%, and NPV of 98.5%. (Table 6, Figure 3)

Table 6: Comparison between benign and malignant lesions according to O-RADS score

	AUC	*P*	95% C.I	Cut off#	Sensitivity	Specificity	PPV	NPV	accuracy%
O-RADS score	0.886*	<0.001*	0.803 – 0.969	>3	94.1	83.1	55.2	98.5	85.1

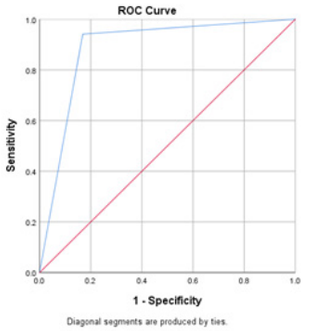

Fig. 3: ROC curve for O-RADS score to discriminate benign from malignant lesions

DISCUSSION

A precise preoperative discrimination between benign and malignant nature of adnexal masses is essential for planning the management strategies which was the motive behind the development of the US-ORAD scoring system[9].

The aim of our study was to evaluate the usefulness of US using the US-ORAD scoring system. Our results show that US- ORADS score > 3 achieved the best and optimal diagnostic performance yielding sensitivity and specificity of 94.1% and 83.1% respectively. The high sensitivity of US-ORADS scoring classification is related to using standardized definitions and description of the lesions that reduce ambiguity of the US report. The high sensitivity on the expense of moderate specificity could be accepted meaning that no or few ovarian malignancies would be missed.

Although MRI was done as an obligatory preoperative investigation for all suspicious adnexal lesions according to our institute protocoal but the scope of our study was to investigate the diagnostic accuracy of US ORAD system .

Many studies were conducted to evaluate the role of US ORAD scoring system for differentiating between benign and malignant adnexal lesions, although they found high diagnostic performance, however the were retrospective which could be a source of Bias[10-13].

Our study was prospective, where the US evaluation of adnexal masses was done by a single sonographer with more than 10 years experience, surgical interference was done by the same surgical team and pathological evaluation was performed by the same pathologist team aiming to reduce Bias at any step of the work. Real time ultrasound allow better assessment of the adnexal mass and avoid missing any details.

Basha *et al*.[10] found that AUC was 0.98 which was higher than in our study (88%).This may be attributed to the larger number of the study population (from 3 research areas) and the characters of the adnexal masses were evaluated by 5 sonographers while our study was conducted in one institute with the evaluation done by only one sonographer

Vara *et al*.[14] reported that the estimated sensitivity and specificity of the O-RADS system (AUC of 0.97) for classifying adnexal masses were 97% and 77%, respectively, donating very high sensitivity and moderate specificity of the O-RADS classification system for classifying adnexal masses.

The advantages of this study is it is a prospective one that depends on dynamic evaluation of adnexal masses helping appropriate evaluation even in large size mass. Moreover, it depends on well defined terminology and standardized descriptions thus the results could be precise helping in selecting the proper management option . The limitation of our study lies in relatively small sample and lack of follow up.

CONCLUSION

The US based evaluation of adnexal masses using theUS- ORADS scoring system has a very good diagnostic performance and can allow to distinguigh between benign and malignant lesions.

AUTHER CONTRIBUTION

The authers (ME, HS, RB, MI, MMA) shared in data collection. The authers (ME, HS, RB, MI, MMA) shared in work plane, and authers (ME, HS, RB, MMA) and all have read and agreed to the published version of the manuscript

CONFLICT OF INTERESTS

There are no conflicts of interest

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