|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
PubMed (National Library of Medicine ID: 101738825)
Index Copernicus Value 2018: 75.71
Original Research Article Volume 4, Issue 1; January: 2020; Page No. 187-191

ROLE OF ULTRASONOGRAPHY & COLOUR DOPPLER IMAGING IN EVALUATION OF ADNEXAL MASSES

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Article Info: Received 16 December 2019; Accepted 22 January. 2020
DOI: https://doi.org/10.32553/ijmbs.v4i1.891
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Conflict of interest: No conflict of interest.

Abstract

Background: Adnexal mass lesions are very common among women of all age group but very common among reproductive age. Differential diagnosis of adnexal mass is difficult and complex. Recognition of the severity of the problem, appropriate and timely evaluation and treatment with good outcome is the goal. Ultrasound is the primary modality used for detection and characterization of adnexal masses. The purpose of this study is to evaluate the diagnostic accuracy of ultrasonography in patients suspected with adnexal masses.

Objectives: Understanding the characterization of adnexal masses on ultrasonography and colour doppler,and to corelate the usg findings with histopathology where ever possible,to derive simple and clinically useful usg based IOTA rules for discriminating between benign and malignant mass.

Methods: The study was conducted on 100 patients with suspected various adnexal masses in a period of 1 year from 2018-2019. Patients are selected based on Clinical history & Adnexal masses detected on pelvic ultrasound. Results of ultrasound were correlated with available histopathological findings.

Results: On histopathology, out of total 50 cases studied 14(28%) were malignant and 36 (72%) were benign. Out of 45 cases where IOTA simple rules were applicable, 16(35.5%) were malignant and 29(64.4%) were benign.

Conclusion: On comparing the findings of ultrasonogram versus histopathology, it was found that ultrasound had a high sensitivity of 91.66%, 84.84% specificity, 68.7% positive predictive value, 96.55% negative predictive value and 88.8% accuracy of detecting adnexal masses.

Keywords: TAS – Transabdominal sonography, TVS – Transvaginal Sonography, Adnexal Masses.

Introduction

Pelvic ultrasonography (US) remains the imaging modality most frequently used to detect and characterize adnexal masses. About 90% of adnexal masses can be adequately characterized with US alone. Pelvic ultrasound is commonly used as part of the routine gynecologic exams, resulting in diagnosis of adnexal masses, the majority of which are functional or benign. Ultrasonography (US) continues to be the primary imaging modality used to identify and characterize adnexal masses (1,2). The collective experience from numerous centers worldwide has provided a wealth of information that allows accurate characterization of about 90% of adnexal masses on the basis of their US features (3). Adequate characterization of an adnexal mass is important both to determine which patients need surgery and to help define the type of surgery and whether a surgical subspecialist is needed (4). Various approaches to characterizing adnexal masses have been used, including subjective assessment, simple scoring systems, statistically derived scoring systems or probability predictors based on logistic regression analysis, and more complex mathematical models such as neural networks (5). Of these, the subjective approach, also called a pattern recognition approach, has been shown to be superior to other methods, with a sensitivity of 88%–100% and specificity of 62%–96% for predicting malignancy (6–8). The high accuracy of the subjective approach was obtained in specialized centers with experienced imagers. The quality of US scans may not be as consistent in less specialized centers (7), although the knowledge and skill set needed to reproduce this degree of performance should be attainable by anyone who routinely performs gynecologic US (8). When determining the risk of malignancy for an adnexal mass, consideration should also be given to factors other than imaging findings. While transabdominal US is helpful for larger masses or those located superiorly or laterally in the pelvis, transvaginal US provides optimal visualization of most adnexal diseases. Real-time US observations contribute to improved characterization (9) and suggest value in recording video clips. Doppler US is useful in cases with an apparent solid area or septum and will be discussed subsequently. Contrast material–enhanced US remains an investigational technique (10).

OBJECTIVES:

1) To characterize the adnexal masses on USG. - To compare the benign and malignant features on USG

- To correlates the USG findings with histopathology wherever possible

2) To derive simple and clinically useful USG & Doppler index-based International Ovarian Tumor Analysis (IOTA) group ultrasound rules for ovarian masses for discriminating between benign and malignant adnexal masses.

Materials and Methods:

Study Site: Study was carried out on patients referred to Department of Radiology at Sir T Hospital, Bhavnagar.

Study Design: Cross-sectional Study.

Total No. of Patients: 100.

Informed consent was taken and patients were assessed clinically.

Detailed history and physical examination were carried out for each patient.

Patients are selected based on: Clinical history or physical examination & Adnexal masses detected on pelvic ultrasound.

Equipment: USG machine ESAOTE My Lab 40 & ESAOTE My Lab 20, SONOACER 5.

Inclusion Criteria:

Patients will be selected from those presenting with:

1. Clinically diagnosed pathology of the adnexal mass. All female cases irrespective of age referred for USG with suspected adnexal pathology will be evaluated.

Exclusion Criteria:

Patients with following conditions will not be included:

1. All patients undergoing radiotherapy/ chemotherapy

2. Post-operative patients

Techniques & Procedures:

Transabdominal/Pelvic Ultrasonography:

Procedure and instructions are explained to subjects for USG.

Most sonograms are performed using 5 MHz or 3.5 MHz linear or curvilinear transducer arrays enable a white scanning field. Imaging of the uterus and the adnexa is performed in both sagittal and transverse plane. The long axis of uterus is identified in sagittal plane and somewhat oblique angulation often necessary to visualize entire uterus and cervix. The adnexa may be imaged by scanning obliquely from thev contralateral side. When Transabdominal sonography is performed other target areas can be scanned free fluid in the abdominal cavity.

Transvaginal Sonogram: Procedure is explained to patient. Verbal consent is obtained; careful consideration and respect should be given to the privacy. A transducer is prepared with ultrasound coupling gel and then covered with a protective sheath usually condom, air bubbles is eliminated to avoid the artefacts .

Statistical Analysis:

For ordinal type data, the analysis will be done by non-parametric test like Wilcoxon-Mann-Whitney test. The categorical data will be summarized by frequency count and percentage and significance will be analysed

Results:

Table 1: Relation of menopausal status and ovarian tumours:

Menopausal Status:	Benign:	Malignant:
Postmenopausal	10	20
Premenopausal	62	8
Total:	72	28

Out of 100 patients 72 had Benign and 28 had malignant tumors. Majority of tumors were in premenopausal patients.

Table 2: Classification as per types of benign adnexal mases:

Type of Benign Adnexal Mass:	No. of cases:
Simple Ovarian Cyst	48
Dermoid Cyst	5
Mature Cystic Teratoma	3
Serous Cystadenoma	4
Mucinous Cystadenoma	3
Chocolate Cyst	3
Ectopic Pregnancy	2
Hemorrhagic Cyst	2
Tubal Cyst	1
Fibroma	1
Total:	72

Table 3: Classification as per types of malignant adnexal mases:

Type of Malignant Adnexal Mass:	No. of cases:
Serous Cystadenocarcinoma	9
Mucinous Cystadenocarcinoma	7
Borderline Serous	4
Borderline Mucinous	3
Endometriocarcinoma	2
Granulosa Cell Tumour	2
Borderline Endometrioid	1
Total:	28

Table 4: Classification of cases as per IOTA simple ultrasound rules:

Nature of the Mass as per IOTA Rules:	No. of cases:
Benign	58
Malignant	32
Indeterminate	10

Table 5: Prevalence and predictive power of benign factors:

Benign:	Predicted:	Result:	Percentage:
B1	17	16	94%
B2	2	2	100%
B3	6	5	83%
B4	6	6	100%
B5	20	19	95%

B5 was the most common occurring factor in all benign lesions, followed by B1. But B2 and B4 predicted the result most correctly (100%) followed by B5 and B1.

Table 6: Prevalence and predictive power of malignant factors:

Benign:	Predicted:	Result:	Percentage:
M1	8	4	50%
M2	8	8	100%
M3	1	1	100%
M4	8	5	63%
M5	4	3	75%

Rules M1, M2, M4 were all equally common factors each present in eight patients with suspected malignancy. Out of these, best M factor was M2 (presence of ascites) which correctly predicted malignancy in all the eight patients in which it was found.

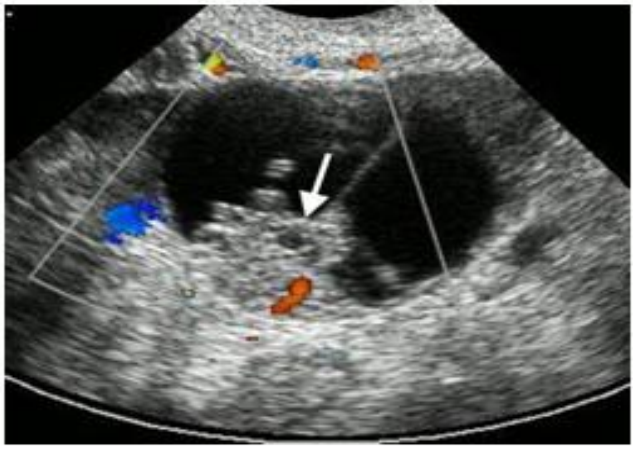
Table7: Efficacy of IOTA Simple Rules:

Factor:	Percentage:
Sensitivity	91.66
Specificity	84.84
PPV	68.75
NPV	96.55
Accuracy	88.88

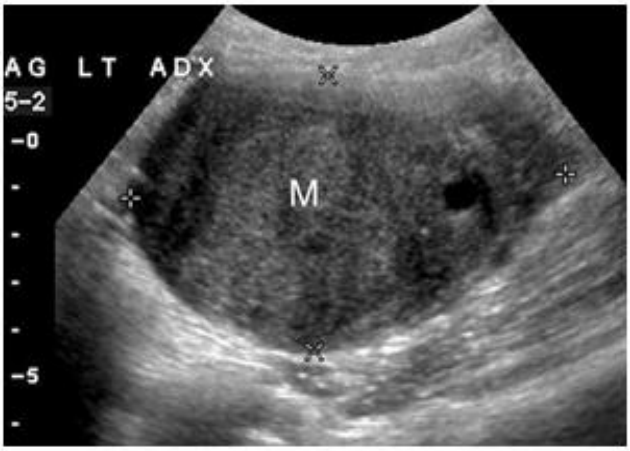
Kappa statistics showed high level of agreement between USG and histopathological findings and it was statistically significant (K=0.323). The sensitivity for the detection of malignancy in cases where IOTA simple rules were applicable was 91.66% and the specificity was 84.84%. Accuracy was 88.88%. Classifying inconclusive cases as malignant the sensitivity and specificity was 93% and 80% respectively.

Representative cases:

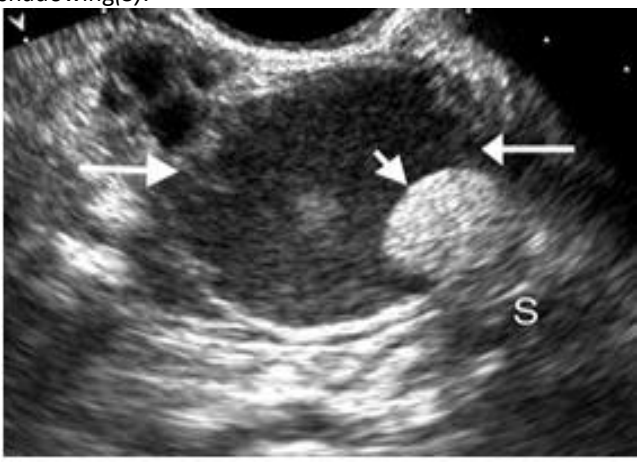
1. Case: Serous cyst adenocarcinoma, Trans-abdominal color Doppler US scan demonstrates a complex ovarian cyst with septum and a solid nodule (arrow). There is flow within the solid nodule, typical of malignancy.



2. Case: Ovarian fibroma in a 24-year-old woman. Trans abdominal US scan reveals a slightly hypoechoic solid mass *(M)* within and replacing most of the ovary (callipers). No distal acoustic shadowing is present.



3. Case: Mature cystic teratoma, Transvaginal US scan shows a complex ovarian cyst (long arrows) with low-level internal echoes and a markedly hyper echoic solid-appearing area (short arrow) with faint distal acoustic shadowing*(S)*.



Discussion:

A total of 100 patients with suspected ovarian pathology were evaluated using transvaginal ultrasonography and

transabdominal ultrasonography when transvaginal approach was not feasible. All the cases were examined first by an inexperienced sonographer (new residents with less than one year training in ultrasound) with prior knowledge of IOTA rules, the findings were noted. Same patient was later examined by an experienced sonographer and mass was again classified strictly as per IOTA rules. No expert opinion was taken intoconsideration. Both the rules were later compared with each other and 100% agreement was found between two results. Findings were correlated with histopathological findings in 50 cases where results of histopathology were available for comparison. On histopathology, out of total 50 cases studied 14(28%) were malignant and 36 (72%) were benign. Out of 45 cases where IOTA simple rules were applicable, 16(35.5%) were malignant and 29(64.4%) were benign. Out of the five cases classified as inconclusive two were malignant and three were benign. The sensitivity and specificity of present study most closely related to study by Hartman CA et al., who reported a sensitivity and specificity of 91% and 87% respectively. The specificity of our study was lower as compared to these seven studies. This variation may be due to limited number of patients studied in the present study as compared to other studies.[11-17] The increased sensitivity and specificity in premenopausal women compared to the postmenopausal women in present study may be explained by increased number of inconclusive cases in the premenopausal patients in present study where the simple rules could not be applied(10%). The rate of inconclusive result in this study was 10%. Using a strategy classifying the inconclusive cases as malignant was adopted by many already published studies in this regard. In previous published studies the IOTA ultrasound rules were not directly applied during sonographic examination, the sonographic data was later collected from patients and was evaluated as per prediction models. Till date only few studies which applied this diagnostic test directly to patient have been performed. Our study overcomes this limitation by directly applying IOTA simple ultrasound rules on the patients.

Conclusion:

Out of 100 patients, 48% of our patients belonged to the 26 to 40 years age group. 30% of our patients were post-menopausal, out of which 20% of females had a malignant lesion. Simple ovarian cyst (48%) was found in the majority of our cases and majority of these were not operated as they were < 5 cm in maximum diameter. Serous (9%) & mucinous (7%) cystadenocarcinoma were the most common malignant lesions on ultrasound analysis. Application of IOTA Simple Rules suggested that 58% of the lesions were benign, 32% were malignant and 10% were indeterminant in nature. Histopathology results were available in 50 of our patients. On comparing the findings of ultrasonogram versus histopathology, it was found that ultrasound had a high sensitivity of 91.66%, 84.84% specificity, 68.7% positive predictive value, 96.55% negative predictive value and 88.8% accuracy of detecting adnexal masses. The findings of our study are comparable to most studies in literature.

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