Characterization of Adnexal Masses on Trans Abdominal Ultrasonography and CT scan

Aliya Ahmed*
Shahla Zamir**
Nuwayrah Jawaid Saghir***

**Senior Registrar*
***Associate Professor*
****Assistant Professor*

,* Radiology Department, Pakistan Institute of Medical Sciences, Islamabad*
**** Fauji Foundation, Rawalpindi*

Objective: To cross validate the diagnostic performance of transabdominal ultrasound and computed tomography for discrimination of benign and malignant masses.
Study Design: Comparative Cross sectional study.
Place and Duration of Study: The study was conducted at department of Radiology from January 2008 to December 2008.
Materials and Methods: The study was conducted in department of radiology from January 2008 to December 2008 .In this study 50 patients with adnexal masses admitted in Gynae MCH ,General Surgery wards of PIMS, scheduled for surgery, were included, using histopathology as a gold standard.
Results: TAUS had sensitivity of 78%, specificity 88.8%, Positive predictive value of 85.7% and negative predictive value of 82.7 %. CT scan showed sensitivity of 91%, specificity of 81.4%, positive predictive value of 80.7% and negative predictive value of 91%. The comparison between two tests was statistically insignificant (p>o.o5).
Conclusion: Evaluation of adnexal masses whether benign or malignant on the basis of characterization there was not a significant difference between TAUS and CT scan. TAUS is as accurate as CT scan in characterization of an ovarian mass.
Key words: Transabdominal ultrasound, computed tomography, Adnexal mass.

Address for Correspondence
Dr. Aliya Ahmed
Department of Radiology
Pakistan Institute of Medical Sciences, Islamabad
Email: aliyaahmed13@yahoo.com

Introduction

Adnexal masses present a special diagnostic challenge because benign adnexal masses greatly outnumber malignant ones especially in younger age groups. Determination of a degree of suspicion for malignancy is critical and is based largely on imaging appearances and is one of the most frequent reasons for referral to a radiologist. 4 to 24% of adnexal masses discovered before menopause and between 36 to 63% found after menopause are malignant.[1] Ovarian cancer represents 5% of all cancers and is most fatal among gynecologic tumours.[2] The role of imaging is to detect and characterize adnexal masses as likely, and recognize unusual findings that may suggest atypical pathology. Whether ultrasound can differentiate between benign or malignant pelvic masses, has been the subject of many studies.[3, 4] Transabdominal ultrasonography remains the study of choice in initial evaluation of suspected adnexal masses because it is relatively inexpensive, noninvasive, and widely available. Excellent results of US for detection of adnexal masses have been confirmed in several studies, which have demonstrated that 60% to 97% of ovarian masses may be visualized sonographically, and 93% to 97% of ovarian masses may be characterized by sonographic morphology.[5]

Despite the dominant use of transabdominal sonography to characterize adnexal masses during the past decade, more women with large, presumed ovarian masses are now being referred for CT scan for mass characterization. When a thick wall, thick septum, papillary projection or solid portion is detected in an ovarian mass on CT, the mass should be considered malignant.[6]

The main challenge to the radiologist is to differentiate benign from malignant adnexal masses. Both transabdominal CT scan and US perform well for prediction of benignity. Studies have been carried out to compare the findings of these techniques.[7] This study was therefore designed to see the extent of diagnostic information provided by TAUS as compared to CT scan. Being a comparative study, my hypothesis was that transabdominal ultrasound provides equally significant information in relation to characterization of an ovarian mass as compared to computed tomography.

Adnexal Masses: The differential diagnosis of an adnexal mass varies considerably with the age of the patient. In premenarcheal and postmenopausal women,

an adnexal mass should be considered highly abnormal and must be immediately investigated. 4% of masses discovered before menopause and between 39% and 63% of those after menopause is malignant.[4-6] Any enlargement of the ovary is abnormal in the older age group and should be considered malignant until proved otherwise. In the reproductive age group, the differential diagnosis is varied, both benign and malignant tumors of multiple organs can occur.

Differential diagnosis of adnexal masses

Adnexal masses of gynecologic origin: Uterine Masses: Pedunculated or interligamentous myoma, pregnancy in a bicornuate uterus often confuses the examiner and leads to believe that the mass originates in the tube or ovary.[8]

Fallopian tube: The triad of pain, bleeding and leucorrhoea is considered pathognomic of tubal carcinoma.[9]

Ovarian Masses:

Ovarian masses may be cystic, cystic and solid or completely solid.

The standard evaluation for adnexal masses includes a history, tumor markers, ultrasound, CT scanning and MRI.

The commonest benign solid tumors types are ovarian fibromas and some dermoids.

Materials and Methods

The comparative Cross sectional study was conducted at department of Radiology from January 2008 to December 2008.

In this study 50 patients with adnexal masses admitted in Gynae MCH ,General Surgery wards of PIMS, scheduled for surgery, were included, using histopathology as a gold standard.

Inclusion Criteria: Patients with pelvic masses of gynaecological origin and diagnosed as adnexal masses by gynaecologist and scheduled for surgery were included in this study.

Exclusion Criteria: Patients with adnexal masses managed conservatively were excluded.

Data collection procedure: All the subjects were scanned initially to assess the gross architecture of the pelvic mass. An optimally distended urinary bladder was ensured before a transabdominal ultrasound. Uterus, adnexa were viewed in sagittal, transverse and oblique views. All the masses were recorded for the following characteristics, i.e. size, site, septations, lobulations, papillary projection, solid component, presence of fat or calcification, ascites and metastatic deposit. These masses were then labeled as benign or malignant according to the echopatterns. Then these patients underwent CT scan. Computed tomography was done in Oral and Intravenous contrast. Complete history of allergy was taken and if there was history of allergy then non-ionic contrast was used .The presence of necrotic mass, septation, solid component, calcification, fat, omental caking and ascites were ruled out.

Transabdominal ultrasound was carried out on Real time B–scan (schmadzu) with 3.5 MHZ Probe, and Computed tomography was done on Toshiba Asteion – VR.

Biopsy being the gold standard was done on all the masses. The information provided by TAUS, CT scan and biopsy were categorized as follows:

i) Benign
ii) Malignant

The ovarian masses having echopatterns like papillary projection, solid component septations >3mm, loculations, free fluid and metastatic deposits were considered as malignant masses. The benignity of a mass was considered if the septations were <3mm or of 3mm, or a mass having fat, calcification.

IN CT scan the ovarian masses were labeled as malignant on the basis of necrosis, septations>3mm, solid enhancing component, papillary projections, lymphnode, fluid in peritoneal cavity and omental caking. The benign masses were having fat, calcification and septations<3mm or 3mm. All the data was collected on the Performa. The ovarian masses were considered malignant masses if at least two malignant characteristic were found. This rule was applied in both imaging modalities.

Data was analyzed with the help of SPSS 10 for Windows. Sensitivity, specificity and predictive values were calculated.

Results

Tabulated data were used to calculate sensitivity, specificity, positive predictive value and negative predictive value of TAUS and CT scan.

13 malignant tumors were diagnosed in post menopausal and 10 in premenopausal women. The mean age was 39.12 (range 13 -72) Y. All patients presented with complaints of pelvic-abdominal pain, and mass abdomen.

In the observed subjects there were 27 benign (54%) and 23 (46%) malignant which were diagnosed on histopathology (Table I).

Chi-square test was used to compare the sensitivity of TAUS and CT scan with level of significance of <0.05.

TAUS had a sensitivity of 78%, specificity of 88.8%, positive predictive value of 85.7% and negative predictive value of 82.7% (Table II)

CTscan showed sensitivity of 91% specificity of 81.4% positive predictive value of 80.7% and negative predictive value of 91% (Table II)

These results showed higher sensitivity of CT scan while higher specificity of TAUS. The accuracy of TAUS was 84% and CT scan was 86%.

Table No I: Benign and Malignant Masses on histopathology In Pre &postmenopausal patients (n=50)

	Premenopausal	Postmenopausal
Malignant	10	13
Benign	24	3

Table II: Test Performance Characteristics of TAUS and CT Scan

		TAUS	CT
Sensitivity		78%	91%
Specificity		88.8%	81.4%
Positive Value	Predictive	85.7%	80.7%
Negative Value	Predictive	82.7%	91%

TAUS = Transabdominal Ultrasound.
CT= Computed Tomography.

The results of TAUS and CT scan were compared using chi-square test of significance and relationship between the two variables was found to be insignificant (p>0.05)
There was no significant difference in the two methods of imaging regarding tumor localization and characterization.
All the patients underwent surgery, like operative laparoscopy, laparoscopy proceeding to laparotomy, exploratory/staging laparotomy.

Discussion

Ovarian cancer is an insidious and intractable disease. A late diagnosis by traditional techniques and paucity of early and specific symptoms is probably the main reason for poor prognosis. Despite advances in treatment, ovarian cancer has consistently had the highest case of fatality ratio of all gynecologic malignancy, with a 5-year survival rate for all stages of 40-50%.[10,11]

Adnexal masses present a special diagnostic challenge in part because benign adnexal masses greatly outnumber malignant ones. Determination of a degree of suspicion for malignancy is critical and is based largely on imaging appearances. An estimated 5-10% of US women with a suspicion of adnexal mass will undergo surgery, but in only 13-21% of these patients with mass prove to be malignant. Thus the number of suspect benign masses is far greater than the number of malignant masses. This discrepancy becomes even greater if screening with cancer antigen (CA—125) or US is used to define the population. The sensitivity of CA-125 is reported to be in the range of 20-57% and specificity has been reported as ranging from 97%-99%.[12]

Many of the most common causes of lesions that may mimic an adnexal mass require no invasive testing. In the interests of efficiency and practicality, patients with suspected adnexal masses initially undergo pelvic US. Among women with ovarian disorders, CT has been used primarily in patients with ovarian malignancies, either to assess disease extent prior to surgery or as a substitute for second look laparotomy. Although CT may play a useful role in diagnosing adnexal masses, it is more often of limited value in this setting Moreover CT of abdomen or of pelvis allows comprehensive evaluation of all potential sites of peritoneal implants or lymphadenopathy. CT allows use of oral contrast agent to distend and mark the bowel. CT is a very attractive method in evaluating the extent of disease in women with ovarian malignancy. However, available studies have not demonstrated that CT is significantly superior to other modalities in characterization of ovarian cancer and simple ovarian cysts are better evaluated on transabdominal ultrasound Anechoic cyst content, well defined walls of varying thickness and posterior acoustic enhancement.[13-15] The commonest type of adnexal mass which meets these criteria is the functional ovarian cyst.[16]

Functional imaging can portray the effectiveness of treatment earlier and more accurately, thus reducing mortality and improving the likelihood of a cure. The radiologist has an integral role in the evaluation of ovarian carcinoma, including detection, mass characterization, and staging. Whether TAUS and CT scan can differentiate between benign and malignant masses has been the subject of many studies
The comparison between transabdominal and computed tomography was found to be statistically insignificant.
The results of our study showed that morphological characteristics associated with strong likelihood of malignancy were the presence of solid component (63%), papillary projection (100%), free fluid in peritoneal cavity (61%), and multiseptated lesion. A statistically significant correlation was found between ovarian malignancy and the presence of sonographic ovarian lesions such as papillae, solid components, (P<0.001) and thick septa (p<0.003), multiloculations and ascites.[17,18]

When faced with a woman with ovarian mass, the physician is required to make a judgment about the likelihood of malignancy. Following clinical assessment, US and serum CA-125 estimation are the next investigations. One of the studies which showed multidisciplinary approach to ovarian cancer at diagnosis· Ilyas[3] has reported 100% sensitivity and 85% specificity for ultrasound in adnexal masses.

Ahmed[4] has reported that TAUS has an accuracy of 92.6% in pelvic pathology.

Our results were correlated with other studies discriminating benign from malignant adnexal masses. Meir et al[20] first examined the accuracy of grey scale ultrasound in delineating a malignant ovarian mass based on size and appearance. In that study fixed septa, tumor size exceeding 5 cm, and multiloculations were considered ominous for ovarian malignancy. Another study done by Onyka BA, Atalla A, Deemer H showed comparative diagnostic values of grey–scale US versus CT Scan in the primary management of gynaecological pelvic mass with emphasis on ovarian cancer detection and staging.[19] The sensitivity of CT scan for all ovarian cancer detection was greater than that of TAUS 83% vs 67%, but TAUS was more specific. Both methods were equally efficacious in detecting and staging advanced ovarian cancer cases. Over all CT did not offer significant additional features and did not result in a change in management plan in any of the patients reviewed. Both methods were almost equally efficacious in detecting ovarian cancer cases. In the light of our study we recommend use of TAUS as an initial technique in routine evaluation and characterization of an ovarian mass. TAU give more information of ovarian mass and gives better overall view of the pelvis and is easy to perform without any radiations.

Conclusion

An accurate diagnosis can usually be made by assessing the characteristics of the mass, taking into account the age of patient. In our study there were no significant differences in the two methods i.e. TAUS & CT scan regarding tumor localization, characterization. Overall CT did not offer significant additional features. For the identification of fat, CT scan had got an edge over TAUS. The marginal benefit of CT scan over TAUS will not warrant its routine usage in the diagnosis of gynaecological pelvic mass. Our findings largely reflected the conclusions of published reports in literature.

Recommendation: Modern imaging is emerging as an important adjunct to the clinical assessment of ovarian cancer, contributing to the tumor detection, characterization, staging, treatment planning and follow-up. Characterization by US require both morphologic and Doppler US findings. For characterization CT has not traditionally been used. CT is used to assess the extent of disease. And it has got a role in staging.

MRI is recommended for further evaluation. The principle advantage of MR imaging is that it combines some of the best features of CT and US.

Reference

1. Behtash N, Rahmani M, Ghotbizadeh F, Karimi Zarchi M, Mousavi A. Asian Pac J Cancer Prev. 2009;10(2):201-4.
2. Poveda A. advanced ovarian cancer: update remarks and conclusions on optimal therapy. Int J Gynecol Cancer 2000;10 :57-60.
3. Ilyas M. Incidence of palpable adnexal masses and role of ultrasound.Pak armed Forces Med J 2000; 50:85-90.
4. Ahmed K K, Shoukat A, Khosa HL, Baloch B. Ultrasonography of pelvic masses. Br J Obstet Gynecol 1998;105:137-9.
5. Stacey FA, Lucy HE. Detection and characterization of adnexal masses. Radiol Clin N.Am 2002; 40:591-2.
6. Timmerman D , Testa AC , Bourne T , et al .Simple ultrasound-based rules for the diagnosis of ovarian cancer . Ultrasound Obstet Gynecol 2008 ; 31 : 681 – 690 .
7. Onyeka BA ,AttallaA, Deemer H. Comparative diagnostic values of grey –scale USS versus CTscan in primary management of gynaecological pelvic mass with emphasis on ovarian detection and staging.J Obstet Gynaecol.2001;21:516-9
8. Jain K, Jeffery RB, Jr. Evaluation of pelvic masses with magnetic resonance imaging and ultrasonography. Ultrasound Med 1994; 13:845-53.
9. Biligin T, Karabay A, Dollar E, Develioglu H O. Per Peritoneal TB with pelvic abdominal mass, ascites and elevated CA 125 mimicking advanced ovarian carcinoma .Aseries of 10 cases. In J Gynecol Cancer 2001;11:290-4.
10. Kuiper M, Peakman M, Farzaneh F. Ovarian tumor antigens as potential targets for immune gene theapy. Gene Ther 1995;2:7-15 .
11. Laframboise S, Nedelcu R, Murphy J, Cole C E, Rosen B. Use of CA 125 and ultrasound in high risk women. In J Gynecol Cancer 2002;12 : 86-91
12. Cao S J, Qian H N, Feng J. The expression Of Co-stimulatory molecules in ovarian carcinoma. J Beijing Med Univ 2000;32:90-1
13. Liu J , Xu Y , Wang J . Ultrasonography, computed tomography and magnetic resonance imaging for diagnosis of ovarian carcinoma. Eur J Radiol 2007 ; 62 : 328 – 334 .
14. Funt SA, Hann LE. Detection and characterization of adnexal masses. Radiologic Clin North Am. 2002; 40:591-608.
15. Metz CE, Wang PL, Kronman HB. A new approach for testing the significance of differences between ROC curves measured from correlated data: information processing in medical imaging In: Proceedings of the Eighth Conference. The Hague, Netherlands: Nijhoff 1984; 432-45.
16. Loyer M, Whitman J, Fenstermacher J M. imaging of ovarian carcinoma. Int j Gynecol Cancer 1999;9 :351-61.
17. LewickiMA. Marie Sklodwsta Curie in America,1921. Radiology 2002;223:229-303
18. Clare MC,Tempany MD,Kelly HZ,Staurt G .To compare US CT and MR for diagnoses and staging of advanced ovarian cancer radiology 2000;251:761-7
19. Jeong YY, Eric k, Outwater MD. Imaging evaluation of ovarian masses .Radiographics .2000; 20:1445-70
20. Meyer JI, Kennedy AW, Friedman R, Ayoub A, Zepp RC. Ovarian carcinoma: value of CT in predicting success of debulking surgery. AJR Am J Roentgenol 1995; 165:875–8.