

A hospital-based assessment of the utilization of ultrasonography (USG) and computed tomography (CT) in the evaluation of suspicious ovarian masses: A comparative study

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Abstract

Aim: To compare modalities like ultrasonography (USG) and computed tomography (CT) in the evaluation of suspicious ovarian masses.

Methodology: This prospective comparative study was carried out in the Department of Radiology, Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana for a period of 1-year 3 months. Total 50 women were included in this prospective study. All patients underwent abdominal Ultrasonography and CT scan with determination of the ovarian mass characteristics. Detailed history of allergy and renal function tests were taken before doing CT scan and if there was history of allergy then non-ionic contrast was used. Site, size, papillary projections, wall characteristics, capsular infiltrations, the presence of solid areas inside the mass and presence of ascites were recorded both by US and CT scan.

Results: Out of 50 patients, majority of patients belonged to 40-50 years of age group (19, 38%) followed by 30-40 years of age group (10, 20%). 8 patients (16%) belonged to 20-30 years age group, 7 (14%) belonged to 50-60 years, <20 and >60 years of age group included 3 patients each. There are total 29 cases of Pre-menopausal stage and 21 cases of Post-menopausal stage having ovarian cyst. Out of 29 cases of Pre-menopausal conditions have 7 number of malignant and 22 number of benign type of ovarian masses. In the Postmenopausal group, 17 cases of malignant and 4 cases of benign ovarian mass were observed. Overall, CT was found to have 96% sensitivity, 92% specificity, and an accuracy of 92% in the differentiation of benign and malignant ovarian masses, while PPV and NPV were 94% and 90%, respectively. The sensitivity of USG was 90%, specificity was 86% and PPV and NPV were 88% and 86% respectively.

Conclusion: CT and USG imaging all have approximately similar accuracy in staging ovarian carcinoma but the sensitivity of CT scan for all ovarian cancer detection greater than that of US. Among women with ovarian disorders, CT can be helpful primarily in patients with ovarian malignancies, either to assess disease extent prior to surgery or as a substitute for second look laparotomy.

Keywords: CT, USG, ovarian masses, benign, malignant

Introduction

Gynecologic malignancies include cervical cancer, endometrial cancer, and ovarian cancer. Ovarian cancer is the second most common gynecologic malignancy^[1], however, it remains the leading cause of death among these diseases and is the fourth leading cause of cancer deaths in women in the United States. In spite of diagnostic and therapeutic advances in the care of women with ovarian cancer, the overall 5-year survival rate has changed little^[1-3].

Ovarian cyst is often asymptomatic and it is a fluid-filled sac inside the ovary. Sometimes it leads to lower abdominal or back pain, pelvic inflammatory disease, but most of the ovarian cysts are not harmful^[4]. Ovarian cyst can be follicular, corpus luteum, dermoid and cystadenomas type^[5]. The diagnosis of ovarian cyst can be performed by the use of ultrasound and other laboratory investigations^[6]. Most of the reproductive age female can develop smaller cyst every month. Larger cyst can cause problems before menopause in 8% of women^[7].

Ovarian tumors can be categorized as epithelial, germ cell, sex cord-stromal, or metastatic. Epithelial tumors are the most common histopathologic type of malignant ovarian tumor (85% of cases)^[8]. The most common type of ovarian malignancy is serous carcinoma (approximately 40% of cases)^[2,3,8].

US remains the study of choice in the initial evaluation of suspected adnexal masses because it is relatively inexpensive, noninvasive, and widely available. Transabdominal US, endovaginal US, or both should be performed for the evaluation of adnexal masses^[9-11]. The advent of high-frequency endovaginal probes allowed high-resolution imaging of the pelvic organs in general and of the ovaries in particular. Endovaginal US has allowed markedly improved resolution for uterine and adnexal imaging and is essential for imaging adnexal masses whose nature is not apparent at transabdominal US^[9-12].

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.

Materials and Methods

This prospective comparative study was carried out in the Department of Radiology, Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana for a period of 1 year 3 months. Total 50 women were included in this prospective study.

Methodology

All patients underwent abdominal Ultrasonography and CT scan with determination of the ovarian mass characteristics. Patients with conservatively manageable ovarian masses were excluded from this study. Patients with mid-line uterine mass lesions on USG, clinically and sonographically proven cases of ectopic pregnancy, sonographically validated benign cystic ovarian lesions such as functional cysts in patients of reproductive age group were excluded from the study.

Detailed history of allergy and renal function tests were taken before doing CT scan and if there was history of allergy then non-ionic contrast was used. Site, size, papillary projections, wall characteristics, capsular infiltrations, the presence of solid areas inside the mass and presence of ascites were recorded both by US and CT scan.

Results

Out of 50 patients, majority of patients belonged to 40-50 years of age group (19, 38%) followed by 30-40 years of age group (10, 20%). 8 patients (16%) belonged to 20-30 years age group, 7 (14%) belonged to 50-60 years, <20 and >60 years of age group included 3 patients each. There are total 29 cases of Pre-menopausal stage and 21 cases of Post-menopausal stage having ovarian cyst. Out of 29 cases of pre-menopausal conditions have 7 number of malignant and 22 number of benign type of ovarian masses. In the Postmenopausal group there are 17 cases of malignant and 4 cases of benign ovarian mass was observed.

Table 1: Age groups and type of ovarian mass details

Variables		Number	Percentage (%)
Age (in years)	Below 20	3	6
	20-30	8	16
	30-40	10	20
	40-50	19	38
	50-60	7	14
	Above 60	3	6
Type of masses			
Benign	Pre-menopausal	22	44
	Post-menopausal	4	8
Malignant	Pre-menopausal	7	14
	Post-menopausal	17	34

Overall, CT was found to have 96% sensitivity, 92% specificity, and an accuracy of 92% in the differentiation of benign and malignant ovarian masses, while PPV and NPV were 94% and 90%, respectively. The sensitivity of USG was 90%, specificity was 86% and PPV and NPV were 88% and 86% respectively.

Table 2: The comparison between USG and CT in diagnosis of ovarian masses

Category	CT Study (No. of Cases)		USG Study (No. of Cases)	
	Benign	Malignant	Benign	Malignant
Sensitivity	96%	84%	90%	78%
Specificity	92%	85%	86%	76%
Positive Predictive Value	94%	90%	88%	74%
Negative Predictive value	90%	84%	86%	72%

Discussion

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. CT, particularly spiral CT, has several advantages: It is widely available and can be performed rapidly and relatively easily. Moreover, CT of the abdomen or pelvis allows comprehensive evaluation of all potential sites of peritoneal implants or lymphadenopathy as well as of the primary tumor site.

CT allows use of oral contrast agent to distend and mark the bowel and help differentiate bowel from peritoneal implants, which gives this modality a major advantage over US and MR imaging. However, available studies have not demonstrated that CT is significantly superior to other modalities in staging ovarian malignancy [13, 14]. CT is most useful for evaluating the extent of disease in the abdomen and pelvis. In some studies, CT has

demonstrated reasonable accuracy in determining which patients may have tumor implants that can be optimally surgically debulked (i.e., all tumor nodules greater than 2 cm can be removed) [14, 15].

US, whether transabdominal or endovaginal, relies on morphologic assessment of the tumor to distinguish between benign and malignant disease. Morphologic features including thick, irregular walls and septa, papillary projections and solid, moderately echogenic loculi have been described as suggestive of malignant tumor [16-18].

In 1991, Sassone *et al.* [19] proposed a morphologic scoring system using endovaginal US to characterize ovarian lesions and demonstrated a sensitivity of 100% and a specificity of 83% in distinguishing benign from malignant ovarian lesions. The sensitivity of morphologic analysis with US in predicting malignancy in ovarian tumors has been shown to be 85%–97%, whereas its specificity ranges from 56% to 95% [16-18].

In our study, CT was found to have 96% sensitivity, 92% specificity, and an accuracy of 92% in the differentiation of benign and malignant ovarian masses, while PPV and NPV were 94% and 90%, respectively. The sensitivity of USG was 90%, specificity was 86% and PPV and NPV were 88% and 86% respectively. The findings of this study are corresponding to the result of Ahmed *et al.* [20] who found Trans-Abdominal-Sonography (TAS) to be 78% sensitive and 88.8% specific and CT to be 91% sensitive and 81.4% specific in evaluating benignity and malignancy in adnexal masses. While we are discordant with the results of USG in the study of Behtash N *et al.* [21] showing a sensitivity of 91.2% and specificity of 68.3%; there is close similarity in CT results of current study with them, showing 85.3% sensitivity and 56.1% specificity. Onyka *et al.* [22] found the sensitivity of CT scan for all ovarian cancer detection greater than that of US 83% vs. 67%, but US was more specific. He found both the methods were equally efficacious in detecting and staging advanced ovarian cancer cases.

Conclusion

CT and USG imaging both have nearly the same accuracy when it comes to staging ovarian carcinoma, although the sensitivity of CT scans for ovarian cancer diagnosis is significantly higher than that of US. In patients who have ovarian cancer, CT is often used either to evaluate the disease's extent before surgery or as a replacement for a second look laparotomy. Women who have ovarian problems are included in this category.

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