# Comparative Study of USG and CT in the Evaluation of Suspicious Ovarian Masses

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**ABSTRACT**
*Ovarian tumors continue to pose a major challenge to clinicians and radiologists. Ovarian Carcinoma is the second most common gynecological malignancy. The present study is undertaken to determine the role of US and CT in the evaluation of suspicious ovarian masses. This will help the treating clinician to plan the management with regard to type and extent of surgery.*
**Methods and Materials:** *All patients underwent Ultrasonography and CT scan. Site and size of the mass, papillary projections, characteristics of cyst walls, capsular infiltrations, necrosis, lymphadenopathy and presence of as cites were recorded Specimens were sent for histopathological diagnosis.*
**Results:** *US had sensitivity of 88.2%, specificity 63.2%, positive predictive value (PPV) of 88.5% and negative predictive value (NPV) of 66.7% for benign tumors whereas for malignant tumors the sensitivity was 63.2, specificity 88.2, PPV 66.7% and NPV 86.5%. CT scan showed sensitivity of 98%, specificity of 95%, and PPV of 98% and NPV of 95% for benign tumours whereas for malignant tumors the sensitivity was 87.5, specificity 92.6%, PPV 77.8% and NPV 96.1%.*
**Conclusion:** *The evaluation of ovarian masses by CT scan was superior to the evaluation by US.*
**Keywords:** *Ultrasound, CT Scan, Ovarian Tumors, Sensitivity, Specificity.*

## INTRODUCTION

Ovarian Carcinoma is the second most common Gynaecological malignancy. Ovarian tumours present a great challenge of all gynaecological cancers as 2/3rd of the patients present in the late stage. Prognosis of these patients can be improved with aid of imaging modalities like ultrasound and computed tomography. Once a pelvic mass is found, the role of the diagnostic radiologic modalities is important to clarify its origin and characteristics.

Ultrasound and computed tomography plays an important role in the diagnosis, preoperative staging, and evaluation of tumour recurrence of ovarian carcinoma. Ovarian carcinoma has characteristic tumour appearances and modes of tumour spread within the peritoneal cavity. By recognizing these features, the radiologist can assist the clinicians in treatment planning.
As benign ovarian tumours greatly outnumber the malignant ones determination of a degree of suspicion for malignancy is critical and is largely

based on imaging modalities. Based on few studies already done, some say that ultrasound is an excellent method for preoperative screening and is the most practical modality readily available and has high negative predictive value for the diagnosis of ovarian tumours. In view of this, we thought to compare the advantages of most practically feasible investigations like ultrasound & computed tomography in making early diagnosis of ovarian tumours & its correlation with Laparotomy, with surgical staging and histopathology subsequently.

## METHODS AND MATERIALS

The study protocol was approved by the ethics committee, written and informed consent was taken from all the patients. The principal inclusion criteria were presence of pelvic mass irrespective of the age of the patient. All the selected patients were subjected to detailed history, physical examination, Ultrasonography and CT scan. Patients with ovarian masses and scheduled for surgery were included in this study, and patients with ovarian masses managed conservatively were excluded.

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.

Color Doppler study was done to assess the presence or absence of neo-vascularization, resistance index (RI) and Pulsatility index (PI). Malignant ovarian masses were diagnosed on Ultrasonography if they were having echopatterns like papillary projection, solid components, and septations >3mm, loculations, free fluid and metastatic deposits. In CT scan the ovarian masses were labeled as malignant if the mass contained evidence of necrosis and septations >3mm, solid enhancing component, papillary projections.

Presence of lymph node enlargements, free fluid in peritoneal cavity and omental caking were considered as supporting evidence for malignancy. Trans-abdominal sonography was carried out with Esoate, My Lab 40 U/S machine using 3.5 and 5 Mhz curvilinear and linear transducers. Scanning in transverse, oblique and saggital planes were carried out and probable characterization of ovarian tumours was evaluated.

CT scan of the abdomen was carried out with Toshiba Asteion spiral single slice CT – Scanner. Pre and Post IV contrast images along with oral contrast were taken in the axial planes. Thin sections of 1 – 3 mm were taken in region of interest. Evaluation of pathologies of adjacent anatomical structures was determined with the help of multi planar reconstruction. All the patients underwent surgery and specimens were collected intraoperatively and postoperatively for histopathological examination.

## RESULTS

A total of 92 potential patients who were hospitalized in the Gynecology department/ emergency department were screened for the study. Of these, 70 were found to be eligible. The main reason for exclusion were medical management (n=12), CT not available (n= 10). Eleven malignant tumors were diagnosed in post menopausal and seven in premenopausal women. The mean age was 41.16 (range 15-71) years.

All patients presented with complaints of pelvic-abdominal pain or abdominal mass. In this study, there were 52 benign (74.3%) and 18 (25.7%) malignant tumors which were diagnosed by histopathology. Majority of patients were in the age group of 31-40 years and are multifarious. Mass abdomen was the most common presenting symptom and contributed to 42%. It is followed by pain abdomen of 38% and abdominal distension by 30%, others by pressure symptoms (3.3%), and loss of appetite (2.1%).

Most common benign tumour is mucinous cystadenoma with a percentage of (55%) followed by serous cystadenooma (24.2%), others are Dermoid (11.2%), Fibro Thecoma (6.1%),

Fibroma (1.7%), Granulose cell tumour (1.7%). Most common malignant tumour is papillary serous cystadeno carcinoma with a percentage of (34.1%).

Followed by mucinous cystadeno carcinoma (24%), others are serous cystadeno carcinoma (18.1%), papillary mucinous cystadeno carcinomoa (4.1%), Borderline Malignant (Serous – 4.9%, Mucinous – 9.1%), endometroid carcinoma (1.5%), Dysgerminoma (4.1%). Benign tumours were more common in age group 31-40 years (35.6%) and malignant tumours in 51-60 years (30%). US image, CT scan image, gross appearance and histopathological images of benign and malignant tumors are shown in figures 1 to 8. US had a sensitivity of 88.2%, specificity of 63.2%, PPV of 88.5% and NPV of 66.7% for benign tumors whereas for malignant tumors the sensitivity was 63.2%, specificity 88.2%, PPV 66.7% and NPV 86.5%.

CT scan showed sensitivity of 98%, specificity of 95%, and PPV of 98% and NPV of 95% for benign tumours whereas for malignant tumors the sensitivity was 87.5%, specificity 92.6%, PPV 77.8% and NPV 96.1% (Table 2). These results showed higher sensitivity and specificity of CT scan.
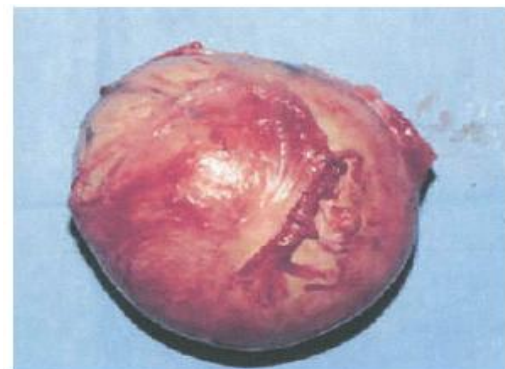
**Table 1: Benign and Malignant Masses on Histopathology in Pre & Postmenopausal Patients (n=)**

|  | Premenopausal | Postmenopausal |
|---|---|---|
| Malignant | 7 | 11 |
| Benign | 37 | 15 |

**Table 2: Test Performance Characteristics of US and CT Scan**

|  | Ultrasound | | Computed Tomography | |
|---|---|---|---|---|
|  | Benign | Malignant | Benign | Malignant |
| Sensitivity | 88.24 | 63.16 | 98 | 87.5 |
| Specificity | 63.16 | 88.24 | 95 | 92.59 |
| Positive predictive value | 88.54 | 66.67 | 98 | 77.78 |
| Negative predictive value | 66.67 | 86.54 | 95 | 96.15 |

CT scan was found to be superior to US imaging as regards tumor localization and characterization. All the patients underwent surgery, like operative laparoscopy, laparoscopy proceeding to laparotomy or exploratory/staging laparotomy.



Figure 1: US showing Solid Hypoechoic Mass Lesion



Figure 2: CECT Showing Heterogenous Enhancing Mass
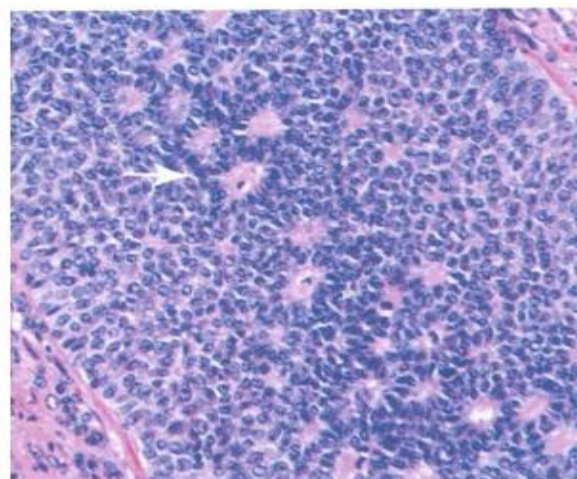


Figure 3: Post Operative Specimen



Figure 4: HPE of Mucinous Adenocarcinoma

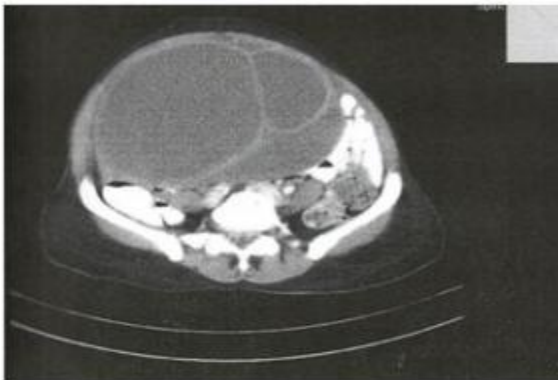Figure 5: US Showing Cystic Lesion with Thick Internal Septations



Figure 6: CECT Showing Non-Enhancing Cystic Lesion with Enhancing Internal Septations
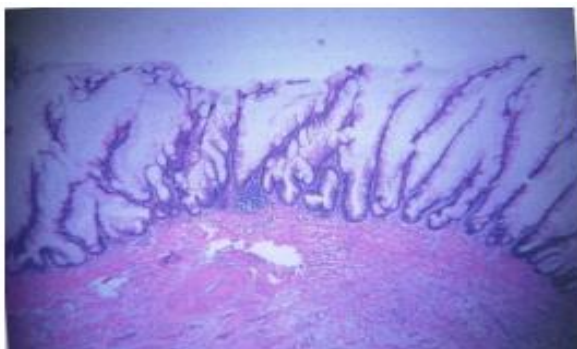


Figure 7: Post Operative Specimen



Figure 8: HPE of Mucinous Cyst Adenoma

## DISCUSSIONS

Ovarian tumours present a greatest clinical challenge of all gynecological cancers and ovarian. Carcinoma is the second most common gynaecological carcinoma in incidence. As most of them present in a late stage, clinical diagnosis alone is difficult and as benign ovarian tumours greatly outnumber malignant ones, determination of a degree of suspicion for malignant is critical and is based largely on imaging modalities.

The determination of a degree of suspicion for malignancy in an ovarian mass is the most significant step in its management as the decision to perform radical surgery or conservative surgery depends on accurate pre-operative diagnosis[2]. Clinical evaluation with regards to site (unilateral or bilateral), fixity, consistency, presence of nodules in Douglas pouch and presence of as cites increase the suspicious of malignancy to certain extent but if combined with other tools as tumor markers and two dimensional ultrasounds, the sensitivity for malignancy increases[2,3] . 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. CT is preferred for identification of peritoneal implants, lymphadenopathy and extent of the disease. However, studies failed to demonstrate that CT is significantly superior to other modalities in characterization of ovarian cancer[4,5,6] . And moreover, simple ovarian cysts are better evaluated by ultrasound.

Jeong et al. showed that morphological characteristics associated with strong probability of malignancy were the presence of solid component (63%), papillary projection (92%), and free fluid in peritoneal cavity (56%)[7].

Onyka et al. 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[8].

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