



Diagnostic Accuracy of Contrast Enhanced Computed Tomography in Detection of Ovarian Cancer in Clinically Suspected Patients

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ABSTRACT

Background: In the gynecologic malignancies, ovarian cancer is the 2nd most common and a big cause of the mortality. Contrast-enhanced CT is a recent imaging technique of choice in preoperative assessment of ovarian cancer. **Objective:** To determine the diagnostic accuracy of contrast enhanced computed tomography of abdomen and pelvis in detection of ovarian cancer in clinically suspected patients by using histopathology as gold standard. **Study Design:** Cross-Sectional Study. **Settings:** Department of Radiology Civil Hospital, Karachi Pakistan. **Duration:** Six months from 26th April to 25th October 2017. **Methodology:** All the clinically suspected patients of ovarian cancer were included. Contrast Enhanced Computed Tomography (CECT) of pelvis and abdomen was performed with injection of intravenous contrast material. The CECT, diagnostic accuracy was established in terms of sensitivity, specificity, PPV, NPV against histopathology. By taking p-value ≤ 0.05 as significant, chi square test (post stratification) was applied. **Results:** The mean age of patients was 31.84 ± 7.95 years. Mean duration of symptoms was 13.37 ± 5.99 weeks. Serum cancer antigen-125 level was 62.23 ± 14.66 U/ml. Total 27.5% subjects were diagnosed with ovarian cancer by contrast enhanced CT and 29.6% by Histopathology. Specificity, Sensitivity, NPV, PPV, and accuracy were 86.7%, 97.4%, 93.4%, 94.5%, and 94.2% respectively. **Conclusion:** The contrast enhanced computer tomography is helpful diagnostic tool to detect the ovarian cancer, with accuracy rate of 94.2%, 86.7% sensitivity and 97.4% specificity.

Keywords: Diagnostic Accuracy, Contrast Enhanced Computed Tomography, Ovarian Cancer.

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INTRODUCTION

The ovarian cancer has become one of the commonest causes of death in gynecological malignancies and the 4th most common causative factor of death in women from cancers within the United States and European nation. In Pakistan, Cancer data from institutional study shows that ovarian cancer accounts for 13.6% of cancers in females.¹ Moreover, it remains the 2nd commonest causative factor of death among women from malignancies following breast tumor.²

The cause of ovarian cancers includes several risk factors. Late menopause is also associated with an increased risk.³ Prevalence rates in developing countries are the largest, with rates in those regions approaching 9 per 0.1 million (excluding Japan where incidence rate is 64 per 1 million). Prevalence rates in several western nations and Japan have been rising gradually. Oral contraceptives usage and high parity minimize the ovarian cancer risk. In India, as per numerous hospital-based cancer databases, the age-adjusted prevalence of ovarian cancer varies between 50 and 83 cases per 0.1 million females. The median age in India is 45 years at the time of diagnosis, which is around 10 years lower than in developed nations.⁴ CT is also the first method used for detecting ovarian cancer. Since ovarian cancer symptoms suggest advanced disease yet are usually non-specific (such as, palpable abdominal weight, distention or abdominal, early satiety, urinary frequency), CT is achieved for ascites or occult intra-abdominal malignancy.⁵ Serum cancer antigen -125 (CA-125) is a tumor indicator for ovarian carcinoma and when it is elevated more

than normal value of 35U/ml, it has been observed to be associated with ovarian malignancy in 80% of women however with early disease in only 50% of females.^{6,7} Ultrasound remains the first line intervention for determining adnexal pathologies, but mostly it cannot differentiate benign lesions from malignant ones and the severity of disease in cancerous cases therefore further evaluation is done using serum CA-125 levels, CT scan and nuclear MRI and in certain cases laparoscopy.⁸ Computed Topography is the preferred investigation in planning additional administration among patients with metastatic disease as well as it also enables to comprehensively evaluate the primary tumor and the site of lymphadenopathy and peritoneal metastasis so the ovarian masses can be distinguished and features concerning the malignancy and benignity can be observed.⁸ One study performed in Pakistan⁹ showed specificity and sensitivity of CT scan in detection of ovarian masses as 86.7 and 92 % respectively, while another study from India¹⁰ showed specificity of CT scan in detection of ovarian malignancy as 46.2%. Petru *et al*¹¹ studied 175 patients suspected of having an ovarian mass found 70% sensitivity. Contrast enhanced computed tomography is commonly available noninvasive and useful diagnostic investigation to detect ovarian cancer. Various studies in literature showed marked differences⁹⁻¹¹ in results of sensitivity and specificity of CT scan in the detection of ovarian cancer. These variations give strong rationale to conduct this study in our population to detect diagnostic accuracy of CT scan in clinically suspected ovarian cancer patients.

METHODOLOGY

Study Design: Cross-Sectional Study.

Settings: This study was conducted in Radiology Department of Civil Hospital, Karachi Pakistan.

Duration: Six months from 26th April 2017 to 25th October 2017.

Sample Size: By taking sensitivity=92%, specificity=86.7%, Prevalence=13.6%¹, margin of error=8%, and 95% confidence level. The calculated sample size was 331 patients

Inclusion Criteria: Age 31 – 70 years. Clinically suspected ovarian cancer as ultrasound features and elevated serum CA-125 levels with presence of vague pelvic pain of mild intensity that do not prohibit patient from performing routine work, feeling of pelvic swelling or heaviness, urinary urgency and frequency and palpable pelvic mass on clinical examination

Exclusion Criteria: Biopsy proven cases of ovarian cancer. History of previous surgery involving either ovary. Serum creatinine greater than 1.5mg/dl or with history of chronic renal failure. Pregnant women.

Methods: Study was done on patients those were referred to the Radiology department of Civil Hospital Karachi for CT scan abdomen ted after approval from CPSP. Purpose and procedure of study were explained including the risks and benefits. After taking an informed consent, CECT of abdomen and pelvis performed at Radiology department Civil Hospital Karachi by senior radiologist with experience of at least 5 years on Toshiba Activion Multislice Computed Tomography scanner with injection of intravenous contrast material. Computed Tomography was performed in the axial plane with multi-planner reformations in sagittal and coronal planes with the patient lying in supine position. Ovarian cancer was diagnosed on the basis of appearances as

cystic or complex ovarian mass of >4cm in diameter with enhancing thick irregular walls (>3mm) and multiple thick septations in cystic ovarian masses, pelvic or/and abdominal lymphadenopathy with loss of fatty hilum and architectural destruction and hepatic metastatic deposits appearing hypodense or/and Peritoneal metastatic deposits appearing iso- to hyperdense. Findings of CT scan were recorded on research proforma and histopathology results reported by consultant pathologist at Dow University of Health Science Laboratory Karachi were then collected and recorded on proforma. Data was analyzed by SPSS version 20. Mean ± SD were calculated for numerical data and frequency and percentages were calculated for categorical data. A 2x2 table was constructed and sensitivity, specificity, PPV, NPV and accuracy of CT of abdomen and pelvis for detection of ovarian cancer was estimated by using histopathology as gold standard.

RESULTS

Total 331 patients were selected and the mean age of the respondents was 55.68±8.80 years. The mean duration of symptoms of study participants was 13.37±5.99 weeks and the mean serum CA-125 level was 62.23±14.66 U/ml. 23.9% subjects were pre-menopausal and rests of the 76.1% were post-menopausal. Unilateral side was involved in 41.7%

subjects and bilateral side was involved in 58.3% subjects as presented in Table 1.

Table 1: Basic statistical data of patients (n=331)

Variables		Frequency	%
Side Involved	Unilateral	138	41.7
	Bilateral	193	58.3
Menopausal Status	Pre-Menopausal	79	23.9
	Post-Menopausal	252	76.1
Age Groups	≤55 years	159	48%
	>55 years	172	52%
Gravidity	≤3	238	72%
	>3	93	28%
Parity	≤3	222	67%
	>3	109	33%
Age (mean±SD)	55.68±8.80 years		
Symptoms duration (mean±SD)	13.37±5.99 weeks		
CA-125 (mean±SD)	62.23±14.66 U/ml		

27.5% were diagnosed with ovarian cancer by contrast enhanced computed tomography. As far as Histopathology findings are concerned, ovarian cancer was diagnosed in 29.6% study subjects as presented in Table 2.

Sensitivity, Specificity, Predictive values and diagnostic accuracy of contrast enhanced computed tomography for the detection of ovarian cancer taking histopathology as gold standard were calculated. The results showed that 85 patients were true positive, correctly diagnosed and 227 patients were true negative, correctly diagnosed. Sensitivity, Specificity, PPV, NPV and accuracy were 86.7%, 97.4%, 93.4%, 94.5%, and 94.2% respectively as presented in Table 2.

Table 2: Diagnostic accuracy of computed tomography (CT) by taken histopathology as gold standard (n=331)

CT	Histopathology			P-value
	Yes	No	TOTAL	
Present	85	6	91	0.000*
Absent	13	227	240	
TOTAL	98	233	331	
Sensitivity	Specificity	PPV	NPV	Accuracy
86.7%	97.4%	93.4%	94.5%	94.2%

DISCUSSION

Ovarian cancer remains the most common causative factor of death from gynecological malignancies and is the 4th most common causative factor of cancer-related death among females in the United States and Europe.¹² Cancer data revealed from an institutional study across Pakistan; indicate that female breast carcinoma was the most prevalent cancer with 38.5% of malignancies among female followed by ovarian carcinoma (13.6%).¹² CT understates the staging and pelvic assessment of pelvic masses by a gynecologist and serum CA-125 along with its sensitivity is frequently below 50% in diagnosis of pelvic masses.¹³ In this study the sensitivity, specificity, predictive values and diagnostic accuracy of contrast enhanced computed tomography for the detection of ovarian cancer taking histopathology as gold standard were calculated. The results showed that 85 patients were true positive, correctly diagnosed and 227 patients were true negative, correctly diagnosed. Sensitivity, Specificity, PPV, NPV and accuracy were 86.7%, 97.4%, 93.4%, 94.5%, and 94.2% respectively. The sensitivity of morphological examination with ultrasound to predict malignancy in ovarian cancers has been reported to be around 85%-97%, while its precision varies from 56%-95%.¹³⁻¹⁵ Kinkel *et al*, in their meta-analysis reported that CT reveals specificity and sensitivity of 87% and 81% respectively, for indeterminate masses observed on ultrasound.¹⁶ Likewise, Liu *et al* revealed that CT/PET scanner exhibits a 87% sensitivity and 100% specificity in distinguishing benign and malignant ovarian malignancies.¹⁷ Tsili *et al* as well reported that adnexal masses can be categorized by MDCT into malignant and benign in around 89% and 93% of cases.¹⁸ One study also reported 97% sensitivity and 91% specificity. Ovarian mass appearance on CT varies greatly, so it is not necessarily possible to provide precise histological characterization. For each tumor type, certain radiological findings prevail; understanding of these main characteristics of ovarian malignancies enable for a particular diagnosis or significant filtering of differential diagnosis.^{19,20} The presence of ovarian cancers in the image varies between cystic through solid mass. While cancers have identical radiological and clinical findings, every form of ovarian cancer has predominant or different main features.²¹⁻²³ However, the recent developments in CT technologies have allowed better detection and enhanced function, not just in differentiating benign ovarian masses from malignant masses, however also in assessing disease extent and metastatic deposits. Adequate estimation of the type of mass and severity of the disease remains valuable in treatment intervention that saves the patients from needless surgical procedure and cost.^{18,20}

LIMITATIONS

According to the limitations of present study, it was done on the small scale and at the urban environment therefore, findings might not be generalizable to larger populations.

CONCLUSION

It was concluded that contrast enhanced computed tomography is the satisfied diagnostic tool, with accuracy rate of 94.2% showing 86.7% sensitivity and 97.4% specificity and it could be used for detection of ovarian cancer.

SUGGESTIONS / RECOMMENDATIONS

Because ovarian cancer has been documented to be the prominent trigger of death among gynecological cancers and that there is inadequate data on the epidemiology of epithelial ovarian ovarian cancer in country, a large population-based research is needed in Pakistan to pave the way for ovarian cancer control and prevention in the area.

CONFLICT OF INTEREST / DISCLOSURE

None.

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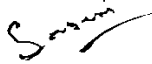

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