VALIDITY OF COMPUTED TOMOGRAPHY SCAN FOR THE DIAGNOSIS OF OVARIAN CARCINOMA AND ITS STAGES

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ABSTRACT

Objective: To determine the validity of CT scan for the diagnosis of ovarian carcinoma and its stages taking histopathology as gold standard

Study Design: Cross sectional validation study.

Place and Duration of Study: The study was conducted in the Department of Radiology, DHQ Hospital Rawalpindi, RMC and Allied hospitals from October 2011 to March 2012.

Patients and Methods: This study included one hundred thirty six consecutive subjects with symptoms of ovarian pelvic mass with an age range of 20 years to 70 years and pre-operative CA -125 level were enrolled in the study by the Principle Investigator (PI).

All 136 patients were gone through CECT scan. Imaging findings of all patients were compared with results of histologic examinationto determine the diagnostic accuracy of CECT scan in the evaluation of disease status. The Histopathological staging of ovarian carcinoma was obtained on the basis of FIGO Classification. Histopathological findings of each patient were obtained from laboratory were actually reported by consultant Pathologist

Result: The mean age of the patient is 50.37 years. The sensitivity and specificity of CT in diagnosis of malignant ovarian carcinoma is 100% with the p value was 0.0001 and 84.85% respectively. The Positive Predictive Value (PPV) and Negative Predictive Value (NPV) is 95.37% and 100% respectively, taking histopathology as Gold Standard. The overall accuracy of CT in diagnosis and staging of ovarian carcinoma is 96% and 93% respectively.

Conclusion: The beneficial effect of the study is to find a non-invasive, less time consuming and relatively easy modality for the diagnosis of ovarian carcinoma including its staging. Prompt diagnosis will lead to instant decision making for the management of this debilitating disease

Keywords: Computed tomography scan, Ovarian carcinoma, Staging ovarian carcinoma.

INTRODUCTION

Carcinoma of the ovary is the fifth most common cancer of the female genital tract[1] and second most common gynecological malignancy in united-states resultant in the greatest number of deaths[2]. The most common type of ovarian malignancy is epithelial carcinoma approximately 85% to 95%. The 5 years survival rate is 90%, if the cancer is confined to the Ovary (Stage – I), 60%-80% if the cancer has spread into the pelvis (stage – II), 20% for stage III abdominal spread, and <10% for stage - IV more distant spread[2].

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Received: 10 May 2013; received revised: 22 Aug 2013; accepted: 22 Nov 2013

In a study conducted in a tertiary care hospital of Hyderabad Sindh estimated the frequency of ovarian carcinoma among different gynecological malignancies found to be 45.53%[4].

Ovarian carcinoma in early stages causes minimal, nonspecific or no symptoms and more than 75% cases of all ovarian cancers are diagnosed at stage III or IV[2]. However, several studies based on chart review advocate that most women diagnosed with ovarian carcinoma presents with the symptoms, which are not gynecological in nature[1].

There are various modalities for the screening of ovarian cancers including bimanual pelvic examination and serum CA-125 level, having 61%-90% sensitivities in the diagnosis of ovarian cancer. Imaging modalities particularly ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) have become indispensible[1].

CT is the current choice for the evaluation of treatment in these patients; however, it has limited ability to reveal small lesions. CT is preferred for comprehensive review of occult intra-abdominal carcinoma peritoneal implants, lymphadenopathy, ascites, thickness of the bowel wall, seeding to adjacent organs and distant metastasis[19]. CT has the major advantage over MRI and US, because it allows oral contrast agent, which distend bowel and help to differentiate bowl from peritoneal implants. Due to above justification, CT is recommended modality for evaluating the extent of disease in patient with ovarian carcinoma[3].

Table-1: International Federation of Gynecology and Obstetrics Stages of Ovarian Cancer.

Stages	Spread
I	Limited to ovaries
II	Pelvic extension
III	Peritoneal implants and/or retroperitoneal or inguinal lymph nodes
IV	Distant metastases

*Stage classification also includes more detailed delineations (e.g., Stages IA to IC)1.

Table–2: Frequency & percentages of lymphadenopathy, adjacent organ invasion, tumor seeding, ascites, peritoneal surface and distant metastasis.

Characteristics	Absent		Present	
	n=136	%	n	%
Lymphadenopathy	113	82%	23	17%
Adjacent Organ Invasion	103	75%	33	25%
Tumor Seeding	127	93%	9	6%
Ascites	74	54%	62	45%
Peritoneal Surface	99	72%	37	27%
Distant Metastasis	126	93%	10	7%

The rationale of the study is to find a non-invasive, less time consuming and relatively easy modality for the diagnosis of ovarian carcinoma and helpful for its staging. Prompt diagnosis will lead to instant decision making for the management of this debilitating disease.

PATIENTS AND METHODS

This cross sectional validation study was conducted at Radiology Department of DHQ Hospital Rawalpindi (RMC & Allied Hospitals) during October 2011 to March 2012. The inclusion criteria for this study was clinically identified symptoms of ovarian pelvic mass, with ultrasound findings of mass of hyper echoic /hypo echoic /contain solid/moderately echogenic loculi and wall thickness of ≥ 3mm, pre-operative CA -125 level were also included in this study for further systematic analysis / correlation of the histopathologically diagnosis with CT findings. Patient's exclusion criteria were with positive pregnancy, prior pelvic-abdominal laparoscopy/surgery within last six months (post-surgical changes) and patients already received Chemotherapy / Radiotherapy.

Consent was obtained from all patients before formal inclusion in this study.Pre-operative CT scans was performed with Aquilion 16 Slice. All patients were given full oral bowel preparation with oral contrast of diluted 20 ml gastograffin / urograffin with 1.5 liter of water. After oral contrast, these patients were given rectal contrast of diluted 20ml of urograffin with 250 ml of water / normal saline. In 136 patients, computed tomography acquisitions was obtained from xiphi sternum to the pubic symphysis with intravenous dynamic injection of 100ml of ipomeron at a rate of 3ml/second with slice thickness of 2–10mm and pitch of one. Volumemetric data was acquired and reported by principal investigator on CT work station using Multi Planner Reconstruction (MPR) and it is reviewed by consultant radiologist.

The Histopathological staging of ovarian carcinoma was done on the basis of FIGO Classification, as shown in table-I. Patients

Histopathological report was taken from the laboratory reported by the Consultant Pathologist.

Data Analysis

Data was entered and analyzed on SPSS version 17 and MS Excel 2007. Mean±SD were calculated for age of the patients, duration of symptoms, size of mass, presence of soft tissue nodule in omentum, mesenteric peritoneal surface, liver, lung base anterior abdominal wall and internal septa thickness. Frequency and percentage were calculated for ovarian carcinoma and its stages (I-IV). All the calculative measures are done taking CT as diagnostic tool for the ovarian carcinoma taking histopathology as gold standard.

RESULTS

One hundred thirty six consecutive subjects with an age range of 20-70 years (mean age 50.37 years) were included in this study. Calculation of sensitivity, specificity, positive and negative predictive value and overall accuracy for ovarian carcinoma detection with CT was performed taking histopathology as Gold standard. Statistical analysis was performed with SPSS (version 17) and MS Excel 2007.

The table–II illustrate the frequency and percentage of different factors involved in ovarian carcinoma for its stages.

Due to which, it is very unlikely that a lesion was diagnosed by ultrasound can be missed on CT.

A CT scan result of ovarian carcinoma staging was compared with the results of histopathology for further precision. The review revealed that accuracy of CT diagnosis of staging of ovarian carcinoma was 93%. Only 9 patients were erroneously diagnosed in other stages, i-e 5 patients of benign was diagnosed in stage I, 1 patient of stage – II was diagnosed in stage – III, 1 patient of stage – III was diagnosed in stage – II and 2 patients of stages III were diagnosed in stage – IV. The summarized figures of CT scan accuracy in staging are given in Table– III.

Receiver- operated characteristic curve was generated for the CT diagnosis of ovarian carcinoma, the scoring index. The y-axis is sensitivity. The area under curve is 0.924 and the p-value is 0.0001.

DISCUSSION

Different studies reviewing role of CT in diagnosis of ovarian carcinoma recommend CT as good modality, however, there is no convincing evidence that it can reduce mortality among average-risk women. Moreover, the prognosis of this disease remains poor as the disease is mostly advanced at the time of diagnosis[6,7].

Recent improvement in imaging techniques, specifically for CT and MRI contributed for effective diagnosis and staging of ovarian carcinoma, which is also endorsed in two recent reports of Radiology Diagnostic Oncology Group including confirmation that CT and MRI are equally accurate for diagnosis and staging of this debilitating disease[8]. The overall accuracy of MRI is 93%, sensitivity and specificity of 100% and 94% respectively, in

Table-III: Accuracy of CT in diagnosis of staging

Stages	CT Accuracy in percentage	CT Postive	CT Negative
Benign	100%	27	00
Stage – I	86%	30	05
Stage – II	80%	04	01
Stage – III	94%	50	03
Stage – IV	100%	16	00

diagnosis of ovarian carcinoma[19]. Similarly, different studies reviewed and confirmed the accuracy of CECT for diagnosis of recurrent ovarian carcinoma in comparison of PET/CT and assure similar accuracy[5]. However, some of the studies found that the sensitivity of PET/CT (74%–100%) was advanced to that of CECT (53%-76%)[9,10-13].

In our study over all accuracy of CT in diagnosis and staging of ovarian carcinoma is 96% and 93% respectively. The sensitivity and specificity of CT in diagnosis of malignant ovarian carcinoma is 100% and 85% respectively. The Positive Predictive Value (PPV) and Negative Predictive Value (NPV) is 95% and 100% respectively taking histopathology as Gold Standard.

In our study the most common presenting symptom was abdominal pain, which resembles the two research analysis, also showed that the most common presenting symptom was abdominal pain (70.59% and 59%) respectively followed by abdominal mass /distension (14.71% - 37%) respectively[14,15]. Another retrospective study by Jamal at el states bleeding per vagina is most common symptom followed by abdominal pain, pelvic mass and gastric intestinal symptoms, which differs with our common sympton[14].

The maximum transverse diameter in our study was ranged from 2 to 24.8 cm with a mean maximum diameter of 7.8cm. Similarly, maximum traverse diameter of each mass was ranged from 5 to 23 cm with mean of 10.5cm in the study of deSouza NM at el[16] is close to patient's data in our study. However in the study of Pickhardt PJ et al[6] maximum transverse diameter of the lesions is between 1.3 to 15 cm, with a mean maximum diameter of 4.1 cm. Moreover, 82% subjects in our study have maximum transverse diameter of lesions is 5cm and larger, however in the study of Pickhardt PJ et al[6] it is 24% (28 out of 118), which proves effectiveness of CT is detection of smaller lesions.

Tumor characteristics' in our study show number of discrepancies ranged from simple unilocular cyst to multi-loculated, multi-septated, nodules, or both. Ascites were seen in 62 women out of 136 and 74 patients are without ascites. Thickened septations (i-e thickness greater than 2 mm) were also seen in 120 tumors. Omental cake, peritoneal nodules/lymphadenopathy, liver metastasis and pleural effusion were seen in 37,23,10 and 10 subjects respectively. However, in the study of deSouza NM et al[15] all tumors had septations, nodules (or both), however non with was a unilocular cyst. Ascites was seen in only three patients and thirteen patients are without ascites. Thickened septations (> 2mm thick) were seen in 16 of 19 tumors (mean 3.3 ± 1.5 mm) and no evidence of omental cake, peritoneal nodules, or lymphadenopathy.

In the study of Byrom j et al[17] the sensitivity and specificity of CECT in detecting malignancy was 90% and 85% respectively, which leads to overall accuracy of CECT for detecting stage was 73% (37 subject out of 51). Similarly, the study of Roette et al[1] showed that the sensitivity and specificity of CECT was 90% and 75% respectively, which is comparable with our study.The overall accuracy of CT in diagnosis and staging of ovarian carcinoma is 96% and 93% respectively in our study.

The study of Shin je et al[18] is based on review of effectiveness of CT alone and CT imaging with CA125 for detection of ovarian carcinoma. The results of CT images only and CT imaging with CA125 was reviewed by two reader groups for sensitivity and specificity. The results of both reader groups considerably matched for sensitivity and specificity of results for CT imaging with CA-125 and at higher side, which is low and significantly differs for CT images only. This shows higher performance of CT with combination of CA 125 in detection of malignancy of ovarian carcinoma. Similarly, in our study we did not consider the role of CA125 in combination with CECT; however, CA 125 was one of the inclusion criteria in our study i-e 71% subjects (101 patients out of 136) are with abnormal CA 125.

CONCLUSION

Our study has represented that CT scan iseffective modality for preoperative diagnosis of ovarian cancer as well as its staging.Prompt diagnosis will lead to timely decision for the treatment of this debilitating disease. CT scan is a non-invasive, less time consuming and relatively easy modality for the detection of ovarian carcinoma and its staging.

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