RESEARCH ARTICLE

Role of Multidetector Computed Tomography in Evaluation of Ovarian Lesions in Women Clinically Suspected of Malignancy

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Abstract

Objective: To determine the diagnostic accuracy of multidetector computed tomography (MDCT) in the evaluation of ovarian carcinoma using histopathology as the gold standard. **Methods:** This prospective cross-sectional study was conducted at Department of Radiology, Dow international medical college, DUHS, Karachi from December 2015 to April 2016. All patients of 30-60 years of age who were referred for CT a scan of the abdomen and pelvis with clinical suspicion of malignant ovarian cancer were included. A total of 158 cases were assessed with signs and symptoms of weight loss and an abdominal or pelvic mass detected on examination by a physician. **Results:** The mean age was 42.7 ±10.3 years (range 30-60). The largest group (46, 29.1%) presented with Stage 0 disease. The mean duration of symptoms was 4.06 ±1.39 months (range 1-6). Taking histopathology as the gold standard the sensitivity, specificity, NPV, PPV and overall diagnostic accuracy values for MDCT were 95.6%, 97.3%, 93.5%, 97.3% and 96.8%, respectively. **Conclusion:** MDCT showed high accuracy in differentiating benign and malignant lesions and as well as staging of malignant cases which should be very helpful in management of ovarian disease.

Keywords: Multidetector computed tomography- ovarian carcinoma- histopathology

Introduction

Ovarian cancer is the most lethal of the gynecologic malignancies which is continuously challenging not only for physicians but radiologists as well (Lutz et al., 2011; Khattak et al., 2013; Lu et al., 2013). In most women with ovarian carcinoma, the disease is not diagnosed until it is at an advanced stage (Vergote et al., 2010).

A study showed post diagnosis survival rate of only 1 year in majority 76% of patients (Tempany et al., 2000). Because of the late presentation, the outcome depends mainly on the stage of disease at first diagnosis. For individualized tumor treatment, detailed assessment of tumor extension using modern imaging is crucial (Fischerova et al., 2014).

Among all new modalities, Multidetector Computed Tomography (MDCT) has made possible to acquire several thin slices and image reconstruction in axial, coronal and sagittal planes. This has added valuable information in pre-operative surgical and management and planning (Parrish et al., 2007; Prokop et al., 2003). In particular, MDCT has largely contributed in diagnosis of ovarian cancer based on combination of its availability, meticulous technique, efficacy and familiarity of radiologists and physicians (Khattak et al., 2013). MDCT has been reported to have sensitivity of 90.5% and specificity of 937.7% for ovarian carcinoma (Tsili et al., 2008).

Moreover, MDCT has the advantage that it can identify the location of primary site of tumor, its local or regional spread and presence or absence of metastasis as it has a high spatial resolution and thus provides good structural information. It is a well-established pre-surgical diagnostic imaging modality for staging and surgical planning of ovarian cancer (Khattak et al., 2013).

In developing country like Pakistan in particular, Computed Tomography (CT) is preferred for its cost effectiveness and wide availability. As ovarian cancer is a leading cause of death among gynecological malignancies, this study was undertaken to determine the diagnostic accuracy of MDCT in evaluation of ovarian carcinoma by using histopathology as gold standard.

Materials and Methods

Study Population

This prospective cross-sectional study was conducted through non-probability consecutive sampling at Department of Radiology, Dow international medical college, DUHS, Karachi from December 2015 to April 2016.

Sample Size

Taking the reported sensitivity and specificity of MDCT for ovarian carcinoma as 90.5% and 93.7%

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(Prokop et al., 2003) respectively, prevalence of ovarian carcinoma of 23% (Khattak et al., 2013), confidence interval of 95% and margin of error according to the sensitivity 8% and according to the specificity 6%, the required sample size came out to be 158.

Sample Selection

All patients were selected basis on the following inclusion criteria; (1) Female patients having age range from 30 to 60 years. (2) Clinically suspected for malignant ovarian cancer irrespective of the stage of disease (3) Patients with signs and symptoms of weight loss, abdominal or pelvic mass within six month duration, (4) Referred for abdomen and pelvis MDCT. While the exclusion criteria were (1) all patients who had been proven histologically to have carcinoma of ovary. (2) Patients with contraindication to iodinated contrast media or radiation.

Data Collection Procedure

After taking signed informed consent and brief history MDCT scan was performed by trained technologists having >5 years of experience using Siemens Emotion 16 slice CT scanner at 120 kvp and 300 mAs. The reporting was done on workstation by consensus between two consultant radiologists having >3 years of clinical experience in women imaging. All patients were followed up and histopathological findings regarding malignancy were noted.

Data Analysis Procedure

Data was analyzed using SPSS version 20. Frequencies and percentages was calculated for malignant/benign and

Table 1. Sensitivity Analysis of MDCT by Histopathology (n=158)

MDCT Ovarian Carcinoma	Histopathology		
	Positive	Negative	Total
Positive	43	3	46
Negative	2	110	112
Total	45	113	158
Sensitivity	95.55%		
Specificity	97.34%		
Positive Predicted Value	93.47%		
Negative Predicted Value	97.34%		
Overall Diagnostic Accuracy	96.83%		

stages of disease while mean and standard deviation (SD) for age and duration of symptoms. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of detection of malignancy was calculated against histopathological findings using cross-tabulation. Stratification was done with regards to age of patient, duration of symptoms and stage of disease to evaluate the effect of these on outcomes through chi-square test by taking $p < 0.05$ as significant.

Results

Baseline characteristics

A total of 158 patients were included in the study. Most of the patients 103 (65.2%) were ≤45 years of age while remaining 55 (34.8%) were >45 years of age (Mean age 42.67 ±10.30 years, range 30-60 years). Similarly, duration of symptoms of majority 88 (55.7%) were ≤4 months while 70 (44.3%) were presented with >4 months

Figure 1. A 43 yrs Old Female Patient, Axial and Coronal CT Pelvis with Contrast Images Showing Heterogenoulsy Enhancing Lesion in Bilateral Adnexal Region Insparable from Both Ovaries with Few Interal Septation and Enhancing Soft Tissue Component more in Favour of Ovarian Neoplastic Lesion

Table 2. Baseline Characteristics and Diagnostic Accuracy of MDCT Taking Histopathology as Gold Standard (n=158)

	Age		Duration of Symptoms		Stages of Disease	
	≤45 years	>45 years	≤4 months	>4 months	Stage 0 and 1	Stage I-IV
Sensitivity	94.11%	100%	96.96%	91.66%	97.72%	0%
Specificity	97.10%	97.72%	100%	94.82%	94.54%	100%
NPV	94.11%	91.66%	100%	91.66%	93.47%	0%
PPV	97.10%	100%	98.21%	98.21%	98.11%	98.30%
Diagnostic Accuracy	96.11%	98.18%	98.86%	94.28%	95.95%	98.30%

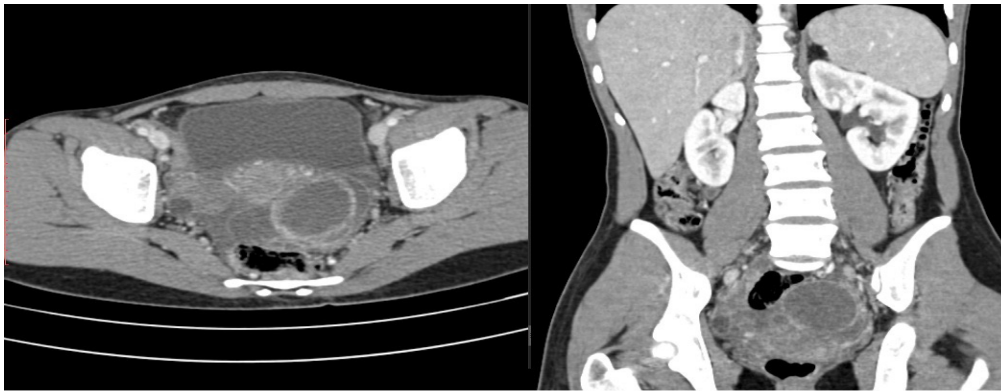NPV, Negative Predicted Value; PPV, Positive Predicted Value

Figure 2. A 43 yrs Old Female Patient, CT Pelvis with Contrast, Axial and Coronal Images Showing Complex Cystic Lesion in Left Adnexa Adnexal with Peripheral Enhancement Associated with Pelvic Ascites Raising the Possilbity of Malignancy

of duration of symptoms (Mean duration of symptoms 4.06±1.39 months, range 1-6 months). Stage 0 and Stage I disease were predominantly higher, i.e. 46 (29.1%) and 32 (20.3%) respectively, whereas Stage II was observed in only 21 (13.3%) of the patients.

Diagnostic findings

MDCT showed benign findings in 46 (29.10%) patients and malignant in 112 (70.9%) patients whereas histopathology showed benign findings in 45 (28.5%) patients and malignant in 113 (71.5%) patients. (Figure 1 and 2)

Overall, diagnostic accuracy of MDCT taking histopathology as gold standard showed sensitivity as 95.55%, specificity 97.34%, NPV 93.47%, PPV 97.34% and overall diagnostic accuracy as 96.83% (Table 1). Diagnostic accuracy with respect to baseline of the patients is shown in Table 2.

Discussion

This study was conducted to determine the diagnostic accuracy of MDCT in the evaluation of ovarian carcinoma. The findings of this study reported high sensitivity and specificity of MDCT in the evaluation of ovarian cancer. Similar findings were also reported by various authors (Tsili et al., 2008; Mubarak et al., 2011; Gatreh-Samani et al., 2011; Kinkel et al., 2005; Liu, 2009). It has been reported that ovarian masses in CT vary widely and accurate histologic characterization is not always possible. Although tumor markers like CA-125, AFP, and HCG are indicative of ovarian cancer and germ cell tumors respectively. Detailed evaluation for malignant spread irrespective of the tumor components is important from a management aspect (Sengupta et al., 2000; Kurtz et al., 1999).

The mean age in our study population for ovarian lesions was closed to fifties which is also comparable with several other studies (Malik et al., 2002; Sarwar et al., 2006; Khan et al., 2010).

The majority of patients in our study presented with less than 4 months of symptoms and therefore, clinicians must maintain a high rate of suspicion for ovarian malignancy and must not hesitate to order MDCT as an

early diagnosis can lead to a better prognosis.

Our study showed 2 false negative and 3 false positive cases. This is comparable with another study, which reported two false and two false negative results (Mubarak et al., 2011). As there are myriad types of ovarian masses and CT appearances vary widely and accurate histologic characterization is thus not always possible however some tumors have certain radiologic features which predominate and knowledge of these key findings may help in reaching a specific diagnosis (Gatreh-Samani et al., 2011).

The presence of ascites in a post-menopausal patient with associated adnexal mass implicates possibility of malignancy. The presence of these findings made it difficult to exclude malignancy leading to false positives. Cysts or masses smaller than 4 cm containing smooth non enhancing internal septations is a characteristic of benign lesion , however few such cases turned out to be mucinous adenocarcinomas on histopathology in our study population.

A study reported that whole-body MRI with diffusion weighted sequence (WB-DWI/MRI) showed greater accuracy in the characterization of primary tumours and peritoneal staging in patients with suspected ovarian cancer compared with CT and F-fluorodeoxyglucose positron emission tomography/ computed tomography (FDG-PET/CT). They further reported that for detecting retroperitoneal lymphadenopathy and distant metastasis, WB-DWI/MRI performed similarly to FDG-PET/CT but was superior to CT (Michielsen et al., 2014).

CT has emerged as highly beneficial and advanced investigation radiological modality. It allows the radiologists and physician to identify internal structures and see their shape, size, density and texture. A CT scan that shows no abnormality still provides useful data.

The main limitation of our study is that we did not calculate inter observer agreement for MDCT findings. As we consecutively recruited all the patients meeting the inclusion criteria this may have resulted in selection bias as the cases belonged to a single tertiary care center. Despite of these limitations, this study is a significant effort in determining the diagnostic accuracy of MDCT in determination of ovarian cancer from our developing country like Pakistan. As ovarian carcinoma is associated with a high mortality and it mostly presents at a late

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stage in low and middle income countries. Therefore, the findings of this study will encourage physicians to order a MDCT in patient with suspicion of ovarian carcinoma and detect it at an earlier stage.

In conclusion, the findings of this reported that MDCT provides great help in differentiating benign and malignant lesions and as well as further staging in malignant cases which is detrimental in management of disease process.

Authors' Contribution

• Study concept and design: Munawar Hussain and Shazia Mukhtar.

• Analysis and interpretation of data: Shazia Mukhtar.

• Drafting of the manuscript: Sohail Ahmed Khan, Shazia Mukhtar and Syed Omair Adil

• Critical revision of the manuscript for important intellectual content: Shazia Mukhtar, Munawar Hussain and Sohail Ahmed Khan.

• Statistical analysis: Syed Omair Adil.

• Final review: Kamran Masood .

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