ORIGINAL ARTICLE

DIAGNOSIS AND STAGING OF CA. OVARY; A COMPARATIVE STUDY BETWEEN COMPUTED TOMOGRAPHY AND ULTRASOUND

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ABSTRACT

PURPOSE: The purpose was to assess the sensitivities and specificities of CT & US in the diagnosis & staging of ovarian cancer. **MATERIAL AND METHODS:** The study was conducted in Ziauddin Medical University and Hospital (Diagnostic Radiology Department). This study was a prospective, cross sectional comparative study completed during 16 months, and carried out for 50 patients. **RESULTS:** Ovarian masses were surgically removed in all 50 patients. The cancers were staged as follows: 02 were stage-I, 29 were stage - II, 11 were stage - III, & 08 were stage - IV. Ultrasound was more sensitive (100%) but less specific (27%) than CT scan (50%, 87% respectively) for the detection of stage-I. CT was more sensitive (75%) and almost equally specific (80%) than ultrasound (10%, 95% respectively), for stage II. CT was more sensitive (54%) and almost equally specific (97%) than ultrasound (27%, 100% respectively) for stage III. CT was more sensitive (100%) and almost equally specific (95%) than ultrasound (75%, 100%respectively), for stage IV. **CONCLUSION:** Our study shows that CT is consistently better than US in ovarian cancer staging, especially for stage II, III, and IV.

Key words: Ovarian carcinoma, Ultrasound, Computed tomography, Surgical staging.

Introduction

Ovarian cancer is the second most common gynecological malignancy. The prognosis is considerably changed by the extent of spread: The 5 year survival rate is 85% if the cancer is confined to the ovaries (stage-I), 55% if the cancer has spread into the pelvis (stage-II), 14% for stage-III Abdominal spread, & 4% for stage-IV more distant spread. In cases of suspected ovarian malignancy there are two major tasks; first is to determine the malignancy and to stage the disease. Surgery can be avoided in case of benign disease if confirmed preoperatively. Surgical & chemotherapeutic planning can be determined by the help of preoperative radiological imaging.[1]

Incidence of ovarian cancer is very high; it is the major cause of death than any other cancer of the female genital tract. The incidence & mortality rate of ovarian cancer increases with age & peak at the age of 80 years.[1] Other risk factors include early onset of menses, nulliparity, family history of ovarian cancer, breast cancer & late menopause. The silent nature of disease is the reason for poor prognosis as most of the ovarian cancers are detected in advanced stage. Route of spread of ovarian carcinoma is intraperitoneal implantation, lymphatic invasion, and hematogenous dissemination. The sensitivity of Bimanual pelvic examination & serum CA - 125 level to detect ovarian cancer is often below 50%.[1-3] Transabdominal ultrasound has accuracy is up to 80% in the evaluation of ovarian masses; Ultrasound (US) is better in detection of masses than in the diagnosis of malignancy.[6-10] Abdominal spread evaluated with Ultrasound has a low accuracy. Studies of contrast material - enhanced CT scan (CT) have shown accuracies of almost 80% in diagnosis of

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ovarian cancer & 80 - 90% in detection of abdominal spread.[11-17] Ovarian cancer is staged surgically at lapratomy in accordance with the recommendation of International Federation of Gynecology & Obstetrics. It is unfortunate that only 4% of all cases are detected at the local stage. The detection of advanced disease prospectively needs to be improved for treatment planning.[12-15]

An accurate depiction of the sites of abnormal diseases is important because it will help to determine the site at which biopsy will be performed at surgery and CT plays vital role in this context. Cytoreduction may be attempted either with surgery or with chemotherapy & depend upon the bulk & amount of metastatic disease present.[16-18]

Ultrasound is the primary and cheap modality for characterization of an ovarian neoplasm however CT & MRI are more accurate than ultrasound for staging purpose and CT is faster, more widely available, & less expensive than the MRI.[19-22] Ultrasound is less sensitive in evaluating extra pelvic region; however CT is very sensitive in detecting ascites, pelvic wall involvement & uterine involvement and it can replace other radiological tools for staging and follow up purpose.[23,24]

Appearances of ovarian carcinomas on CT can be unilocular or multilocular cystic mass; it may have mixed cystic & solid components; or it may be uniformly solid (with or without calcification).

Ascites can enhance the intraperitoneal seeding of tumor cells, implanting along the mesentry, omentum, peritoneum, diaphragm & liver surface. Lymphatic spread or spread to contralateral ovary is also well known. Hematogenous spread through the liver, lung & pleura is considered rare. Early ovarian cancer is confined to the ovary then after capsular invasion direct involvement of adjacent structures can occur. CT signs of tumor extension is the distortion of the uterine contour, loss of fat plane between the tumor and adjacent organ, distance between the tumor and the pelvic side wall of < 3mm, and iliac vessels surrounded or displaced by the tumor. Trans peritoneal spread is the primary mode of metastases in ovarian carcinoma.

In the course of ovarian cancer management, surgery is the core of treatment. Initially exploratory laparotomy performed for surgicopathological staging and debulking of main tumor. If tumor is in early stage than standard of surgery is total abdominal hysterectomy, bilateral salpingo-oophorectomy, and omentectomy, as well as aspiration of ascites or peritoneal lavage for cytologic examination, random peritoneal biopsies including paracolic gutters and undersurfaces of hemidiaphragms, and sampling of pelvic and paraaortic lymph nodes. However in cases with advanced disease; after induction of chemotherapy second look surgery can be avoided by the help of radiological imaging with declined CA -125 levels.

Material and Methods

This study was conducted in Ziauddin Medical University and Hospital (North Nazimabad) during 16 months, from October 02, 2002 to February 12, 2004. The study was carried out for 50 patients. That was Non probability purposive, cross sectional comparative study.

All female over 18 yrs. with suspected ovarian cancer on ultrasound or physical examination were included in the study. And pregnant females and patients who were ineligible for pelvic/ abdominal surgery were excluded. Ultrasound was done with real time 3.5 MHZ convex scanner of Tosbee (Toshiba) machine. CT scan was done on Toshiba-CT system, Auklet model No. TXX-003. Surgery was done in all 50 cases.

Staging was done according to Modified International Federation of Gynecology & Obstetrics. Each patient had per abdominal ultrasound and CT prior to pelvic abdominal surgery. The performance of ultrasound and CT were compared for the diagnosis of ovarian malignancy and for the evaluation of spread of disease into extra ovarian pelvis and to the abdomen. All patients underwent surgery. The gold standard of this study was histopathological analyses following surgical staging based on Modified International Federation of Gynecology and Obstetrics staging classification. All types of ovarian malignancies were similarly staged.

Data was analyzed by using SPSS version-10 on computer. Descriptive statistics were computed for data presentation. The performances of ultrasound and CT in the diagnosis and staging of ovarian cancer were evaluated by applying Sensitivity analysis.

Results

Before surgical exploration all masses were identified by Ultrasound and Computed Tomography; total of 50 patients were enrolled and after surgery histopathological analysis was done on all patients which confirmed that 14 patients had unilateral ovarian carcinoma while 36 patients had bilateral ovarian disease.

The cancers were staged on histopathology as follows:

2 cases confined to the ovaries (stage - I) 4%, 29 involving the ovaries & adjacent pelvic structures (stage - II) 58%, and 11 with peritoneal spread (stage-III) 22%, & 08 with deep liver Mets (stage - IV) 16%. So the majority of patients in our study were reported with Stage - II. This result was likely due to the referral source, which was specialist in gynecologic oncology.

The staging of ovarian cancer with ultrasound showed that 26 of 29 cases of stage II were staged as stage I (false negative result) and 7 and 1 of 11 cases of stage III were staged as stage I and stage II respectively (false negative result) and 2 of 8 cases of stage IV were staged as stage I (false negative result) and 1 of 11 cases of stage III were staged as stage IV (false positive result), while no case of stage I were over staged.

However with CT scan 5 of 29 cases of stage II were staged as stage I (false negative result) and 1 and 3 of 11 cases of stage III were staged as stage I and stage II, respectively (false negative result) and 1 of 2 cases of stage I was staged as stage II (false positive result) and 2 of 29 cases of stage II were over staged as stage III and stage IV (1 for each) (false positive result) and 1 of 11 cases of stage III were staged as IV(false positive result) and for stage IV there was no under staging.

Above description suggested that with ultrasound there was under staging for stage II, III, IV, and over staging for stage III, while with CT scan there was under staging for stage II and III and over staging for stage I, II, III.

In summary, the specificity of ultrasound was 27% for stage I and of CT scan was 87% and sensitivity of ultrasound was 100% and that of CT scan was 50%. The specificity of ultrasound for stage II was 95 and that of CT was 80% and sensitivity of ultrasound was 10% that of CT was 75%. The specificity of ultrasound for stage III was 100% and that of CT was 97% while sensitivity of ultrasound was 27% and that of CT was 54%. The specificity of ultrasound for stage IV was 100% that of CT was 95% and sensitivity of ultrasound was 75% and that of CT was 100%.

The results of analysis of sensitivity and specificity pair in (Tab. 1) suggest that:

Stage	Ultrasound		CT Scan	
	Sensitivity	Specificity	Sensitivity	Specificity
I	100%	27.08%	50%	87%
II	10.3%	75.2%	75%	80.9%
III	27.2%	100%	54%	97%
IV	75%	100%	100%	95%

Table 1: Sensitivity and Specificity of CT and US for staging ovarian cancer.

Ultrasound was more sensitive (100%) but less specific (27%) than CT scan (50%, 87% respectively), for the detection of stage I.

CT was more sensitive (75%) and almost equally specific (80%) than ultrasound (10%, 95% respectively), for the detection of stage II.

CT was more sensitive (54%) and almost equally specific (97%) than ultrasound (27%, 100% respectively), for the detection of stage III.

CT was more sensitive (100%) and almost equally specific (95%) than ultrasound (75%, 100% respectively), for the detection of stage IV.

Discussion

This prospective study addressed the issues of diagnosing malignant ovarian masses and evaluating cancer spread. We enrolled the patients in Ziauddin hospital Diagnostic Radiology Department, evaluated with CT and ultrasound, for staging purpose and then correlated imaging results with the results of surgery and histopathological analysis.

US is the initial imaging modality for the detection of ovarian masses. Malignancy was suspected on the basis of sonographic findings, which may include; thickened septas, internal echoes, solid components, wall nodularity or ascites. The extent of disease was also evaluated on the US, but to some extent. Pelvic

lymphadenopathy, ascites and abdominal Mets were the main criteria for this purpose. CT performed in all 50 patients.

The intent of this study was to evaluate abilities of ultrasound and CT to allow diagnosis and staging of ovarian malignancy.

The data suggest the following:

a) For stage I there was overstaging with CT.

b) For stage II there was under staging with ultrasound and under staging as well as overstaging with CT.

c) For stage III there was considerable under staging and over staging with ultrasound and CT.

d) For stage IV there was under staging with ultrasound.

In summary abdominal spread was more likely to be under staged with ultrasound and pelvic malignancy was more likely to be over staged with CT.

Our results show remarkable accuracy in demonstrating the extent of malignant spread for both CT and US. Investigators have also suggested that ultrasound is not useful for preoperative staging and recommended it for the initial imaging examination only.[1-4]

US is often the initial imaging study in evaluation of suspected ovarian abnormality, but it is not as good as CT for staging. Per the results of our study, examination with CT can recommended for staging in patients with advanced disease especially for stage II, III and IV. CT performed very well in detecting disease in the peritoneum and thus can be expected to perform well in monitoring treatment in these areas. The omentum can be evaluated well with contrast material- enhanced CT. In all these locations CT depicted slightly more than US, the differences were statistically significant.

CT performed very well in detection of upper abdominal metastatic deposits, US was also very useful for this purpose especially for the detection of hepatic Mets of parenchymal origin.

Our findings indicate that CT is the main modality for the staging of ovarian carcinoma because of its higher sensitivity than US (Fig. 1 and 2) especially for stage II, III, IV.

My study is comparable with a study done by Tampany et al in 2000 which showed that US is more sensitive but less specific however CT is more sensitive and equally specific.[15]

Another comparison with study done by Kurtzet al in 1999 which showed that US is less sensitive and specific, while CT is more sensitive and equally specific in my study which is comparable to the studies.[1]

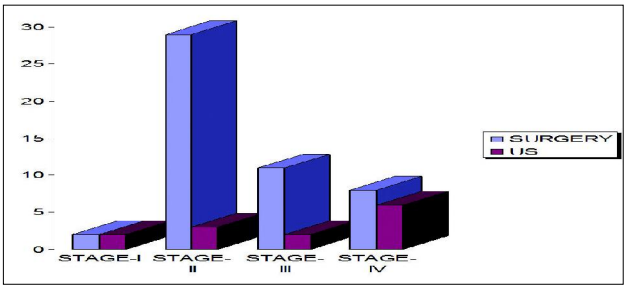

Figure 1: Ovarian carcinoma staging (surgery v/s ultrasound).

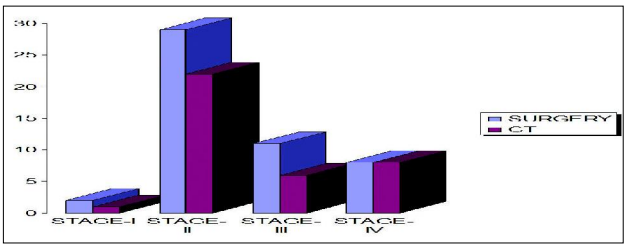

Figure 2: Ovarian carcinoma staging (surgery v/s CT scan).

Conclusion

Our study shows that CT is consistently better than the ultrasound in ovarian cancer staging, especially for stage II, III, and IV and ultrasound can be used to supplement CT scanning, especially in hepatic substance and in lymph node assessment. Ultrasound should be the initial imaging study in evaluation of a suspected ovarian abnormality because of its higher sensitivity for the detection of pelvic masses, but its sensitivity is not high as CT for the detection of abdominal spread like peritoneal Mets, omental spread, retroperitoneal lymphadenopathy, and liver Mets especially on its surfaces. CT scan with IV and oral contrast should be performed because of its higher sensitivity in staging. Whatever the modality is used, it is hoped that correct staging in advanced disease will lead to appropriate management of ovarian cancer.

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