



Investigating the agreement between the findings of multi-slice CT scan and surgical findings in the diagnosis and detection of metastasis of malignant ovarian tumors to the peritoneum and intra-abdominal organs

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ABSTRACT

The present study was conducted to determine the agreement between the findings of multi-slice CT scan and surgical findings in the diagnosis and detection of metastases of malignant ovarian tumors to the peritoneum and intra-abdominal organs. In this cross-sectional study, 115 women with ovarian cancer who were hospitalized and underwent surgery in Al-Zahra Hospital during 1396 and 1397, underwent multi-slice CT scan of the abdomen and pelvis before the operation, and the presence of metastases in these areas was investigated; then the comparison of these results with the findings of the operation indicated the amount of agreement between the two methods, which was determined by the Kappa agreement test. According to the finding of the surgery, 96 patients (83.5%) and according to the findings of multi-slice CT scan, 94 patients (81.7%), had metastasis in adjacent tissues. Five patients (4.3%) had metastases in the surgical findings, but the result of CT scan was a negative. Also in 3 patients (2.6%), the presence of metastasis was negative in the surgical findings but the result of CT scan was positive. According to the Kappa agreement test, a significant agreement with the amount of 0.76 was observed between the findings of the surgery and the CT scan results. The results of this study showed that there is a favorable agreement between the findings of surgery and multi-slice CT scan in the diagnosis of metastasis of malignant ovarian tumors to abdominal and pelvic areas, However, due to the limitations of multi-slice CT scan in the diagnosis of metastases of malignant ovarian tumor to the abdomen and pelvis, including being dependent on the size and location of the tumor, the use of this diagnostic method may be helpful in cases where surgery is not possible and may be useful in determining surgical indication.

ARTICLE HISTORY

Received February 19
2020, Accepted March 13,
2020 Published July 16,
2020

KEYWORDS

Multi-slice CT scan,
Metastasis, Ovarian
cancer.

INTRODUCTION

Ovarian tumors are of great importance due to high mortality and have the highest mortality rate per total number of cases among all cancers of the reproductive system (1). The resulting death in the United States is 13,900 cases per year and more than 23,300 new cases per year (2-4).

Ovarian tumors are highly diverse due to their histological structure. There is also a great deal of variation in the incidence of ovarian cancers and the different types of ovarian tumors in different communities. The highest rates of ovarian cancer have been reported in Scandinavia and then in Israel

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and the United States, and the lowest rates in developing countries and Japan (5).

Examination of the effective factors in determining the prognosis of ovarian cancer would be helpful in the early diagnosis of the disease. Although the life expectancy of patients would not greatly change in long term, their quality of life would improve (6-9). One-third of women with ovarian cancer have a cyst or mass without any visible evidence of spread to other organs. Therefore, it is necessary for women with suspected ovarian cancer to undergo staging surgery in the early stages, which involves taking samples from some parts of the abdominal cavity and retroperitoneal lymph nodes, in order to determine the need for further treatments (10). One potential strategy is to have all women with suspicious masses in their ovaries undergo staging surgery without using any known histological information during the procedure. This would complete the staging process, but more women face the potential risk of surgical treatment.

In addition to surgery, other techniques are available for examining ovarian tumors, as well as tumor staging; including Multi-slice CT scan of the Abdominal, which provides good images and findings from the ovaries and adnexa (11). Multi-slice CT scan is a non-invasive method for accurate assessment of intra-abdominal masses and in the MDCT method, using post processing techniques and the ability to reconstruct images in the axial, coronal and sagittal sections, as well as the ability to evaluate images in different formats, it is possible to determine the mass status. Also, in this method, it is possible to fully examine the abdominal cavity, staging and possible malignancies at the same time (12).

Since the diagnosis of cancer in the early stages of the disease improves the patient's survival, if the multi-slice CT scan would be highly accurate in these studies, it could be used as a mean for proper and on time selection of the treatment, and also greatly reduce the costs of treatment (13)

but so far, no adequate study has been done to determine the diagnostic value of multi-slice CT scans in detecting the metastasis of malignant ovarian masses to the peritoneum and intra-abdominal organs. The aim of this study was to determine the agreement between the findings of multi-slice CT scan and surgical findings in the diagnosis and detection of metastasis of ovarian tumors to peritoneum and intra-abdominal organs.

Materials and Methods

This study is a descriptive-analytical study that was conducted in 1397 and 1398 in Al-Zahra Medical Center in Isfahan. The target population was patients

with malignant ovarian mass who underwent surgery at this center.

Criteria for entering the study included ovarian tumor and consent to participate in the study. Also, the patient's refusal to continue attending the study for different reasons and the lack of access to the final pathology result were considered as exclusion criteria of the study.

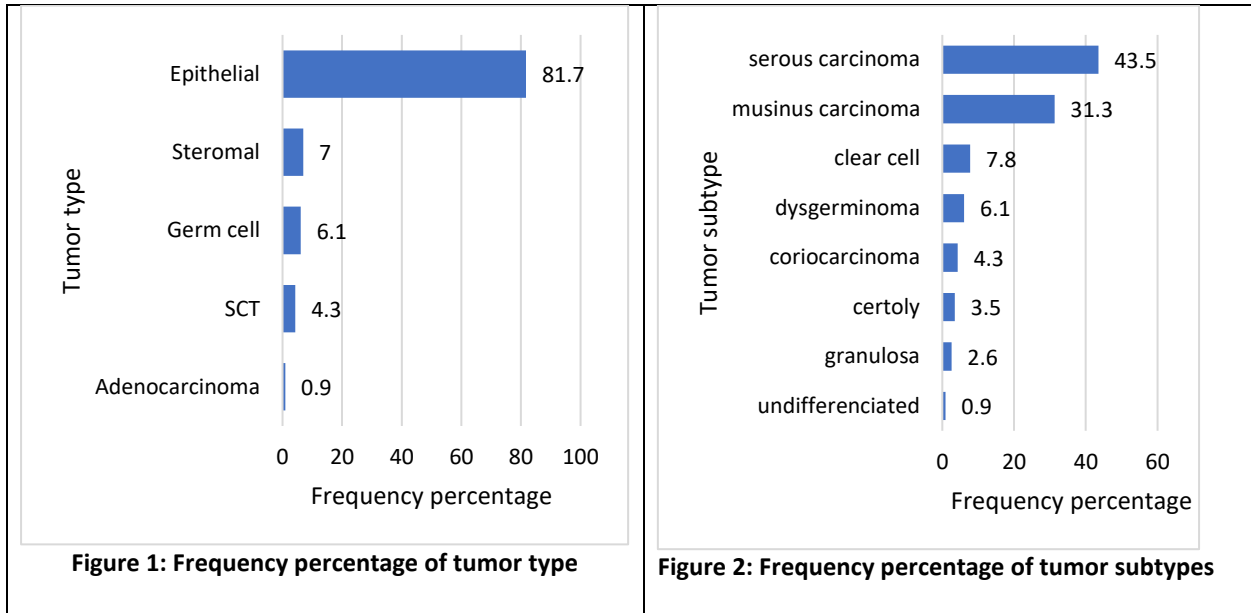
The sample size required for the study using the sample size formula for the study of prevalence and considering the 95% confidence level, metastasis prevalence in ovarian malignancies, which was considered to be 0.5, and acceptance of the error rate of 0.1, a total number of 96 patients were calculated, but 115 patients were studied to increase confidence. After obtaining a license from the University's Medical Ethics Committee, 115 patients with study inclusion criteria were selected and initially their demographic characteristics were recorded in the data collection form.

In the next step, all patients were examined by a skilled radiologist for tumor metastasis to the peritoneum and other intra-abdominal organs such as the liver and spleen, and the results were recorded in each patient's information collection form.

In the next step, the patients underwent surgery and during the operation, the adjacent organs suspected of metastasis, including liver, spleen and peritoneum, were examined and the surgeon's opinion on the presence or absence of metastasis in these organs was recorded. The findings of multi-slice CT scans were compared with the surgical findings and the degree of agreement between the findings of multi-slice CT scan and the surgical findings. The data were eventually entered into SPSS software version 23 and analyzed using T-test, Chi-square scan, Kappa agreement test and Altman visual diagram.

Results

In this study, 115 women with tumors were studied. The mean age of the patients was 48.9 ± 13.7 years. The mean body mass index was 28.1 ± 8.2 kg/m² and 22 patients (19.1%) had underlying disease. The most common type of tumor in selected patients was epithelial tumors with frequency percentage of 94 (81.7%) and adenocarcinoma with frequency percentage of 1 (0.9%), had the least prevalence among all type of tumors. Data obtained from analysis of different subtypes of tumors demonstrated that serous carcinoma with frequency of 50 (43.5%), is the most common tumor subtype. (Figures 1 and 2) The mean tumor size in all patients was 5.17 ± 1.6 cm and the lowest and highest tumor sizes reported as 2 and 9 cm, respectively.



The results obtained from 115 individuals selected for the current study, reported an agreement between the findings of multi-slice CT and the findings of surgery in 107 cases (93%). According to the results of the surgery, 96 patients (83.5%) and according to the findings of CT scan, 94 patients (81.7%) had metastasized to adjacent tissues. Five patients (4.3%)

had metastases in the surgical findings, but the result of CT scan was negative. Also, in 3 patients (2.6%), the presence of metastasis was negative during the surgery, but the result of CT scan was positive. According to the Kappa agreement test, there was a significant agreement between the operating results and the CT scan results of 0.76 (P < 0.001). (Table 1)

Table 1: Frequency distribution of metastasis in results of surgical findings and CT scan

Surgical operation	Presence of metastasis	Absence of metastasis	Total
CT scan			
Presence of metastasis	91(79.1)	3 (2.6)	94(81.7)
Absence of metastasis	5(4.3)	16(13.9)	21(18.3)
Total	96(83.5)	19(16.5)	115(100)

Kappa Agreement: 0.76; P<0.001

Table 2: Frequency distribution of metastasis in surgical findings and CT scan results

Site of metastasis	Amount of agreement	P
LUQ	0/78	<0/001
LLQ	0/79	<0/001
Pelvic	0/67	<0/001
RLQ	0/70	<0/001
RUQ	0/84	<0/001
Liver	0/83	<0/001
Total	0/76	<0/001

Comparison of the findings of multi-slice CT scan and surgical findings by evaluation the site of metastasis showed that the highest agreement in metastatic lesions was in the RUQ section, so that in both methods, the metastasis rate to this section was 53.9%. In contrast, the lowest rate of agreement is related to the diagnosis of metastasis to the pelvis, so

that in the findings of the operation, the frequency of metastasis to this part was 53.9%, but in the findings of CT scan, it was 47% (Figure 3)

Figure 4 shows that the frequency percentage of false negative (negative CT result and positive result of metastasis following surgery) is higher in the diagnosis of LLQ, LUQ and pelvic metastases than

other points. Also, the frequency percentage of false positives (positive CT results and negative surgical results) is higher in diagnosis of RLQ metastases than in other points.

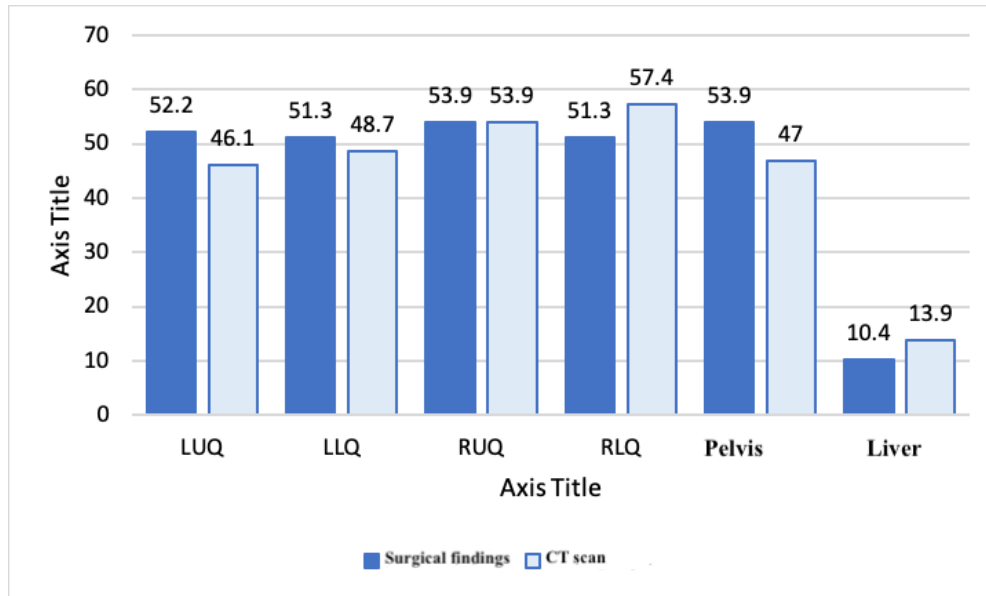


Figure 3: Frequency percentage of metastasis detection in surgical findings and CT scan results

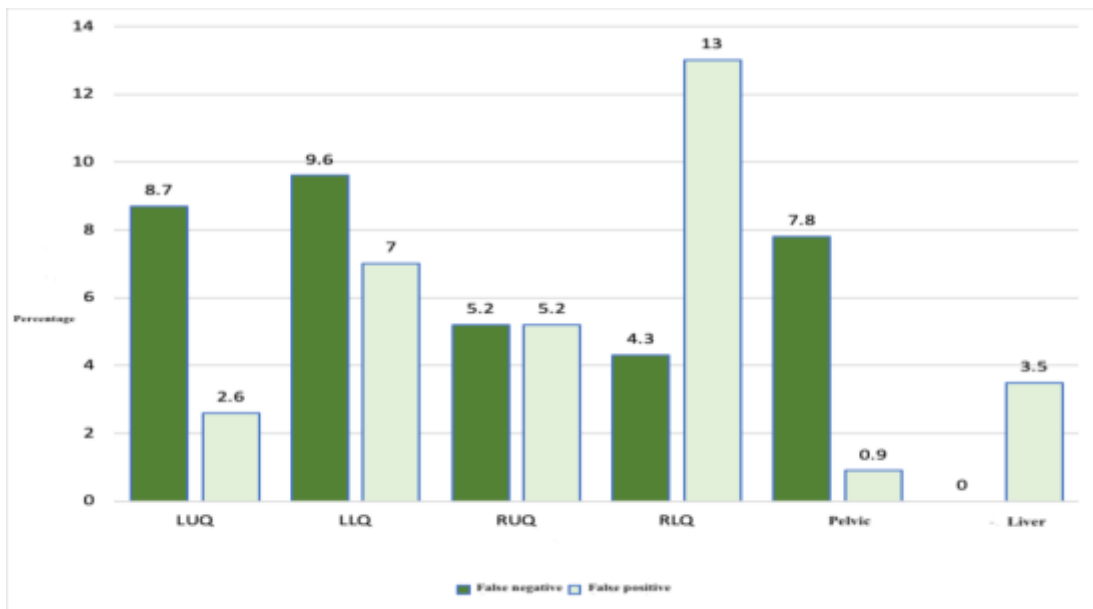


Figure 4: Frequency percentage of false negative and positive of CT scans compared to the surgical findings

Discussion

Malignant ovarian tumors are the most common tumors of the adnexa with high metastasis rate to adjacent tissues. Diagnosis of metastases in this type of tumor is usually made during surgery, and due to the late referral of patients, many of them have metastases to adjacent tissues during surgery. Since the results of some studies suggest that multi-slice CT scans are more effective in diagnosis of metastases of

ovarian cancers, this study aims to determine the agreement between the findings of multi-slices CT scans and surgical findings in the diagnosis and detection of metastases of malignant ovarian tumor to peritoneum and intra-abdominal organs.

The results of our study showed that in 93% of cases, the findings of the operation were the same as the findings of multi-slice CT and the overall agreement between the two methods was 76%, which is

statistically significant, but the amount of this agreement, varies depending on the location of the metastasis, so that the highest level of agreement was seen in metastases located in RUQ site of liver and the metastasis the level of agreement in this site was excellent (above 80%).

Chandrasekhara et al. examined the agreement between multi-slice CT scan and pathological findings in the diagnosis of metastasis of ovarian tumors to the abdomen and pelvis. Similar to the findings of this study, the agreement between the two methods in the diagnosis of metastasis is estimated at 88.9% in their stud (14). In another study by Dowdy et al., 87 women with ovarian cancer who were on stages 3 and 4 underwent multi-slice computed tomography prior to surgery and the obtained CT results were compared with postoperative findings. Their mentioned study showed that the positive predictive value of multi-slice CT was 68% and its sensitivity was 52% (15).

Hural et.al have evaluated the diagnostic accuracy of multi-slice CT scan for diagnosing of ovarian cancer metastases to the abdomen and pelvis. In this study, 30 women with ovarian cancer underwent multi-slice CT to detect metastasis before surgery and results of CT were compared with the findings of the pathology. The results of this study showed that the diagnostic accuracy of CT scan in the diagnosis of metastases of ovarian to the abdomen and pelvis was 75%. According to the other findings of this study, multi-slice CT had a sensitivity of 62%. On the other hand, the sensitivity level was significantly related to tumor size, so that the lowest sensitivity was related to tumors less than 1 cm with 25.9% and the highest sensitivity, at 87.9%, was for tumors larger than 5 cm. Also, the specificity of multi-slice CT reported 99% for metastases of ovarian tumor (16).

However, the findings of various studies have shown that the use of CT scans in the diagnosis of abdominal and pelvic metastases is helpful, because this modality can examine large volumes of intra-abdominal and pelvic tissue with thin slices, but it should be noted that this method has several limitations, including the location and size of tumor which could impact on diagnosis of metastasis (17), but in cases where the patient is suspected of metastasis but surgery is not possible, this diagnostic method (CT scan) could be a determining factor in surgical indication (17).

Conclusion

The results of this study showed that there is a favorable agreement between the findings of surgery and multi-slice CT scan in the diagnosis of metastasis of malignant ovarian tumors to abdominal and pelvic areas, However, due to the limitations of multi-slice

CT scan in the diagnosis of metastases of malignant ovarian tumor to the abdomen and pelvis, including being dependent on the size and location of the tumor, the use of this diagnostic method may be helpful in cases where surgery is not possible and may be useful in determining surgical indication. Also, due to the limitations of this study, it is suggested that more studies be conducted in this field.

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