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ORIGINAL ARTICLE

Ct Patterns of Omental Pathology and to Determine the Validity of Omental Caking in Diagnosis of Ovarian Cancer

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ABSTRACT

Objective: To depict and characterize CT patterns of omental pathology and to determine the validity of omental caking in diagnosis of ovarian cancer.

Methodology:

A cross-sectional study was conducted in a tertiary care center between January 2020 to February 2021. In this study, 64 consecutive female patients with omental pathology, scheduled for biopsy, surgery and follow up were included. All CT scans were reviewed and findings were discussed with the consultant radiologists. The results were compared and confirmed on histopathology by either open surgical biopsy or per-cutaneous needle biopsy.

Result: A total of 64 patients were enrolled in the study. Omental caking on computed tomography was identified in 44 (68.8%) patients. Presence of Omental caking was significantly associated with ovarian cancer ($p<0.001$). The positive and negative predictive values were 86.4% and 75%, respectively. The sensitivity and specificity of omental caking as diagnostic criteria for ovarian cancer were 88.4% and 71.4%.

Conclusion: CT scan is the modality of choice to detect omental pathology. In addition it depicts all other related or unrelated abnormalities as well as causative factors like ovarian carcinoma.

Keywords: Omental Caking, Ovarian Carcinoma, Multi Detector Computed Tomography, Patterns, Tuberculosis.

INTRODUCTION

The largest serous membrane and complicated structure in the human body is the peritoneum membrane that lines and supports the abdomen [1]. The omentum is a double-layered peritoneal projection that links the stomach to surrounding organs [2]. The larger and lesser omenta are formed by peritoneal reflections, with natural gravity flow regulating the direction of intraperitoneal fluid as well as disease processes inside the abdominal cavity [3].

The omenta serve both as boundaries and conduits for disease containment and spread respectively. They are frequently involved in infectious, inflammatory, neoplastic, vascular, and traumatic processes [4]. Ovarian cancer is the most lethal gynecologic malignancy, with peritoneal involvement in approximately 70% of patients at the point of identification. Direct infiltration and intraperitoneal dispersion are the most common modes of transmission [5,6].

It is crucial to gain an understanding of the transmission of tumors to develop a treatment plan. Ovarian cancer metastasizes to adjacent pelvic tissues through direct stimulation. The most typically implicated tissues are the fallopian tubes, uterus, and contralateral adnexa, although the rectum, bladder, and pelvic sidewalls can also be extensively involved [7]. Intraperitoneal seeding, lymphatic invasion, and hematogenous dissemination are three routes by which tumors can spread beyond the pelvis [8].

To determine the progression of the disease in patients with ovarian cancer, CT scans are widely used before surgical procedures or in some cases to replace the second-look laparotomy. CT scans may be beneficial in identifying adnexal masses, although it has limited use in this situation [9]. CT had a sensitivity of 84% and a specificity of 88% in disease detection. Nevertheless a negative CT scan does not exclude microscopic disease or macroscopic tumor less than 1 to 3 cm and thus second look laparotomy remains the gold standard for persistent small volume tumor [10]. Greater omentum can be involved by infections, inflammation, neoplastic, vascular and traumatic processes [10,11]. It is the frequent site of metastatic seeding from primary malignancies. Approximately 71% patients with ovarian cancer have omental metastasis followed in frequency to a lesser degree by carcinoma of stomach, colon, pancreas and others. Computed tomography provides the most reliable radiographic technique to routinely evaluate omental pathology. A detailed knowledge and understanding of CT patterns of omental disease is important in identifying the cause of omental infiltration. Distinct patterns of omental pathology i.e. omental caking, discrete nodules, cystic masses, or mixed patterns can be identified on CT images due to different diseases. Infectious disorders such as tuberculosis are revealed in the presence of smooth peritoneum with little thickness and significant enlargement. Malignant infiltration is diagnosed by nodular implants, uneven peritoneal thickening, and omental caking.

The present study was performed to assess the features of CT patterns in patients with omental disease and to evaluate the role of omental caking in the diagnosis of ovarian carcinoma.

METHODS AND MATERIALS

A cross-sectional study was conducted between January 2020 to February 2021 at Central Park Teaching Hospital, Lahore. After ethical approval was obtained, the study was conducted.

All female patients with CT scans of documented omental pathology followed by histopathological evaluation were included in this study. Patients with normal omentum with homogeneous attenuation on CT scan were excluded.

All cases of omental pathology documented by CT scan were included in our study. Patients were scanned using Auklet FS helical CT scan operated at 120 kV, 300-400mAs. Slice thickness of 10mm and 5mm was used. Helical CT was performed at pitch of 1 in our institution. 150 ml of intravenous contrast agent at a rate of 1.5ml/sec was given. History of allergy was taken and if there was history of allergy then non ionic contrast was used.

All CT scans were performed with oral as well as rectal contrast agents. Total one and a half liter of water with 10~15 ml of gastrografin was used as oral contrast. One liter was given for 30~40 minutes before the start of examination and remaining immediately prior to CT scan. 120 ml of rectal contrast with the same preparation as used for oral contrast was given before the start of CT scan. Use of oral contrast helps to distend bowel and thus help to differentiate bowel from metastatic implants.

Multiplanar reconstruction (sagittal, coronal, obliques) was done with MDCT scan. This was quite helpful in evaluation of complex female pelvic anatomy. It also helped in differentiation of bowel from omental and peritoneal deposits. All scans were obtained from top of higher diaphragm to ischial tuberosities. 15 minute delayed images of pelvis were taken with fully distended urinary bladder. It was helpful for the better assessment of distal large bowel and pelvic adenopathy.

All CT scans were reviewed by attending residents as well as two radiologists on CT monitoring console. Further thin slices, multiplanar reconstructions were performed if needed. Characterization of omental deposits was done by two radiologists. Omental Caking was documented when omental fat was replaced by thick confluent soft tissue mass. Fine smooth infiltration of omentum was considered as Smudged Appearance. Presence of cystic masses and nodular deposits were recorded.

Additional CT findings of adnexal masses, ascites, osseous, bowel, abdominopelvic organ involvement, lymphadenopathy were also observed. Diagnosis on the basis of CT findings was established. Percentages of different diseases for varied omental appearance were calculated.

Data was entered and analyzed using SPSS 26. Descriptive data analysis was done first for continuous variables to determine the mean and standard deviation. For categorical variables frequency (percentages) were presented. Chi-square test was used to compare the sensitivity and specificity of CT scan finding of omental caking in comparison to histopathology (gold standard) among patients of ovarian carcinoma. A p-value of < 0.05 was set as the cut off for significance.

RESULTS

A total number of 64 female patients were included in this study. Age distribution of study participants was 49 +/- 16 years. In the observed subjects there were 43 patients (67.2%) of ovarian cancer, 8 patients (13%) of abdomino-pelvic tuberculosis, 3 patients (4.7%) of adenocarcinoma stomach, 3 patients (4%) of adenocarcinoma pancreas, 2 patients (3.1%) of adenocarcinoma colon, 2 patients (3.1%) of pseudomyxoma peritonei and 1 patient (1.6%) of hepatic cirrhosis. CT scan was performed in all 154 patients. Different patterns of omental disease i.e. omental caking, nodular deposits, smudged appearance, cystic masses and mixed pattern were seen in patients respectively (Table 1).

Table 1: Characteristics of Study Participants

Characteristics	No. of patients	Percentage
Presenting complaints of patients		
Abdominal pain	58	90.6
Abdominal mass	30	46.8
Heaviness lower abdomen	24	37.5
Menstrual irregularities	25	39
Constipation	3	4
Jaundice	4	6.25
Fever	8	12.5
Vomiting	10	15.6
Weight loss		
Anorexia	48	75
CT scan findings of Tuberculous peritonitis		
Mesenteric thickening:	9	90
Omental thickening and smudged appearance:	3	30
Nodular deposits in		
omental fat:	3	30
Lymph node:	1	10
Ascites:	7	70
Involvement of spine and	9	90
intervertebral disc spaces:	2	20
Small bowel involvement:	6	60
Ileocecal involvement:	7	70
Features of peritoneal tuberculosis on CT scan		
Ascites & mesenteric	9	90
thickening	3	30
Omental disease	6	70
Small bowel involvement	7	70

All the patients underwent histopathological analysis, like operative laparoscopy, laparoscopy proceeding to laparotomy, exploratory / staging laparotomy and ultrasound / CT scan guided biopsy and results are shown in Table 2 and 3. Omental caking on computed tomography was identified in 44 (68.8%) patients.

Table 4 illustrates that CT diagnosed 42 (65.6%) patients with ovarian carcinoma as compared to 43 (67.2%) using histopathological analysis. Out of the 64 cases, two were diagnosed as adenocarcinoma of the colon, three were identified as pancreatic cancer, and three were diagnosed as adenocarcinoma of the stomach (Table 4).

Presence of Omental caking was significantly associated with ovarian cancer ($p<0.001$). The positive and negative predictive values were 86.4% and 75%,

respectively. The sensitivity and specificity of omental caking as diagnostic criteria for ovarian cancer were 88.4% and 71.4% (Table 5).

Table 2: Findings of Computed Tomography

Parameters	No. of patients	Percentage
Smudged appearance on computed tomography (n=64)		
Yes	19	29.7
No	45	70.3
Omental caking on computed tomography		
Yes	44	68.8
No	20	31.3
Nodular omental deposits		
Yes	45	70.3
No	19	29.7
Cystic omental masses		
Yes	8	12.5
No	56	87.5
Mixed pattern		
Yes	11	17.2
No	53	82.8

Table 4: Comparison of Diagnosis based on CT versus Histopathology

Diagnosis on the basis of computed tomography	Frequency	Percentage
Carcinoma colon	2	3.1
Carcinoma ovary	42	65.6
Carcinoma pancreas	2	3.1
Carcinoma stomach	4	6.3
Hepatic cirrhosis	1	1.6
Tuberculosis	12	18
Pseudomyxoma peritonei	1	1.6
Diagnosis on the basis of histopathological findings		
Adenocarcinoma of the colon	2	3.1
Carcinoma ovary	43	67.2
Adenocarcinoma pancreas	3	4.7
Adenocarcinoma of the stomach	3	4.7
Hepatic cirrhosis	1	1.6
Non-specific enteritis	2	3.1
Peritoneal tuberculosis	8	12.5
Pseudomyxoma peritonei	2	3.1

Table 5: Accuracy Indices (Positive/ Negative Predictive Values, Sensitivity, and Specificity) of Omental Caking as Diagnostic Criteria for Ovarian Cancer

Accuracy Indices	N (%)
Positive Predictive Value (PPV)	38/(38+6)=86.4%
Negative Predictive Value (NPV)	15/(5+15)=75%
Sensitivity	38/(38+5)=88.4%
Specificity	15/ (6+15)=71.4%
Total Patients with Ovarian Cancer	43 (67.2%)

DISCUSSION

Omentum primary neoplasm is an infrequent occurrence. Greater omentum metastatic illness is significantly more prevalent than initial malignancies [11]. The most prevalent form of ovarian cancer spread is intraperitoneal metastasis, and about 70% of patients have peritoneal metastases at staging laparotomy [12]. The most prevalent cancer of the omentum and peritoneum is ovarian cancer. At the time of presentation, the majority of patients are in stages III or IV of their illness. Detection of these lesions is important for follow up and treatment planning [13,14].

Carcinoma of ovaries constitutes the majority of the cases of our study followed by Tuberculous peritonitis, Ca pancreas, Ca stomach, Ca colon, Pseudomyxoma peritonei and Hepatic cirrhosis [15].

Characterization of the CT pattern of omental pathology into five groups was done in our study. We were able to determine the association of these five patterns of omental pathologies with different diseases keeping histopathology as gold standard. We observed that among these five distinct patterns, omental caking showed the highest association with ovarian carcinoma as encountered in 86.3% patients. Combination of omental caking and nodular omental deposits was seen in 56.8% patients. Early changes of soft tissue permeation within omental fat resulting in smudged appearance were seen in 18% patients of metastatic ovarian carcinomatosis. This very early change was difficult to differentiate from infectious causes of omental pathology. However, presence of complex adnexal masses, ascites helped to establish correct diagnoses. Stippled calcifications within omental deposits were seen in 22% patients of ovarian cancer. Our study coincides with previous literature [16-17].

Complex adnexal masses were also seen in 36 (81.8%) patients. Associated findings of bowel wall thickening and mesenteric infiltration was seen in 10 (22.7%) patients. Severe involvement, encroachment of rectosigmoid was observed in 4 patients with suspicion of colonic malignancy, however keeping in view finding of omental caking, provisional diagnosis of ovarian cancer was made which was confirmed later by histopathology. These results are favored by others [18]. Ascites, Pleural effusions and hepatic metastatic nodules were seen in 22, 10 and 3 cases respectively.

With multidetector CT scan thin section abdominopelvic images were obtained for better assessment of subcentimeter implants. Three dimensional images were created with reduced artifacts. Use of MDCT helps to diagnose subdiaphragmatic nodules of <03mm in 2 patients. Other less frequent causes of omental metastatic disease include colonic, pancreatic, gastric carcinomas. We observed that these malignancies cause enhancing nodular omental deposits greater than 5 mm. Primary sites of disease causing thickening, mass formation and distortion of stomach, pancreas and colon respectively are seen in all these patients which helped in establishing correct diagnosis. Intrahepatic cholestasis and cystic omental masses were seen in 2 cases of pancreatic malignancy. Large bowel obstruction causing proximal small bowel dilatation was seen in 1 case of colonic malignancy. Mesenteric thickening, nodularity and congestion were seen in all these cases. Isolated finding of nodular omental deposits without mesenteric involvement is rare in these malignancies. Typical finding of omental caking was also not seen.

Our study proves that in the female population of appropriate age ovarian carcinoma is the most common cause of omental pathology followed by tuberculosis, colonic ca, pancreatic ca, gastric carcinoma. This has already been described in literature [15-18], however such a high degree of sensitivity of omental caking for metastatic

ovarian carcinoma has not been reported previously. Multiple studies already conducted have shown that, after ovarian carcinoma, colonic, pancreatic, gastric malignancies are other causes of omental infiltration [19-20].

Characterization of omental disease is a subjective finding and no quantitative measurements are described in literature or in my study which are its limitations.

CONCLUSION

CT scan is the modality of choice to detect omental pathology. In addition it depicts all other related or unrelated abnormalities as well as causative factors like ovarian carcinoma.

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