PERITONEAL CARCINOMATOSIS COMPUTERIZED TOMOGRAPHY SCANS FINDINGS AND CAUSES

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ABSTRACT

Objective: To study the causes and Computerized Tomography Scan findings in patients with peritoneal carcinomatosis.

Methods: A retrospective review of Computerized Tomography Scans in 26 patients with proven peritoneal carcinomatosis was conducted from 1997 to 2002. In 22 patients, there was proven primary malignant tumor and patients presented for follow-up studies. In four patients, the primary tumor was diagnosed at the time of presentation, looking for distribution of peritoneal thickening, ascitic fluid, and its extension.

Results: Diffuse peritoneal thickening and enhancement was seen in the scans of all patients. Ascites was seen in 24 patients with extension to Douglas pouch in four patients. The primary tumor responsible for peritoneal involvement was ovarian in 12 patients, colonic in eight, pancreatic in three, breast in one and unknown primary in two patients.

Conclusion: Peritoneal thickening, enhancement, and ascites are the commonest findings in peritoneal involvement by malignancy 'peritoneal carcinomatosis'. Ovarian carcinoma followed by colonic are the commonest primary tumors to cause peritoneal carcinomatosis. The Computerized Tomography Scan is the imaging modality of choice to show the changes in peritoneal carcinomatosis.

Key words: Peritoneal carcinomatosis, Computerized Tomography Scan, Primary tumors.

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Introduction

Metastatic carcinoma is the commonest malignant tumor involving the mesentery. Ovarian, colonic, gastric, pancreatic and less commonly hepatocellular, renal, uterine, bladder, lymphomas and unknown primary tumors are the causes of peritoneal spread (1,2). The common Computerized Tomography Scan (CT) features of peritoneal malignancy are: Ascites, peritoneal thickening, and peritoneal enhancement. Nodular tumor implants on the undersurface of the right diaphragm can indent the liver surface, simulating capsular or subcapsular liver metastases are recognized findings especially in ovarian tumors (3). The common sites of peritoneal involvement include the greater omentum, right subphrenic space, pelvis Douglas pouch, and surfaces of diaphragm (2,3).

Methods

We retrospectively reviewed the CT scans of 26 patients with peritoneal carcinomatosis, 8 males and 18 females, the age range was 24-70 years and the mean age was 55.7 years. In 4 patients, there was no history of malignancy and the patients were referred because of ascites on clinical examination, in whom primary malignant tumor and peritoneal carcinomatosis was diagnosed on CT scan, and the diagnosis was confirmed by fine needle aspiration "FNA" under ultrasound guidance "2 with pancreatic one with ovarian and one with colonic tumors". In
22 patients there was a history of malignant tumor and patients were referred for follow up to look for disease progression, response to therapy or metastatic work up. All patients were scanned between January 1997 and March 2002. FNA of peritoneal thickening was done under ultrasound guidance to confirm the peritoneal involvement. The scans were performed from diaphragm down to the symphysis pubis on spiral CT scan "Siemens plus 4", with 8mm slice collimation, pitch of one during suspended respiration. I.V contrast 100ml 300mg/l of non-ionic water-soluble contrast was given at a rate of 2ml/sec. The scan were done with 75sec delay from the beginning of injection. Oral contrast to opacity the small bowel was given to all patients.

**Results**

The 26 abdominal and pelvic CT scans in 26 patients with peritoneal carcinomatosis were reviewed, looking for findings of peritoneal tumor spread and the causes of malignant peritoneal involvement. Ascites was present in 24 of our patients (94%), extending to pouch of Douglas in 4 patients, one with breast, one with pancreatic, one with colonic and two with unknown primary tumors (Fig. 1), and this finding was not seen in any patient with ovarian carcinoma. Peritoneal involvement as evident by omental thickening, enhancement and displacement of the bowel loops was found in all patients, and in one female patients with ovarian carcinoma implants in the right subphrenic and subhepatic spaces were found (Fig. 2). Associated liver metastases in 3 patients, splenic metastases in 2 patients, pleural effusion in 3 patients, and right adrenal metastasis and rectus sheath metastasis in one patient each.

Regarding the causes of peritoneal involvement; there were 12/26 patients (41%) with ovarian carcinoma, colonic cancer in 8 (31%), pancreatic carcinoma in 3 (12%), breast carcinoma in one (4%), and primary of unknown origin in 2 patients (7%).

The primary tumor was diagnosed with peritoneal involvement on CT scan at time of first presentation in 4 patients, 2 with pancreatic, one with ovarian tumor and one with colonic tumor.

The previously mentioned results are summarized in Table I.

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**Fig. 1a.** CT scan at mid pelvis level, shows extension of ascitic fluid in the pouch of Douglas in a female patient with pancreatic carcinoma.

**Fig. 1b.** CT scan at the lower abdomen level in the same patient shows omental thickening and ascites.

**Fig. 2.** CT scan at upper abdomen shows multiple sub diaphragmatic nodules in a patient with ovarian carcinoma and peritoneal carcinomatosis.
Discussion
The commonest CT features of peritoneal malignancy are: Ascites, peritoneal thickening and peritoneal enhancement, an interesting finding observed in malignant, but not benign ascites was fluid throughout the peritoneal space except for the cul-de-sac \(^4\). In 4 of our patients fluid extension in the Douglas pouch was noted (Fig. 4). No patient with ovarian cancer showed ascitic fluid extension to the Douglas pouch. The early changes of omental disease can be manifested as soft tissue permeation of omental fat, later discrete nodules; usually with irregular margins and in homogeneous contrast enhancement is found. Thickened omentum with diffuse tumor infiltration (omenta caking) is seen in advanced disease. Diffuse omental thickening and enhancement were seen in all patients indicating late presentation and advancement of the disease process. Secondary findings of peritoneal implants are bowel distortion, bowel wall thickening; bowel distortion is usually seen in the CT scan.

Carcinoma of the ovaries constitutes the majority of cases (46%), followed by colonic carcinoma (31%), pancreatic carcinoma (12%), breast carcinoma (4%), and of unknown primary in (8%). These results are comparable with another study conducted by Walkey M M \(^4\). Nodular tumor implants on the undersurface of the diaphragm associated with peritoneal involvement were seen in one patient with ovarian tumor (Fig. 2). The major limitations of conventional CT were its inability to depict implants on peritoneal and liver surfaces that are smaller than 2 cm in diameter. Implants less than 5 mm in diameter are detected when they are either in the subphrenic region or profiled by ascites \(^3\). In a recent study by Coakley et al \(^5\), they claim a sensitivity of 85%-93 % for detection of peritoneal metastases with spiral CT scan in patients with ovarian carcinoma in contrast to previously reported values of 63%-79% with conventional CT scan, and this is due to the absence of misregistration artifacts, thinner slices and improved resolution of the spiral scanners.

Peritoneal thickening occurs in other diseases like T.B peritonitis, mesenteric panniculitis, extramedullary hematopoiesis, and chronic leak from dermoid cyst with granulomas \(^6\), and these diseases are rare but should be considered in the differential diagnosis of peritoneal thickening. Limitations of our study are: The small number of patients, and secondly it is a retrospective study in patients with advanced peritoneal involvement, while the early changes of the disease have not been diagnosed.

Fig. 3. CT at lower abdomen shows omental thickening and enhancement in a patient with breast carcinoma and peritoneal carcinomatosis.

Fig. 4. CT scan at mid pelvis level, shows ascites in pouch of Douglas in a female patient with peritoneal carcinomatosis secondary to colonic carcinoma.

Conclusion
Ovarian carcinoma is the commonest tumor to cause peritoneal involvement, followed by colonic, pancreatic, and tumor of unknown origin. Peritoneal thickening and enhancement, which can be diffused, are the usual findings, and ascites is the second most common finding. Spiral CT scan is the examination of choice for detection of peritoneal involvement.
<table>
<thead>
<tr>
<th>Primary tumor</th>
<th>No. of patients &amp; gender</th>
<th>Peritoneal thickening</th>
<th>Ascites</th>
<th>Other findings</th>
<th>Comments</th>
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<tr>
<td>Ovarian carcinoma</td>
<td>12 F</td>
<td>+++</td>
<td>11 patients</td>
<td>Subdiaphragmatic metastasis in one patient and liver metastasis in another</td>
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<tr>
<td>Colonic carcinoma</td>
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<td>+++</td>
<td>8 patients</td>
<td>Liver metastasis in 2 patients &amp; left pleural effusion in one patient</td>
<td>Extends to Douglas pouch in one patient</td>
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<tr>
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<td>+++</td>
<td>2 patients</td>
<td>Splenic metastasis in 2 patients</td>
<td>Extends to Douglas pouch in one patient</td>
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<tr>
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<td>1F</td>
<td>+++</td>
<td>1 patient</td>
<td>Rectus sheath metastasis &amp; pleural effusion</td>
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<tr>
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<td>2 patients</td>
<td>Adrenal metastasis &amp; pleural effusion in one patient</td>
<td>Extends to Douglas pouch in 2 patients</td>
</tr>
</tbody>
</table>

M: Male     F: Female     +++: Extensive peritoneal thickening and enhancement

References


