CT findings of tuberculous peritonitis

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ABSTRACT

Introduction: The diagnosis of tuberculous peritonitis is still challenging and very important. Early and accurate diagnosis leads to an effective therapy and good survival rates. With the widespread use of computed tomography (CT) in the abdomen, it is important to be familiar with the spectrum of CT appearances seen in tuberculous peritonitis. Our retrospective study aims to describe the common CT features of this disease.

Methods: Abdominal CT images in 17 patients with tuberculous peritonitis in our institution from January 2002 to December 2005 were retrospectively reviewed. CT findings were evaluated for the presence of ascites, the abnormal patterns of mesentery, omentum and peritoneum.

Results: Ascites and mesentery involvement were present in all patients. The most common pattern of mesenteric changes was thickened soft tissue strands with crowded vascular bundles (65 percent). The involvement of the omentum was present in 15 patients (88 percent), and the most common type was smudged pattern (82 percent). Peritoneal involvement was present in 15 patients (88 percent). Smooth uniform thickening pattern was the most common type (76 percent).

Conclusion: Common features in the patients with tuberculous peritonitis include the combination of free ascites, thickened strands with crowded vascular bundles within the mesentery, smudged pattern of the omental involvement and smooth uniform thickening of the peritoneum.

Keywords: computed tomography, mesentery, omentum, peritoneum, tuberculous peritonitis

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INTRODUCTION

Tuberculous peritonitis is a rare manifestation of tuberculosis (TB), which occurs in fewer than 4% of all TB patients.[1] Patients with alcoholism, cirrhosis, renal failure, diabetes mellitus, malignancy, intravenous drug abuse, steroid therapy, and AIDS are at high risk for tuberculous peritonitis.[2-4]

The diagnosis of tuberculous peritonitis is still challenging and very important. Early and accurate diagnosis leads to an effective therapy and good survival rates. Delayed initiation of treatment can lead to high mortality rates.[4,5] It is therefore necessary to recognise the disease early and initiate treatment for this curable disease.

With the widespread use of computed tomography (CT) in the abdomen, and its advantages of demonstrating changes in the entire abdomen in a single examination, it is important to be familiar with the spectrum of CT appearances seen in tuberculous peritonitis.Our retrospective study describes the CT features of tuberculous peritonitis in 17 clinically or pathologically proven cases.

METHODS

Between January 2002 and December 2005, 17 consecutive patients with clinically or pathologically proven tuberculous peritonitis and who had CT images of the abdomen as part of their diagnostic work-up were retrospectively reviewed. The diagnosis was established on the basis of at least one of the following criteria:

(1) Histological evidence of caseating granuloma;
(2) Histological demonstration of acid-fast bacilli in the lesion or ascitic fluid;
(3) Satisfactory therapeutic response to antituberculous chemotherapy in patients with clinical, radiological and operative evidence of tuberculous peritonitis.

The case records were analysed according to age, gender, clinical presentation and CT findings. The CT findings were reviewed and classified for:

(1) the presence of ascites, free or loculated;
(2) the pattern of omental involvement;
(3) the pattern of mesenteric involvement;
(4) the pattern of peritoneal involvement.

The CT images were independently reviewed by two abdominal radiologists, and any disagreement in findings was resolved by a combined review of the images and reaching a consensus. All CT studies were performed with conventional or spiral techniques, using 7-mm or 10-mm sections at 7-mm or 10-mm intervals, respectively, from the dome of the diaphragm to the symphysis pubis. A commercially- available spiral CT scanner (Aquilion16, Toshiba, Tochigi-Ken, Japan) and conventional CT

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Fig. 1 Axial CT image shows infiltration with small ill-defined soft tissue densities interspersed within the omental fat showing a "smudged" appearance (arrows).

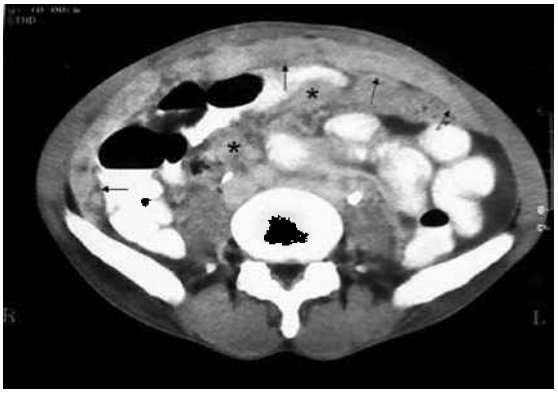

Fig. 2 Axial CT image shows a massive soft tissue omental cakes (arrows), and soft tissue density masses in the mesentery (asterisks).

Fig. 3 Axial CT image shows diffused thickened soft tissue strands with crowded vascular bundles in the small bowel mesentery (arrows).

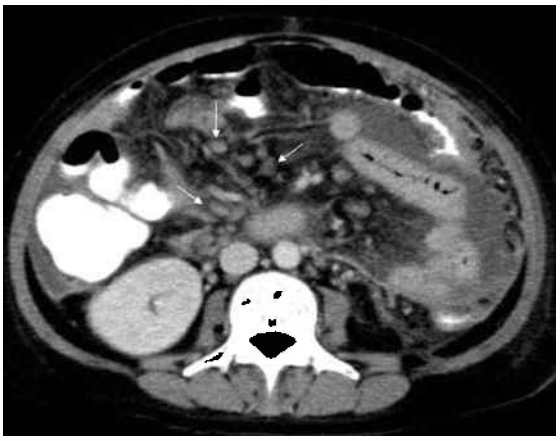

Fig. 4 Axial CT image shows multiple discrete well-defined mesenteric nodules (arrows), consistent with the nodular pattern of mesenteric involvement.

scanner (Cytec 3000i, General Electric Medical Systems, Milwaukee, WI, USA) were used. All patients received oral contrast material and 16 patients received intravenous contrast medium. Oral contrast material (500–750 ml) was given 1–2 hours before scanning. The intravenous contrast agent was administered as a bolus to a total amount of 100 ml. Images were obtained 60 seconds after the administration of the intravenous contrast.

CT analysis of the ascites was classified as free or loculated ascites. Involvement of the omentum was classified as nodular, smudged (infiltration with ill-defined soft tissue density), and caked (soft-tissue replacement) appearances.[6] Involvement of the small bowel mesentery was classified as nodular, thickened soft tissue strands with crowded vascular bundles, and diffused infiltration with soft tissue density masses. Involvement of the peritoneum was classified as smooth uniform thickening, nodular implant and irregular thickening.

RESULTS

There were nine men and eight women, with an age range of 27–87 years (mean age of 49.5 years). Ascites was present in all patients. 16 (94%) cases had free ascites, and there was loculation in only one (6%) case. Involvement of the omentum was demonstrated in 15 (88%) patients, and the most common type was smudged pattern (82%) (Fig. 1). Omental caking was found in only one (6%) case (Fig. 2). All patients had involvement of the small bowel mesentery. The most common pattern of mesenteric changes was thickened soft tissue strands with crowded vascular bundles in 11 (65%) cases (Fig. 3). Nodular pattern was found in five (29%) cases (Fig. 4), and diffused infiltration with soft tissue density masses pattern was found in one (6%) case (Fig 2). Peritoneal involvement was present in 15 (88%) patients. Smooth uniform thickening pattern was the most common type (76%) (Fig. 5). Irregular thickening pattern was found in two (12%) cases (Fig 6). Nodular implant pattern was not demonstrated in our patients.

DISCUSSION

Tuberculous peritonitis is a rare manifestation of TB, which occurs in fewer than 4% of all TB patients.[1] It is considered to be a result of rupture of the mesenteric lymph nodes seeded by haematogenous dissemination from a distant primary focus (usually the lung) or lymphatic spread from the primary lesion sites. Direct spread is rarely from the genitourinary infection.[7] Immunodeficient state, alcoholism, intravenous drug abuse, diabetes mellitus, cancer and steroid therapies are relevant risk factors.[2-4]

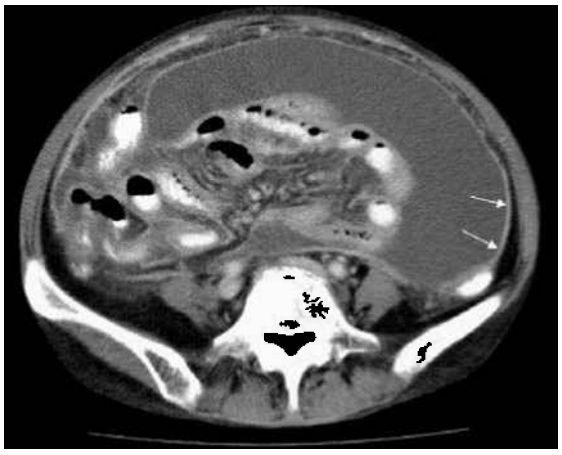

Fig. 5 Axial CT image shows ascites and smooth uniform thickening with pronounced enhancement of the peritoneum (arrows).

Fig. 6 Axial CT image shows irregular and marked thickening of the peritoneum (arrows).

The diagnosis of tuberculous peritonitis is difficult to establish because of its variable clinical manifestations and nonspecific laboratory investigations. Accurate diagnosis of tuberculous peritonitis is very important because there is a good prognosis following an early and appropriate treatment.[3] CT serves as an important non-invasive diagnostic tool for assessing the extent of the disease.

Tuberculous peritonitis has been divided into three types; "wet" type with free or loculated ascites; "dry" or "plastic" type with caseous nodules, fibrous peritoneal reaction and dense adhesions; and "fibrotic fixed" type with mass formation of omentum and matted loops of bowel and mesentery and occasionally loculated ascites.[8] However, there is considerable overlap between the three types on CT. Variable involvement of the peritoneum, greater omentum, and small bowel mesentery with ascites can occur over the course of the disease; therefore, the different radiological findings of the peritoneum, greater omentum, small bowel mensentery and ascites should be described separately.[6,9]

Ascites in tuberculous peritonitis may be clear (near water density) in an earlier transudate stage of immune reaction, or high density (20–45 HU) in late cell mediated immunity when the fluid is complex with high protein and cellular contents.[10,11] Free or loculated ascites are seen in 30%–100% of cases.[6,8,10] The high density nature of the fluid is reported by some authors[7,12] as specific for peritoneal tuberculosis, while others[13,14] suggest that it is not a reliable factor and can overlap with peritoneal carcinomatosis. Therefore, we did not record the density of the ascitic fluid in our patients. We found ascites in all cases, loculated in one case. Approximately 3% of patients have a dry plastic type.[3] The dry type was not found in our patients, possibly because it is uncommon and the number of patients in our study was rather small. In proper clinical settings, the presence of fine fibrinous strands in the ascites, localised ascites and caseous or calcified lymph nodes are highly suspicious of a diagnosis of tuberculous peritonitis.[15] There was no septation or fibrinous strands in our patients. Unlike ultrasonography, the complex nature of the ascites is difficult to demonstrate by CT.

Involvement of the omentum is classified as nodular, smudged (infiltration with ill-defined lesions), and caked (soft tissue replacement) appearances. CT reveals omental changes in most cases in up to 80% of cases.[6,7,12,14] The smudged type is the most common type demonstrated by CT, while the caked type is uncommon.[14] We found omental involvement in 15 (88%) cases and the smudged type was the most common (82%). The caked pattern was found in one case. In this case, we could not distinguish tuberculous peritonitis from peritoneal carcinomatosis. The omental caking is more commonly seen in peritoneal carcinomatosis.[14] The nodular type of omental involvement has not been reported in any case with tuberculous peritonitis, as well as in our patients, but it was reported in patients with peritoneal carcinomatosis (13%).[6,14]

Mesenteric disease is an important and common abnormality of early stage peritoneal tuberculosis. The mesenteric abnormalities consist of mesenteric thickening resulting from oedema, lymphadenopathy and fat deposition.[16] CT offers the distinct advantage of demonstrating these features in up to 98% of cases.[14] The most common mesenteric changes are nodular lesions and mesenteric thickening.[14] We classified the mesenteric involvement as nodular pattern, thickened soft tissue strands with crowded vascular bundles, and diffuse infiltration with soft tissue density masses. We found mensenteric abnormalities in all patients. The thickened soft tissue strands with crowded vascular bundles pattern was the most common type (65%), and the nodular pattern was identified in 29% of our patients.

Thickened peritoneum with tiny nodules and

adhesions are the most frequent laparoscopic findings in tuberculous peritonitis.[17,18] CT shows enhancement of a smooth thickened peritoneum in up to 80%.[12,13,19] In our study, peritoneal involvement was present in 15 (88%) patients. In most of our patients, the peritoneum showed a unique type of enhanced and smooth uniform thickening (76%). Irregular thickening pattern was found in two cases (12%). Nodular implant pattern was not demonstrated in our patients, as well as in the previous study, possibly because miliary peritoneal nodules (approximately 4–5 mm in size) in patients with tuberculous peritonitis were too small to identify by CT.[17,19] Nodular implants of the peritoneum are more suggestive of peritoneal carcinomatosis.[19]

Manifestations of tuberculous peritonitis are variable. CT reliably demonstrates the entire range of findings. Although no single CT feature is diagnostic of the disease, CT findings interpreted in the light of clinical and laboratory data, can be a valuable tool in the diagnosis of abdominal tuberculosis. The common features in the patients with tuberculous peritonitis include the combination of free ascites, thickened strands with crowded vascular bundles within the mesentery, smudged pattern of the omental involvement, and smooth uniform thickening of the peritoneum.

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