

# A REVIEW OF PATTERNS OF CT SCAN APPEARANCES OF ABDOMINAL TUBERCULOSIS

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## ABSTRACT

**Objectives:** To assess role of CT in diagnostic workup of abdominal tuberculosis.

**Methodology:** In this descriptive study, through electronic database, out of 7000 CT abdomens performed between January, 2002 to August, 2013, 30 patients with suggestion of Abdominal TB based upon CT and clinical findings were identified. Out of these 30 cases, twenty one patients were confirmed to have abdominal TB based upon histopathological data and response to anti tuberculous treatment and were included in the study and the remaining 9 patients were excluded from the study.

**Results:** Out of 21 confirmed abdominal TB cases, majority (n=13) were females. Peritoneal involvement was the most common feature seen in all 21 (100%) patients. Smudgy pattern, with or without smooth marginal enhancement, was the most commonly seen pattern of peritoneal involvement. Wet peritonitis (peritonitis with ascites) was seen in 14 (66%) out of 21 patients while dry peritonitis was seen in 7 (34%) patients. Lymphadenopathy was the second most common feature seen in 13 (62%) out of 21 patients. Bowel involvement was demonstrated in 11(52%) patients. Ileocecal region was the commonest site of bowel involvement seen in 7 of these 11 patients. Liver lesions were observed in 2 patients and splenic and pancreatic lesions were identified in 1 patient each.

**Conclusion:** Smudgy pattern of peritoneal involvement, enlarged necrotic abdominal lymph nodes, high density ascites and ileocecal involvement are the most common abnormalities seen in patients of abdominal tuberculosis in our local population.

**Key Words:** Abdominal tuberculosis, peritonitis, ascites, lymphadenopathy.

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## INTRODUCTION

TB is a major cause of morbidity and mortality in developing countries including Pakistan and its incidence is rising in western world as well<sup>1</sup>. Abdominal TB displays wide spectrum of clinical and radiological features and mimick diseases such as inflammatory bowel disease (IBD), lymphoma and abdomino pelvic malignancies<sup>2</sup>. Approximately one eighth of total TB cases are extra pulmonary, of these abdominal tuberculosis accounts for 11%-16%. In HIV positive patients the incidence of extra pulmonary TB is up to 50%<sup>3</sup>.

Routes of transmission of abdominal TB include ingestion of infected TB bacilli in sputum or contaminated food, hematogenous spread and direct spread from adjacent infected organs. TB bacilli cause caseation necrosis in the intestine, followed by spread

to the mesenteric lymph nodes that may rupture into the peritoneum causing TB peritonitis<sup>4</sup>.

Abdominal TB effects gastrointestinal tract, peritoneum, lymph nodes or solid viscera<sup>5</sup>. In one third patients only extraintestinal manifestations are seen and two thirds of patients with abdominal TB may have lymphadenopathy or peritoneal disease<sup>5</sup>. Although barium studies highlight the intestinal changes, abdominal CT scan demonstrates extraluminal, peritoneal, nodal, and visceral involvement. Expected spectrum of CT findings in abdominal tuberculosis includes peritoneal disease, ascites, lymphadenopathy, solid organ (Liver, spleen, pancreas) lesions and bowel involvement<sup>6</sup>.

Diagnosis of TB is often delayed due to vague clinical history and low yield of mycobacterium culture or smear. Untreated or delayed treatment can result in life long morbid complications. It is therefore necessary to

recognize the disease early and initiate treatment for this curable disease. CT is an excellent tool to depict abdominal TB findings and is widely available. It is therefore important to be familiar with the CT features of this disease and its complications. The purpose of this article is to share our experience with the clinicians and to encourage them to make use of this diagnostic tool in abdominal tuberculosis.

**METHODOLOGY**

After taking permission from Institutional Review Board ( IRB# 2020-069-2012) we searched from a database of around 7000 patients who underwent CT abdomen with IV contrast between January 2002 to August 2013 and studied every case in which there was suggestion of abdominal TB based upon clinical and CT findings. There were 30 cases in which there was a possibility of Abdominal TB. Further data of these 30 patients including their files, laboratory reports, treatment and follow ups were obtained.

Patients meeting at least one of these three criteria, as mentioned in International Literature<sup>6</sup> were considered as confirmed abdominal TB:

1. Positive Acid Fast Bacilli (AFB) smear/ culture or cytology.

2. Histo-pathology showing tubercular granuloma (with or without caseation).
3. Patients who showed good response to therapeutic trial of anti TB medicines.

As per this criteria twenty one patients had confirmed abdominal TB and were included in this study, while rest of the 9 patients were excluded.

Cases were reviewed by experienced radiologist having more than 3 years experience in cross-sectional imaging.

**RESULTS**

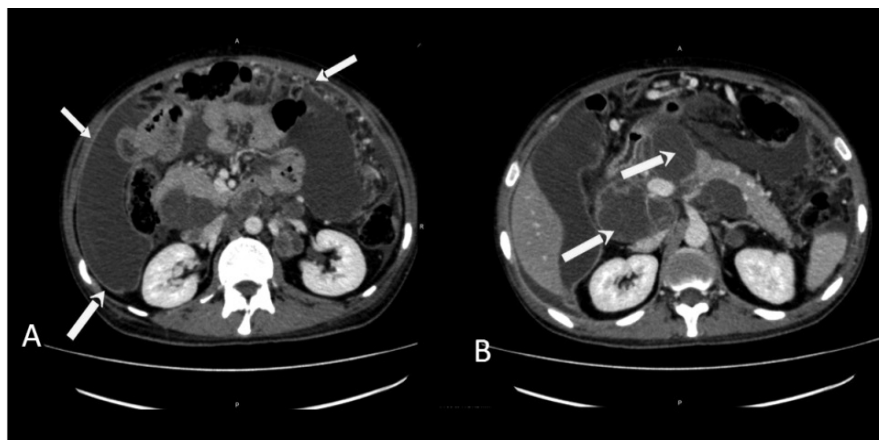
A total of 21 patients with confirmed abdominal TB, (13 female, 8 male) with age ranging between 10 to 76 years were identified. CT analysis of patterns of abdominal TB showed peritoneal involvement in all 21 patients. Smudgy pattern with or without smooth peritoneal enhancement (Fig 1A) was the most commonly seen pattern in 14 (66%) patients. Mixed pattern was seen in 4(20%) patients while omental caking was documented in 3(14%) cases. Cystic patterns were not seen.

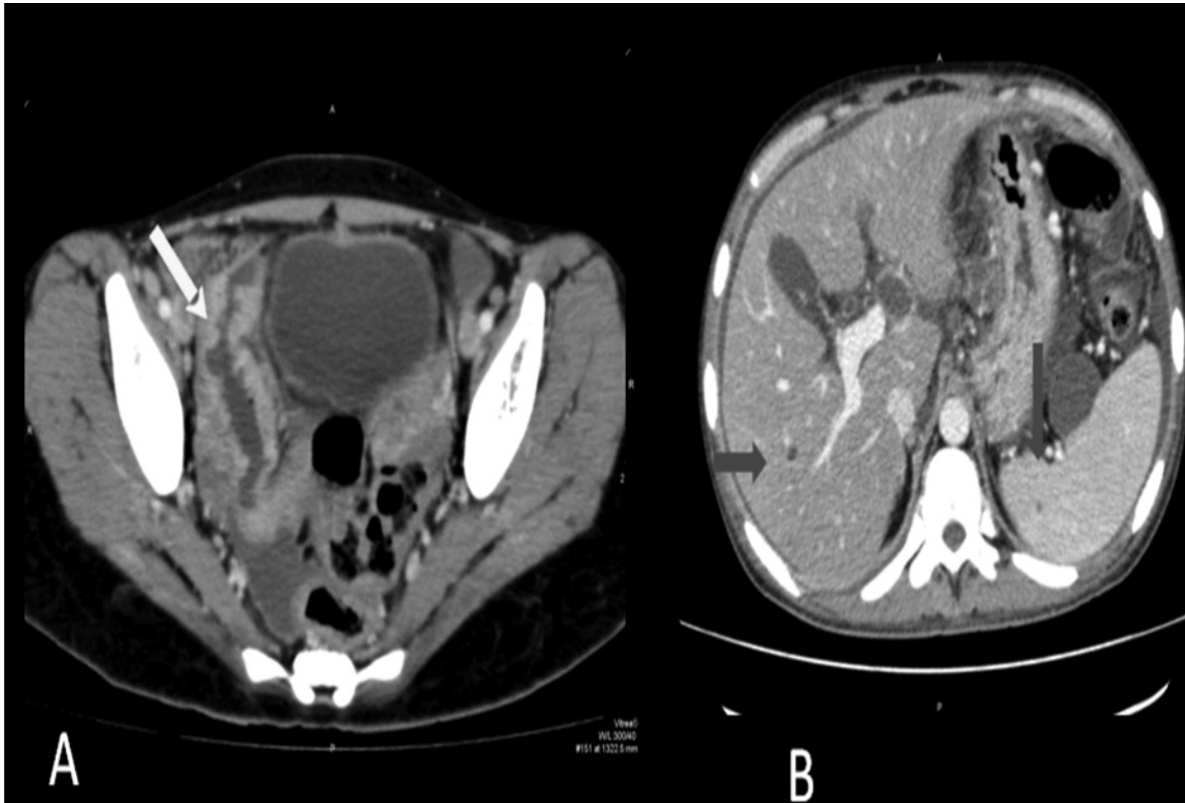
Peritoneal involvement was further classified into wet type (peritonitis with ascites or pockets of loculated

**Table 1: Comparative analysis of our findings with international literature in terms of % involvement**

	Our study	Sinan <sup>6</sup> et al	Uzonkoy <sup>3</sup> et al
Peritoneal involvement	100	77	64
Ascites	66	55	100
Lymphadenopathy	62	48	36
Bowel wall thickening	52	39	18
Solid organ involvement	14	20	-

**Figure 1: (A). CT abdomen showing smudgy pattern with smooth marginal enhancing peritoneum (arrows) with ascites. (B). CT abdomen showing enlarged hypodense lymph nodes with enhancing margins (arrows).**



**Figure 2: (A). CT abdomen showing circumferential thickening of distal ileal wall (arrow).**

fluid) seen in 14 (66%) out of 21 patients (Fig 1A). Dry peritonitis (with caseous nodules and adhesions without ascites) was seen in 7 (34%) patients. Fifteen patients (70%) had high density ascites ranging between 20-40 HU, while 6 (30%) patients had ascites with CT density less than 20 HU.

Lymph nodal involvement was the second most common feature seen in 13 patients. Enlarged lymph nodes with hypodense centre and enhancing margins were seen most commonly in 7 of these 13 patients (54%) (Fig 1B), mixed pattern in 4 patients and enlarged nodes with uniform density in 2 patients. Most common sites of lymph nodal involvement were pericecal, mesenteric, peripancreatic, periportal and para aortic.

Gastrointestinal disease was found in 11 patients. Ileocecal region was the commonest site of bowel involvement seen in 6 (55%) of these 11 patients. Small bowel involvement (other than distal ileum) was seen in 2(18%) patients, isolated large bowel involvement in 2(18%) patients and gastric involvement in 1(9%) patient.

Solid organ disease occurred in 3 out of 21 patients. Liver lesions were observed in 2 patients and splenic and pancreatic lesions were identified in 1 patient each. Liver and splenic lesions were seen as tiny 2-3 mm hypodense lesions. (Fig 2B). No discrete visceral abscess formation was identified.

## DISCUSSION

In literature, peritoneal TB is the most common form of abdominal TB and involves alone or in combination the peritoneal cavity, mesentery and omentum. It may be smudgy, mixed, nodular or cystic. Three additional types of peritoneal TB have been described<sup>7-10</sup>. A wet type with ascites or pockets of loculated fluid; a dry type with bulky mesenteric thickening and lymph adenopathy; and a third type with mass formation due to omental thickening which may be mistaken for a tumor.

In our study, peritoneal involvement was the most common feature seen in all 21 patients. Most common pattern was smudgy, with or without smooth marginal enhancement, seen in 66% of our patients followed by mixed pattern (20%) and omental caking (14%). Similar results were seen in other studies in which smudgy pattern was the most common type of peritoneal involvement seen in 47.3% in a study by Sinan et al<sup>5</sup> and 36% of patients in Uzonkoy et al<sup>3</sup>.

Ascites in abdominal TB can be due to an earlier transudate stage of immune reaction in which cases it can be of low CT density or due to late cell mediated immunity when the fluid is complex with strands, septation and debris appearing as high density on CT<sup>9</sup>. Unlike ultrasound, the complex nature of the ascites is difficult to demonstrate by CT<sup>11</sup>. However CT is useful in deter-

mining the density of the ascitic fluid which is reported to be mostly high; presumably due to the complex nature of the fluid.

Peritoneal involvement accompanied by ascites was seen in 66% of our patients compared to 52% in Sinan et al<sup>6</sup>. Ascites was high density (20-40 HU) in 70% of our patients. In a study by Ebstien et al<sup>4</sup>, 75% of cases showed high density ascites.

Regarding lymphadenopathy it has been shown in literature that in disseminated TB diffuse lymphadenopathy without predilection to any site may be seen<sup>12</sup>. The nodes are usually matted together with hypodense centers which probably is due to caseation and many occasionally contain calcification<sup>13,14</sup>. Central necrosis with rim enhancement, though not pathognomonic, is suggestive of abdominal TB. Enlarged uniform density lymph nodes can also be seen.

In our study, most common pattern of lymph nodal involvement was enlarged lymph nodes with hypodense center and enhancing margins seen in 66% of our patients compared to 90% seen in study of Yang Z et al<sup>14</sup>. Enlarged lymph nodes with uniform density were also seen in our study in few patients.

In gastro intestinal tract most common sites of involvement by abdominal TB are terminal ileum and cecum<sup>15-17</sup>. Other sites in which the disease occurrence has been reported are, in descending order of frequency, the ileum, cecum, ascending colon, jejunum, other parts of colon, rectum, duodenum and stomach<sup>18,19</sup>. In early stage disease a few regional nodes and circumferential thickening of the wall of the cecum and terminal ileum are seen, while stricture formation and other complications are mostly the late sequelae of this disease.

In our study, the commonest site of bowel involvement was the ileo-cecal region, seen in 6 (55%) patients followed by other sites. Similar results were seen in a study by Sinan et al<sup>6</sup> where 50% cases showed ileocecal involvement.

Regarding visceral TB, it has been reported that it is rarely seen in isolation and is more frequently part of multifocal or disseminated disease<sup>9,20</sup>. Liver and spleen are the main organs involved and their involvement can occur in the form of micro abscesses in miliary TB, seen in CT as diffuse low density focal lesions, or in the form of larger abscesses<sup>21</sup>. In later stages or during healing often the only feature of visceral TB is organomegaly with calcified granulomas. Pancreatic TB is a rare entity and may result from either hematogenous dissemination or direct spread of the disease from adjacent nodes.

Liver, spleen and pancreas were relatively less involved (14%) in our population as compared to Sinan et al<sup>6</sup> (20%). Liver involvement seen in two patients and spleen and pancreatic lesions in one patient each. Small

2-3 mm hypodense lesions were seen in these organs suggesting hematogenous spread of disease. No discrete visceral abscess formation was identified.

Overall, comparing with international literature our study shows some variations from international literature as can be assessed by Table 1. Degree of involvement of peritoneum, lymph nodes and bowel is significantly more than those mentioned in international literature. Liver, spleen and pancreas on the contrary, are relatively less involved than those reported internationally.

The reasons of this difference can be partly attributed to different mycobacterial behavior particularly of drug resistant strains of mycobacterium tuberculosis and regional variations. One important factor in our opinion is that most patients of abdominal tuberculosis in our population are of poor socioeconomic status and they usually present to the hospital when all local remedies have failed to cure them. As a result mostly the disease is relatively advanced and widespread at the time of CT scan thus accounting for the apparent increased severity of disease in our population as compared to the developed countries.

We wish to highlight the point that CT scan has the unique capability to display the wide range of abnormalities expected in abdominal tuberculosis. Familiarity with CT patterns of Abdominal TB in our population can play an important role in diagnosing Abdominal TB at an early stage and can help in reducing the morbidity and mortality associated with this disease.

Our study has few limitations. It is a retrospective study and sample size is small, so the results cannot be generalized. Despite these limitations, our study gives a glimpse of the expected CT patterns of abdominal TB in our local population. More studies with larger sample size would be required for definitive results.

## CONCLUSION

CT scan is an excellent modality for assessing abdominal tuberculosis due to its ability to display the whole range of abnormalities expected in abdominal tuberculosis. Smudgy pattern of peritoneal involvement with smooth marginal enhancement, enlarged necrotic abdominal lymph nodes, high density ascites and ileocecal involvement are the most common abnormalities seen in patients of abdominal tuberculosis in our study.

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#### CONTRIBUTORS

IUR conceived the idea. BY wrote the manuscript. FJ, FS, SB helped in data collection and manuscript writing. MYC supervised the study. All the authors contributed significantly to the final manuscript.