

Study on Role of Imaging Modalities in the Diagnosis of Abdominal Tuberculosis in a Tertiary Care Hospital of Bihar

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Abstract

Objective: The objective of this study was as follows: (1) To find the role of various investigation modalities in diagnosing abdominal tuberculosis and (2) to compare ultrasonography and computed tomography (CT) scan findings in abdominal tuberculosis.

Materials and Methods: This study was a prospective descriptive study and has been done in 1 year during October 2006–September 2007 in the Department of Radio Diagnosis, Indira Gandhi Institute of Medical Sciences, Patna. 55 adult patients of clinically suspected abdominal tuberculosis were included in this study. After consent detailed history and physical examination, routine investigation was done. Followed by X-ray abdomen, ultrasonography (USG) and CT scan abdomen, ascitic fluid examination, and fine-needle aspiration cytology from abdominal lymph node were done. Sometimes, endoscopy was done to rule out other disease conditions.

Results: Of all 55 patients, 42 were diagnosed as abdominal tuberculosis by combining several investigation modalities. USG and CT abdomen were more sensitive modalities in detecting abdominal lymphadenopathy and ascites. CT was equally or more accurate than USG in identifying abnormalities of abdominal tuberculosis except bowel dilatation.

Key words: Abdominal lymphadenopathy, Abdominal tuberculosis, Ascites, Computed tomography scan, Ultrasonography

INTRODUCTION

Tuberculosis is one of the most common and prevalent diseases in our country. According to annual report TB India 2017, India accounts for one-fourth of the global TB burden.^[1] Resurgence of the disease has been found since the HIV epidemic and rise in immunocompromised host. The pattern of tuberculosis has been changed in the recent years. According to Mukewar *et al.*, the abdominal TB not so common as pulmonary TB, and it can be a source of significant morbidity and mortality and is usually diagnosed late due to its non-specific clinical presentation.^[2] It can mimic most gastrointestinal disease including inflammatory

bowel disease, malabsorption syndrome, and colonic cancer.

Radiological investigations are the mainstay in the diagnosis of abdominal tuberculosis. Conventional X-ray imaging including barium study plays a very limited role, especially if bowel itself is involved. Ultrasonography (USG) and computed tomography (CT) scanning are very useful investigating tool these days. The present study was carried out to assess the value of imaging, especially USG and CT scan of abdomen in the diagnosis of the abdominal tuberculosis.

MATERIALS AND METHODS

This study was a prospective descriptive study and has been done in 1 year during October 2006–September 2007 in the Department of Radio Diagnosis, Indira Gandhi Institute of Medical Sciences, Patna, referred patients from Gastroenterology and General Medicine. This study was done as part of DNB thesis. 55 adult patients of clinically suspected

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Table 1: Demographic profile of the patients of abdominal tuberculosis

Age group in years	Males	Females	Total (% of cases)
	Number (% of cases)	Number (% of cases)	
≤19	03 (7.1)	07 (16.7)	10 (23.8)
20–29	09 (21.4)	06 (14.3)	15 (35.7)
30–39	02 (4.8)	03 (7.1)	05 (11.9)
40–49	07 (16.7)	03 (7.1)	10 (23.8)
>50	01 (2.4)	01 (2.4)	02 (4.8)
Total	22 (52.4)	20 (47.6)	42

Age and sex distribution of the patients

Table 2: Distribution of the patients of abdominal tuberculosis according to symptoms

Symptoms	Number of patients (%) (n=42)
Anorexia and weight loss	31 (73.8)
Fever	21 (66.7)
Abdominal pain	24 (57.1)
Abdominal distension	22 (52.4)
Malaise and lethargy	20 (47.6)
Diarrhea	11 (26.2)
Diarrhea alt. constipation	04 (9.5)
Subacute intestinal obstruction	02 (4.76)
Occasional bleeding with stool	02 (4.76)

*Multiple symptoms were present in most of the patients

Table 3: Findings of chest radiographs of the patients of abdominal tuberculosis

CXR findings	Number of patients (%) (n=42)
Normal	30 (71.4)
Abnormal	12 (28.6)
Consolidation	07 (16.7)
Pleural effusion	05 (11.9)
Unilateral hilar lymph nodes	03 (7.1)
Pleural thickening	02 (4.7)
Fibrocavitary lesion	02 (4.7)
Calcified nodule	01 (2.4)
Fibrosis	01 (2.4)

*Multiple abnormalities were present in most of the patients. All the patients in the study underwent X-ray chest examination. 12 (28.6%) patients among the abdominal tuberculosis patient showed chest X-ray features suggestive of active or healed pulmonary tuberculosis

abdominal tuberculosis were included in this study. After consent detailed history and physical examination, routine investigation was done. These patients were then investigated in systematic stepwise manner. Moreover, accordingly, patients were subjected for X-ray abdomen, USG and CT scan abdomen, ascitic fluid examination, and fine-needle aspiration cytology from abdominal lymph node. Sometimes, endoscopy was done to rule out other disease conditions.

Inclusion Criteria

The following cases were included in the study:

1. Clinically suspected cases of abdominal tuberculosis presenting with varying combination of clinical features.
2. Both male and female.

Table 4: Findings of barium contrast studies of the patients of abdominal tuberculosis

Barium contrast study findings	Number of patients (n=23)
Barium meal follow through	(n=20)
Normal	04
Abnormal	16
Dilated small bowel loops	12
Narrowing of terminal ileum	08
Stricture of ascending colon	07
Contracted pulled up cecum	05
Distended cecum	03
Deformed ileocecal angle	03
Mucosal irregularity	02
Barium enema	(n=02)
Normal	02
Barium swallow	(n=01)
Normal	01

*Multiple abnormalities were present in most of the patients. Barium contrast studies were performed in 26 patients suspected to have intestinal tuberculosis. The result of 23 patients among the patients of finally diagnosed abdominal tuberculosis shows abnormal barium meal follow through in 16 patients and normal in four patients who underwent this examination. Barium enema was normal in both patients who underwent this. Barium swallow was done in one patient for dysphagia and was found to be normal

Table 5: Findings of ultrasonography of the patients of abdominal tuberculosis

USG findings	Number of patients (%) (n=42)
Normal	06 (14.3)
Abnormal	36 (85.7)
Abdominal lymphadenopathy	26 (61.9)
Ascites; free/loculated	20; 19/01 (47.6)
Bowel dilatation	15 (35.7)
Bowel wall thickening	12 (28.6)
Mesenteric thickening (>15 mm)	03 (7.1)
Omental thickening	02 (4.8)
Hepatomegaly	04 (9.5)
Splenomegaly	01 (2.4)
Hepatosplenomegaly	02 (4.8)
Hepatic/splenic tiny hypoechoic foci	02 (4.8)

USG: Ultrasonography *Multiple ultrasonographic features were present in most of the patients. All the patients in the study underwent ultrasonographic evaluation of abdomen. 36 (85.7%) patients reveal abnormal findings. Abdominal lymphadenopathy, ascites, bowel dilatation, and bowel wall thickening comprise 61.9%, 47.6%, 35.7%, and 28.6% of cases. Rest of the findings include mesenteric and omental thickening, hepatomegaly, splenomegaly, or both

Table 6: USG features of ascites in the patients of abdominal tuberculosis

USG features of ascites	Number of patients (%) (n=20)
With debris/septae	18 (90)
Without debris/septae	02 (10)

USG: Ultrasonography Distribution of ascites according to the presence or absence of debris/septae in the patients of abdominal tuberculosis is 90% and 10%, respectively

Exclusion Criteria

The following criteria were excluded from the study:

1. Confirmed cases of abdominal tuberculosis coming to this hospital.
2. Not willing to participate in the study.

Table 7: USG features of abd. lymph nodes in the patients of abdominal tuberculosis

USG features of abdominal lymphadenopathy	Number of patients (%) (n=26)
Anatomic location	
Mesenteric	22 (84.6)
Periportal/peripancreatic	07 (26.9)
Pericaval/para-aortic	08 (30.8)
Pattern	
Conglomerated	14 (53.8)
Discrete	12 (46.2)
Echogenicity	
Mixed heterogeneous	26 (100)
Homogeneous	00 (0)
Central hypoechoogenicity	
Present	08 (30.8)
Absent	18 (69.2)
Calcification	
Present	01 (3.8)
Absent	25 (96.2)

USG: Ultrasonography *Multiple groups of lymph nodes were involved in many patients. Distribution of abdominal lymphadenopathy according to their anatomic location and characterization was conglomerate, mixed heterogeneous echotexture type without central hypochoic area, or without calcifications in the mesenteric group

Table 8: Findings of CT scan in patients of abdominal tuberculosis

CT scan features	Abdominal tuberculosis (%) (n=14)
Abdominal lymphadenopathy	08 (57.1)
Ascites	06 (42.8)
Bowel wall thickening	05 (35.7)
Bowel dilatation	04 (28.6)
Omental thickening	03 (21.4)
Mesenteric thickening	02 (14.3)
Hepatomegaly	03 (21.4)
Splenomegaly	01 (7.1)
Hepatosplenomegaly	01 (7.1)
Hepatic/splenic tiny hypoattenuating foci with minimal peripheral enhancement	02 (14.3)

CT: Computed tomography *Multiple CT scan features were present in most of the patients. Contrast-enhanced CT of abdomen was performed in 17 patients enrolled in the study. The CT scan findings of finally diagnosed 14 patients of abdominal tuberculosis out of 17 who underwent this examination showed 57.1% of patients with lymphadenopathy followed by ascites (42.8%), bowel wall thickening (35.7%), bowel distention (28.6%), and omental thickening (21.4%), respectively. Ascites was loculated in one patient and free in other five

RESULTS

There were 55 subjects enrolled on the basis of inclusion criteria for the study. Three of the subjects lost during study, while the diagnosis remained inconclusive in two subjects. Of 55, 42 patients were diagnosed abdominal tuberculosis.

The mean age of patients was 28.9 years, there were 22 males and 20 females Table 1. Male-to-female ratio was 1.1:1. Anorexia and weight loss, pain abdomen, and fever were common symptoms and were present in 31, 24, and

Table 9: CT scan features of abd. lymph nodes in the patients of abd. tuberculosis

CT scan features of abdominal lymphadenopathy	Number of patients (%) (n=8)
Anatomic distribution	
Mesenteric	07 (87.5)
Periportal/peripancreatic	05 (62.5)
Pericaval/para-aortic	03 (37.5)
Hypodense center	05 (62.5)
Enhancement pattern	
No definite enhancement	02 (25)
Peripheral rim enhancement	04 (50)
Homogeneous enhancement	01 (12.5)
Heterogeneous enhancement	01 (12.5)

CT: Computed tomography *Multiple groups of lymph nodes were involved in most of the patients. Abdominal lymphadenopathy was present in eight of 14 patients of abdominal tuberculosis who underwent CT scan examination showed involvement of the mesenteric group of lymph nodes with hypodense center and peripheral rim enhancement was the most common pattern



Figure 1: Ultrasonography showing free fluid in peritoneum

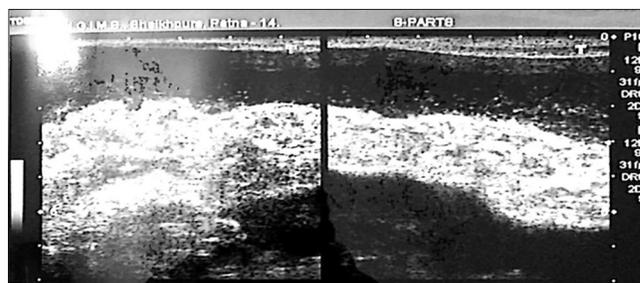


Figure 2: Marked thickening of omentum and ascites

21 of 42 patients, respectively Table 2. X-ray chest was abnormal in 12 of 42 patients (28.6%) Table 3.

Barium contrast study was performed in of 26 patients Table 4. Among these, 23 of 26 patients diagnosed as abdominal tuberculosis. Barium follow-through studies were abnormal in 16 of 20 patients. Dilated small bowel loops and narrowing of terminal ileum were common findings.

Ultrasound was done in all 42 confirmed cases and 36 of them had abnormalities. Abdominal lymphadenopathy

Table 10: USG and CT scan comparison in 14 patients of abd. tuberculosis

Findings	Detected on ultrasound number of patients (n=14)	Detected on CT scan number of patients (n=14)
Abdominal lymphadenopathy	08	08
Mesenteric	07	07
Periportal/peripancreatic	02	05
Pericaval/para-aortic	01	03
Ascites	06	06
Bowel wall thickening	04	05
Bowel dilatation	05	04
Omental thickening	01	03
Mesenteric thickening	02	02
Hepatic/splenic lesion	02	02

CT: Computed tomography, USG: Ultrasonography Findings detected on both ultrasound and CT scan of abdomen in the patients with abdominal tuberculosis were compared and it shows that detection of the lymph nodes, omental thickening, and bowel wall thickening was better detected in CT scan. Equal sensitivity for ascites, hepatic/splenic lesion, and mesenteric thickening

and ascites were common observation, 61.9% and 47.6%, respectively Table 5-7 and Figure 1,2.

CT abdomen was done in 17 cases. Of all 14 confirmed cases, lymphadenopathy and ascites were present in 8 and 6 of 14 patients, respectively Table 8,9.

Findings detected on both ultrasound and CT scan of abdomen in the patients with abdominal tuberculosis were compared and it showed that detection of the lymph nodes, omental thickening, and bowel wall thickening was better in CT scan studies Table 10.

Ascitic fluid aspiration was done in 19 of 20 patients having free abdominal fluid. Of all 19 patients had fluid total cell count >1000/ml with lymphocytic predominance. Protein was raised >3 g in 18 of 19 patients.

DISCUSSION

In our study, 55 clinically suspected patients of abdominal tuberculosis were enrolled. A total of 42 of 55 patients were labeled diagnosis of abdominal tuberculosis.

The diagnosis remained inconclusive in two patients while three patients were lost during the study.

The age range of the patients of abdominal tuberculosis in our study was 13–55 years and the mean age was 28.9 years. There were 22 males and 20 females with male-to-female ratio of 1.1:1. Although many studies suggested abdominal tuberculosis to be predominantly a disease of young adults with equal sex predilection, Kapoor^[3] has suggested a slight female predilection. We have found slight male predilection with nearly half (47.6%) of the patients in 20–39 years age group.

Chest X-ray features suggestive of active or healed pulmonary tuberculosis were present in 12/42 patients of

abdominal tuberculosis in our study group; 10 (23.8 %) of them had features suggestive of active disease. Recent studies reported the evidence on chest X-ray, suggesting active pulmonary tuberculosis in as low as 4.8% of the patients in Khan *et al.*^[4] series to approximately in one-third, that is, 35.2% of patients in Uygur-Bayramicli *et al.*^[5] series.

The most common finding on barium meal follow-through examination was dilated small bowel loops being present in 12/16 positive studies. It is, however, largely non-specific finding unless present with distal stricture or narrowing.^[6] Strictures of ascending colon were present in 7/16 and contracted pulled up cecum was present in only 5/16 positive studies. These findings are suggestive of intestinal tuberculosis when present as isolated findings and highly suggestive of abdominal tuberculosis when present along with shortening/involvement of ileocecal region and abnormal ileocecal angle/terminal ileum, respectively.^[6] Thus, barium contrast studies seem to have good diagnostic yield when performed in patients with suspected intestinal tuberculosis.

Abdominal lymphadenopathy was most common USG finding present in 61.9% followed by ascites in 47.6% patients. Ascites, however, was reported as the most common USG finding in many studies, being present in 48.4–53.2% of the patients of abdominal tuberculosis.^[5,7] Abdominal lymphadenopathy was reported to be present in 12.9–56% of the patients of abdominal tuberculosis in various studies.^[7]

USG identified mesenteric thickening of >15 mm in 7.1% and omental thickening in 4.8% of the patients of abdominal tuberculosis in our study group. A thickening of the small bowel mesentery of 15 mm or more and an increase in mesenteric echogenicity combined with mesenteric lymphadenopathy has been reported as the

characteristic sonographic feature of early abdominal tuberculosis.^[8]

Contrast-enhanced CT of abdomen was performed in 17 patients enrolled in the study. 14 of them were finally diagnosed abdominal tuberculosis. The most common CT scan finding was abdominal lymphadenopathy in 57.1% followed by ascites in 42.8% of patients, respectively, in our study group. Leder and Low^[9] also reported abdominal lymphadenopathy as the most common finding of abdominal tuberculosis on CT scan as in many other studies. Ascites on CT scan was present in 6/14 (42.8%) patients of abdominal tuberculosis in our study and all of them were high-density ascites; however, many recent studies also reported ascites to be most common CT scan manifestation in these cases.^[5,7]

In our study, CT was equally or more accurate than USG in identifying abnormalities of abdominal tuberculosis except bowel dilatation. Although overall detection of the number of patients with abdominal lymphadenopathy was similar with both modalities, CT scan more commonly detected periportal, peripancreatic, pericaval, and para-aortic lymph nodes was more common. This may be explained by the fact that CT scan is not affected by retroperitoneal bowel gas. CT scan was found to be equally good as USG for detecting ascites. However, unlike ultrasonography, the complex nature of the ascites is difficult to demonstrate by CT scan. Bowel wall thickening in patients of abdominal tuberculosis was more commonly detected on CT scan than USG, being picked up in 5/14 by CT scan and in 4/14 by USG. This may be due to the occasional obscuration of USG window by bowel gas. Bowel dilatation, however, was more commonly detected on USG than CT scan, being picked up in 5/14 by USG and in 4/14 by CT scan. CT scan more commonly identifies omental thickening than USG. Mesenteric thickening and hepatic or splenic lesions were, however, picked up equally with both modalities.

SUMMARY AND CONCLUSION

A total of 42 cases of the abdominal tuberculosis were diagnosed of 55 cases enrolled in the study. The role of imaging with special reference to USG and CT scan was assessed in diagnosis of abdominal tuberculosis.

The salient features are as follows:

- The age range of the patients of abdominal tuberculosis was 13–55 years and the mean age was 28.9 years. Overall, slight male predilection was observed with male-to-female ratio of 1.1:1. Symptoms and signs were non-specific. Constitutional symptoms were seen in large number of cases. A high index of

suspicion needed for early diagnosis. Hematological and biochemical investigations were non-specific and were of little help.

- Ascitic fluid analysis may be suggestive/diagnostic of peritoneal tuberculosis.
- USG is a useful diagnostic tool in the patients of abdominal tuberculosis.
- In patients with high index of suspicion, the presence of the USG findings of conglomerated mesenteric lymph nodes of heterogeneous attenuation with central hypoechogenicity or calcification, ascites with internal echoes/septae, mesenteric thickening ≥ 15 mm, or omental thickening is suggestive of tubercular etiology.
- CT scan was equally or more accurate than USG in identifying abnormalities of abdominal tuberculosis except bowel dilatation. CT scan has advantage of not being affected by bowel gas; therefore, it more commonly identified periportal, peripancreatic, pericaval and para-aortic lymph nodes, and bowel wall thickening.
- It also more commonly identified omental thickening. USG, however, more commonly identified bowel dilatation and has edge over CT scan in defining complex nature of ascites.
- The two undiagnosed patients despite fully covered protocols were the limitation of our study.

RECOMMENDATION

Clinical suspicion is a key to the early diagnosis of abdominal tuberculosis. In all suspected cases, ultrasonography should be used as early investigation modalities.

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REFERENCES

1. TB India. National Report; 2017. Available form: <https://www.tbcindia.gov.in/WriteReadData/TB%20India%202017.pdf>. [Last accessed on 2018 Nov 28].
2. Mukewar S, Mukewar S, Ravi R, Prasad A, S Dua K. Colon tuberculosis: Endoscopic features and prospective endoscopic follow-up after anti-tuberculosis treatment. *Clin Transl Gastroenterol* 2012;3:e24.
3. Kapoor VK. Abdominal tuberculosis. *Postgrad Med J* 1998;74:459-6.
4. Khan R, Abid S, Jafri W, Abbas Z, Hameed K, Ahmad Z, *et al.* Diagnostic dilemma of abdominal tuberculosis in non-HIV patients: An ongoing challenge for physicians. *World J Gastroenterol* 2006;12:6371-5.
5. Uygur-Bayramicli O, Dabak G, Dabak R. A clinical dilemma: Abdominal tuberculosis. *World J Gastroenterol* 2003;9:1098-101.
6. Kumar N, Aggarwal R. Abdominal tuberculosis. In: *API Textbook of Medicine*. 7th ed. Mumbai: National Book Depot (Distributor); 2003. p. 562.

7. Szmigielski W, Venkatraman B, Ejeckam GC, Larikre LN. Abdominal tuberculosis in Qatar: A clinico-radiological study. *Int J Tuberc Lung Dis* 1998;2:563-8.
8. Kedar RP, Shah PP, Shivde RS, Malde HM. Sonographic findings in gastrointestinal and peritoneal tuberculosis. *Clin Radiol* 1994;49:24-9.
9. Leder RA, Low HS. Tuberculosis of the abdomen. *Radiol Clin North Am* 1995;33:691-705.

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