

ABDOMINAL TUBERCULOSIS

B.R. Thapa
S.K. Yachha
S. Mehta

Tuberculosis is responsible for high morbidity and mortality in children in developing countries. Most commonly the disease involves lungs, central nervous system (CNS), peripheral lymph nodes and bones, whereas, tuberculosis of gastrointestinal tract (GIT) is rare in children(1). There is paucity of literature regarding GIT tuberculosis in the pediatric age group(2) and it is mostly reported from pediatric surgical centres(3-6). Pediatricians might be missing tuberculosis of GIT due to unawareness and lack of facilities to confirm the diagnosis in children.

Pathogenesis

Abdominal tuberculosis may be isolated or associated with extraintestinal tuberculous lesion(1,7). *Mycobacterium tuberculosis* is the principle causative agent and rarely, *Mycobacterium bovis* and atypical mycobacterium are encountered.

From the Division of Pediatric Gastroenterology, PGIMER, Chandigarh 160 012.

Reprint requests: Prof. S. Mehta, Department of Pediatric Gastroenterology, PGIMER, Chandigarh 160 012.

Tuberculous involvement of abdomen can be due to primary involvement of the intestines and other abdominal viscera. However, this is very rare. In prechemotherapeutic era it was calculated to be about 5%(8). Boiling of milk, pasteurisation, eradication of infected cattle and lack of infected material may be responsible for this. The post primary complex elsewhere in the body spreads via hematogenous route. Mostly, it is intermittent silent bacteremia occurring at low rate. But there can be rupture of infected focus in to a blood vessel and this can lead to miliary tuberculosis involving GIT.

Ingestion of tubercle bacilli can also lead to intestinal tuberculosis as evident from well established association with pulmonary tuberculosis(7). Involvement of intestine might be related to number of bacilli ingested, virulence of organism, nutritional status and immunological state of the child. The site of involvement also varies. This is influenced by the pH of gut, fatty capsule of *Mycobacterium tuberculosis*, mucosal barrier, duration of contact, increased physiological stasis, abundant lymphoid tissue in small as well as large gut, increased rate of electrolyte and water absorption and minimal digestive activity and maximal contact(1,7,8). The order of involvement of various sites is ileum, ileocecal region, colon, jejunum, rectum, duodenum, stomach and esophagus(9). The frequency of involvement of various abdominal organs as seen by us is shown in Table I. Secondary reactivation of old healed focus, common in adults, may occur in older children and adolescents. Continuous extension occurs from adjacent organs, commonly reported in adolescent

TABLE I—Site of Involvement in 78 Cases of Abdominal Tuberculosis

Site	Number	Per cent
Intestinal	52	6.7
Duodenum	2	2.5
Jejunum	3	3.8
Ileum	34	43.6
Ileocecal	5	6.5
Colon and rectum	8	10.2
Peritoneal	21	27.0
Nodal	3	3.8
Hepatic	2	2.5

girls with tuberculous salpingitis and tuberculosis of spine(1,8). The various types of abdominal tuberculosis are given in *Table II*.

TABLE II—Types of Abdominal Tuberculosis in Children

1.	Tuberculosis of mesenteric lymphnodes (tubs mesenterica)
2.	Peritoneal tuberculosis
	Peritonitis
	Ascitic (exudative)—generalised, localised.
	Dry-plastic type—adhesion formation
	Fibroblastic
	Miliary tuberculosis—granular peritoneal surface
	Omental-mass, miliary
3.	Tuberculosis of the intestine
	Ulcerative
	Hypertrophic
	Ulcerohypertrophic
	Miliary (granular)

Clinical Features

Abdominal tuberculosis has protean manifestations. Sometimes these are non-

specific. The extra-abdominal tuberculous lesion may give additional clues towards the diagnosis of abdominal tuberculosis especially when associated with GI symptoms. Conversely, there may not be any evidence of tuberculosis elsewhere in presence of abdominal tuberculosis.

Analysis of symptoms and signs of 78 patients of abdominal tuberculosis from our centre has been shown in *Table III*. The duration of symptoms varied from 2 weeks to 6 years.

Investigative Approach to Abdominal Tuberculosis

The diagnosis should be based on the history and clinical findings. A high index of suspicion guides the investigative approach.

Techniques for Definitive Diagnosis

A. Demonstration of AFB

1. *Fine Needle Aspiration Cytology (FNAC)*: FNAC from intraabdominal masses is a well established mode of quick diagnosis. This is easier if a mass is palpable. Aspiration cytology can be guided by ultrasound. Endoscopic (upper and lower GI) guided FNAC can be done from submucosal lesions.

2. *Ascitic Fluid for AFB and Culture*: AFB can be demonstrated from the ascitic fluid and tubercle bacilli can be cultured. For this, a large amount of fluid is required. Culture positivity varies from 40-60%(10). Ascitic fluid in tuberculosis is usually exudative with lymphocyte predominance on cytology.

3. *AFB in the Biopsy Tissue*: Demonstration of AFB in the biopsy material confirms the diagnosis. AFB can also be cultured.

TABLE III—Clinical Features of 78 Cases of Abdominal Tuberculosis

Symptoms	No.	(%)	Signs	No.	(%)
Pain abdomen	63	(81)	Distension	54	(69)
Anorexia	60	(77)	Visible peristalsis	21	(27)
Fever	53	(68)	Lump abdomen	15	(19)
Weight loss	66	(84)	Doughy abdomen	30	(39)
Chronic diarrhea	50	(64)	Ascites	12	(15)
Vomiting	24	(31)	Hepatomegaly	41	(52)
Diarrhea/Constipation	14	(18)	Splenomegaly	16	(21)
			Enterocutaneous fistula	3	(4)
Constipation	4	(5)	Peripheral lymphadenopathy	26	(33)
Cough	29	(37)	Lung signs	13	(17)

Histopathology of the Tissue

Demonstration of typical tuberculous granuloma with caseating necrosis confirms the diagnosis. Various ways to obtain biopsy material are:

1. *Upper GI Endoscopy*: In children, pediatric size endoscope can be used to have direct visual impression of lesions in esophagus, stomach and duodenum. With the help of flexible endoscopic biopsy forceps, biopsy can be obtained.

2. *Lower GI Endoscopy*: Pediatric size sigmoidoscope or colonoscope used to see the colon for any lesion and the material can be directly obtained for confirmation of diagnosis. We are using this routinely when colonic symptoms are present. In a study 8 patients with colonic symptoms, biopsy material revealed submucosal granuloma in all(11). Endoscopic FNAC can be used for quick diagnosis.

3. *Peritoneal Biopsy*: Peritoneal biopsy can be done with Vim-Silverman needle

and Cope needle. It should be carried out when enough ascitic fluid is there. Pick up rate varies from 30 to 50%.

4. *Laproscopy/peritoneoscopy*: These are very helpful to diagnose peritoneal and omental tuberculosis. Direct vision gives pick up rate of about 85%. Material can be obtained for culture and histopathology(7,10).

5. *Laparotomy*: Rarely laparotomy may be needed when other parameters are not contributory and diagnosis of tuberculosis is strongly considered. Two patients in our data were diagnosed on laparotomy.

6. *Surgical Specimen*: Characteristic gross description of surgical specimen with caseating mesenteric lymph node gives the diagnosis before histopathology.

7. *Liver Biopsy*: Liver biopsy gives varied changes such as granulomatous hepatitis, miliary tubercles, conglomerate tubercles, and nonspecific hepatitis, fatty infiltration, inflammatory cell infiltrate, portal inflammation, portal fibrosis,

Kupffer cell hyperplasia, tuberculomas, abscesses and cholangitis in abdominal tuberculosis(12).

Investigations to Support Tuberculosis

I. Mantoux Test

Mantoux (Mx) test was positive in 53.8% cases in our patients. Negative Mx test *per se* does not exclude tuberculosis.

II. Radiology

(a) *X-ray Chest*: Incidence of pulmonary tuberculosis varies from 6-90% in abdominal tuberculosis(7). In our series 69.2% cases had associated pulmonary lesions. Hilar lymphadenopathy was present in 32 and 37.2% had hilar lymphadenopathy with parenchymal lesions. In contrast to adults, the cavitary lesions and tuberculous bronchiectasis are rarely encountered in children.

(b) *Family Screening*: A definite history of contact is not always present but 37.5% cases had history of contact in our series. X-ray chest of all family members should be done and Mx test of preschool age children should be done when there is history of contact.

(c) *Plain X-ray Abdomen*: Multiple fluid levels were present in 20.5% of our group suggesting subacute intestinal obstruction (SAIO) or mass shadow and 2.8% had intra-abdominal calcification.

(d) *Barium Studies*: Barium meal follow through is a useful investigation to determine the nature, the site, the extent of involvement, peritoneal and nodal tuberculosis. This can pick up ulceration, hypertrophic lesions, strictures (single or multiple), malabsorption pattern, matted intestinal coils indicating plastic peritonitis, fistulous tract and compression or separation of

intestinal coils by enlarged lymphnodes. Fluoroscopy can delineate calcified lymphnodes in the mesentery or para-aortic region.

Barium enema is indicated when colonic lesion is suspected. Barium enema helps to find out ulcerated and hypertrophied lesions and obstruction/stricture in the colon. This can pick up fistulous communications(11,13).

III. Malabsorption Studies

Abnormal malabsorption tests seen in these children are not diagnostic. Abnormal parameters were seen in 30.8% of cases in our series. It has been in 17-33.7% in different series in adults(9,14). Malabsorption is due to decreased small intestinal mucosal surface, lymphatic obstruction, fistula formation between the small and large intestine, deconjugation of bile salts secondary to bacterial overgrowth and decreased bile salt pool because of impaired active absorption in the terminal ileum.

IV. Demonstration of AFB

AFB can be seen in gastric aspirate, stool, sputum, urine and secretions from the fistulous tract. However, their presence do not confirm abdominal tuberculosis.

V. Histopathology of Peripheral Lymph node

In presence of abdominal symptoms, lymph node biopsy is helpful in diagnosis.

VI. Hematological and Biochemical Tests

They may indicate the extent of dysfunction of GIT but are not specific for diagnosis of abdominal tuberculosis.

Newer Modalities

1. Double Contrast Radiology

We are using barium and air for small bowel enema and colonic enema. In contrast to conventional barium study, this gives better delineation of the lesion and pick up rate is very good(13). Enteroclysis (small bowel enema) is preferred when subacute intestinal obstruction or stricture is suspected.

2. Imaging Techniques

These are not good modalities to diagnose tuberculosis of abdomen. CT Scan is a noninvasive technique which can indicate the site of the lesions and ascites but nature is difficult to define. Ultrasonography is not a good modality to pick up lesions in the gut but peritoneal disease, lymphnode enlargement and ascites may be diagnosed.

3. Serodiagnosis of Tuberculosis

(i) *Antibodies*: There are various serological methods to detect antibodies such as complement fixation, hemagglutination precipitation and gel diffusion, soluble antigen fluorescent antibody (SAFA), radio immunoassay (RIA), enzyme linked immunosorbent assay (ELISA), circulating immune complex and agglutination tests such as Kaolin Agglutination Test (KAT). ELISA and SAFA are more sensitive and specific(15-17). KAT in a recent study was positive in 94.1% of abdominal tuberculosis(18). Various authors have shown rise of IgG, IgE classes of antibodies but out of these IgG(IgG₂) has a better correlation(15).

(ii) *Monoclonal Antibodies*: Monoclonal antibodies have been developed against *M. tuberculosis*. Monoclonal antibodies (IgG,

type) also called TB 72, are raised in 74% of pulmonary tuberculosis but very high titres have been reported in patients with peritoneal, pleural, pericardial and bone tuberculosis. In some way, synthetic peptides have been developed to detect *M. tuberculosis* antibodies(15).

(iii) *Antigens*: To detect the presence of mycobacterial antigen in the blood, very sensitive methods like RIA and ELISA have been used. ELISA is highly sensitive for detection of antigen in CSF(19). A simple dot-ELISA for detection of *M. tuberculosis* in sputum samples has been developed. The sensitivity of antigen detection was 61% in AFB positive compared to 40% in AFB negative samples(20).

(iv) *Recombinant DNA Technology*: The availability of recombinant DNA clone expressing mycobacterial antigens has opened new approach to immunodiagnosis of tuberculosis(15).

4. Adenosine Deaminase Activity (ADA)

ADA in the peritoneal fluid in tuberculosis peritonitis is raised many folds with sensitivity and specificity of 95-100% and 96-98%, respectively(21-23). ADA in the ascitic fluid is very helpful to differentiate tuberculous peritonitis from other causes of peritonitis.

Various criteria(7) have been suggested for the diagnosis of abdominal tuberculosis (Table IV).

Complications

The relatively common complications of tuberculous enteritis include obstruction, fistula formation, confined perforation with abscess, hemorrhage, enterolithiasis and traction diverticula. The

TABLE IV—Criteria for Diagnosis of Tuberculosis(7).**A. Definitive**

1. Culture of AFB from tissue
2. Histologic demonstration of AFB
3. Histologic evidence of granuloma with caseation necrosis
4. Typical gross description of surgical specimen
5. Fine needle aspiration showing granuloma with or without AFB (endoscopic FNAC or directly from mass or lymph-node)

B. Probable

1. Clinical features of GI tuberculosis
2. Evidence of tuberculosis elsewhere in the body
3. Response to antitubercular therapy without relapse following completion of therapy

rarer ones only are free perforation with peritonitis, malnutrition and malabsorption.

Tuberculosis of Colon and Rectum

Tuberculous involvement of colon and rectum is rarely encountered even in adults. In children there is paucity of literature regarding this entity. In our series of abdominal tuberculosis, 10.2% cases had colorectal tuberculosis. Mode of spread is similar to that of tuberculosis of small intestine.

Apart from the constitutional symptoms there may be diarrhea, lump abdomen and large bowel obstruction. Lesions can be in the form of ulcerative, hypertrophic or ulcerohypertrophic. These are mostly segmental(24) and occasionally diffuse(25). Five of our cases had blood

and mucus in stool on presentation and had rectal disease also. One child had rectovaginal fistula. The diagnosis was possible by sigmoidoscopy, barium enema and colonoscopy(11).

Treatment

Chemotherapy consists mainly of streptomycin (40 mg/kg), isoniazid (5-10 mg/kg) and rifampicin (10 mg/kg). Isoniazid is also effective in doses of 4-6 mg/kg/day. Streptomycin was given initially intramuscularly for 90 days and subsequently rest of the two drugs were continued for eighteen months to complete the therapy. We monitored hepatic transaminases periodically till completion of therapy. When hepatotoxicity was present, both the drugs isoniazid and rifampicin were stopped and ethambutol (15 mg/kg) was given till the time there was recovery of hepatic injury. If hepatotoxicity was unavoidable then isoniazid and ethambutol combination was given. Children getting ethambutol were followed for ophthalmological check up monthly. Short course chemotherapy and role of pyrazinamide have not been evaluated in children with abdominal tuberculosis. There is a report of short term chemotherapy in adults with 3 drug regimen of INH, rifampicin and pyrazinamide for 2 months followed by INH and rifampicin for 4 months. Favorable response was seen in 97% in short course therapy versus 92% in standard treatment group. However toxicity was 26% in short course group and 13% in the standard therapy group (26).

Surgery is indicated when there is perforation of intestinal ulcer, confined perforation with abscess, fistulous communication, obstruction and massive hemorrhage. Children getting chemotherapy should be followed up regularly because complica-

tions like obstruction due to cicatricial healing or adhesions of intestine can develop while on medical treatment.

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NOTES AND NEWS

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Guest Editor : Dr. Vimlesh Seth

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