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Intestinal tuberculosis with abdominal complications: radiologic and pathologic features

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Abstract

Background: To investigate radiologic and pathological features of intestinal tuberculosis with abdominal complications.

Methods: Twenty-two patients with 23 surgically proven complications (nine intestinal obstructions, eight perforations, three fistulae, and three intestinal bleeds) were analyzed. Medical records, radiologic studies, and pathologic examinations were reviewed with special emphasis on searching for the common features in each group of complication.

Results: The most important single feature in seven of the nine patients with intestinal obstruction was the presence of stricture. In the remaining two patients, bowel adhesion was a primary cause of obstruction. In eight patients with intestinal perforation, both obstruction and ulcerations in the dilated proximal loop were the important features in six, and multiple deep ulcerations without obstruction was a primary cause in the remaining two. The common features in three patients with fistulae were focal or multiple strictures, severe adhesions, and fibrotic bowel wall. Intestinal bleeding originated from diffuse mucosal ulcerations. The abdominal complications occurred during antituberculous therapy in 10 of the 22 patients.

Conclusion: Understanding the radiologic and pathologic features of intestinal tuberculosis with complications help in making an appropriate clinical decision for the treatment strategy. Close observation is necessary, especially in those patients who are acutely ill during antituberculous medical therapy.

Key words: Enteritis—Intestines, diseases—Intestines, infection—Intestines, perforation—Intestines, stenosis or obstruction.

A broad spectrum of abdominal complications, including obstruction, perforation, fistula formation, intestinal bleeding, enterolithiasis, traction diverticula, and venous thrombosis, occur in intestinal tuberculosis [1]. Although intestinal tuberculosis is primarily a medically treatable disease, surgery should be reserved for those patients with complications such as obstruction, free perforation, confined perforation with abscess or fistula, or massive hemorrhage. Early detection of complicating intestinal tuberculosis is important to avoid catastrophic events because emergency surgery for such lesions carries a high mortality rate [2, 3]. However, because this disease has diverse clinical presentations, detection of abdominal complications using clinical data has limitations. Therefore, to identify such patients, radiological examinations, such as abdominal computed tomography (CT) and barium studies, may have decisive roles.

The purpose of this study was to investigate radiologic and pathological features in 22 patients with 23 surgically proven complications of intestinal tuberculosis.

Materials and methods

In reviewing the medical records of 201 patients with intestinal tuberculosis who were treated between January 1989 and March

Table 1. Summary of findings in patients[a] with tuberculous strictures causing bowel obstruction

Case	Chest X-ray	Treatment history (m)	Pathologic types	Bowel thickness (cm)	Obstructed sites	Stricture		
						+/−	S/M[b]	Length (cm)
1	Active	No	Ulcerohypertrophic	1.5	Ileum	+	Single	> 10
2	Inactive	9	Hypertrophic	1.0	Jejunum	+	Single	2
3	Active	1	Ulcerohypertrophic	1.4	Ileum	+	Multiple	> 10
4	Normal	1	Ulcerohypertrophic	1.2	Ileum	+	Single	2
5	Active	7	Ulcerohypertrophic	1.8	Ileum	+	Single	2
6	Normal	No	Ulcerohypertrophic	1.0	Jejunum	+	Single	3
7	Normal	1	Ulcerohypertrophic	1.2	Ileum	+	Multiple	> 10

[a]Two patients who had obstruction caused by adhesion were excluded from this table
[b]Single/multiple

1995, we identified 22 patients who were operated on for abdominal complications. There were 15 men and 7 women. The patients ranged in age from 17 to 73 years old (mean age = 45 years). Six patients underwent surgery for segmental small bowel resection, seven for ileocecectomy, seven for right hemicolectomy, and two for adhesiolysis. The diagnosis of abdominal tuberculosis in 20 patients was made when histologic tissue examination revealed granulomatous inflammation with either acid-fast bacilli or caseation necrosis. Although pathological proof was not obtained in the remaining two patients, one of whom underwent adhesiolysis for bowel adhesion and the other who underwent right hemicolectomy due to fistula, the underlying cause of adhesion and fistula was highly suggestive of intestinal tuberculosis because both patients had multiple calcified mesenteric lymph nodes scattered diffusely in the peritoneal cavity. Twelve patients had active tuberculous lesions in the chest and four had inactive lesions; the remaining six showed no evidence of tuberculous lesions. The 12 patients with active chest lesions underwent antituberculous drug therapy, and surgery for abdominal complication was performed during (n = 10) and after (n = 2) medical treatment. These patients were treated for 9–12 months with a combination of three or four drugs, including myambutol, pyrazinamide, isoniazid, and rifampicin.

The 23 surgically proven abdominal complications in 22 patients included intestinal obstruction (n = 9), perforation (n = 8), fistula formation (n = 3), and intestinal bleeding (n = 3); one patient had both perforation and intestinal bleeding. In each patient, the hospital records, operative notes, radiological studies, and pathologic examinations of the surgical specimens were reviewed. Of these patients, CT scans were available in 17 patients, the interval between CT and surgery was 2 days to 2 months (mean = 25 days). CT was performed using commercially available equipment with 5-, 8-, or 10-mm collimation at 8- or 10-mm intervals from the dome of the diaphragm to the symphysis pubis. Patients routinely received oral and intravenous (IV) contrast material. The IV contrast medium was administered as a bolus followed by rapid drip infusion. Other available radiological studies included barium studies (barium enema or small bowel follow-through) in 13 patients and visceral angiography in two.

On radiologic and pathological examination, the following features were evaluated: bowel wall involvement patterns (thickness and length of the involved bowel and observation of serosal surface), pathologic types of lesion (ulcerative, hypertrophic, or ulcerohypertrophic), gross appearance of ulcer or stricture (multiplicity and length), and presence or absence of perienteric or peritoneal changes, adhesion, obstruction, or fluid collection. On CT, the bowel wall was considered to be thickened when it was thicker than 3 mm with the lumen well distended [4].

Results

Obstruction (n = 9)

Clinical symptoms of patients with obstruction were abdominal pain, distention, or palpable mass. Strictures were the cause of obstruction in seven patients (Table 1) (Fig. 1). There were single stricture in five and multiple in two. In the two remaining patients, bowel adhesion was a primary cause for bowel obstruction. In two patients, granulomatous masses (6.2 × 7.3 and 2.5 × 1.5 cm) seemed to partly cause bowel obstruction because they were seen just distal or proximal to the strictured areas (Fig. 2). The bowel wall was thickened in seven of nine patients (mean = 1.3 cm); on CT, the serosal surface appeared irregular in four and smooth in the remaining five. Microscopically, the thickened or hypertrophic intestinal wall consisted mainly of moderate to severe subserosal fibrosis and fibrous adhesion of the perienteric or pericolic fat tissues. Geographic, transverse, or irregular ulcerations were present in six patients; microscopic examinations of these patients disclosed that fibrosis was prominent in the submucosa adjacent to the ulcerations or erosions. Lymphadenopathy was seen in the mesentery or paraaortic space in seven patients. Obstruction developed during antituberculous therapy in five patients.

Perforation (n = 8)

The most common clinical symptoms in these patients included diffuse abdominal pain, fever, or tender palpable mass; one patient also complained of vomiting and intestinal bleeding. There were single perforation sites in four patients and multiple sites in the remaining four; the perforation was described to occur at the antimesenteric border of the intestine in one and at the mesenteric border in another, but there was no mention of the exact site on the pathologic reports in the remaining patients. Five patients exhibited both intestinal obstruction caused by

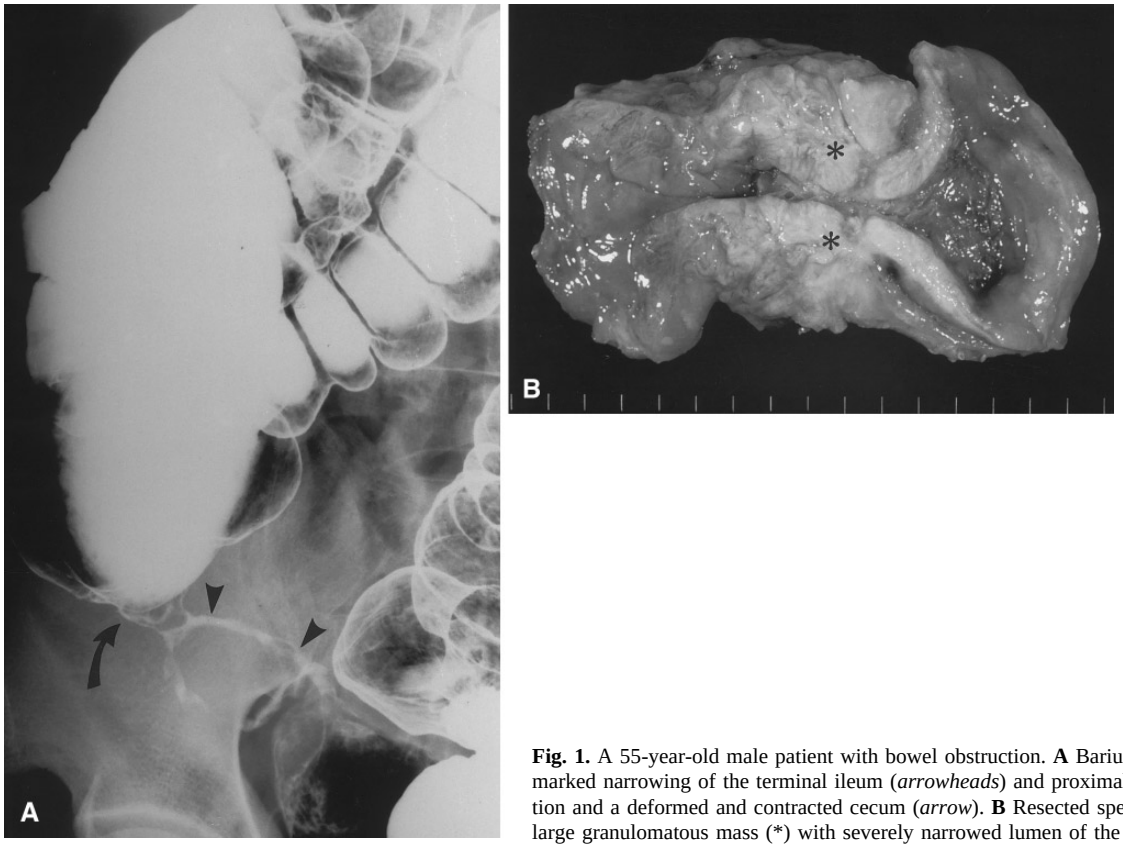


Fig. 1. A 55-year-old male patient with bowel obstruction. **A** Barium enema shows marked narrowing of the terminal ileum (*arrowheads*) and proximal ileal loop dilatation and a deformed and contracted cecum (*arrow*). **B** Resected specimen shows a large granulomatous mass (*) with severely narrowed lumen of the distal ileum.

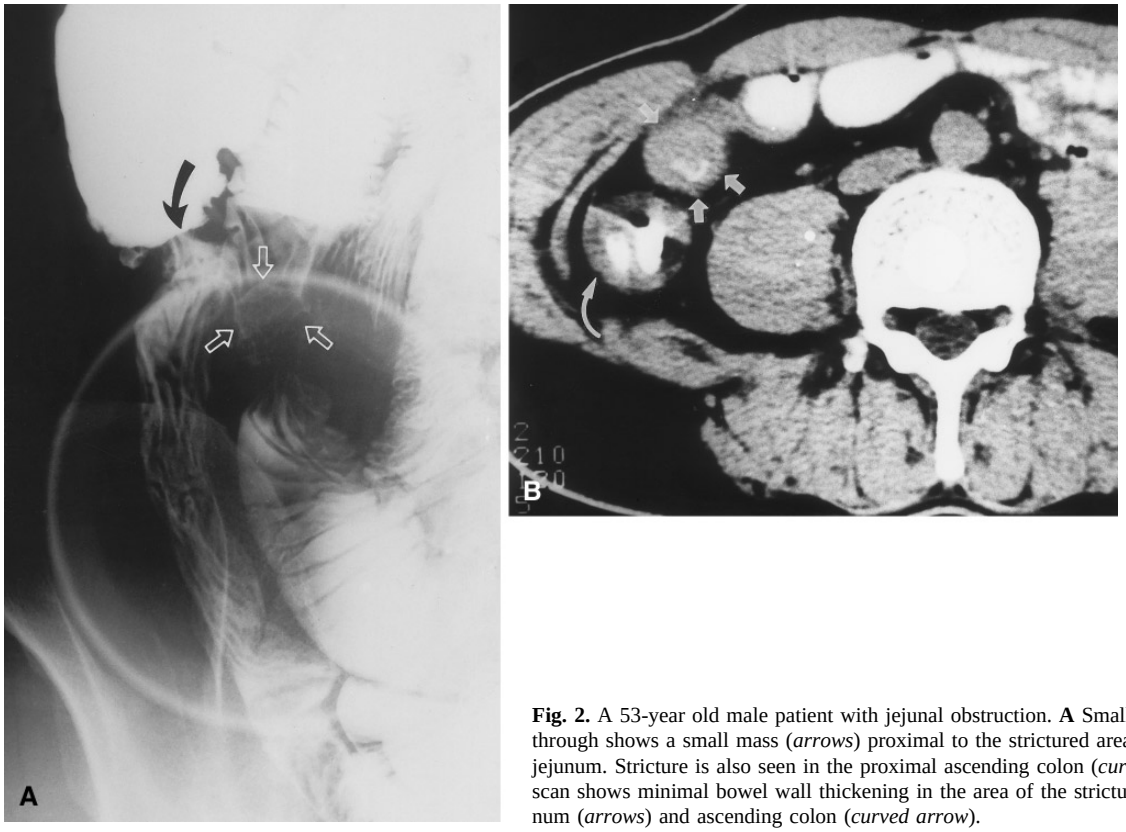
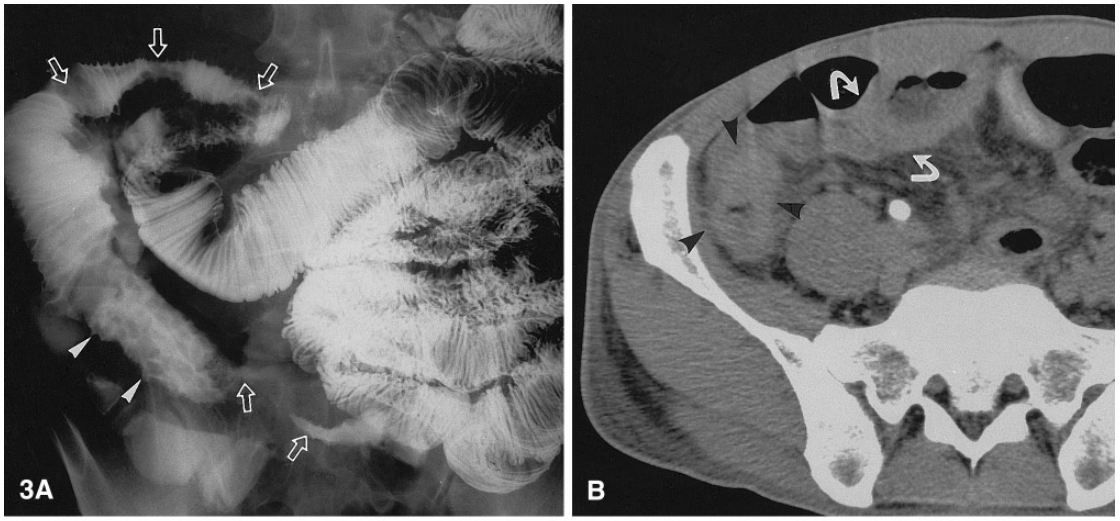


Fig. 2. A 53-year old male patient with jejunal obstruction. **A** Small bowel follow-through shows a small mass (*arrows*) proximal to the strictured area of the proximal jejunum. Stricture is also seen in the proximal ascending colon (*curved arrow*). **B** CT scan shows minimal bowel wall thickening in the area of the strictures in the jejunum (*arrows*) and ascending colon (*curved arrow*).



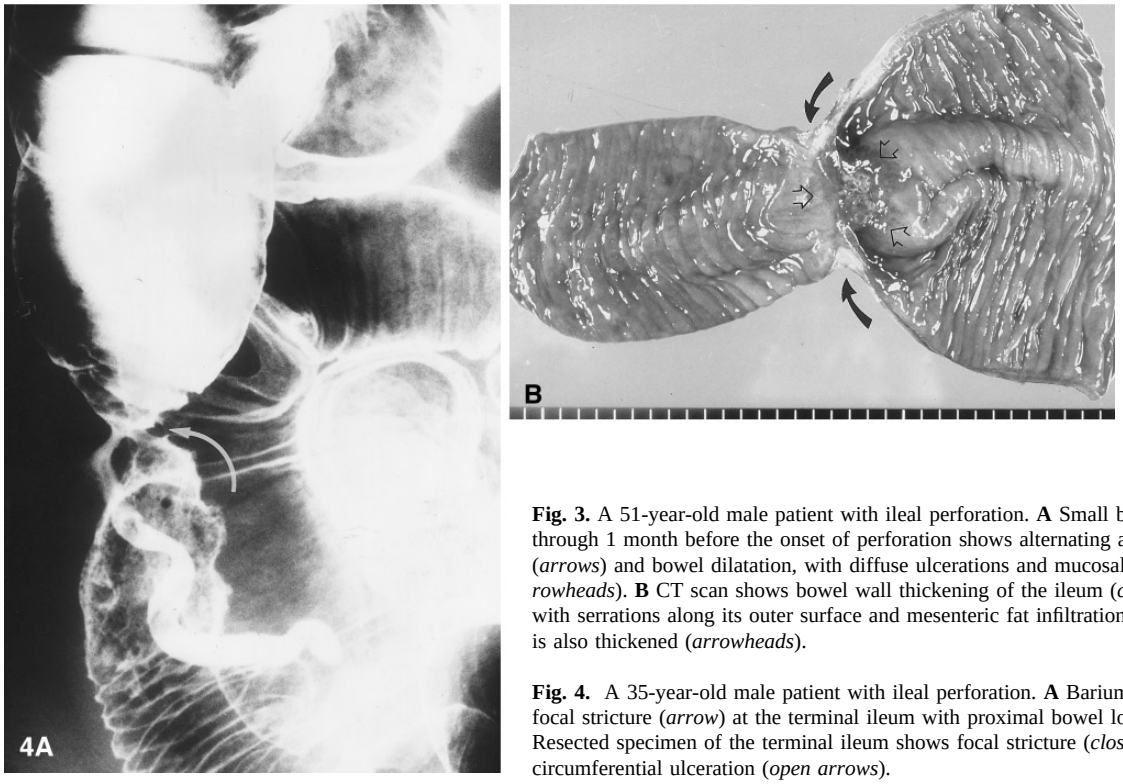


Fig. 3. A 51-year-old male patient with ileal perforation. **A** Small bowel follow-through 1 month before the onset of perforation shows alternating areas of stricture (*arrows*) and bowel dilatation, with diffuse ulcerations and mucosal nodularity (*arrowheads*). **B** CT scan shows bowel wall thickening of the ileum (*curved arrows*), with serrations along its outer surface and mesenteric fat infiltration. The cecal wall is also thickened (*arrowheads*).

Fig. 4. A 35-year-old male patient with ileal perforation. **A** Barium enema shows focal stricture (*arrow*) at the terminal ileum with proximal bowel loop dilatation. **B** Resected specimen of the terminal ileum shows focal stricture (*closed arrows*) and circumferential ulceration (*open arrows*).

stricture and ulcerations in the dilated proximal bowel loop (Figs. 3, 4) (Table 2). In the remaining three patients, there were multiple deep ulcerations without obstruction. The ulcers in these patients were described on pathologic examinations as transverse or circumferential, ovoid, or irregular. On CT scans, bowel wall was thickened in all patients (mean = 1.1 cm), with irregular serosal surface in seven. Moderate to severe perienteric infiltration was noted in all patients, with diffuse mesenteric or paraaortic lymphadenopathy in seven. Exudative fluid or pus of varying amounts (100–2000 cc) accumulated in the peritoneal cavity. Free perforation occurred in five and localized abscess formation occurred in the remaining three.

Fistula (n = 3)

Clinical symptoms of patients with fistula included chronic abdominal pain or palpable mass. Types of fistula were duodenocolic in one patient, enteroenteric in one, and ileocolic and enterocutaneous in one. The common feature in these three patients was the presence of focal or

Table 2. Summary of findings in patients with bowel perforation secondary to intestinal tuberculosis

Case	Chest X-ray	Treatment history (m)	Pathologic type	Bowel thickness (cm)	Perforated sites	Stricture		
						+/−	S/M	Length (cm)
1	Active	2	Ulcerative	1.0	Ileum	−	—	—
2	Inactive	No	Ulcerohypertrophic	1.0	Jejunum	+	Single	5
3	Active	No	Ulcerative	0.4	Ileum	−	—	—
4	Active	3	Ulcerohypertrophic	1.2	Ileum	+	Multiple	> 10
5	Active	2	Ulcerohypertrophic	1.6	Cecum	+	Single	> 10
6	Active	4	Ulcerative	1.0	Ileum	+	Multiple	> 10
7	Active	No	Ulcerohypertrophic	1.5	Ileum	+	Multiple	> 10
8	Active	No	Ulcerative	0.7	Ileum	−	—	—

multiple areas of stricture in the colon or small bowel and severe adhesions (Fig. 5). The adhesions were limited to the area of the fistulous tract or were present throughout the entire peritoneal cavity, although it was unclear as to whether their presence represented the secondary change of the fistulae or was one of the primary causes of fistula formation. In all three patients, the bowel wall appeared to be fibrotic and thin with a smooth outer surface. One patient had history of prior antituberculous therapy of 18 months' duration.

Gastrointestinal bleeding (n = 3)

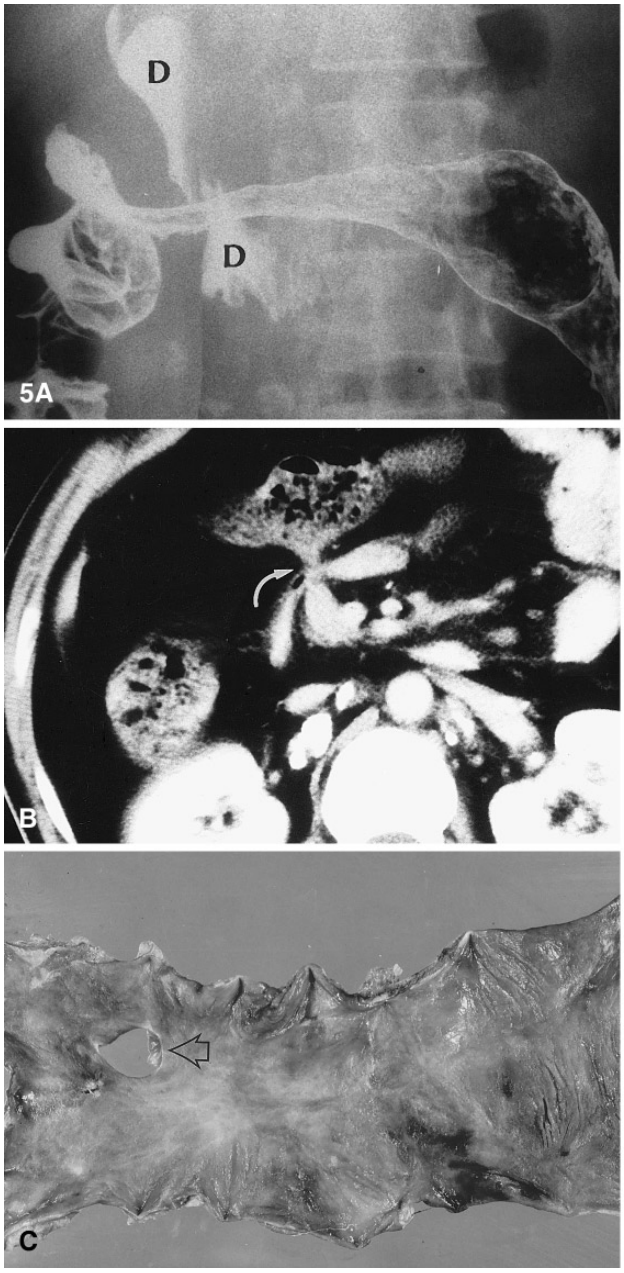
In two of the three patients, bleeding sites were detected preoperatively by angiography, but control of the bleeding failed in both patients, although vasopressin infusion through the arterial catheter was attempted. In the first patient, bleeding was caused by a 15-cm geographic, longitudinal, ulceration penetrating up to the submucosal layer from the cecum through the ascending colon (Fig. 6). This patient had acute renal failure secondary to the severe pancreatitis, which appeared to be an important precipitating cause of the bleeding. Bleeding in the second patient occurred during the early period (2 weeks) of antituberculous therapy. Pathologic examination confirmed the presence of multiple mucosal ulcers (0.1–0.2 cm) in the ileum. The third patient, whose bleeding site was not detected preoperatively, also had perforation of the ileum with a long length of stricture (>10 cm) and diffuse lymphadenopathy in the mesentery and paraaortic regions. Pathologic examination showed a long segmental involvement of the ileum (21 cm), with diffuse irregular mucosal ulcerations and a thickened intestinal wall. The first and third patients expired within a month following surgery.

Discussion

Intestinal tuberculosis manifests three gross pathological types, namely ulcerative, hypertrophic, or ulcerohypertrophic. Some relationship seems to exist among the number of tubercle bacilli, their virulence, and the pathological types [5]. Although most patients with intestinal tuberculosis respond favorably to medical therapy [1], surgery should be reserved for complications such as obstruction, free perforation, confined perforation with abscess or fistula, and massive bleeding [2, 6, 7]. However, as our study and others [3, 8] have demonstrated, such complications can occur frequently during treatment with antituberculous drugs.

Among various complications of intestinal tuberculosis, obstruction is the most common and has been reported in 12–60% of patients [1, 3, 5]. In our study, the most important single feature in patients with this complication was the presence of stricture caused by the hypertrophy of the intestinal wall. The bowel adhesion also has a minor role in some patients. Although the stricture did not usually extend more than 2–3 cm in length, three of nine patients with obstruction showed a long length of involvement (10 cm or more). Such patients with long strictures or multiple areas of involvement seem less likely to respond to medical treatment [8]. Healing by cicatrization during the course of antituberculous therapy increases the tendency to develop obstruction [3, 8], and the use of modern chemotherapeutic agents, such as rifampicin, also partly plays a role in developing cicatrization [9]. In addition, all four patients with stricture involving the jejunum developed complication: obstruction in two and perforation in the remaining two.

Free perforation occurs in 1–10% of patients [3, 6, 7]. Perforation can also be confined to a localized area, presumably due to the preexisting adhesive change [10] or hypertropied intestinal wall [5]. The single most important feature in patients with this complication was the presence of bowel obstruction caused by stricture, with ulcerations in the dilated proximal loop. The high prevalence of thickened wall and irregular serosal surface noted on CT reflected the pathological type of lesion associated with this complication; most cases showed an ulcerative or ulcerohypertrophic type. In two patients, the perforations were multiple, indi-



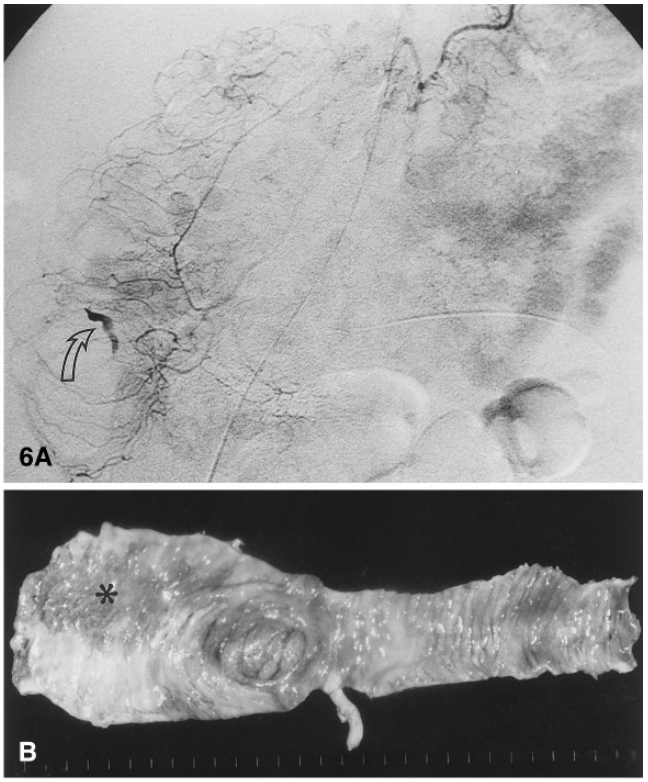


Fig. 5. A 40-year-old male patient with coloduodenal fistula. **A** Barium enema shows barium-filled duodenum (*D*) due to the presence of fistula. **B** CT scan favorably demonstrates a fistulous tract (*arrow*) connecting the colon and the duodenum. **C** Resected specimen shows a fistulous opening (*arrows*) in the transverse colon. The bowel wall is thin and fibrotic.

Fig. 6. A 48-year-old male patient with intestinal bleeding. **A** Bleeding site in the ascending colon (*arrow*) is well demonstrated on visceral angiogram. **B** Resected surgical specimen shows a geographic longitudinal ulceration in the ascending colon (*).

cating that they developed from a transmural ulcerative process or "blow-out" from a dilated bowel segment proximal to the stricture. Although only one such patient was observed in our series, other researchers [11, 12] have demonstrated that perforations occur most often along the antimesenteric border of the small intestine. Intestinal perforation related to *Mycobacterium tuberculosis* in patients with AIDS has also been reported [13, 14]. In contrast to our cases in which several acid-fast bacilli were noted within the granulomas or caseous necrotic debris, the most striking finding in the AIDS patients was the extremely large number of acid-fast bacilli invading the full thickness of the intestinal wall, presumably due to impaired T-cell function [13].

Fistulae also occur in intestinal tuberculosis in 1–44% of patients [5, 15, 16]. Although the number of patients in our study was limited, common features in patients with fistulae included the presence of focal or multiple areas of stricture, severe adhesions, and fibrotic bowel wall. The fistulae may result from either secondary bacterial invasion of the necrotic area in the bowel with a penetrating abscess [5] or the sequelae of the confined perforation. The primary cause of coloduodenal fistulae in one patient was uncertain.

Intestinal bleeding caused by intestinal tuberculosis is very rare [17, 18]; there were no cases in a study of 300 patients with abdominal tuberculosis [3], and only one case was observed in another study of 102 patients [17].

The rarity of this complication may be attributable to the fact the ulcer develops from endarteritis [3]. Despite the limited number of patients in our study, all bleeding seemed to originate from the diffuse ulcerations of the intestinal mucosa. Because two of the three patients expired within a month following surgery, bleeding episodes in patients with diffuse ulceration in a long bowel segment may have a poor prognosis.

The aforementioned observations were obtained primarily from the pathological examinations following surgery by using a basis of radiological findings and clinical notes. However, for identifying the high-risk group of patients prior to surgery, radiologic examinations may have decisive roles. CT has advantages for evaluating bowel wall involvement patterns, extraluminal space, and changes in other organs. However, CT has an inherent limitation for demonstrating the mucosal abnormalities such as ulceration. Furthermore, one important feature, namely stricture, cannot be depicted directly on CT. In contrast, barium studies (barium enema or small bowel follow-through examination) are obviously advantageous for assessing mucosal ulceration or stricture. Therefore, barium study seems to be a better choice for selecting patients with high risk for complication. In addition, the limitation of our study was the lack of no control group of patients with intestinal tuberculosis without abdominal complications. Therefore, whether the common features associated with each complication are the real risk factors for predicting the abdominal complications should be evaluated further.

In conclusion, understanding of the radiologic and pathologic features of intestinal tuberculosis with abdominal complications should help in making an appropriate clinical decision for treatment strategy. Close observation is also necessary, especially in those patients who are acutely ill during antituberculous medical therapy.

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