

## Intestinal Tuberculosis: Findings on Double-Contrast Barium Enema

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**Abstract.** Seven cases of intestinal tuberculosis in an active stage were studied by the double-contrast barium enema (DCBE) method. Formerly, diagnosis of intestinal tuberculosis in the early stage by single-contrast barium enema (SCBE) and barium meals was based on functional phenomena, such as spasm and hypermotility of the ileocecal region. Presently, this can be better accomplished by DCBE. DCBE enables the detection of shallow ulcers with their characteristic elevated margins. These ulcers are frequently slim and transversally oriented. Confluence of ulcers may create whole girdle ulcers or affect entire segments. In more advanced stages, characteristic deformities, also evident by SCBE, such as symmetrical annular stenoses, shortening, retraction, pouch formation, and the frequently observed pathology of the ileocecal valve and the cecal region, acquire a new dimension with DCBE.

**Key words:** Tuberculosis, gastrointestinal — Radiography — Endoscopy.

Until recently, intestinal tuberculosis has been considered a rare chronic disease occurring mainly in people from developing countries [1]. Sporadic reports from Asia [2], India [3], the Middle East [4], Africa [5], and even from Western countries [6–11] were published in the last two decades.

In the last few years an increased incidence of tuberculosis in patients suffering from AIDS has been noticed [12–14]. Compared to the nonimmunosuppressed, AIDS patients with tuberculosis most

frequently develop the extrapulmonary form [12, 14–16]. As a result, reports have begun to appear on the occurrence of intestinal tuberculosis in these patients [17, 18].

X-ray studies correlating the pathophysiology of intestinal tuberculosis have been well and amply documented in the past [19–21]. Reports on the radiographic findings of intestinal tuberculosis by double-contrast barium enema (DCBE), which has been rapidly improved and become a routine examination, are few in the English literature and mainly come from Japanese investigators [22–28]. But even these reports are sometimes based on cases in the scarring or overt scar stage [22].

We present herein the roentgenographic findings as seen by DCBE in seven cases of intestinal tuberculosis in the active stage. Special attention is paid to the study of ulceration pointing out the characteristic features which may enable a correct diagnosis.

### Materials and Methods

At our institution, during the 15-year period between April 1971 and March 1987, we diagnosed seven cases of intestinal tuberculosis in the active stage by DCBE. All of them fulfilled the criteria proposed by Paustian and Bockus [29]. We considered the disease to be in its active stage in all cases where an ulcer could be demonstrated as a niche on the x-ray film.

The patients consisted of four men and three women with ages ranging from 18–62 years (Table 1). Their chief complaints, in order of frequency, were diarrhea (N = 3), fever (N = 3), right lower quadrant pain (N = 2), abdominal fullness (N = 2), and decreasing body weight (N = 2).

Chest x-ray films showed signs of pulmonary tuberculosis in four cases, one being in the clinically active stage with numerous tubercle bacilli found in the sputum. The tubercle bacillus was cultured from the feces in two cases, but in one of these it was not considered as a sign of intestinal tuberculosis because of the concomitant presence of the bacillus in the sputum [30]. Positive cultures from mesenteric lymph nodes obtained during surgery were reported in the other two patients. All cases presented typi-

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**Table 1.** Main characteristics of seven cases of active intestinal tuberculosis

Case	Age/sex (yr)	Chief complaint	Site of involvement	Evidence of intestinal tuberculosis	Chest x-ray
1	36/M	Diarrhea, fever	Cecum ~ descending colon (sporadically)	Caseating granulomas in colonoscopic biopsy specimen	Active tuberculosis
2	18/F	Right lower abdominal pain, weight loss	Cecum ~ ascending colon	Laparotomy, macroscopic finding. Caseating granulomas in mesenteric lymph nodes. Positive culture from lymph node	Normal
3	36/M	Diarrhea, weight loss	Cecum ~ ascending colon	Laparotomy, macroscopic finding. Caseating granulomas in mesenteric lymph nodes. Positive culture from lymph node	Old tuberculosis
4	52/M	Abdominal fullness	Transverse colon	Laparotomy, surgical resection. Caseating granulomas in bowel wall and mesenteric lymph nodes	Normal
5	42/F	Diarrhea, fever	Cecum ~ descending colon (skip lesions)	Caseating granulomas in colonoscopic biopsy specimen	Old tuberculosis
6	62/F	Abdominal fullness, fever	Cecum ~ transverse colon Sigmoid	Laparotomy, macroscopic finding. Surgical resection of stenosis. Caseating granulomas in the bowel wall and mesenteric lymph nodes	Old tuberculosis
7	46/M	Right lower abdominal pain	Ileocecal valve, terminal ileum	Laparotomy confluence of noncaseating and scarce caseating granulomas in the bowel wall and mesenteric lymph nodes	Normal

cal histological findings of the tuberculosis in tissues obtained during colonoscopy (N = 2) or at laparotomy (N = 5).

Two patients (cases 1 and 7) had laparotomy, and the other patients underwent antitubercular chemotherapy and showed clinical and radiological improvement with the disappearance of ulcers and a relative distention of the stenoses after a short period, with no evidence of recurrence (Table 1).

## Results

All cases presented with ulcerations and characteristic deformities of intestinal tuberculosis. Ulcers in the early stage were usually shallow with prominent elevated margins (Fig. 1). Sometimes their irregular borders gave a stellate appearance (Figs. 1 and 4). Slim ulcers with elevated margins and oriented perpendicularly to the colon's longitudinal axis were frequently observed (Figs. 1 and 2). Also seen was the confluence of ulcers creating a whole girdle ulcer (Figs. 2 and 5). This confluence when more generalized could affect entire segments (Figs. 3 and 6).

Due to fibrosis, the areas over the girdle ulcers sometimes showed a stenotic tendency (Figs. 2 and 5). Pouch formation was observed in one case (Fig. 2). Hyperplastic effects were seen as polypoid-like formations (Figs. 2 and 3) or producing stenosis (Fig. 4).

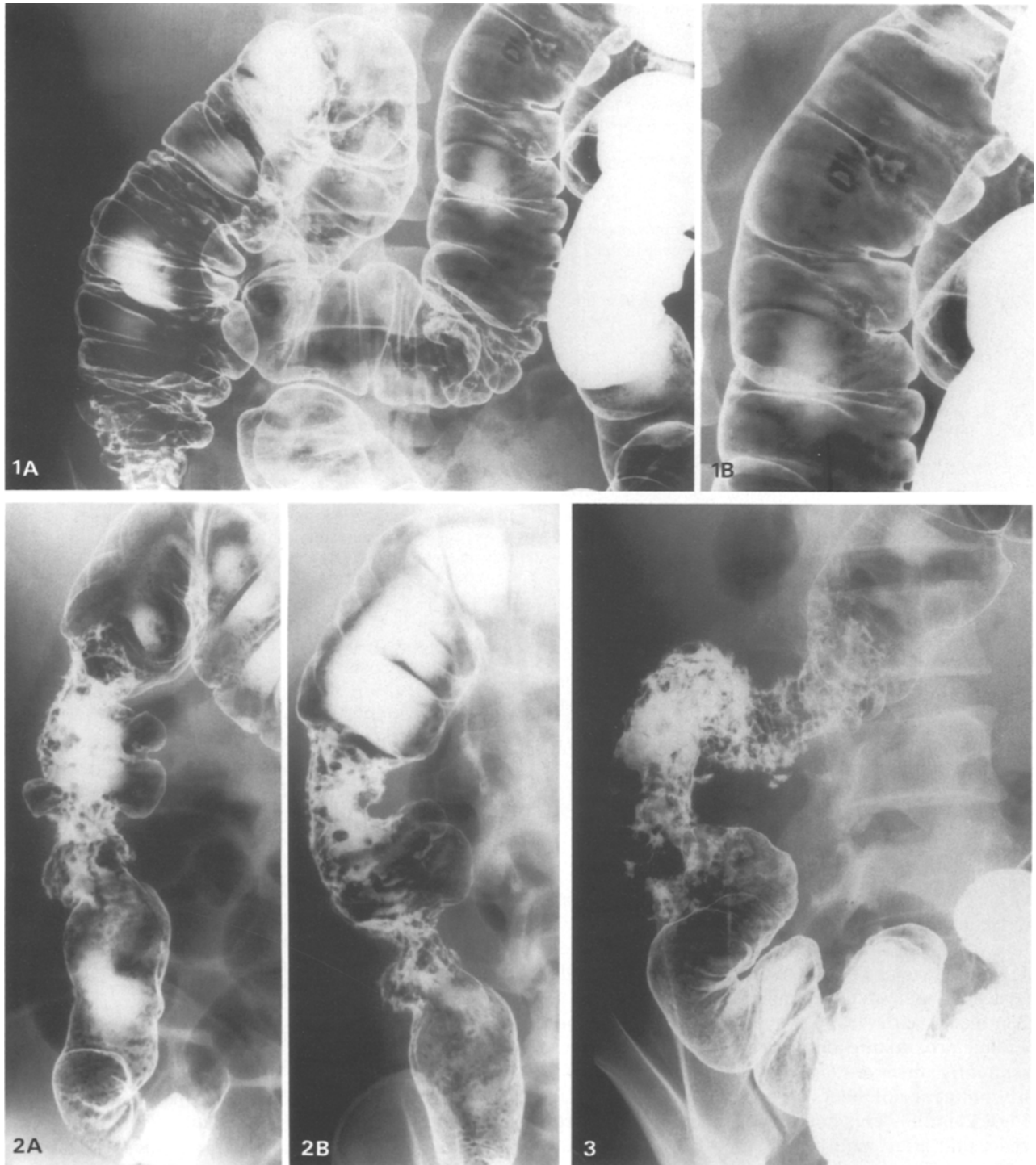
The ileocecal region was frequently affected and the ileocecal valve was a common site of involvement (Figs. 2, 3, 6, and 7). In earlier stages an edem-

atous valve was seen (Fig. 7) and, when more advanced, fibrosis with retraction produced a fixed valve that often was gaping and incompetent (Figs. 2, 3, and 6). The sigmoid was affected in only one case (Fig. 6) and the rectum was always preserved. The terminal ileum was affected in its preterminal segment in one case (Fig. 6) and in another case it was the most affected part showing superficial longitudinal ulcerations.

Two cases were considered to be in an early stage. Case 1 presented only small and shallow irregular ulcers distributed in the colon (Fig. 1). Case 7 presented an edematous ileocecal valve with superficial longitudinal ulcerations in the terminal ileum accompanied by marked lymphoid hyperplasia (Fig. 7).

The distinct roentgenographic findings in these patients can be summarized as follows:

1. Shallow ulcers with elevated margins sometimes presenting a stellate appearance (Figs. 1 and 4).
2. Slim ulcers frequently arranged perpendicularly to the colonic longitudinal axis (Figs. 1 and 2).
3. Confluence of ulcers forming whole girdle ulcers with a tendency toward symmetrical stenosis (Figs. 2, 3, 5, and 6).
4. Short and symmetrical circular stenosis (Figs. 4 and 6).
5. Deformed and retracted cecum accompanied by a fixed, irregular and frequently gaping and incompetent ileocecal valve (Figs. 2, 3, and 6).

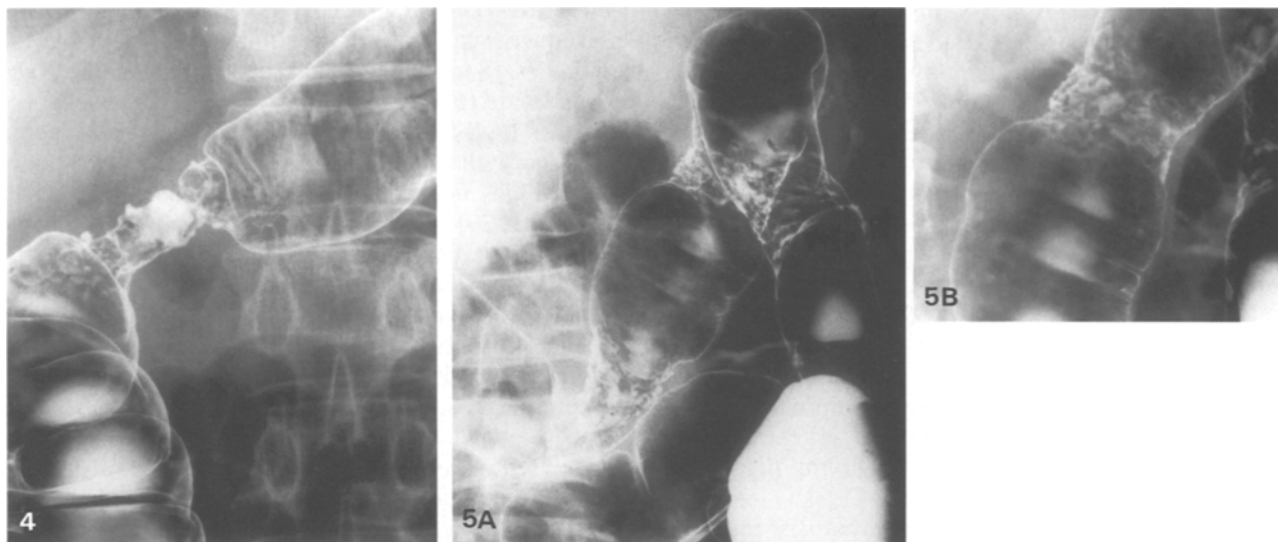


**Fig. 1.** *Case 1.* Early stage of tuberculous colitis. **A** Shallow and irregular ulcers are sporadically distributed in the cecum and ascending and transverse colon. **B** Close-up view of the transverse colon showing that each irregular ulcer has a marginal elevation whose longitudinal axis runs perpendicular to the colonic longitudinal axis.

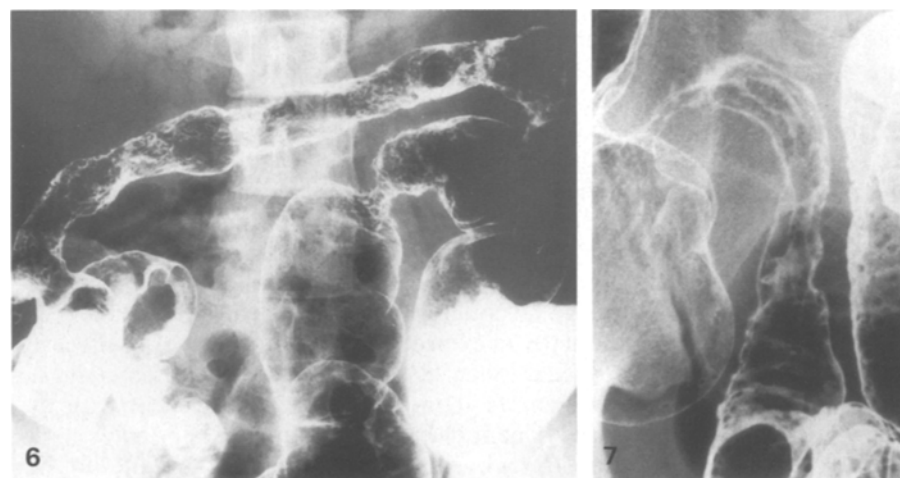
**Fig. 2.** *Case 2.* **A, B** In the shortened ascending colon two stenosing girdle ulcers are seen with pouch formation. Small ulcers and polyps are seen on the mucosal surface of the stenoses. Transverse-oriented shallow ulcerations are noted in the pouch area. The cecum is shortened and retracted. The ileocecal valve is

irregular, gaping, and incompetent. In the terminal ileum, lymph follicles are seen. Observe the alignment of terminal ileum, cecum, and ascending colon in the same vertical axis.

**Fig. 3.** *Case 3.* Fine barium collections representing ulcerations are seen in the shortened and narrowed ascending colon. The cecum is retracted and deformed. Sinus tract formation is seen near the hepatic flexure, and a fistula has developed between the cecum and ascending colon. A superficial circular ulceration is seen in the ileocecal valve which is fixed, irregular, gaping, and incompetent, permitting the filling of the terminal ileum.



**Fig. 4.** *Case 4.* In the transverse colon, a short and symmetrical ulcerated annular stenosis with noncancerous spicula formation is observed. Shallow ulcers with stellate appearance and elevated margins are seen at both sides of the stenosis.



**Fig. 5.** *Case 5.* **A** In the transverse and descending colon several girdle ulcers with a tendency to produce symmetrical stenoses are seen as skip lesions. **B** Close-up view of the transverse colon. Confluence of superficial and irregular ulcers creating a whole girdle ulcer.

6. Involvement of the prevolvular segment of the ileum (Figs. 6 and 7).
7. Terminal ileum presenting longitudinal superficial ulcerations accompanied by edema of the ileocecal valve (Fig. 7).
8. Pouch formation (Fig. 2).

## Discussion

Before the AIDS epidemic, tuberculosis was a problem mainly of developing countries [31, 32], with approximately 8–10 million new cases occurring every year, resulting in 2–3 million deaths [14, 33]. It is estimated that half of the population in Africa is infected with the tubercle bacillus [14, 31, 34] compared to 10 million persons in United States [35]. In the majority of healthy individuals the infective organism can survive for years or even decades with-

**Fig. 6.** *Case 6.* The cecum and ascending and transverse colon are markedly shortened and narrowed with a tendency toward annular stenosis. A lead pipe-like appearance is seen simulating ulcerative colitis. The mucosal surface is coarse with small irregular ulcers. The ileocecal valve is irregular, gaping, and incompetent. The terminal ileum is affected in its prevolvular segment. In the sigmoid a circular stenosis with small irregular ulcers on its surface is observed.

**Fig. 7.** *Case 7.* Retrograde double-contrast study of the terminal ileum. A swollen ileocecal valve causing narrowing of the prevolvular segment of the terminal ileum is seen. Superficial longitudinal ulcers are seen in the terminal ileum, and there is marked lymphoid hyperplasia in the distal part of the ileum.

out causing disease [13]. If a deterioration of the immune system occurs, as in AIDS, there will be an increased risk of developing active tuberculosis [13, 32, 35]. Approximately 5–10% of patients with AIDS in the United States are believed to be in-

ected with tuberculosis [15, 36]. Also, probably due to immunosuppression, AIDS patients develop extrapulmonary tuberculosis relatively more often [12, 14, 16, 18, 37]. In the United States, approximately 50% of AIDS patients with tuberculosis have extrapulmonary foci [15]. Even persons with positive HIV serology and positive tuberculin test have an increased risk of developing tuberculosis [14, 15, 32, 36]. Positive HIV serology is found in 12–59% of tuberculosis patients in some African countries [14, 32]. Indeed, the development of tuberculosis can be an early sign of immunosuppression preceding infections by less virulent organisms [16]. Since September 1987 in the United States, extrapulmonary tuberculosis with laboratory evidence of HIV infection has been considered an AIDS qualifying diagnosis [15, 36].

The number of AIDS and tuberculosis cases is expected to increase in the future [15, 32]. Until 1989, 203,599 cases of AIDS were reported in total in the world [38]. WHO estimates that at least 5 millions persons are infected with HIV. In parts of sub-Saharan Africa 20–30% of sexually active adults are infected with HIV [14], being potential targets for the tubercle bacillus. To differentiate from other opportunistic infections occurring in AIDS patients, tuberculosis is a disease that can be transmitted by close contact. AIDS care workers have a high incidence of tuberculin seroconversion [37]. It is not yet known how fast and how far the tubercle bacilli will spread among the world [37].

Thus, we can expect that more cases of intestinal tuberculosis in AIDS patients will appear in the future. From the present literature it is difficult to infer what percentage of AIDS patients are infected with intestinal tuberculosis. Apparently, the clinical presentation does not differ from other patients with intestinal tuberculosis except that probably it could be more severe [17]. There is frequently a cellular anergy reflected in a negative tuberculin test [12, 14, 16, 37] and tendency not to form granulomas [14, 18]. If accompanied by pulmonary tuberculosis it may be very atypical on x-ray films [12–14, 18, 32].

In the past, due to the high incidence of tuberculosis and because of the lack of effective antitubercular chemotherapy, there was great concern to diagnose intestinal tuberculosis at an early stage, before it could lead to fatal consequences [19, 39]. This is still valid, especially in the AIDS patient where the disease is present in a more severe form and because drug resistance may occur [40]. In the last two decades, gastroenterologists have not been so aware of the disease, and usually the diagnosis has been made at an advanced stage with irreversible changes to the bowel. Although the disease has been related to low socioeconomic classes and re-

cently to AIDS, it is not their patrimony [9]. It is still a frequent cause of disease in some developing countries. Sometimes it has been misdiagnosed as Crohn's disease which may yield severe consequences [9, 17, 21]. One should not always expect pulmonary changes in a suspected case of intestinal tuberculosis as it can occur as a solitary entity [3, 10, 17, 18, 21, 29]. In three of our cases no evidence of pulmonary tuberculosis could be demonstrated on chest x-ray films, and they most probably corresponded to primary intestinal tuberculosis.

Radiological diagnosis of intestinal tuberculosis was performed during a long period by means of barium meals and single-contrast barium enemas. In the early stage, where only small and shallow ulcers associated with an irritability of the bowel (probably caused by inflammatory edema around the nerve plexus of the wall) [19] were found, the radiological signs were mainly of functional phenomena described as splitting of the barium meal or spasm and hypermotility of the ileocecal region (Stierlin sign). The ulcer itself as a direct finding was not considered, simply because it was not demonstrated by the single-contrast barium enema [20]. In 1930 Gershon-Cohen [19] applied the DCBE method to diagnose early ileocecal tuberculosis and mentioned not only functional changes, such as spasm and hyperstalsis, but also the visualization of intraluminal lesions. Although he could demonstrate the small ulcers experimentally in excised colons from cadavers with early ileocecal tuberculosis, in only a few cases could he demonstrate them in patients. At present with the improvement of barium mixtures it is possible to diagnose such small shallow ulcers by the DCBE method, DCBE being an accurate reproduction of the macroscopic pathology.

In more advanced stages permanent radiological defects are evident by both SCBE and DCBE. Changes are mainly seen in the ileocecal region because it is the favorite site of tuberculosis [19, 21, 29]. Depending on the amount of fibrosis, retraction, ulceration, and hyperplasia, different radiological findings are seen, such as ulcerations, stenoses, shortenings, and pouch formation. The DCBE permits not only study of the margins of the colon but also its intraluminal surface, so that polypoid lesions and the characteristic transversally oriented ulcers of tuberculous colitis become more evident.

In the only case where the terminal ileum was the main part affected, the ulcerations had a longitudinal orientation. The first target of the tubercle bacilli are the lymph follicles [19–21]. In the colon, lymph follicles have a tendency to be oriented transversally, so ulcers will frequently adopt this axis. In the terminal ileum there are lymph follicles oriented in the longitudinal axis so ulcers can be longitudinal [21]. It is

important to observe that the ileocecal valve in this case was edematous.

Although the clinical course and radiological findings can be very typical of intestinal tuberculosis, it is frequently difficult to prove. Maruyama, after studying clinicopathologically 12 operated cases of ileocecal tuberculosis, concluded that when one could prove girdle or linear ulcers appearing perpendicularly to the colonic axis accompanied by fold convergence and pseudopolyps, the radiological diagnosis may be valid [24]. The diagnosis of colonic tuberculosis can be performed endoscopically, but since granulomas and the tubercle bacilli are often situated in the deeper layers of the intestinal wall or in the regional lymph nodes [29], endoscopic biopsy and culture of the tissues are often negative [4, 41, 42], although more positive results have been reported in smaller series [43, 44]. Six of our seven cases were colonoscoped, but in only two were caseating granulomas seen at biopsies. Therefore, to fulfill the criteria proposed by Paustian and Bockus [29], a diagnostic laparotomy is frequently necessary to obtain tissues for culture and histological analysis. Laparoscopy with biopsy sampling seems to be a good alternative in selected cases [45]. Recently, positive results have been obtained with computed tomography demonstrating preferential thickening of the ileocecal valve accompanied by lymphadenopathy, but in early stage the findings seem to be less specific [17]. Preliminary results of serologic tests give some hope for the future [46].

In conclusion, DCBE permits visualization of the characteristic tuberculous ulcer with its elevated margins. The ulcer itself is shallow, irregular, and frequently arranged perpendicularly to the colonic longitudinal axis. Confluence of ulcers can create whole girdle ulcers. This prompts us to suspect intestinal tuberculosis at an early stage. Typical deformities also evident by SCBE include symmetrical annular stenoses, pouch formation, shortening, and retraction, especially of the cecum and ascending colon areas. Engagement in the ileocecal valve with incompetence is also frequently observed.

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