

[CASE REPORT]

Severe Colitis with Portal Venous Gas Caused by *Brachyspira pilosicoli* Infection

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Abstract:

We herein report a case of *Brachyspira pilosicoli*-caused severe colitis presenting with portal venous gas. A 75-year-old man was admitted because of a fever, severe abdominal pain and bloody diarrhea. He was negative for anti-HIV antibodies. He had been in close contact with a dog earlier. Abdominal computed tomography detected severe wall-thickening and fat-stranding of the entire colon accompanied by portal venous gas. A smear examination of his stool showed many Gram-negative spiral rods, suggesting intestinal spirochetosis. A polymerase chain reaction assay using stool samples detected an amplified band specific for *B. pilosicoli*. He responded well to antimicrobial agents including metronidazole.

Key words: *Brachyspira pilosicoli*, intestinal spirochetosis, severe enterocolitis, portal venous gas

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Introduction

Intestinal spirochetosis is mainly caused by two types of Gram-negative spiral rod *Brachyspira* species: *B. pilosicoli* and *B. aalborgi*. *B. pilosicoli* infects a wide range of animals, such as humans, dogs, pigs, monkeys and chickens, whereas *B. aalborgi* causes spirochetosis only in humans and primates (1). *B. pilosicoli* is considered to be a zoonotic organism capable of being transmitted from animals to humans (2). The major infectious source of these organisms is oral ingestion of contaminated food and water, although contact with infected animals is also regarded as an important source of transmission of *B. pilosicoli* to humans (1). Intestinal spirochetosis has been reported to be common in developing countries but is relatively rare in industrialized countries, except in immunocompromised individuals, such as human immunodeficiency virus (HIV)-positive individuals (2).

Brachyspira species are relatively hard to culture due to

their slow-growing properties and fastidious growth requirement (3, 4). Therefore, the clinical diagnosis of intestinal spirochetosis is commonly based on the histological finding of a dense “false brush border” or so-called fringe formation at the apical surfaces of colonic mucosa (5, 6). The definitive diagnosis is usually made via non-routine methods, including polymerase chain reaction (PCR), electron microscopy and positivity of serum antibody titers against *Brachyspira* species (7).

There has been considerable controversy over the pathological significance of colonization of spirochetes (8). Most cases of intestinal spirochetosis are asymptomatic, suggesting that they are non-pathogenic commensals (4). Previous studies have reported that *B. aalborgi* is mainly associated with asymptomatic intestinal spirochetosis (9, 10), but *B. pilosicoli* sometimes induces mild gastrointestinal symptoms, such as constipation, abdominal distension, abdominal pain, diarrhea and bloody stool (4, 8). Some cases of bacteremia caused by *B. pilosicoli* infection have been reported previously (7, 11, 12).

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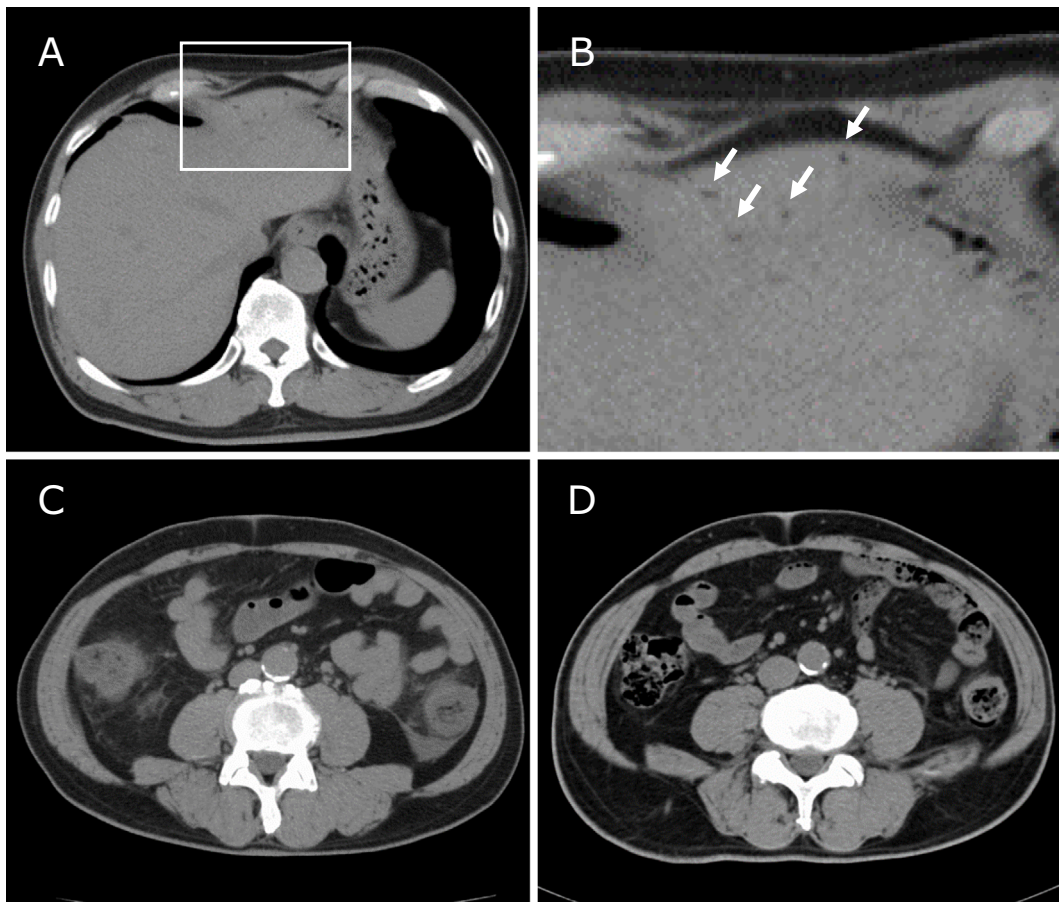


Figure 1. (A-C) Abdominal CT scan on admission. Bowel wall-thickening and fat-stranding of the entire colon with portal venous gas (white arrows). (D) CT scan on the 7th day of hospitalization showed a remarkable improvement in the colitis.

Portal venous gas indicates the presence of severe intestinal lesions and is clinically synonymous with mesenteric infarction (13). This finding sometimes suggests the need for urgent surgical intervention. We herein report a case of *B. pilosicoli*-induced severe colitis presenting with portal venous gas.

Case Report

A 75-year-old man was admitted to the hospital of Shiga University of Medical Science because of a 7-day history of a fever with shaking chills (38.3°C), severe abdominal pain and bloody diarrhea. He was being treated for hypertension. He had no experience with traveling abroad and had had no sexual activity for 15 years. He had been in close contact with a dog one month earlier.

A physical examination revealed a tenderness without rebound throughout the abdomen, but no skin lesions were apparent. Laboratory studies on admission showed leukocytosis with a left shift [white blood cell (WBC) count $12.2 \times 10^3/\mu\text{L}$ and neutrophils $9.4 \times 10^3/\mu\text{L}$] and elevation of C-reactive protein (1.7 mg/dL). He was negative for HIV antibody, and his serum immunoglobulin and complement levels were normal.

Abdominal computed tomography (CT) detected severe

wall-thickening and fat-stranding of the entire colon, accompanied by portal venous gas in the left hepatic lobe (Fig. 1). Minimal ascites was also observed. A smear examination of his stool showed many Gram-negative spiral rods, suggesting intestinal spirochetosis (Fig. 2). No other pathogens (i.e. *Campylobacter* species, *Salmonella* species, *Shigella* species and *Vibrio* species) were detected by stool culture. A latex agglutination test for *Treponema pallidum* was negative. Colonoscopy was deferred in order to avoid exacerbating the disease and inducing perforation.

He was directed to rest his bowels and was treated with intravenous infusion of tazobactam/piperacillin. After the start of treatment, the abdominal symptoms and hematochezia rapidly improved. A smear examination of his stool suggested intestinal spirochetosis, and the antimicrobial agent was switched to metronidazole. The thickening of the entire colon, fat-stranding, ascites and portal venous gas had all disappeared on abdominal CT on the 7th day of treatment (Fig. 1D).

Previous studies have reported that the length of *B. pilosicoli* is 4 to 20 μm , while that of *B. aalborgi* is 2 to 6 μm (5). The organism in the current case was approximately 10 μm , and *B. pilosicoli* infection was suspected. Close contact with a dog a month earlier also supported this possibility, since *B. pilosicoli* has been reported to be a zoonotic or-

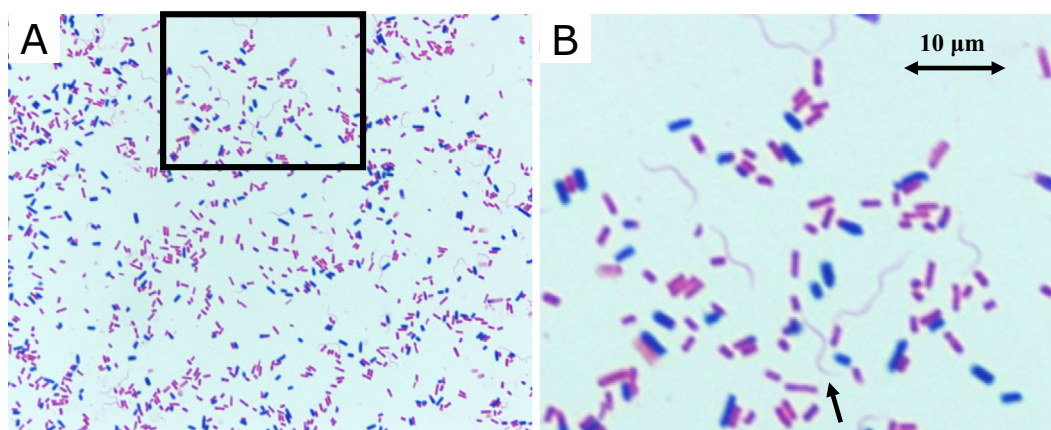


Figure 2. A smear examination of the stool. Gram-negative spiral rods (red arrows) were observed (A: $\times 100$ and B: $\times 400$).

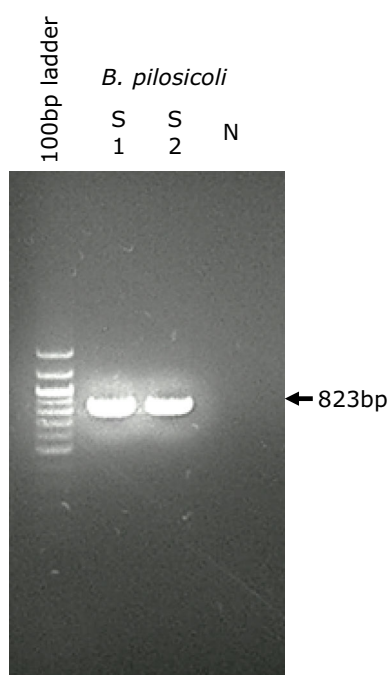


Figure 3. PCR for *Brachyspira pilosicoli* using fecal samples. A PCR-amplified band of 823 bp specific for *B. pilosicoli* was detected. S1: non-dilution, S2: 10-fold dilution, N: distilled water used as negative control.

ganism. In order to confirm *B. pilosicoli* infection, we performed a PCR assay with specific primers for *B. pilosicoli*, as described previously (14). As shown in Fig. 3, the amplified band specific for *B. pilosicoli* was detected in DNA samples isolated from the patient's feces. He was discharged on the eighth day, and colonoscopy three months later revealed no abnormal findings. Recently (approximately one year later), we confirmed negative results of a fecal smear and PCR examination for *B. pilosicoli* in this patient.

Discussion

Human intestinal spirochetosis was first reported by Har-

land and Lee in 1967 (15). This condition is characterized by wide-spread colonization of spirochetes on the surface of the colonic mucosa. The prevalence of intestinal spirochetosis is reported to be between 2% and 7% in Western countries and 11-34% in developing countries (5). Its incidence in Japan (1.7%) is similar to that in Western countries (5). A high incidence of up to 54% has been reported in homosexual men and HIV-positive patients (4). The incidence of intestinal spirochetosis is associated with geography, hygiene and immune condition.

Most cases of intestinal spirochetosis are asymptomatic, but *B. pilosicoli* infection sometimes adopts a serious clinical course, such as bacteremia, under immunocompromised conditions or in critically ill patients (12, 16). However, a case of portal venous gas with *B. pilosicoli*-associated colitis has not been reported in the literature. Another characteristic of the present case was the patient's health condition. He was 75 years old but had no remarkable abnormality in his health. Bait-Merabet et al. reported that an age over 50 years old is a factor associated with severe disease activity of *B. pilosicoli* infection (12). Therefore, age-related dysfunction of the mucosal immune system might have contributed to disease aggravation in this patient.

Portal venous gas indicates underlying serious mucosal damage of the intestine, such as mesenteric infarction and/or bowel necrosis (13). However, this condition has also been reported in benign pathology, such as enterocolitis or localized obstruction (17). It is considered difficult to differentiate benign from life-threatening causes based on imaging alone (13). The current case showed serious symptoms of colitis, and CT suggested the presence of severe mucosal lesions throughout the entire colon. These indicated that *B. pilosicoli* infection induced severe colitis and that extensive mucosal damage allowed luminal gas to enter the portal vein. Since severe mucosal damage was suspected, we did not perform colonoscopy in order to avoid exacerbation of the disease or intestinal perforation.

Culture of spirochetes is relatively difficult (3, 4) and clinical microbiologists have not routinely cultured them.

Therefore, intestinal spirochetosis has traditionally been diagnosed on the basis of histological findings in biopsies. In the present case, a smear examination of stool was useful for a rapid diagnosis of intestinal spirochetosis. Previous reports have recommended a stool smear examination for the evaluation of protozoal infection, such as *Giardia* and *Cryptosporidium* (18) as well as *Campylobacter* and/or *Entamoeba* infection (19). However, there are few reports in which a stool smear led to a rapid diagnosis of intestinal spirochetes, except for one report using imprint cytology of biopsy samples (20). The present case may suggest the significance of a stool smear examination in the evaluation of intestinal spirochetes.

The source of spirochetes infection in this patient was suspected of being contact with a dog. This was supported by previous reports. Koopman et al. found identical genotypes of spirochetes among independent isolates originating from humans and dogs with GI disorders (21). These genotypes were not observed in other host species, and they concluded that intestinal spirochetes are transmitted between humans and dogs (21). Another study reported that the incidence of *B. pilosicoli* in the feces of dogs in pet stores was 14.3%, suggesting that dogs might be reservoirs for the spread of *B. pilosicoli* to humans (22).

Two species of spirochetes-*B. pilosicoli* and *B. aalborgi* have been reported to cause intestinal spirochetes in human, and several findings in the current case highly suggested *B. pilosicoli* infection. *B. pilosicoli* and *B. aalborgi* are reportedly distinguishable by their length: *B. pilosicoli* is 4 to 20 μm long, while *B. aalborgi* is only 2 to 6 μm long (5). The organism in the present case was approximately 10 μm long, which is compatible with *B. pilosicoli*. The patient's experience of close contact with a dog also supported *B. pilosicoli* infection. *B. pilosicoli* infects a wide range of animals, including dogs (2), but *B. aalborgi* is known to infect only humans and primates (1). Furthermore, almost all severe cases of intestinal spirochetes in the literature are *B. pilosicoli* infection (4, 7, 11, 12), although *B. aalborgi* has been reported to be associated with asymptomatic infection or mild symptoms. Finally, *B. pilosicoli* infection was confirmed by a PCR assay in this case.

The treatment strategy for intestinal spirochetosis remains controversial (11). Some reports have described a number of patients whose symptoms were resolved after antibiotic treatment, while other reports noted antibiotics to have no effects in asymptomatic patients (11). Most cases of intestinal spirochetosis are asymptomatic, and such patients might not require any treatment. If patients are symptomatic after ruling out of other diseases, eradication therapy should be considered. It is common to use metronidazole or amoxicillin as therapeutic agents (1, 11, 23), but in recent years, the efficacy of penicillin has decreased due to an increase in β -lactamase-producing strains (24).

In the present report, we described a case of severe colitis with portal venous gas induced by *B. pilosicoli* infection. Close contact with a dog was suspected as the source of in-

fection. A stool smear and PCR assay were helpful in arriving at a definite diagnosis.

The authors state that they have no Conflict of Interest (COI).

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