

Perforative Peritonitis by the Infection with Young Adult Female of *Bolbosoma* sp.: A Case Report

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Abstract

A woman who had abdominal colic in her right abdomen was hospitalized for a laparotomy on the suspected suppurative appendicitis. Her disease was in fact perforative peritonitis and a partial resection of the intestine was performed. Incidentally, a parasite was found in the peritoneal cavity near the perforation. The resected intestine, especially in the vicinity of the perforation, was infiltrated with eosinophils and also had an edematous exudative inflammation in the underlayer of the mucosa around the perforation. No mixed bacterial infection was observed. This disease must therefore have been caused by a parasite. A parasitological study identified the extracted worm as *Bolbosoma* sp. To our knowledge, the present case is the third report of infection with *Bolbosoma* sp. in Japan.

Key words: *Bolbosoma* sp.; perforative peritonitis; codfish, morphology; host response.

Introduction

Genus *Bolbosoma* Porta, 1908, belongs to the Order Paraacanthocephala Meyer, 1931 in taxonomy. This family has two genera; one of them is genus *Bolbosoma*. According to Schmidt (1969), there are approximately one thousand species of the class acanthocephala, including *Bolbosoma* sp. Thus many species have the same scientific term because this scientific name, "acanthocephala (acanthocephalan)", was given to the class itself. Even though

some specialists; Delymure (1968), Sokolovskaia (1968), and Parshad and Crompton (1981) reviewed on this class of parasites, these are only a part of the description. Therefore, we still have many open questions in this field today. The case which we will report here was collected in Nemuro, northern Japan and was the third case of *Bolbosoma* sp. in Japan. No case has been reported outside of Japan, according to Tada *et al.* (1983) and Beaver *et al.* (1983). In the present case, we examined the parasite by phase microscopy and by staining of the tissue sections. We also examined the tissue reaction of the accidental host (human being). We will discuss the human infection with *Bolbosoma* sp. as the accidental host of the worm.

Case Report

The patient, a 59 year-old woman who lived in Nemuro, Hokkaido, had been hospitalized for a

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laparotomy. She had eaten Ika-somen (sliced squid) almost every day for about three months before the onset. She had never made contact with domestic animals such as cows, pigs, dogs or marine mammals such as seals or fur seals. On October 20, 1994, she started to have abdominal colic in her right abdomen, and she came to see a doctor two days before the surgery because of her continuous pain. In the first examination, the leukocyte count was increased to 16100, but the number of eosinophils was normal and her bowel opening was regular. No findings of suspectile ileus or intestinal perforation

were observed by roentgenography. However, since her abdominal colic did not abate, she was hospitalized for a laparotomy with suspectile appendicitis in the ileocecal region.

Materials and Methods

Histopathological examination of the intestine: According to the operating surgeon's description, approximately 20 cm of the perforated intestine was resected and fixed in 10% formalin. The 4- μ m sections from the paraffin-embedded specimen were

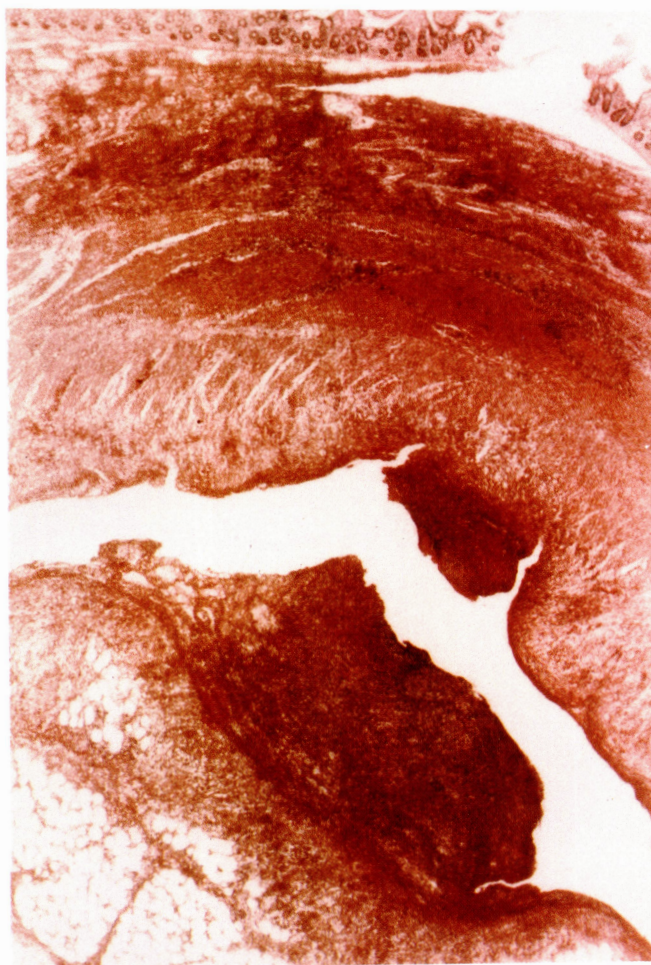


Fig. 1 Histological findings of the resected ileum with perforative peritonitis caused by the *Bobosoma* sp. The ileum and the adjacent peritoneum show edema and infiltration with both neutrophils and eosinophils.



Fig. 2 The permealized view of the young adult female *Bolbosoma* sp. (Acanthocephala: Polymorphidae: *Polymorphus*) from the patient with perforated ileum. In the anterior extremity (A), it shows hooks (h), proboscis (p), and scolex (sc) or bulb. In the middle part of the body (B), numerous eggs (eg) are present in the body cavity, demonstrating of a female form of the worm. In the posterior extremity (C), genital pore (gp) opened in the middle of the terminal end after the trunk (tr).

cut and stained with Hematoxylin-Eosin as routine procedures.

Examination of the parasites: In laparotomy, a white string-like object with more than 1.5 cm in length was identified in abdominal cavity near the perforated intestine. The object was sent to our laboratory for detailed examination. The body length of the worm was 1.75 cm after fixation in 10% formalin. First, this worm was cleared in lactophenol solution for phase microscopic examination. Then the worm was fixed in 10% formalin and embedded in paraffin. The 4- μ m sections from the paraffin block were stained with hematoxylin and eosin, or Giemsa. Because of limitation of the materials, scanning electron microscopy could not be performed.

Results

Macroscopic and microscopic findings on the resected intestine

In laparotomy, transparent yellowish ascites in the abdominal cavity were observed. A flare and swelling near Bauhin's valve of the terminal ileum was observed. Because of ulcer and perforation in the terminal ileum, approximately 20 cm of the intestine was resected. In addition, a white string-like object with more than 1.5 cm in length was identified in abdominal cavity near the serous membrane in the intestinal perforation. This object and the resected intestine were sent to our laboratory for detailed examination. The bacterial culture of ascites failed to detect any bacteria. The tissue section of the perforated ileum is shown in Fig. 1. The intestinal wall was mostly normal except for perforation and ulcer. In contrast, the intestinal wall around the perforation showed severe exudative change and edema with infiltrations with both neutrophils and eosinophils. However, the changes were relatively mild as compared with histopathological changes of bacterial or anisakiosis perforative peritonitis.

The microscopic examination of the parasite

The phase microscopic examination revealed that the worm had divided into three portions: bulb or scolex, neck, and trunk. Fig. 2A shows the scolex or bulb, with a cylinder-like proboscis at the tip of

bulb. Around the proboscis, there are proboscis sheaths, and a root of the proboscis. The root of the proboscis and elliptic proboscis bulb are slightly visible. In addition, at both sides of the proboscis, there are fixed ligaments of the proboscis and proboscis bulb. In each proboscis, bulb and neck, different forms of hooks cover the cuticle. These hooks have different characteristics in each portion and are



Fig. 3 Giemsa staining of the longitudinal section of *Bolbosoma* sp.

In the upper body cavity, there are ovarian balls (ob), mostly unripe, but no digestive tract. In the right lower body cavity, there are uterine (ut) as a cystic space and circular muscle (cmsc). In the left lower body cavity, a part of ovarian balls (ob) is shown. The features are compatible with young adult female of *Bolbosoma* sp.

the markers for identification of the species.

Fig. 2B shows a thick genital tube at the center of the trunk, and also a thin ligament running vertically on both sides. Eggs, mostly unripe, occupied the body cavity assembling ovarian balls and free ovary. Ovarian balls are situated everywhere in the body cavity.

In Fig. 2C, genital pore can be observed in the middle of the posterior end. Several pieces of traction muscle were seen at the end of the tail. Most of the ovarian balls lined up on the sides of the worm and are most likely unripe forms. The central portion of the worm has cavities and cylinder-like ligaments

in the upper and lower parts. A thick cylinder-like object runs slightly protruding from the upper sides of the genital pore.

Fig. 3 shows a longitudinal section of the worm's trunk. Ovarian balls are present in parallel to both side, demonstrating of a female form of the worm. No gastrointestinal tract exists in the body cavity.

Fig. 4 shows the cross section of the lower neck of the worm. There are lacuna in the body wall. Proboscis with proboscis sheath are present in the center of the body cavity. In the body cavity, circular muscles were also present. There was no digestive tract in the body cavity.

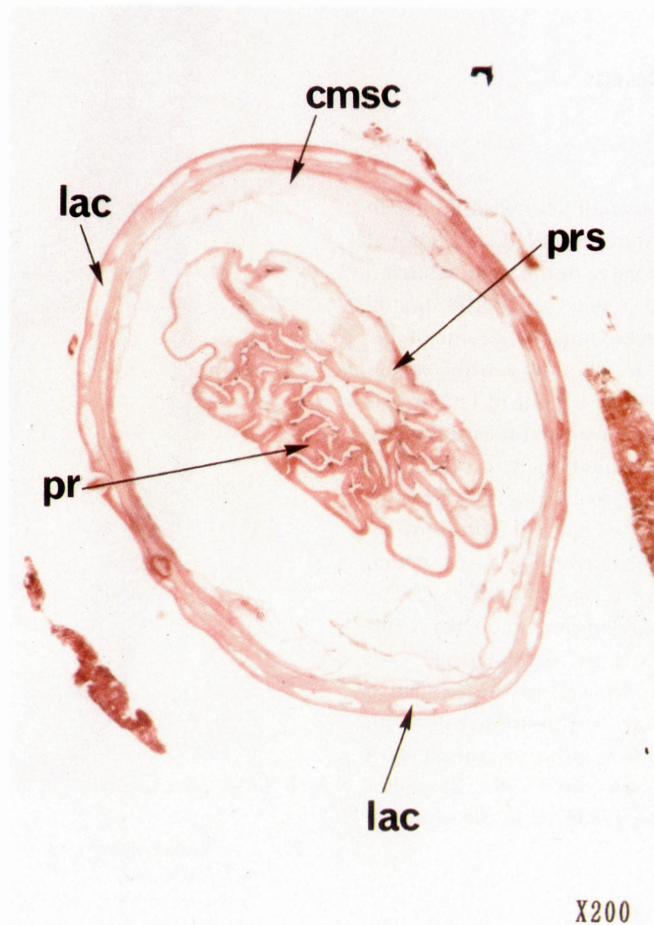


Fig. 4 Hematoxylin-eosin staining of the cross section of *Bolbosoma* sp. It shows a circular muscle (cmsc) and body cavity, in which proboscis sheath (prs) and proboscis (pr) are present. There is lacuna (lac) in the body wall.

In Fig. 5, the characteristic features of the present worm was summarized as a scheme, showing typical features of young adult female *Bolbosoma* sp.

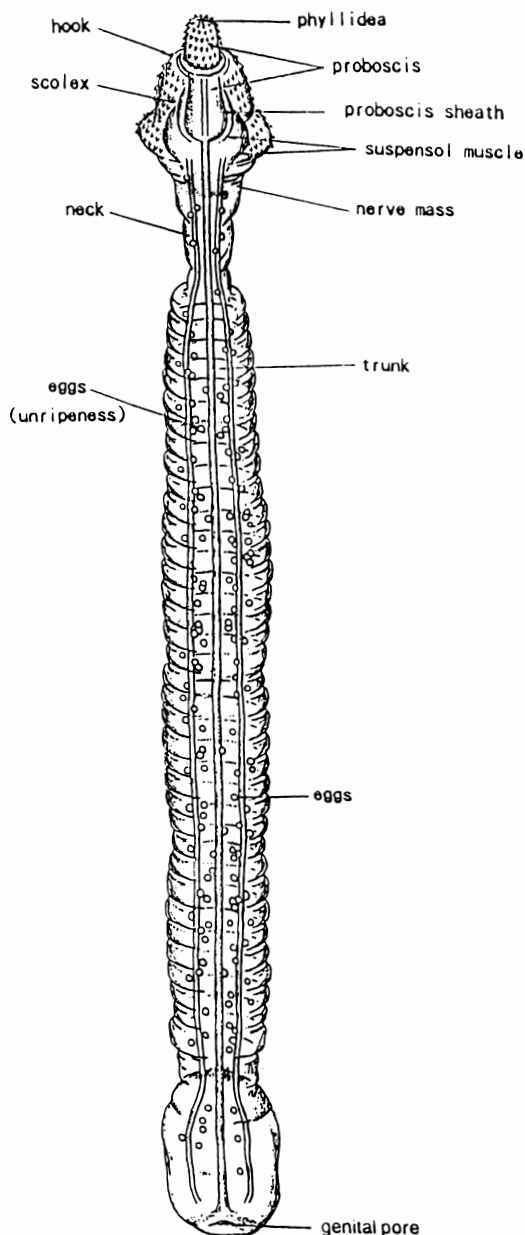


Fig. 5 Schematic view of the present case caused perforative peritonitis showing typical features of young adult female *Bolbosoma* sp.

Discussion

Bolbosoma spp. belongs to the group phylum Acanthocephalan, which has approximately one thousand species (Delymure, 1968; Sokolovskaia, 1968; Parshad and Compton, 1981). In Japan, Kikuchi and Nakajima (1993) classified eleven species of *Bolbosoma* spp. in morphology (Baylis, 1968; Delymure, 1968; Porta, 1906, 1908, 1909), which infected on whales and dolphins. Then they described the differences between the adult of these eleven species and that of *Bolbosoma capitatum* in terms of their body length and of their intermediate hosts. Shimazu (1975) recorded the main internal organs of the larvae and immature adult worms of *Bolbosoma caenoform* which infected on *Euphausiid crutacaeans* in the North Pacific Ocean. He found some characteristic observations:

- 1) The wall of the proboscis sheath is double-layered.
- 2) The tip of the trunk is expanded and has dermal hooks.
- 3) The lacunar system consists of a pair of main longitudinal ducts and a large number of transversal ducts.

Considering the number, shape, and arrangement of proboscis hook and dermal hooks distribution on the trunk along with the above observations, the larvae and immature adult worms of *Bolbosoma caenoform* are very similar to the adult of *Bolbosoma nipponicum* in the Pacific Ocean. Based on the morphological examinations with referring to the previous reports as described by Yamaguti (1939), Shimazu (1975), Kamiya (1977), Kagei (1979), Iseki (1989), and Araki *et al.* (1995, 1996), the parasite was identified as an immature female adult of *Bolbosoma* sp. Though the young *Bolbosoma caenoform* sp. that we found was not examined by SEM, it was considered to be *Bolbosoma nipponicum* of findings through the phase microscopy and histological examination (Figs. 3–5).

As for parasites in this field, more than two hundred and fifty-six examples of human infection have been documented in the literature using CAB Network and eight species were reported in sixteen different countries. Of these sixteen countries, most of the cases were from China, where two hundred thirteen examples were reported. Two cases (Beaver

et al., 1983; Tada *et al.*, 1983) of bolbosomiosis (tentative name) were reported in Japan. These cases were reported at the same period in 1983. The present case is the third bolbosomiosis in Japan.

In conclusion, we reported a parasite obtained from the peritoneal cavity near the perforated terminal ileum of a patient who was diagnosed as acute abdomen and underwent laparotomy. As the results of the examinations, this parasite was found to be very similar to *Bolbosoma nipponicum*. Most species of worms which belong to the genus *Bolbosoma* infected on sea mammals all over the world. To our knowledge, only two cases of human infection, both are Japanese, have been reported in the past. This case is the third report of human infection with *Bolbosoma* sp.

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