An Unexpected Finding of Diphyllobothrium nihonkaiense in a Patient with Inflammatory Bowel Disease

Mawuli Attipoe,1 William Putnam, MD,2 Charles Sturgis, MD1*

Clinical History
The patient in this case was a 52-year-old man with a known history of ulcerative colitis. His inflammatory bowel disease was asymptomatic; he presented for an outpatient endoscopy for routine surveillance of his condition. He underwent lower endoscopy to exclude colonic dysplasia; he was taking no medications at the time of his procedure. The patient had experienced no diarrhea or blood loss from the rectum and reported no symptoms that would suggest changes in his condition since his most recent previous colonoscopy 27 months previously. The patient had no known allergies. We did not discuss with the patient whether he might have ingested raw or undercooked fish. Results of a digital rectal examination were normal.

Principal Findings
Endoscopic Findings
On lower endoscopic examination, we discovered mild inflammation characterized by friability, granularity, linear erosions, and loss of vascularity in a continuous and circumferential pattern from the anus through the rectum. Compared with the results of previous examinations, the findings were unchanged and were believed by the gastroenterologist to be consistent with the patient’s known ulcerative colitis. A benign-appearing sessile polyp was also noted in the rectum; this entity was biopsied and sent to the pathology department. The remainder of the colon and the terminal ileum had an unremarkable appearance. An incidental parasitic tapeworm was discovered in the ascending colon (Image 1). The tapeworm was extracted from the ascending colon and was sent in formalin to the pathology department.

Enteric Pathologic Findings
Endoscopic colonic mucosal biopsies were taken at 10-cm increments, from 10 cm to 80 cm. All biopsy results showed mild to moderate lamina propria eosinophilia (Image 2). The most distal biopsies (ie, 10 cm) also showed mild chronic colitis with mild activity, which was histologically compatible with ulcerative colitis. No microgranulomata were identified. There was no dysplasia or malignant neoplasms present in any of the samples. We interpreted the incidental rectal polyp as a hyperplastic polyp.

Parasite Findings
The tapeworm taken from the body of the patient was yellow-tan in color and was 56 cm long (Image 3, part A). The body of the organism was ribbon-like and focally coiled on itself. We recognized repetitive small body units. The individual body segments (proglottids) of the worm were wider than they were tall, measuring 2 to 4 mm × 5 to 8 mm (Image 3, part B). The scolex (head of the parasite) was not present with the sample.

Segments of the parasite were submitted for histologic study, including axial/transverse and sagittal/longitudinal sections of multiple body segments. Microscopic examination of hematoxylin-eosin–stained sections of the tapeworm confirmed the presence of both types of central...
immature female reproductive organs (ovaries and oviducts) and peripheral immature male reproductive organs (Image 4). In addition to confirming these microanatomic structures, the longitudinal sections showed outer protuberances that demarcate proglottid segments. Oil immersion examination (magnification, ×100) confirmed rare intrinsic undeveloped eggs (Image 5), which showed small terminal knobs.

Based on the combined gross pathologic and histologic studies, we issued a final diagnosis of cestode parasite (tapeworm). A diagnostic comment followed, which stated that findings were most consistent with an adult broad fish tapeworm (*Diphyllobothrium* species). The formalin-fixed gross specimen and histology slides were sent to the United States Centers for Disease Control (CDC), where a diagnosis of *Diphyllobothrium* species was confirmed by polymerase chain reaction. Further sequencing of the 18S rRNA gene performed by the CDC Parasitic Diseases Branch confirmed an identification of *D. nihonkaiense*. The report from the CDC emphasized that the proglottids were broader than long and that microscopic examination of the tapeworm revealed typical cestode tegument with microvilli and smooth muscle. The patient was treated with a one-time dose of oral praziquantel.
Case Studies

Image 3

The body of the tapeworm extracted from the ascending colon of the patient. A, Gross photograph of the tapeworm body. B, Close-up from gross photograph in Part A, showing individual body segments with greater width than height.

Image 4

Physical features of the tapeworm extracted from the ascending colon of the patient. A, Digital photomicrographic image of an axial/transverse section of the tapeworm. The image shows centrally located immature female reproductive organs and peripherally located immature male reproductive organs (hematoxylin-eosin stain; original magnification, ×5). B, Digital photomicrograph of a sagittal/longitudinal section of the tapeworm; body segments are demarcated by longitudinal protuberances. In addition, central female reproductive organs are identified (hematoxylin-eosin stain; original magnification, ×10).
Questions

1. Why was endoscopic examination indicated?
2. How was the *Diphyllobothrium nihonkaiense* infection acquired?
3. What are common symptoms of having ingested a tapeworm?
4. Through what mechanisms is the diagnosis of *Diphyllobothriasis* confirmed in diagnostic laboratories?

Answers

1. Endoscopic examination (ie, colonoscopy) was indicated to monitor the patient’s ulcerative colitis. Patients with inflammatory bowel disease are at increased risk of developing colonic malignant neoplasms. No dysplasia or carcinoma was identified.
2. *Diphyllobothrium nihonkaiense* is a fish tapeworm that usually infects sea lions or fur seals. Humans can be accidental hosts of this entity. A ciliated embryo originally infects microcrustaceans in an aquatic environment. Crustaceans serve as intermediate hosts for the parasite as it develops into an infective proceroid larva. Fish become infected by ingesting the infected microcrustaceans. The larva then develops into its plerocercoid stage; at this point, it is infective to humans.

Image 5

Digital photomicrographic image of an undeveloped parenchymal egg. The egg shows a terminal knob (hematoxylin-eosin stain; original magnification, x100).

Figure 1

The life cycle of the *Diphyllobothrium nihonkaiense*. Reprinted with permission by M. Attipoe.
and other fish-eating mammals. The patient most likely acquired this infection from ingesting raw or undercooked fish. See the pictorial *D. nihonkaiense* life cycle in Figure 1.\(^1,2\)

3. Symptoms may include diarrhea, anemia, abdominal pain, and possibly clinical features of intestinal obstruction.\(^2,3\) Notably, many patients with cestode infections are asymptomatic, as was our patient.

4. There are multiple ways to confirm the diagnosis of *Diphyllobothrium* infection. Examination of stool specimens for the presence of diagnostic egg forms and possibly proglottid body segments is perhaps the most common means of establishing a specific diagnosis.\(^4,6\) Another mechanism for diagnosis is colonscopic documentation and endoscopic photography.\(^7\) Histologic studies of adult worms may be beneficial.\(^5\) Recent publications\(^8-10\) have touted molecular methods, including polymerase chain reaction (PCR) for the diagnosis of diphyllobothriasis. Our recent review of the literature suggests that serologic studies for the diagnosis are not widely used. Reports of *Diphyllobothrium nihonkaiense* have been increasing in urban areas of Japan, but this parasite is only rarely encountered in patients in North America.\(^11,12\)

Acknowledgments

The authors would like to thank both Sherif Zaki, MD, PhD, and Dianna Blau, DVM, PhD, from the CDC for their exemplary consultative services. LM

References


