Rare disease

Diphyllbothrium nihonkaiense infection linked to chilled salmon consumption

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Summary

This is a case of a 40-year-old Japanese adult male who had acute onset watery diarrhoea with intermittent abdominal discomfort. Several days later, he found a 1 metre of tape-shaped object emerged from his anus and was eventually admitted to our hospital for further investigation. Stool examination revealed eggs of *Diphyllbothrium* with characteristic shape in his stool. After oral praziquantel administration, segments of proglottids were expelled from his anus. The proglottids were sent to the Infectious Disease Surveillance Centre of Japan, and DNA analysis of the proglottids proved to be those of *Diphyllbothrium nihonkaiense*. The patient confessed that he had an eating habit of chilled salmon. His diarrhoea and abdominal discomfort were completely diminished after 1 day of oral praziquantel administration. He was successfully discharged from the hospital a few days later admission without any complication of the disease and the side effect of treatment.

BACKGROUND

Tapeworms are hermaphroditic flatworm which parasitise in the human gastrointestinal tract. Tapeworm infections include Taeniasis, Diphyllbothriasis, Hymenolepiasis and Dipylidiasis. Fish tapeworm infections are due to parasites of the *Diphyllbothrium* species. Eleven species have been identified to cause Diphyllbothriasis in humans^{1 2} including *Diphyllbothrium nihonkaiense*, *D latum*, *D dentriticum* and *D pacificum*. Infection is established by eating raw or undercooked fish with larval plerocercoids. After ingestion, the larvae develop into adult tapeworms in small intestine. Clinical symptoms are watery diarrhoea, abdominal discomfort or pain, fatigue and allergic symptom. Mechanical obstruction of the intestine can occasionally occur if several worms become entangled in the intestine.

Different species of *Diphyllbothrium* are endemic all over the world. Originally, *Diphyllbothrium* infections in Europe and Japan had been considered to be caused by *D latum*.³ However, another Japanese broad tapeworm was identified as the new species, *D nihonkaiense*.⁴ *D nihonkaiense* infestation, commonly seen in the Far East, is due to consumption of wild Pacific salmon including *Oncorhynchus masou* (masou salmon), *O gorbuscha* (pink salmon) and *O keta* (chum salmon), while *D latum* employs freshwater fish.^{3 5 6}

Salmon has become increasingly popular commodities across the world with growing numbers of fish-eating populations and preference for specialties such as sashimi, sushi and carpaccio.^{7–9} Exports of raw or chilled salmon from Japan, Alaska and Canada to other countries including European Union have remarkably increased in conjunction with great advances in international transport systems.¹⁰ This trend has led to an increase in the occurrence of Diphyllbothriasis as an emerging parasitic disease in regions where it was previously absent.¹¹ In that sense, Japan, and European countries have increased the prevalence of *D nihonkaiense*,^{7 9 12} that reflects global

increases in salmon consumption and changes in fish-eating habits.

CASE PRESENTATION

A previously healthy 40-year-old male receptionist presented with 9 days history of watery diarrhoea with and intermittent and generalised abdominal discomfort. Seven days ago, he went to see a general practitioner for his abdominal symptoms and was diagnosed as viral enteritis and finally sent to his home with prescribed loperamide and butylscopolamine. Four days ago, he found a tape-shaped object emerged from his anus and he pulled out up to almost 1 metre. The object ended up with teared off halfway through. He visited the physician again and referred to our hospital for further investigation.

INVESTIGATIONS

Physical examination on admission was unremarkable except for slight evidence of dehydration. Blood test did not reveal any significant or specific findings. Colonoscopy revealed spotty redness and erosions at his ileocecal junction (figure 1). No proglottids or scolex were observed. Abdominal ultrasonography and CT did not show any significant finding. Microscopic test for stool revealed oval shaped eggs with an operculum at one end which was inconspicuous (figure 2). Further history taking clarified that he frequently ate chilled, not frozen, salmon which were caught at near his hometown at the East coast of Japan.

TREATMENT

Diphyllbothriasis was strongly suspected. Single dose (20 mg/kg) of praziquantel and 250 ml of citrate magnesium were administered orally. After the administration, 150, 4, 5 and 7 cm long strobilas were expelled with massive muddy stool (figure 3A,B). One hundred and fifty-

centimetre long strobila included its scolex. All proglottids were sent to the Infectious Disease Surveillance Centre of Japan for DNA-PCR analysis, and DNA sequences of the genes from the strobilas were compatible with those of *D nihonkaenese*.

OUTCOME AND FOLLOW-UP

After administration of praziquantel followed by expulsion of the worm, the patient sharply recovered from his abdominal symptom. He gained appetite and energy, and was finally discharged from the hospital a few days after the praziquantel treatment.

DISCUSSION

Acute watery diarrhoea is commonly seen on daily practice. Physicians should be alerted to think of varieties of aetiologies of acute watery diarrhoea which can mimic acute viral enterocolitis. Tapeworm (cestodes) infestation

is one of the aetiologies whose clinical manifestation sometimes resembles that of acute viral enterocolitis. This patient was primarily diagnosed as acute viral enterocolitis at the previous physician's impression which was modified with typical availability bias.

As with many diseases, investigation for the parasites should be started as early as possible in order to reach the true diagnosis in order to offer the appropriate disease management to the patient, thereby realising better patient outcome, preventing prolonged patients' agony and reducing unnecessary healthcare cost. Take for example, otherwise properly treated, this patient shall be severely dehydrated due to progressive diarrhoea or suffer from mechanical ileus due to intestinal obstruction by several worms.

After suspecting the Diphyllobothriasis, thorough detection and deworming should be very important. If a single scolex remains in the patient's small intestine, the scolex will re-produce strobilas and finally develop another Diphyllobothriasis.¹³ In order to achieve full length investigation of intestine, capsule endoscopy may play a pivotal role to facilitate the diagnosis of the infestation in the small intestine.¹⁴⁻¹⁶ Although there is further evaluation of this

Figure 1 Erosions and spotty redness of the membrane were seen at 1 cm proximal to the ileocecal junction. No proglottids or scolex were observed.

Figure 2 Oval shaped eggs with an operculum at one end was revealed microscopically.

Figure 3 (A, B) After the oral administration of the single dose of praziquantel and 250 ml of citrate magnesium, 150, 4, 5 and 7 cm long strobilas were expelled with massive muddy stool.

procedure in management of Diphyllbothriasis, it is an effective measure to shed light on the undetected worm. We did not perform this diagnostic measure to the patient, however, the patient has not found any new symptoms and passage of the worm through anus with outpatient follow-up appointment.

With regard to the treatment of *D nihonkaiense* infection, oral administration of a single dose of praziquantel at 5 to 10 mg/kg was reported to be effective and safe for *D nihonkaiense* infections, but generally, a single dose of 25 to 50 mg/kg is administered.^{17–19} Side effects of praziquantel are usually mild and do not entail treatment, although they may be more frequent and severe in patients with a heavy worm infestation. In order of severity, the following symptoms are the adverse effects of praziquantel: malaise, headache, dizziness, abdominal discomfort with or without nausea, rise in temperature and rarely, urticaria.²⁰ Such symptoms can, however, also occur with the infection itself. Fortunately, the patient did not experience any of the side effects.

People should be aware of the risk of tapeworm infection when they eat raw or undercooked wild salmon. Infection can be prevented by cooking the fish at a temperature of 54 to 56 degree for 5 min. Alternatively, the plerocercoids can be destroyed by blast-freezing the fish at –35 degree for 15 h or by regular freezing at –20 degree for 7 days before consumption.¹¹ This patient ate chilled salmon on daily basis. The salmon was likely at more than –20 degree when ingested, containing inappropriately destructed plerocercoids.

Learning points

- ▶ Patients with watery diarrhoea with a history of chilled (not frozen) salmon consumption, suspect Diphyllbothriasis until proven otherwise.
- ▶ The definitive diagnosis of Diphyllbothriasis is confirmed by detecting characteristic eggs in the patient's stool or by finding evacuated segments of proglottids.
- ▶ A single dose praziquantel is the first line therapy for all tapeworm infestation including Diphyllbothriasis.
- ▶ The infection can be prevented by cooking at 54 to 56 degrees for 5 min, by blast-freezing the fish at –35 degree for 15 h or by regular freezing at –20 degree for 7 days before consumption.

Competing interests None.

Patient consent Obtained.

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