Novel diagnostic procedure

Capsule endoscopy is a feasible procedure for identifying a *Diphyllobothrium nihonkaiense* infection and determining the indications for vermifuge treatment

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Summary

Diphyllobothrium is a member of *Cestoda* family, which is the largest parasite of humans. The diagnosis of diphyllobothriasis is based on the detection of eggs in the stool. Because the remainder of the scolex causes a relapse in diphyllobothriasis, the scolex must be completely discharged to cure the parasite infection. However, the scolex or forefront of the *Diphyllobothrium* is difficult to detect with gastroduodenoscopy and colonoscopy, because most *Diphyllobothrium* attach to the jejunal wall. In the present case, capsule endoscopy detected proglottids as well as forefront of the parasite at jejunum. Based on the results of capsule endoscopy, the patient underwent additional vermifuge (anthelmintic) treatment to cure the diphyllobothriasis and discharged a worm measuring 3 m in length with a scolex. Capsule endoscopy is a practical option to determine whether additional vermifuge treatment is required through the detection of the proglottids as well as a scolex or forefront of the parasite.

BACKGROUND

Diphyllobothrium is a member of the *Cestoda* (tapeworm) family and it is the largest parasite of humans. Among *Diphyllobothrium* tapeworms, more than 10 species are known to cause human infection, which is called diphyllobothriasis,¹ and *Diphyllobothrium nihonkaiense* is the main causative species of diphyllobothriasis in Japan.² The second intermediate hosts of *D. nihonkaiense* are anadromous Pacific salmon such as masu salmon *Oncorhynchus masou masou*, pink salmon *Oncorhynchus gorbuscha* and chum salmon *Oncorhynchus keta*, and humans normally acquire the parasite by eating raw or undercooked fish.^{1–3}

The diagnosis of diphyllobothriasis is based largely on the detection of eggs in the stool of the patients. Because the remainder of the scolex causes a relapse in diphyllobothriasis, the scolex must be completely discharged to cure the parasite infection. However, the scolex or forefront of the *Diphyllobothrium* is difficult to detect by gastroduodenoscopy and colonoscopy, because most *Diphyllobothrium* attach to the jejunal wall. The current case report describes how capsule endoscopy can directly detect live *Diphyllobothrium*, including the forefront of the parasite; thus, suggesting the usefulness of this examination for determining the necessity of performing vermifuge (anthelmintic) treatment.

CASE PRESENTATION

A 23-year-old man visited our hospital due to numerous white string-like excretions. No particular abnormality was

noted with the physical or blood examinations. The patient had eaten no raw salmon within the period of several months. Eggs of ovoid shape with an operculum on a narrowed pole were detected in the patient's stool. Therefore, the patient was diagnosed to have a *Diphyllobothrium* infection. To confirm whether the scolex of the parasite remained, capsule endoscopy was performed. The examination detected the forefront of the parasite at the upper jejunum (figure 1) and numerous proglottids from the upper to lower small intestine (figure 2). Mature proglottids were also found in the small intestine. No other abnormality was observed during the examination. Subsequently, an additional vermifuge treatment using 200 ml of gastrografin (Nihon Shering, Osaka, Japan) was performed and the patient discharged a worm measuring 3 m in length with a scolex and many proglottids after approximately 1 h. To identify the tapeworm at species level, cytochrome *c* oxidase subunit I (*cox1*) and cytochrome *b* (*cob*) genes of mitochondrial DNA (mtDNA) were analysed according to Yanagida *et al.*⁴ Both *cob* and *cox1* sequences showed more than 99.7% identities with those of *D. nihonkaiense* (AB522615 and AB508838, respectively). These results demonstrated the tapeworm obtained in the present case to be *D. nihonkaiense*.

OUTCOME AND FOLLOW-UP

The patient was completely cured by an additional vermifuge treatment.

Figure 1 The forefront of *Diphyllobothrium nihonkaiense* was observed in the patient's jejunum.

Figure 2 Numerous proglottids were detected in the jejunum and ileum.

DISCUSSION

In the present case, capsule endoscopy contributed to the diagnosis of diphyllobothriasis infection through the direct observation of the live parasite in the small intestine. It is noteworthy that the capsule endoscopy identified numerous proglottids as well as forefront of the parasite; thus, suggesting that this examination is a practical and effective procedure for determining whether additional treatment is required to treat a *Diphyllobothrium* infection. Seven reported cases and the present patient with tapeworm infection detected by capsule endoscopy^{5–10} are summarised in table 1. Three subjects were infected by *Diphyllobothrium spp*, while the other five were infected by *Taenia*. Four subjects had histories of eating raw fish or meat. Capsule endoscopy detected a scolex or forefront of the parasite in six cases and proglottids in all eight cases. In four cases, the cause of anaemia was attributed to tapeworm infection. In the present case, capsule endoscopy was useful to confirm the remaining scolex or forefront of the parasite, which might cause a relapse of the diphyllobothrium infection and it is also a safer and more comfortable method for the patient. Based on the results of capsule endoscopy, the patient underwent additional vermifuge treatment to cure the diphyllobothriasis.

In summary, the present study demonstrates that capsule endoscopy is a feasible option to identify tapeworm infection and also to determine whether additional vermifuge treatment is required through the detection of the proglottids as well as a scolex or forefront of the parasite. Therefore, capsule endoscopy, which is a safe and less invasive procedure for observing the small intestine, may be applied to accurately diagnose parasite infections in the intestinal tract.

Learning points

- Capsule endoscopy, which is a safe and less invasive procedure for observing the small intestine, is a practical procedure to detect the proglottids as well as a scolex or forefront of the parasite.
- Capsule endoscopy is useful to determine the indication of an additional vermifuge treatment.
- Therefore, capsule endoscopy may be applied to accurately diagnose parasite infections in the intestinal tract.

Table 1 Reported cases with tapeworm infection detected by capsule endoscopy

Age/sex	Species	History of eating raw fish or meat	Detectability of the scolex or forefront of the parasite	Detectability of proglottids	Efficiency of capsule endoscopy	Reference
23/Female	<i>Diphyllobothrium latum</i> or <i>D nihonkaiense</i>	Raw salmon	Detected	Detected	Capsule endoscopy confirmed the <i>Diphyllobothrium</i> infection	5
75/Male	<i>Taenia saginata</i>	Raw meat	Detected	Detected	Capsule endoscopy indicated that the cause of iron deficiency anaemia was a tapeworm infection	6
14/Male	<i>T saginata</i>	Not described	Detected	Detected	Capsule endoscopy indicated that the cause of iron deficiency anaemia was a tapeworm infection	7
50/Female	<i>T saginata</i>	Raw beef	Not described	Detected	Capsule endoscopy identified the possible cause of anaemia to be a tapeworm infection	8
54/Female	<i>D latum</i>	Not described	Not described	Detected	Capsule endoscopy identified the cause of anaemia was a <i>Diphyllobothrium</i> infection	9
44/male	<i>Taenia</i>	Not described	Detected	Detected	Capsule endoscopy detected the remaining proglottids and scolex of the parasite; thus, additional treatment was conducted	10
47/Female	<i>Taenia</i>	Not described	Detected	Detected	Capsule endoscopy detected the remaining proglottids and scolex of the parasite; thus, additional treatment was conducted	10
23/Male	<i>Di nihonkaiense</i>	No history of eating raw salmon	Detected	Detected	Capsule endoscopy detected the remaining proglottids and forefront of the parasite thus additional treatment was conducted	Present case

Competing interests None.

Patient consent Obtained.

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