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## Case Report

## Ultrasonographic findings of *Diphyllobothrium nihonkaiense*: A case report

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## ABSTRACT

A 6-year-old girl was admitted to our hospital due to discharging the strobila of a tapeworm (*Diphyllobothrium nihonkaiense*) from her anus. Before excreting the tapeworm completely with anthelmintics, ultrasonography was performed. The tapeworm was shown as a slightly high echoic strand-like lesion on ultrasonography in the terminal ileum. In this strand-like lesion, some high echoic spots were detected. This finding was considered as a characteristic of *Diphyllobothriasis*.

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### Introduction

*Diphyllobothrium nihonkaiense* (*D. nihonkaiense*) is a tapeworm commonly found in Japan. Recently, *diphyllobothriosis* is reemerging because of expanded global importation and increased popularity of eating raw fish [1]. There are some imaging modalities for diagnosis of tapeworms such as small bowel series [2], capsule endoscopy [3–5], and ultrasonography (US). In this paper, we present a case whose *diphyllobothriasis* could be diagnosed with characteristic US findings that have not previously been reported.

### Case report

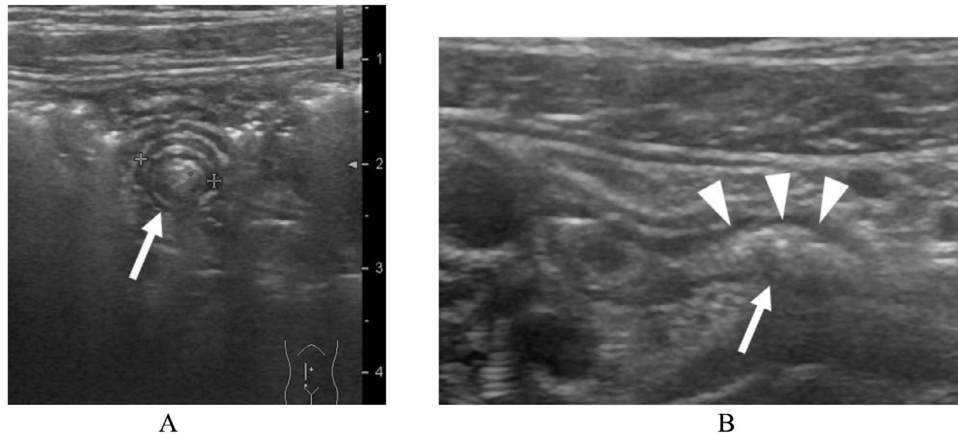
A 6-year-old girl was admitted to our hospital because she found a string like structure protruding from her anus. Her body temperature was 38°C. She had diarrhea and vomiting. Although her mother tried to pull out the string-like lesion, it tore off at about 1 m in length. *Diphyllobothriasis* was suspected from her medical history and the parasite was confirmed as *D. nihonkaiense* from the stool ova and examination. Because the scolex (head) could not be detected, an anthelmintic (praziquantel: 450 mg = 17 mg/kg) was

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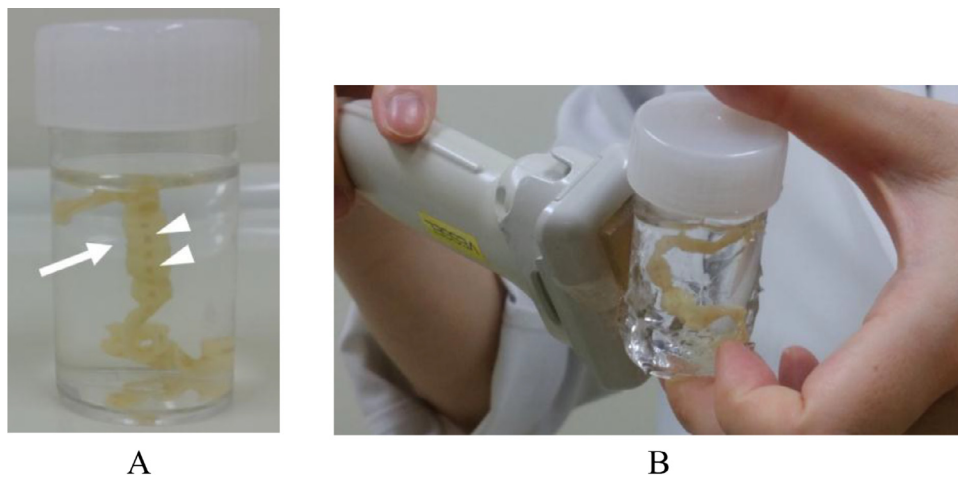
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**Fig. 1** – There was a slightly high echogenic strand-like lesion (arrows) in the terminal ileum. (A): short-axis and (B): long-axis image. There were some high echogenic spots (arrow heads) in the strand-like lesion (B).



**Fig. 2** – (A): The plastic case filled with saline contains pieces of the tapeworm (arrow). In the midline of the strobila, there were small brown spots (arrow heads) which were considered to be the uterus of the tapeworm. (B): This specimen was scanned with the same 4-9 MHz linear probe used to examine the patient.

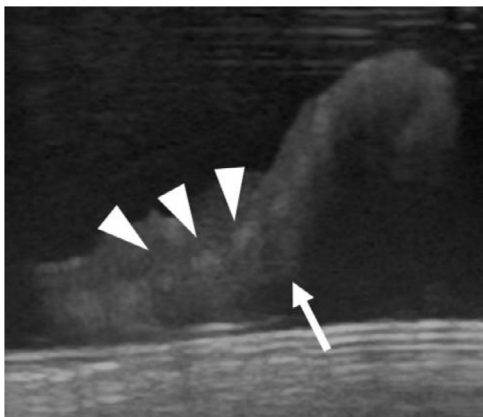
administered to promote complete recovery. Before administering the anthelmintic, US with a 4-9 MHz linear probe (HI VISION Ascendus, Hitachi Aloka Medical Ltd, Tokyo, Japan) was performed to depict the tapeworm. A slightly high echogenic strand-like lesion was detected in the terminal ileum (Fig. 1). There were some high echogenic spots in the strand-like lesion. Because this lesion did not move or change form for 20 minutes or more during the US examination, we considered this string-like lesion to be the strobila, that is, the body of tapeworm made of proglottids. After administration of the anthelmintic and a glycerin enema, the strobila 360 cm in length was ejected. The scolex could not be found. After treatment, the patient was discharged with no further problems. The route of infection was unclear because the girl said that she had not eaten raw fish recently. Recurrence of diphyllobothriasis was not seen at 2-year follow-up.

The tapeworm specimen was fixed in 10% formalin. We evaluated imaging findings of *D. nihonkaiense* with *in vitro* US. The tapeworm was cut and specimens were put in a plastic

case filled with saline. The specimens were scanned with the same 4-9 MHz linear probe used to examine the patient (Fig. 2). The body of the tapeworm was shown as slightly high echogenic (Fig. 3). A row of spotty high echogenicities were detected at the midline of the strobila (Fig. 3).

## Discussion

Although *D. nihonkaiense* had been considered identical to *D. latum* since 1889, Yamane et al. [1] reported morphological and biochemical differences of broad tapeworms between Baltic countries and Japan; the latter was then renamed *D. nihonkaiense*. Freshwater copepods are the first intermediate host for both tapeworms. *D. latum* stays in freshwater fish such as perch, char, and pike as the second intermediate host. Interestingly, however, *D. nihonkaiense* stays in anadromous fish (*Oncorhynchus* species such as masu salmon, pink salmon,



**Fig. 3** – The body of the tapeworm was shown slightly high echogenic (arrow). A row of spotty high echogenicities was detected at the midline of the strobila (arrow heads); these findings were considered to correlate with the spots seen *in vivo* (Fig. 1B). The spots resembled the row of the uterus of the tapeworm (Fig. 2A).

and chum salmon) as the second intermediate host [6]. Usually, patients of *D. nihonkaiense* consult physicians after passing tapeworm strobila. The average length of this strobila was 83 cm [6]. Other symptoms of *D. nihonkaiense* include abdominal pain and diarrhea.

Morphological examination of the eggs appears to be helpful in the identification of tapeworms [7]. Intestinography with oral meglumine/diatrizoate sodium (Gastrografin) administration is a useful method to depict a tapeworm [8]. Moreover, this method can also be expected to evacuate a tapeworm due to the hypertonicity of amidotrizoic acid [9]. Some reports suggest usefulness of capsule endoscopy for diagnosing a tapeworm [3–5]. US is a useful modality for detecting many abdominal diseases. Although visibility on US is sometimes disturbed by gastrointestinal gas, this noninvasive examination can be used for screening and follow-up study. It might be difficult to distinguish intestinal contents from a tapeworm. Our case suggests, however, that a long observation period (20 minutes) and the hyperechoic dot of the body are useful to diagnose diphyllbothriasis. In *in vivo* US, spotty high echogenicities were detected at the midline of the tapeworm body (Fig. 1). To our knowledge, there is no paper reporting these spotty high echogenicities of the tapeworm. However, we consider that this finding in US represents the uterus of the tapeworm and is useful for diagnosis of diphyllbothri-

asis because the tapeworm of our case also had these spots in the *in vitro* study (Fig. 3). It might be difficult to distinguish *D. nihonkaiense* from other tapeworms by US findings with these spotty high echogenicities because other species of tapeworms also have the uterus in their strobilae.

If the scolex is not eliminated by treatment, the entire worm may regenerate [4]. When the scolex is torn off and cannot be found, follow-up may be needed to confirm a complete treatment.

## Conclusion

A row of high echogenic spots detected at the midline of a slightly echogenic strand is a characteristic US finding for diphyllbothriasis.

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