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Case Series

Easy Detection and Fast Removal of Gastric *Anisakis* during Narrow-Band Imaging Endoscopy with L-Menthol Administration

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Keywords

Anisakis · Narrow-band imaging · L-Menthol

Abstract

Anisakiasis is a parasitic disease caused by the ingestion of raw or uncooked seafood infected with third-stage larvae of the anisakid nematodes. A 45-year-old Japanese man presented with epigastric pain and itchy skin with rash on his arm, chest, and back after eating vinegar-marinated raw mackerel sushi. He underwent an emergent endoscopic examination using narrow-band imaging (NBI) that revealed two anisakid larvae. NBI showed the larvae more clearly than white light imaging on the cardiac region of the stomach. We sprayed L-menthol on the larvae for stopping their movement and then easily removed them using biopsy forceps. The macroscopic examination and genotype analysis of the specimens revealed the two larvae as belonging to *A. simplex sensu stricto*. Our case demonstrates the usefulness of endoscopic examination with NBI and of the L-menthol spray in visualizing and immobilizing the larvae for removal.

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Background

Gastric anisakiasis is a parasitic disease acquired after ingesting raw or uncooked seafood harboring third-stage larvae of the nematodes belonging to the genus *Anisakis* or *Pseudoterranova* [1–4]. The disease is characterized by the acute onset of epigastric pain 1.4 ± 1.1 days after ingesting the contaminated food [1]. *Anisakis* larvae are reportedly killed by exposure to some medications such as peppermint, creosote, and albendazole in vitro in some animal models [5–7]. Although the clinical effectiveness of these medications after oral administration remains unclear, the endoscopic removal of the live larva from the gastric mucosa has been shown to cure the disease [1]. Precise diagnosis is obtained after endoscopic examination followed by morphological and genotype analysis of the removed larvae [1]. Thus, establishing the methods finding the larvae quickly and removing them thoroughly is crucial. *Anisakis* larva infection involves the invasion of the stomach by the larval head, and the entire larval body is often hidden among the gastric edematous folds. Additionally, the larva wiggles its body continuously and the tail moves quickly or even in circular motions [8, 9]. For these reasons, conventional endoscopic detection and removal of the living larvae remain challenging, and more sophisticated methods are required.

Case Report

A 45-year-old Japanese man with epigastric pain and itchy skin with rash of his arm, chest, and back reportedly ate vinegar-marinated raw mackerel sushi at a ramen restaurant 11 h prior to the development of the epigastric pain. His vital signs were normal. Physical examination showed moderate abdominal tenderness without rebound or guarding in the epigastrium.

On the basis of his clinical history and physical examination, we suspected gastric anisakiasis and performed an emergency endoscopic examination. We used a GIF-H290Z (Olympus Medical Systems) endoscopic apparatus and detected two white larvae penetrating into the thick mucosa of the cardiac part of the stomach. However, this identification was particularly challenging with white light imaging (WLI) because the surrounding mucosa was edematous and erythematous (Fig. 1a). Using narrow-band imaging (NBI) technology (structure enhancement function B8), the larvae were emphasized and contrasted clearly against the mucosal layers. We identified two larvae measuring approximately 15 mm in length. We could see the movement of the tails of the larvae during the procedure (Fig. 1b).

For inhibiting gastrointestinal spasms and weakening the larval movements, we sprayed L-menthol (MINCLEA, Nihon Seiyaku, Tokyo, Japan) onto both larvae on site. After the spray, the larval movements got weaker and they changed their shape from circles to straight lines in approximately 10 s (Fig. 1c, d). We were then able to easily catch the head portions of the larvae using endoscopic forceps (Fig. 1e). After the removal of the larvae, we verified the absence of remnants of the larvae in the stomach (Fig. 1f). After the procedure, the patient's symptoms completely and immediately resolved.

Morphological examination revealed the two larvae as being in the third-stage of *A. simplex* (Fig. 2). For verifying the species, we performed molecular analyses of the removed specimens by sequencing and confirmed them as *A. simplex* sensu stricto.

Discussion

Gastric anisakiasis is a well-known parasitic disease resulting from the consumption of raw marine food infected with third-stage larvae of the nematode *A. simplex*, which causes severe epigastric pain and allergic reactions [5]. Although most patients with gastric anisakiasis are reportedly from Japan, due to the traditional Japanese habit of eating raw seafood (sashimi and sushi), the popularization of the food to other world regions has increased the number of patients of gastric anisakiasis globally [1].

The advanced NBI system depends on the use of two short-wavelength light beams of 415 nm (blue) and 540 nm (green) that are well absorbed by hemoglobin and applied optic digital methods for enhancing the images. The system improves visualization of the mucosal surface architecture and the microvascular patterns [10–12]. We used this NBI for enhancing the contrast between the small *Anisakis* larvae and the gastric mucosa, effectively facilitating the detection and the removal of the gastric *Anisakis* larvae [8].

L-Menthol is a peppermint oil solution compound that relaxes the gastrointestinal smooth muscle by reducing the calcium influx [13]. L-Menthol is reportedly effective as an antispasmodic drug during gastroendoscopic examinations [14, 15]. The intraluminal administration of L-menthol using a hand pump is safe and simple. A limited number of clinical case studies reporting effective drugs against anisakiasis have included L-menthol as a candidate drug and provided its in vitro and in vivo experimental results against *A. simplex* [6]. We evidenced an effect of the L-menthol spray on the movement of the larvae and not just on the gastrointestinal smooth muscle of the patient [16]. Thus, our two-step strategy of NBI application for the easy detection of gastric *Anisakis* and spray injection of L-menthol for weakening the movement of the parasite worked in a complementary manner for facilitating larvae removal from the stomach with forceps. Thus, our method prevents accidental overlooking of the penetrating site of the *Anisakis* parasite on the gastric mucosal surface and allows for the safe and easy removal of the gastric *Anisakis* larvae. Future studies are required for confirming the efficacy of this method.

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Statement of Ethics

There are no ethical conflicts to declare. We received written consent by the patient.

Disclosure Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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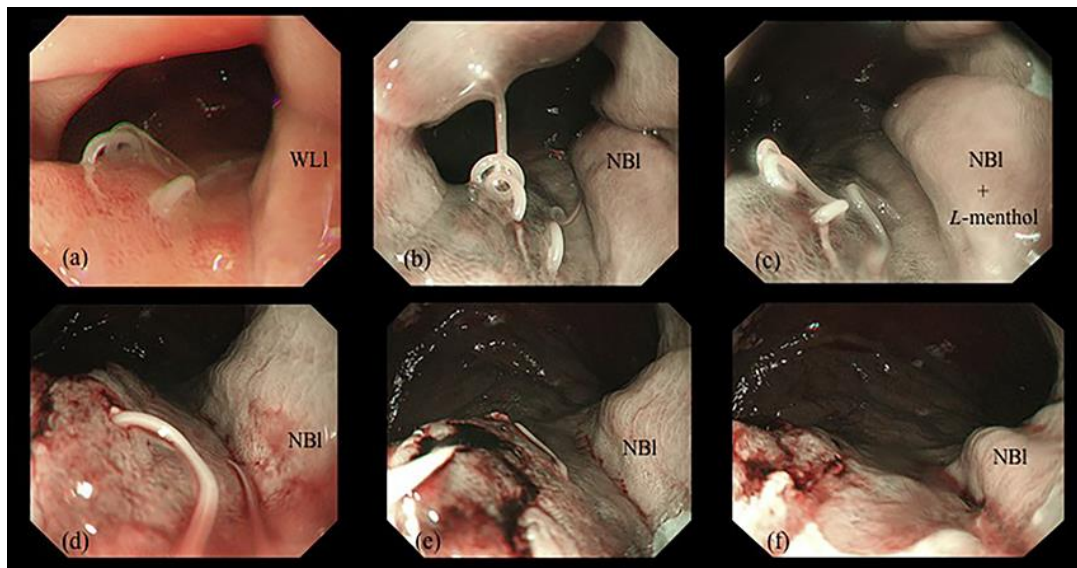


Fig. 1. Endoscopic image of the *Anisakis simplex* larvae. **a** Endoscopic image of the stomach demonstrating two larvae with white light imaging. The larvae are almost indistinguishable from the edematous and erythematous gastric mucosa. **b** Endoscopic image of the stomach with narrow-band imaging highlighting the larvae against the background of the gastric mucosa. **c, d** Endoscopic image of the *A. simplex* parasite after L-menthol spraying of the parasites. The larvae changed their shape from circular to straight lines. **e** Endoscopic image of the stomach demonstrating biopsy forceps removing the larvae. **f** Endoscopic image of the stomach after larvae removal. No larvae remains were left on the stomach.

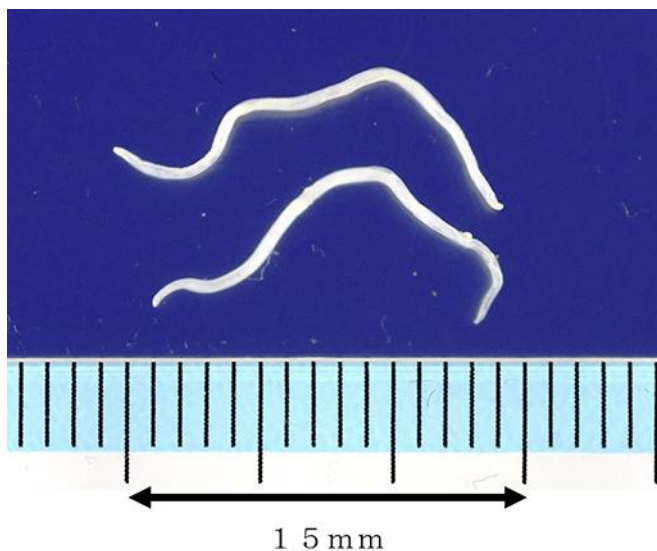


Fig. 2. Morphological image of *A. simplex*. ~15 mm white worms are consistent with *A. simplex* larvae.