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SHORT COMMUNICATION Clinical Case Report

Migration of a metallic foreign body into the liver and thoracic cavity of a cat

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Abstract

A foreign body was found in a 6-month-old female domestic cat that presented with a slightly elevated respiratory rate. Thoracic plain X-ray imaging revealed a fishhook of about 2 cm in length extending from the abdominal cavity into the thoracic cavity via the diaphragm, accompanied by pleural effusion. Laparotomy was performed, and it appeared that the fishhook may have entered the liver from the visceral surface of the right medial lobe, exited the diaphragmatic surface, and penetrated the thoracic cavity via the diaphragm. The fishhook was pulled slowly in the caudal direction and was successfully removed with minimal bleeding.

Key Words: Foreign Body, Liver, Migration

Foreign body migration is commonly reported in both veterinary and human medicine. In cats, the migration of foreign bodies, such as grass awns[2,8,10,18,20)], hair[11)] and needles[4)], has been reported in various organs, including the eyes[20)], urinary bladder[2)], spinal epidural space[8)], mediastinum[10)], extrahepatic biliary duct[11)], brainstem[4)] and spleen[5)], and this is accompanied by various clinical signs. To our knowledge, this is the first report of a fishhook that penetrated the liver asymptomatically and entered the thoracic cavity via the diaphragm.

An intact female domestic short-haired cat about 6 months of age and weighing 2.0 kg was brought to our hospital for vaccination. At the first consultation, the cat was slightly underweight but showed a sufficient appetite. Physical examination revealed that the cat was normothermic (39.0°C), with a slightly elevated heart rate (240 beats/min) and respiration rate (40 breaths/min). On auscultation, abnormal breathing sounds were heard over the entire lung field.

A complete blood count revealed leukocytosis (41.6×10^3 /μl). Serum chemistry revealed normal limits, and FeLV antigen and FIV antibody were negative. Radiographic examinations revealed a pleural effusion in the thoracic cavity and an approximately 2-cm-long fishhook penetrating the thoracic cavity via the diaphragm from the liver area in the abdominal cavity (Fig. 1). A gastrointestinal series with diatrizoate revealed that the fishhook was outside the digestive tract and showed no leakage of contrast medium from the gastrointestinal tract (Fig. 2). On ultrasonography, a hyperechoic structure was observed to extend from the right medial lobe of

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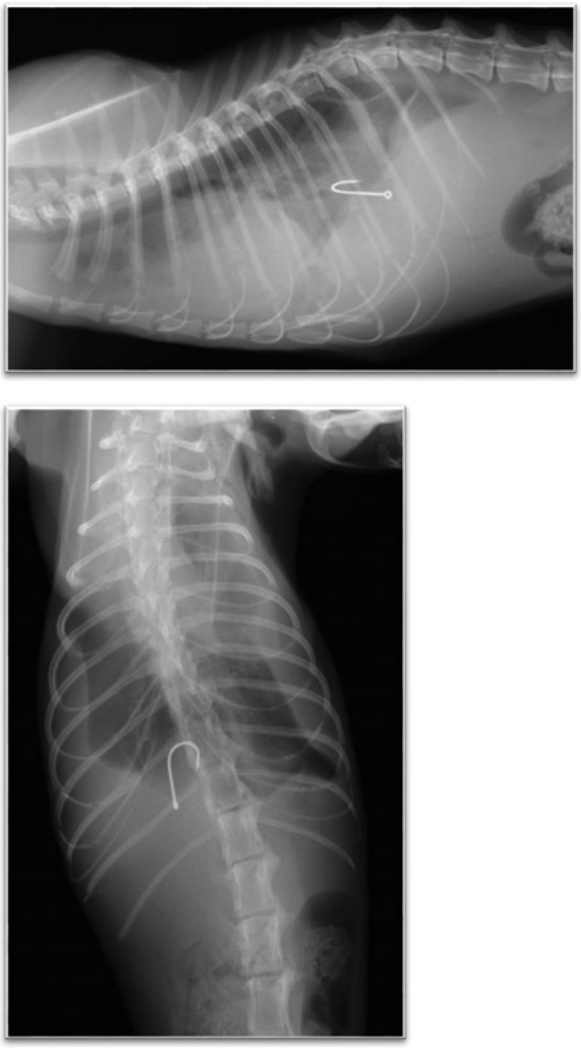

Fig. 1: A 2-cm-long fishhook extending from the abdominal cavity to the thoracic cavity via the diaphragm was identified on X-ray

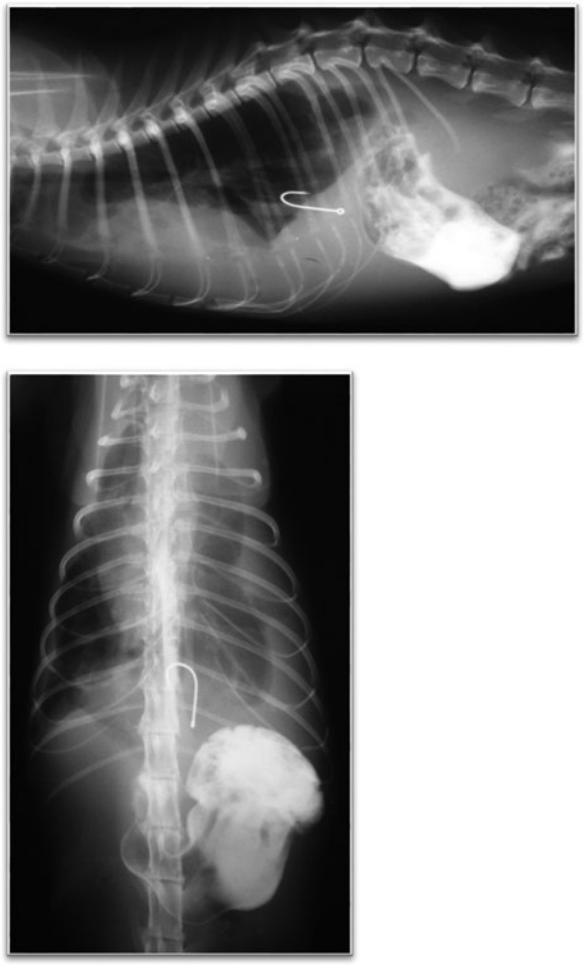

Fig. 2: Gastrointestinal series with diatrizoate revealed that the fishhook was outside the digestive tract and showed no leakage of contrast medium from the esophagus, stomach, or other parts of the digestive tract

the liver into the thoracic cavity. No abnormal findings such as abscess and hematoma were observed in the liver. Ultrasonography confirmed the presence of the pleural effusion and the absence of large vessels around the needle. The pleural effusion was sampled by thoracentesis and was found to be purulent (total protein 4.2 g/dl, cell count 8610 cells/μl), and cytology revealed numerous neutrophils, lymphocytes, and macrophages, leading to a diagnosis of pyothorax. Bacterial culture of the pleural effusion detected *Pasteurella* spp, which are sensitive to most antibiotics.

Because the owner declined surgery to remove the fishhook, symptomatic treatment with the antibiotic cefazolin sodium (22 mg/kg IV, q12hr) and chest lavage twice a day with saline solution was administered for 5 days. A chest tube was placed after the cat was sedated with medetomidine hydrochloride (50 μg/kg IM). As a result, the respiratory condition of the cat improved to normal, and the pleural effusion disappeared on the 5th day after the initial examination by plain radiograph. However, considering the risk of damage to the surrounding thoracic and abdominal organs,

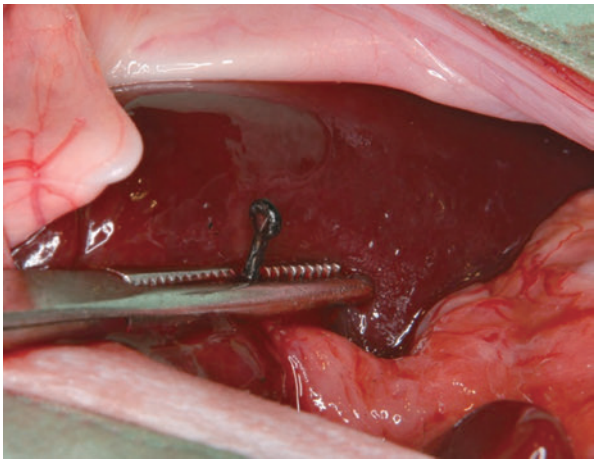

Fig. 3: During laparotomy via a midline incision, the eye of the migrating fishhook was identified on the visceral surface of the liver

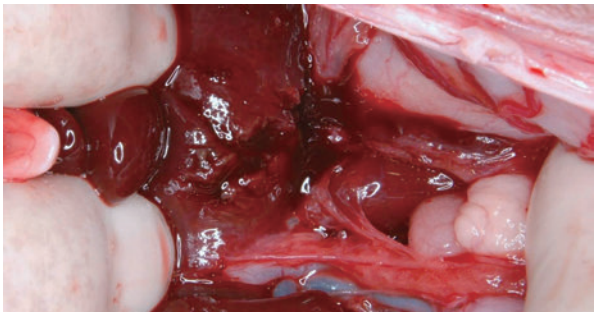

Fig. 4: The fishhook appeared to have entered the liver from the visceral surface of the right medial lobe, exited the diaphragmatic surface, and penetrated the thoracic cavity via the diaphragm. The fishhook was pulled slowly in the caudal direction, resulting in successful removal with minimal bleeding. Macroscopic examination of the liver revealed no apparent abnormalities, such as abscess.

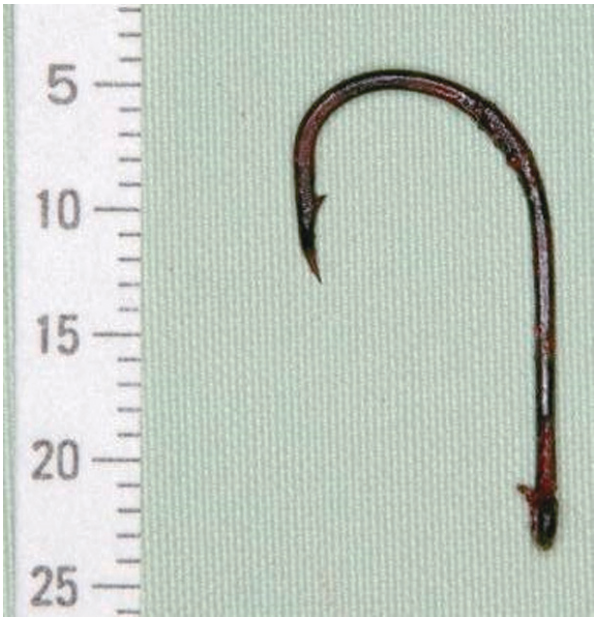

Fig. 5: The removed fishhook was corroded and measured 2.0 cm in length

surgery was performed on the 6th day with the owner's consent. Preoperative ultrasonography again confirmed that only a small portion of the needle tip had deviated into the thoracic cavity and that there were no large blood vessels in the surrounding area.

The cat was premedicated with butorphanol (0.4 mg/kg IV), meloxicam (0.3 mg/kg SC), cefazolin sodium (22 mg/kg IV), and midazolam (0.3 mg/kg IV), followed by induction with propofol (2 mg/kg IV). After tracheal intubation, anesthesia was maintained with isoflurane and oxygen.

After laparotomy, the rear end of the migrating fishhook was identified on the surface of the liver by X-ray fluoroscopy (Fig. 3). The fishhook appeared to have entered the liver from the visceral surface of the right medial lobe, exited the diaphragmatic surface, and penetrated the thoracic cavity via the diaphragm. No findings suggestive of perforation, such as scarring and bleeding, were observed in the stomach or gastrointestinal tract. Although no ascites were observed in the abdominal cavity, slight inflammation of the greater omentum was observed locally. The fishhook was pulled slowly in the caudal direction, resulting in successful

removal with minimal resistance (Fig. 4 and 5). To ensure that there was no bleeding from the liver, a peritoneal drainage tube was placed and the abdomen was closed. Upper gastrointestinal endoscopy was performed after surgery to check for traces of perforation but no abnormalities were observed. From the day after surgery, the cat was given buprenorphin (0.02 mg/kg SC, q6hr) and meloxicam (0.05 mg/kg PO, q24hr) as a postoperative analgesia. The tubes were removed because no subsequent pleural effusion was observed. The cat was discharged 7 days after surgery and cat recovered uneventfully.

In humans, foreign bodies that are accidentally ingested usually pass through the gastrointestinal tract without incident within 1 week[15,17]. However, they can cause problems, such as bleeding, perforation, and obstruction. Sharp objects such as sewing needles[15], chicken bones[17], and toothpicks[12] have the potential to penetrate the digestive tract. In the digestive tract, foreign bodies most commonly perforate the stomach and the duodenum[17]. Perforation occurs mainly in the abdominal cavity, but migration into the liver and thoracic cavity has been reported in a few cases[12]. In dogs, reported intrathoracic foreign bodies include Kirschner wire[7] and grass awns[18], including one case of wire migration in the liver[3]. To our knowledge there are no reports of foreign bodies in the liver in cats, and only a few cases of grass awn migration in the thoracic cavity have been reported[10,18].

In our case, the foreign body in the liver and thoracic cavity was identified as a fishhook. There are two possible routes of entry for the needle to pass from the thoracic cavity to the liver. The first route is to enter the liver from the intrathoracic cavity via the diaphragm and re-perforate the thoracic cavity, and the second route is to deviate from the gastrointestinal tract in the abdominal cavity and stray into the liver and thoracic cavity. However, the second route via the abdominal cavity was considered unlikely because *Pasteurella* spp, which have difficulty surviving in the strongly acidic stomach, were detected in the thoracic cavity and no peritonitis was observed in the abdominal cavity[9]. The slight inflammation observed in the greater omentum was presumed to be related to the posterior end of the needle, which was partially protruding from the liver. The possible sites of perforation into the thoracic cavity were the skin, intrathoracic esophagus, and trachea. The skin route was considered unlikely because the *Pasteurella* species detected was an oral bacterium and there was no obvious trauma to the skin. Because an intrathoracic foreign body via the respiratory tract has been reported in one human case, it is possible that the fishhook entered the intrathoracic airway in this case as well[13]. However, because there were no findings suggestive of pneumothorax in this case, the possibility of an airway route was considered unlikely. Although no abnormality was found in the esophagus under endoscopy, esophageal perforation could not be ruled out because the perforation site in the gastrointestinal tract would have healed over time[16]. In addition, the esophagus is the most common site of entry for intrathoracic foreign bodies, and the presence of pyothorax containing indigenous oral bacteria suggests that this was the most likely route of intrusion into the thoracic cavity[16]. The fishhook has a large curvature, so it would not travel straight through the thoracic or abdominal cavity, but rather in a circular motion. From the above, we speculated that the needle penetrated the thoracic esophagus, entered the thoracic cavity, and strayed into the liver via the diaphragm before migrating in a circular motion until the tip penetrated the diaphragm again and deviated into the thoracic cavity.

In this case, the owner brought the cat to the hospital for vaccination and was unaware of any abnormalities. On initial examination, a slightly elevated respiratory rate and low body weight were confirmed, but these clinical signs were non-specific. Blood tests did not indicate hepatic abnormalities, and an ultrasound revealed the presence of an intrathoracic foreign body (rather than an intrahepatic foreign body), which was

the likely cause of the clinical signs in this case. In addition, the respiratory rate returned to normal following removal of the pleural effusion. In people, hepatic foreign bodies can remain asymptomatic for a long period in the absence of infection or abscess formation in the liver[17]. We believe that a similar phenomenon occurred in this cat. This report describes a rare case of metallic foreign body migration in the liver of a cat discovered incidentally while investigating the cause of an elevated respiratory rate without any clinical signs specific to liver disease.

In people, the recommended intervention for hepatic foreign bodies is early exploratory laparotomy to remove the foreign body and check the condition of the surrounding organs[6,17]. Misdiagnosis or delayed diagnosis of hepatic foreign bodies has led to death resulting from rupture of the gallbladder or liver abscess[6]. Thus, this rare condition requires rapid detection and response. It has also been reported that empyema caused by foreign bodies in the thoracic cavity requires surgery to prevent damage to the surrounding blood vessels and lungs in addition to the removal of the foreign body, which is the fundamental treatment[19]. In addition to these reasons, we performed surgery in order to prevent the spread of an intrathoracic infection to the liver and abdominal cavity. Although the clinical course was good, surgical intervention was considered necessary. Surgical removal of the foreign body is a conventional protocol for the treatment of empyema and peritonitis and is effective.

Regarding the removal of fishhooks that have strayed into the caudal region of the heart, there is concern that they may involve blood vessels such as the pulmonary artery, and deaths have been reported in dogs due to rupture of the pulmonary vein[1,14]. Accordingly, imaging studies are necessary to evaluate the relationship of the foreign object with blood vessels as well as to visually inspect the open chest when removing an esophageal foreign body that has strayed into the same site. However, due to the owner's limited budget, we were unable to perform imaging studies such as computed tomography to accurately determine the location of the needle in relation to the surrounding organs before surgery. Therefore, we planned the surgery based on the information from the X-rays and echocardiography as follows. Preoperatively, we assumed that the needle had entered the thoracic cavity by the radial esophageal route, strayed into the liver, and then deviated back into the thoracic cavity. Preoperative echocardiography confirmed that only a small portion of the needle tip had deviated into the thoracic cavity and that there were no large blood vessels in the surrounding area. Because there was no pneumothorax, it was assumed that the needle tip had not penetrated the lung and did not involve the pulmonary arteriovenous vein. If there was even the slightest resistance during traction, we were prepared to immediately proceed to open thoracotomy. In fact, the foreign object was pulled out posteriorly with little resistance during traction and was successfully removed as it was.

In conclusion, we reported both the first case of a foreign body in the liver of a cat, as well as the first case of a fishhook that strayed into the liver of an animal, including humans and dogs.

Potential conflicts of interest

The authors have nothing to disclose.

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