

## Gastrointestinal linear foreign bodies in cats: A retrospective study of 12 cases

### Research Article

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### ABSTRACT

Gastrointestinal foreign bodies are common in animals and may present with various clinical manifestations depending on the location, severity, and duration of the obstruction. Linear foreign body (LFB) obstructions are more common in cats compared to dogs, and the foreign body causing the obstruction is usually thread or threaded needle. In this study, it was aimed to determine the radiography and the localization of the obstruction in the diagnosis of LFB in cats, to investigate the operative treatment options and their effects on the prognosis. The study material consisted of 12 cats of different breeds, ages, and genders, which were referred with the suspicion of foreign body with acute/chronic vomiting and anorexia. After the identification of obstruction due to foreign body, the treatment was planned considering its localization, severity and duration of pathology. All foreign bodies were removed through surgical procedures. The most common finding was the plication in the intestines. Four cats died in the postoperative period. As a result, an early and rapid diagnosis of LFB positively affects the prognosis. Intestinal perforations caused by LFB and infection due to bacterial translocation are inevitable in delayed cases. Another issue to be considered is that extremely important to carry out a detailed examination of the mouth in cats, which show symptoms of gastrointestinal system origin illness. In addition, it is thought that to pull out the LFBs that protrude from the anus increase the perforation risk of intestine.

**Keywords:** Cat, foreign body, gastrointestinal, linear, vomit

### INTRODUCTION

Gastrointestinal (GI) foreign bodies are common in pets and may present with various clinical manifestations depending on the severity, location, and duration of the obstruction (Aronson et al., 2000; Papazoglou et al., 2003). In general, complete obstruction is associated with more dramatic clinical signs and a rapid worsening, whereas partial obstruction may be associated with more chronic signs of inadequate digestion and malabsorption (Papazoglou et al., 2003). Intestinal foreign bodies are easy to treat and have a good prognosis if diagnosed early. However, special situations may occur for surgeons due to linear foreign bodies (LFB) (thread, fabric, tape, cord, etc.). These foreign bodies can easily pass through the GI tract. However, these objects are usually stuck while passing through around the base of the tongue and pylorus (Evans et al., 1994). As peristalsis continues, foreign bodies become tense and embedded in the mesenterium of the GI lumen. Thus, the intestines get compressed due to LFB and causes plication. As a result, perforation may occur in the intestines (Aronson et al., 2000; Hayes, 2009).

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It has been reported that LFB obstructions are more common in cats than in dogs, and the object causing the obstruction is mostly thread or thread-needle (Bebchuk, 2002; Evans et al., 1994; Felts et al., 1984; Hayes, 2009). The most common clinical manifestations are vomiting, anorexia, and depression for both species (Bebchuk, 2002; Evans et al., 1994).

In this study, it was aimed to investigate the role of radiography in the diagnosis of LFB in cats, determination of obstruction localization, surgical treatment options and their effects on prognosis.

### **MATERIAL and METHOD**

#### ***Animal***

The study material consisted of 12 cats of different breeds, ages and genders, which were referred to Selcuk University Faculty of Veterinary Medicine Surgery Clinic with acute/chronic vomiting and anorexia, with suspicion of foreign body. Clinical signs and the anamnesis of the cats were recorded on the general examination forms at admission, and owners were asked if they witnessed swallow of the foreign body and the time that had elapsed occur clinical signs and admission.

#### ***Clinical Examination***

The physical examination started with direct inspection of the oral cavity in all animals and continued with palpation of the esophagus and abdomen. The obtained data were recorded. Vascular catheterization on the vena cephalica antebrachi and hematological examinations (blood gas analysis with GEM Premier 3000, USA and hemogram with MS4e, France) were performed. In order to diagnose the foreign body, radiological examination of the GI tract (right or left lateral and ventro-dorsal positions) were performed. Contrast-enhanced radiography was performed with Barium Sulfate 60% solution (2 mL/kg, PO) in cases without intestinal perforation which do not

show signs of peritonitis in physical, radiological and hematological examination.

#### ***Surgical Treatment***

After the identification of the foreign body that caused the obstruction, treatment was planned considering its localization, severity and duration of pathology. For the surgical procedure, medetomidine HCl (Domitor®-Zoetis, 0.025 mg/kg, IM) and butorphanol (Butomidor-Interhas 0.1 mg/kg, IM) were administered as preanesthetic. Subsequently, anesthesia induction was achieved by administering propofol (Propofol-Lipuro 1%® 1.5-3 mg/kg, IV). Then the cats were intubated and anesthesia was maintained with isoflurane (Isoflurane 2%-Adeka Pharmaceuticals, for maintenance anesthesia) in 100% oxygen with a flow of 2 L/min.

In all cases, abdominal exploration was performed starting from the stomach to the rectum and intestinal segments were carefully examined. After the location of the foreign body was determined enterotomy was used to remove it. In a case with invagination, resection/anastomosis was performed in addition to enterotomy. In addition to enterotomy, gastrotomy was performed in two cats in which the foreign body caused obstruction in the pylorus. In the presence of a foreign body connected with the oral cavity, before removal by enterotomy, the foreign body was released from the oral cavity by an assistant. After all foreign bodies were removed, the incision line on the intestine was routinely closed with a single layer of continuous suture (parallel suture in the antimesenteric region or transverse suture in the stenotic segment). Polydioxanone (PDO 3/0 and 2/0) nontraumatic sutures were used as suture material. The leak test was performed by injecting physiological saline with the syringe from the cranial side of the suture line. After the closure of the incision lines, the omentum was sutured to the cranial and caudal of the incision

lines with simple separate sutures. Abdominal cavity was lavaged at least twice with warm saline and closed routinely.

Metoclopramide HCl (0.2 mg/kg, IM) to counteract vomiting and, fluid therapy (lactated Ringer's solution, 100 mL, q12h, IV) were given for correcting dehydration and improving tissue perfusion in all cats. For postoperative antibiotic therapy, metronidazole (Polygyl

0.5%, Polifarma 7.5 mg/kg, q24h, IV) for 3 days and cefazolin sodium (Iespor®, Ulagay Pharmaceutical, 30 mg/kg, q24h, IM) for 7 days were administered. As analgesic, meloxicam (Metacam®, Boehringer Ingelheim) was administered (0.1 mg/kg, q24h, PO) on the first day and continued (0.05mg/kg, q24h, PO) for the next 4 days. Soft diet intake was allowed after temporary diet restriction for 8-12 hours postoperatively.

## RESULTS

### Clinical findings

The animals included in the study were determined as young animals with a mean age of 15 months (6 months-5 years), and gender distribution was 5 males and 7 females. The breed distribution was observed as 7 mixed breeds, 1 Blue Point Siamese, 2 British Shorthairs, 1 Scottish Fold and 1 Siamese (Table 1).

None of the patient owners reported witnessing foreign body ingestion. Only one cat (case 10) had a history of suspected foreign body ingestion, and another two cats (case 6 and 12) had a history of partially protruding foreign body (thread) from the anus at certain intervals. According to the anamnesis, it was noted that food intake decreased after vomiting in early period, and completely stopped with recurrent vomiting.

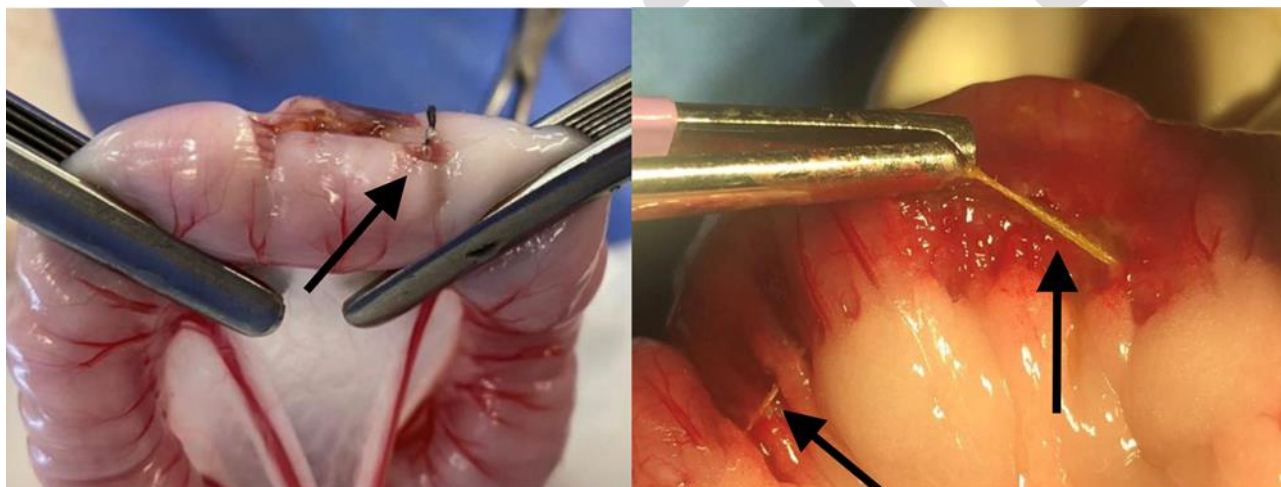
**Table 1.** Signalements and diagnosed foreign bodies of the cases

Case	Signalements				Diagnosis	Treatment
	Breed	Age	Sex	History		
<b>1 (EX)</b>	Mix	1 year	Male	Vomiting for 2 days, no defecation	LFB (thread)	Enterotomy and Gastrotoomy
<b>2</b>	Siamese	6 months	Female	Loss of appetite and vomiting for 7 days	LFB (thread)	Enterotomy
<b>3</b>	Mix	9 months	Female	Loss of appetite and vomiting lasting more than 1 week	LFB (thread)	Enterotomy
<b>4</b>	Mix	1 year	Female	Loss of appetite and vomiting lasting more than 1 week	LFB (threaded needle), perforation	Enterotomy
<b>5</b>	British shorthair	1 year	Male	Loss of appetite and vomiting lasting more than 1 week	LFB (thread)	Enterotomy
<b>6 (EX)</b>	Mix	5 years	Male	Vomiting and loss of appetite for 4 weeks, protruding LFB through the anus	LFB (thread), seen on the base of the tongue	Enterotomy
<b>7</b>	Scottish fold	2 years	Female	Up to 30 times vomiting per day for 5 days, no defecation	LFB (thread), seen on the base of the tongue	Enterotomy
<b>8</b>	Blue point	7 months	Male	Vomiting and loss of appetite for 3 days, no defecation	LFB (thread), invagination	Enterotomy and resection/anastomosis
<b>9</b>	Mix	1 year	Female	Loss of appetite and vomiting for 3 weeks	LFB (thread), perforation	Enterotomy
<b>10</b>	Mix	2 years	Female	Loss of appetite and vomiting for 5 days	LFB (thread), perforation	Enterotomy
<b>11 (EX)</b>	British Shorthair	11 months	Male	Loss of appetite and vomiting for 5 days	LFB (thread), perforation	Enterotomy
<b>12 (EX)</b>	Mix	9 months	Female	Loss of appetite and vomiting for 1 week, protruding LFB through the anus for 2 weeks	LFB (thread), perforation	Enterotomy

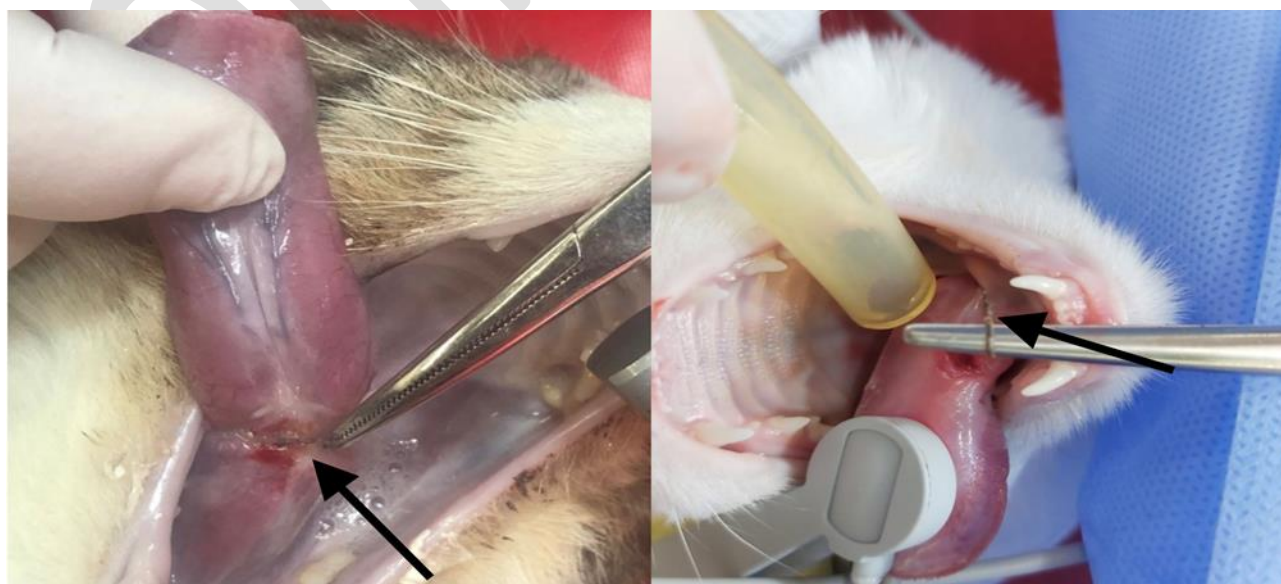
LFB: Linear Foreign Bodies

The primary findings in the clinical examinations of all cats were varying degrees of vomiting, loss of appetite, tangles and matting of the coat. Dehydration and lying in the sternal position were observed in all cats. The absence of defecation, which suggested a complete obstruction, was noted in three cats (cases 1, 7, 8). Besides these clinical symptoms, abdominal pain was observed in 50% (cases 4, 6, 8, 9, 10, 12) and retching was observed in 17% (cases 6, 7). Severe abdominal pain was observed especially in cases with the presence of intestinal perforation (cases 4, 9, 10, 11 and 12) (Figure 1). In addition, the case with the needle as foreign body were located in the intestine also showed the abdominal pain (case 4). In the clinical examination, foreign body (thread) was

encountered under the tongue in two cats (cases 6 and 7) (Figure 2). During the intraoral inspection it was observed that the foreign body extending from the mouth to the intestines. In response to the oral examination, decreased neck movements, and ptyalism were noted in both cats. Lethargy, anorexia, retching, and severe vomiting were mainly observed in cases of the foreign body located in the mouth. However, vomiting and anorexia were often observed in cases of the foreign body which located in the lower GI tract. The owners reported that medical treatment was performed, and no response obtained in these cats. For this reason, only 3 of the cases (cases 1, 8 and 10) were diagnosed in the early period.



**Figure 1.** Foreign body (thread) causing perforation (black arrow).



**Figure 2.** Looped LFB (thread) around the base of the tongue.

### Hematological Findings

Some hematological parameters were evaluated (Table 2). Hypokalemia (42%, n=5), hypernatremia (42%, n=5), hyperchloremia

(50%, n=6), hypochloremia (20%, n=2) and hyperlactatemia (50%, n=6) were identified. However, it was observed that 60% (n=3) of cats with hypernatremia progressed with hyperchloremia.

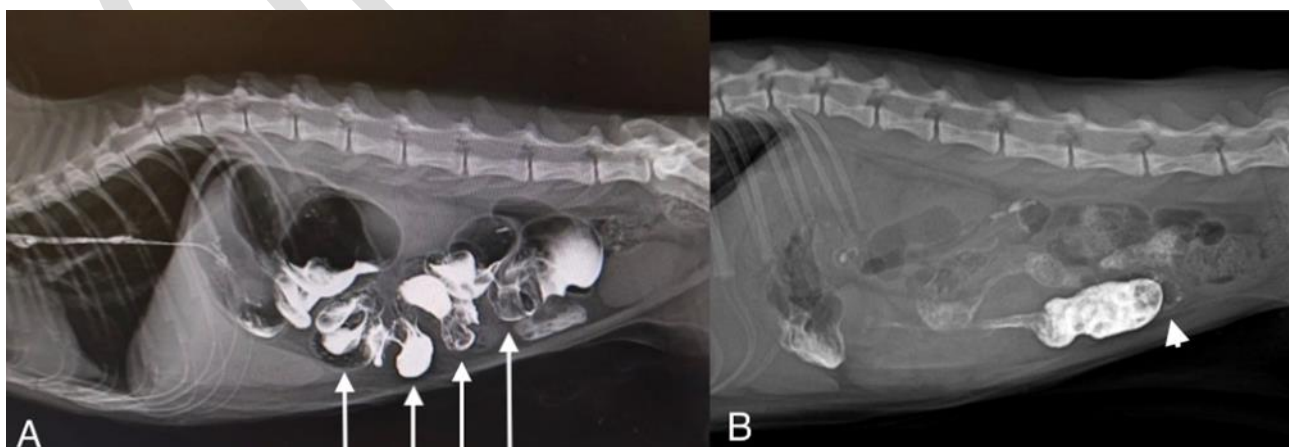
**Table 2:** Hematological and biochemical values

Case	pH (mmol/L) (7.35-7.40)	pO <sub>2</sub> (mmHg) (35-100)	K <sup>+</sup> (mmol/L) (3.5-5.8)	Na <sup>+</sup> (mmol/L) (135-152)	Cl <sup>-</sup> (mmol/L) (106-115)	cLac (mmol/L) (0.6-2.2)	WBC (x10 <sup>3</sup> /μL) (5.5-19.5)	HCT (%) (30-57)
1	7.39	40.2	3.6	159	122	1.4	18.4	56.2
2	7.49	40.7	2.9	162	107	2.5	20.1	61.3
3	7.36	43.0	3.4	145	113	7.2	37.4	19.2
4	7.31	38.2	2.8	140	103	5.6	10.5	59.2
5	7.54	28.0	2.1	162	89	2.5	35.9	67.5
6	7.37	55.4	4.4	149	120	3.7	8.9	54
7	7.48	42.5	4.2	151	124	1.5	12.4	61.6
8	7.40	30.1	4.1	159	122	1	29	40.8
9	7.38	38.2	3.9	151	121	1.5	7.2	57.4
10	7.37	31.0	3.6	170	126	1.9	18.5	52
11	7.51	56.2	3.1	148	106	2.4	17.3	57.7
12	7.33	33.7	4.8	137	109	1.5	10.4	36

### Radiological Findings

Direct radiographic examination was performed for all cases. The barium sulfate was used in cases requiring contrast-enhanced radiography (cases 6, 8). However, severe vomiting, the vomiting reflex that developed after ingestion of barium sulfate prevented contrast-enhanced

radiography. As a result of radiographic examinations, foreign body (needle) was clearly observed in 1 case (case 4). In the other cases after detection of obstruction and plication findings (Figure 3) experimental laparotomy decision was taken and the foreign body was determined during the surgical procedure.



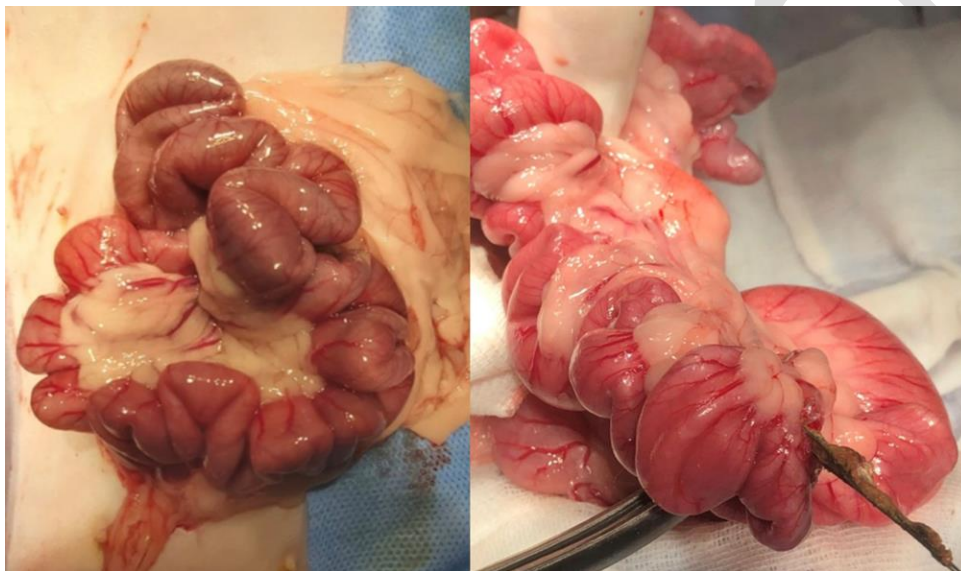
**Figure 3.** Plication (arrows) and obstruction (arrowhead) findings on contrast-enhanced radiographs.

### *Surgical Findings*

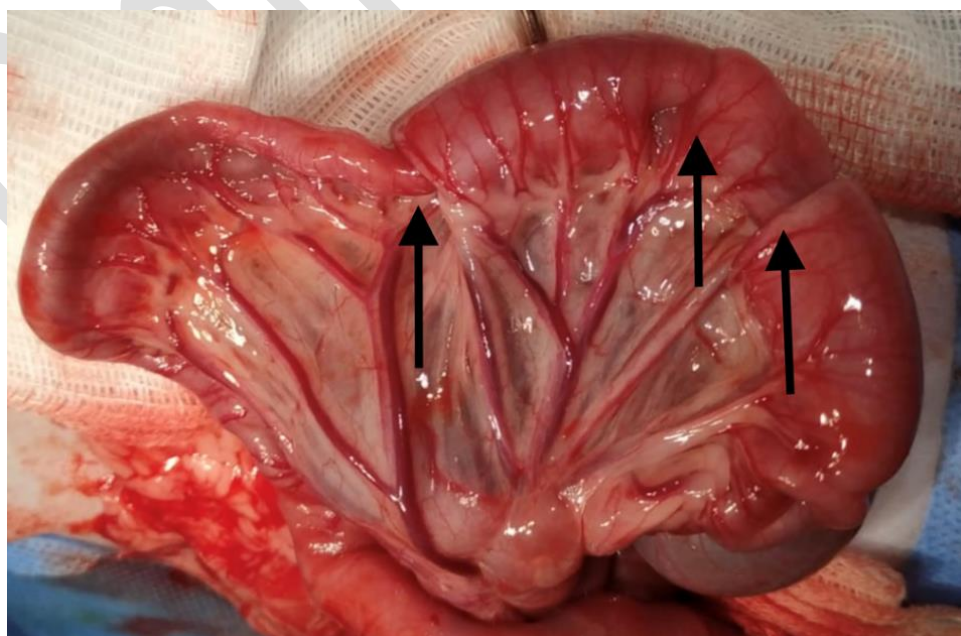
In two cats (cases 6 and 7) the foreign body was detected to locate in upper GI tract, in other cases it was seen in lower GI tract region. In the present study encountered foreign bodies were thread but only one threaded needle found in one case (case 4).

All foreign bodies were removed using one or more of the surgical procedures such as gastrotomy, enterotomy and resection/anastomosis following laparotomy. Intestinal plication was evident in ten cats (Figure 4). In

the present study, intestinal perforation in five cats (cases 4, 9, 10, 11 and 12) and intestinal invagination at three points in one cat (case 8) were observed (Figure 5). Intestinal perforations were caused by ingested foreign bodies that are sharp and elongated, such as needle and thread. In cases with perforation due to thread, there was excessive plication in three cats. However, plication was not observed in two cats with intestinal invagination (case 8) and perforation due to thread as foreign body (case 9). Four cats died in the postoperative period (cases 1, 6, 11 and 12).



**Figure 4.** Typical plication of intestines.



**Figure 5.** Invagination on the different three sites (black arrow).

## DISCUSSION

Direct radiographs are used in the diagnosis of foreign bodies. However, it was not always sufficient for a definitive diagnosis (Elser et al., 2020). Although direct radiographs are very helpful in the diagnosis of needles and similar radiopaque materials, they are quite insufficient in the diagnosis of radiolucent foreign bodies such as threads. The fluid or gas accumulation can be observed in the intestines or stomach, these findings are not pathognomic for the foreign bodies, and contrast-enhanced radiography or USG examination are needed in accordance with the literature (Codrenau et al., 2019; Madany et al., 2020).

Hypochloremia, metabolic alkalosis, hypokalemia and hyponatremia have been reported in dogs with various GI foreign body cases, and LFB cases have generally been associated with serum sodium changes. While these changes were generally accompanied by hyponatremia, they were accompanied by hypernatremia in other foreign body cases. However, the observed biochemical changes were not associated with foreign body localization (Boag et al., 2005). In our study, hypernatremia was observed in five cats and no hyponatremia was encountered. This situation showed inconsistency with the literature data. Literature data have been reported in dogs. In this study, which evaluated cats, it was observed that species differences were an important factor in biochemical data. However, foreign body localization and duration of pathology differed, and no variation was observed among the cats. In accordance with the literature data, foreign body localization did not cause specific biochemical changes.

The survival rate in LFB cases in cats has been reported to be 84-92% (Basher & Fowler, 1987; Felts et al., 1984). These rates were observed in the cats with the duration of clinical findings between 1-10 days. However, the mortality rate was reported to be quite high in

cases with symptoms over 14 days (Hayes, 2009). Clinical findings lasting up to 30 days have been observed in some cases. In our study, the clinical findings were similar to the periods in the literature and were observed predominantly for 7 days (2-30 days). The survival rate in our study was 66% (n=8) and it is consistent with the literature data. Although mortality rates were generally associated with more than one enterotomy site in these studies, it was thought that the effect of chronic partial obstructions caused by LFB may also contribute to the mortality rate. In addition, perforation in the lower GI tract and subsequent peritonitis have also been associated with deaths (Aronson et al., 2000; Basher & Fowler, 1987). The association of chronic partial obstructions with mortality is consistent with the presence of a 14- and 30-days foreign body history in two of the cats that died in our study. This may cause an increase in mortality in chronic cases (Aronson et al., 2000). It was thought that the mortality rate could be observed in acute cases as well as in chronic cases, depending on the severity of the obstruction.

It has been reported that partial obstruction usually occurs in LFB cases (Aronson et al., 2000). Similar to this, partial obstruction was encountered in most cases, while complete obstruction was encountered in only one case in our study. This case died after surgical treatment. This showed that complete obstructions can also be encountered in cases of LFB, suggesting that this may be more fatal than in cases of non-LFBs.

The owners' observation in foreign body located in the oropharyngeal region is very important. In our study, the findings of ptyalism, tenderness in the cervical region and loss of appetite before the clinical examination suggested the presence of a foreign body in the mouth. In this situation, a simple intraoral control is done by animal owners could accelerate the diagnosis and contribute to a better prognosis. In our study, the foreign body

(thread on the base of the tongue) detected in the oropharyngeal region at a rate of 17% (n=2) and it was similar to the literature data (Neamtu et al., 2021; Pratt et al., 2014). Anorexia, retching and vomiting were frequently observed clinical findings. Severity of these clinical findings were associated with the interest of the animal owner. In this study, a case was admitted to the clinic after 30 days later of ingested foreign body when the clinical symptoms became more severe. The increase of the mortality rate has also been associated with the patient's admission time to the clinic.

In a previous study, it was reported that the location, severity and duration of the obstruction were not associated with the survival rate (Hayes, 2009). Severity, localization and duration of obstruction due to the LFB were varied in this study. Nevertheless 75% of the cats were survived after the surgical treatments. The cats with chronic and complete obstruction were died. It has been observed that the localization of the foreign body has no effect on the mortality rate, which is consistent with the literature. However, contrary to the literature, it was thought that the severity and especially the duration of the obstruction may have an effect on the mortality rate.

### CONCLUSION

As a result, early and rapid diagnosis of LFB positively affects the prognosis in the post-operative period. Secondary infection caused by LFB should be avoided in delayed cases. LFBs that protrude from the anus should not be made to pull out. This increases the risk of plication and perforation. Cat owners should be warned about this. Another issue to be considered is that it is extremely important to carry out a detailed oral examination if the conditions are suitable, in cats that have symptoms generally originating from the GI system, such as vomiting, loss of appetite, and irregular defecation.

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**Ethical approval:** This study was approved by the Selcuk University, Faculty of Veterinary Medicine, Laboratory Animal Production and Research Center Ethics Committee (SUV DAMEK) with the decision date (06.01.2022) and number (2021/146). Patient owners of all cases signed an informed consent form.

**Conflict of interest:** The authors declared that there is no conflict of interest.

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