Endoscopic Removal of Foreign Body in Upper Gastrointestinal Tract in Dogs: Success Rate and Complications

Franco Metzker Poggiani¹, Rodrigo Pereira da Costa Duarte², Marcelo Ismar Silva Santana² & Paula Diniz Galera²

ABSTRACT

Background: Dogs and cats with acute signs of choking, retching, cough, vomiting, regurgitation, hypersalivation, dysphagia and odynophagia should have the presence of a gastrointestinal foreign body (FB) as part of their differential diagnosis, where it is a frequent condition in the care of small animals. Most objects lodged in the esophagus, stomach, and proximal duodenum can be removed by upper digestive endoscopy, a curative, little invasive procedure. The objective of our study was to evaluate the physical aspects and location of esophageal and gastric FBs observed in 88 dogs and the age and breed of the affected animals, and to determine the success rate and eventual complications associated with the procedure as well.

Materials, Methods & Results: Eighty-eight cases of dogs, males and females of varying ages and breeds, submitted to upper digestive endoscopy were selected because of suspicion of esophageal or gastric FBs. The endoscopic procedure aimed at confirming the diagnosis, whether or not followed by endoscopic removal of these objects. Prior to endoscopy, the animals had laboratory tests (blood count and serum biochemistry) and subsequently to the anesthetic protocols of choice for each case. Data including breed, age, type of constituent material and anatomical location of the FB, endoscopic procedure success rate and complications were recorded and descriptively evaluated. Of the 88 dogs evaluated, 60% (n = 53) were male and 40% (n = 35) female. According to the breed of the animals, 55% (n = 49) were small-breed dogs, 29% (n = 25) large-breed dogs, and 8% (n = 7) medium-breed dogs, and 8% were of mixed breed dogs, which could assume various sizes. Shih tzus accounted for 18% (n = 16) of the animals, Lhasa apso 8% (n = 7) and mixed breed 8% (n = 7), where these were the most frequently affected breeds. Regarding age, animals 1 to 5 years old represented 66% (n = 58) of the patients, and those 6 to 10 years old accounted for 20% (n = 18), while 11% of the dogs were over 10 years old (n = 10). Two animals (3%) had no information about their ages. Pieces of cloth were the most frequently found FBs, representing 20% (n = 20), followed by animal bones (19%) and fruit pits (10%). As for location, 78% (n = 69) of the FBs were located in the stomach and 22% (n = 19) in the esophagus. The success rate of endoscopic FB removal in this study was 83% (n = 73). In 76% (n = 67) of the animals, there were no complications due to the presence of FB in the upper gastrointestinal tract. The most frequent complications were esophageal ulcerations (n = 7) and inability to move the FB (n = 5) and adhesions (n = 4).

Discussion: The results showed that small-breed dogs, especially Shih tzus and Yorkshires, represented a larger number of cases, probably due to their popularity in Brazil, where the study was conducted. Males were more prevalent than females, and the most affected age was between 1 and 5 years, with emphasis on younger animals. There were more gastric FB cases compared to esophageal FB cases, which was related to the interval between ingestion of the object and veterinary care. Although not the most prevalent FB, the high rate of mango pits can be explained by the vast number of mango trees in the Federal District. There were few complications compared to the success of cases, indicating that endoscopy is the procedure of choice for the diagnosis and removal of FBs from the gastrointestinal tract.

Keywords: endoscopy, foreign body, stomach, esophagus, dogs.

DOI: 10.22456/1679-9216.100574

Received: 10 February 2020

Accepted: 18 May 2020

Published: 7 June 2020

¹Vetscopia Núcleo Especializado de Endoscopia Veterinária, Brasília, DF, Brazil. ²Universidade de Brasília (UnB), Brasília. CORRESPONDENCE: P.D. Galera [dra.paulagalera@gmail.com]. Faculdade de Agronomia e Medicina Veterinária - UnB. Campus Darcy Ribeiro - ICC Sul. CEP 70910970 Brasília, DF, Brazil.

INTRODUCTION

The presence of a foreign body (FB) in the upper gastrointestinal tract is frequent in dogs and cats [20], where it is considered an emergency if located in the esophagus. Animals with acute signs of choking, retching, cough, vomiting, regurgitation, ptyalism, dysphagia and odynophagia should have the presence of a gastrointestinal FB included in their differential diagnosis [21].

Bones are the most commonly reported gastrointestinal FBs, although snacks, balls, toys, hooks, pieces of wood and needles have also been reported [1,6,7,16,21]. Although rare, possible complications associated with endoscopic removal of FBs include perforation, hemorrhage, malfunctions in moving the FB making it more difficult to remove, breathing problems related to esophageal perforation with possible tracheal involvement, and the formation of stenosis when there is damage to the esophageal mucosa [20].

Most objects lodged in the esophagus, stomach and proximal duodenum can be removed endoscopically. It is recommended that a curative and less invasive procedure such as upper digestive endoscopy be performed immediately whenever possible, avoiding progressive worsening of the esophageal mucosa and consequently necrosis and other secondary complications [15,18].

Advantages of the procedure include low invasiveness, high success rate, and shorter performance time compared to surgical procedures [6]. Accordingly, the objective was to evaluate the physical aspects and location of esophageal and gastric FBs observed in 88 dogs and the ages and breeds of the affected animals, and to determine the success rate and complications associated with the procedure as well.

MATERIALS AND METHODS

Animals

We selected 88 cases of dogs, males and females of varying ages and breeds, that were submitted to upper digestive endoscopy because of suspicion of esophageal or gastric FBs. The endoscopic procedure aimed at confirming the diagnosis, whether or not followed by endoscopic removal of these objects. Prior to the procedure, the animals underwent laboratory tests (blood count and serum biochemistry) and, subsequently, the anesthetic protocols of choice for each case.

Endoscopic procedures

In the endoscopic procedures, we used a flexible videogastroscope (Olympus GIF-100)¹ with a 100 mm long and 9.8 mm diameter insertion tube with a 2.2-mm working channel and a flexible videocolonoscopy (Olympus GIF-100)² with a 130 mm long and 13.0 mm diameter insertion tube, with 2.2-mm working channel. The choice of one or the other endoscope for the procedure was made according to the size of the patient, and the videocolonoscopy was used for large and very large patients to allow access and adequate visualization of the pyloric antrum. For removal of the FB, we used endoscopic grasping forceps³ and also of the handle type. Images were obtained and recorded using a video capture card (Zscan®)⁴.

The endoscopy technique was according to Guilford [5], by introducing the endoscope into the oral cavity and directing it to the dorsal-caudal epiglottis region. After gas insufflation by the equipment, the pharyngo-esophageal junction was crossed, and it was possible to visualize the esophageal lumen. The entire esophageal length was inspected down to the cardiac ostium. After passage through the cardiac ostium, it was possible to observe the mucosal pool and folds of the gastric body. Subsequently, after stomach insufflation, the gastric fundus was inspected by an endoscopic retroflexion maneuver, followed by observation of the antrum and pylorus.

After locating the object in the esophageal or gastric lumen, the endoscopic forceps best suited for that type of material were introduced through the working channel of the equipment. The object was then seized and the endoscope retracted toward the oral cavity, along with the FB to be removed (Figures 1 and 2). The endoscopic procedure was considered successful in the complete removal of the FB orally without the need for surgical intervention or complications resulting from the procedure. Endoscopy was deemed a failure when it was not feasible to remove the FB or when it was necessary to push it into the stomach for later gastrotomy.

Data including breed, age, type of constituent material of FB, anatomical location, endoscopic procedure success rate and complications were recorded (Table 1), and descriptive analysis of the data was performed.

RESULTS

Of the 88 dogs evaluated, 60% (n = 53) were male and 40% (n = 35) female. According to the breed of animals, 55% (n = 49) were small-breed dogs, 29%

(n = 25) large-breed dogs, and 8% (n = 7) medium-breed dogs, and 8% were of mixed breed, which could assume various sizes, but had no documented data. Among the most represented breeds in this study, Shih tzus accounted for 18% (n = 16) of the animals, Lhasa apso 8% (n = 7), mixed breed 8% (n = 7), poodles 7% (n = 6), Yorkshires 6% (n = 5) and Rottweilers 5% (n = 4). Regarding age, the animals evaluated were between 1 and 13 years old, and those 1 to 5 years old represented 66% (n = 58) of the patients, those 6 to 10 years old 20% (n = 18) and those over 10 years old 11% (n = 10). The ages of two animals (3%) were not recorded.

Pieces of cloth were the most frequently found FBs, representing 20% (n = 20), followed by animal bones (19%), with 14% (n = 12) being pork and 5% (n = 4) chicken, and fruit pits (10%), with 7% (n = 6) being mango and 3% (n = 3) peach (Figure 3). As for location, 78% (n = 69) of the FBs were located in the stomach and 22% (n = 19) in the esophagus. With regard to gastric FBs, 42% (n = 29) were only in the antrum, 29% (n = 20) only in the body and 9% (n = 6) only in the fundus. Gastric FBs were commonly observed in more than one region of the organ (Graph 1). Among the esophageal FBs, 53% (n = 10) were located in the esophageal hiatus, 31% (n = 6) at the heart base height, 11% (n = 2) in the cervical esophagus and 5% (n = 1) in the chest entrance (Graph 2). FB obstruction of the esophageal lumen was complete in most cases.

The success rate of endoscopic FB removal in this study was 83% (n = 73), 89% (61 of 69 cases) in gastric removal and 63% (12 of 19 cases) in esophageal removal. In general, after endoscopic FB removal, the mucosa was normal in appearance. However, in some cases it was possible to observe mild to moderate enanthem.

Of the 11% (n = 8) of cases in which endoscopic removal of a gastric FB was not possible, 7% (n = 5) of the animals underwent gastrotomy and 4% (n = 3) gastrotomy and enterotomy. Of the 37% (n = 7) of unsuccessful cases of endoscopic withdrawal of an esophageal FB, 21% (n = 4) of the animals underwent esophagotomy and 16% (n = 3) had the FB pushed into the stomach, which led to a change in the surgical intervention from thoracic esophagotomy to gastrotomy.

In 76% (n = 67) of the animals, there were no complications due to the presence of an FB in the upper gastrointestinal tract. Among those with complications, the most frequently found were esophageal ulcerations (n = 7), the inability to move the FB (n = 5) and adhesences (n = 4) [Graph 3].

DISCUSSION

The improvement of flexible fiber endoscopes for video endoscopes, and the development of FB-grasping forceps, basket forceps, and polypectomy handle have made endoscopic removal the procedure of choice for the removal of esophageal and gastric FBs [19]. A technique involving the use of fluoroscopy-guided forceps has been described, however, little scientific information has been published on the subject or the long-term clinical evolution of the animals involved in such studies [12]. Due to their versatility, the most popular endoscopes in small animal practice are gastroscopes, which have four-way deflection of the tip. A gastroscope less than 9 mm in diameter and at least 130 cm long is suitable in most dogs for upper and lower digestive endoscopy [19].

There are diverging opinions on the ideal type of endoscope for performing esophageal FB removal. While some authors have found that the use of flexible

Figure 1. Piece of tile in the stomach removed by endoscopy.

Figure 2. Plastic bottle cap seal in the esophagus removed by endoscopy.

Figure 3. Main gastric and esophageal foreign bodies removed by endoscopy of the upper digestive tract. A- fishing hook. B- fruit pit (mango). C- synthetic leather bone. D- socks. E- bones. F- plastic bag. G- rocks. H- hard plastic (toy). I- milk carton lid.

endoscopes is the most appropriate way to evaluate the FB and esophageal mucosa integrity [17], others emphasize the advantage of using the largest diameter rigid endoscope to remove esophageal FBs when removal by flexible endoscopy becomes difficult or even impossible. This is due to the ability of rigid endoscopy to allow greater distension of the esophageal

wall immediately cranial to the FB [8] and, the use of lateral endoscopic forceps. As these forceps does not need to be inserted through the endoscope's working channel, they can have a larger diameter, be more robust and have greater amplitude of object grasping, which could increase the likelihood of successful endoscopic removal of an esophageal FB.

Tabela 1. Description of the sex, breed, age, foreign body, localization in the affected organ and the FB removal procedure in 88 dogs between 2013 and 2019.

Name	Sex	Breed	Age (years)	Foreign Body	Organ	Organ Region	Removal
1	Male	Border Collie	6	Ring and rocks	Stomach	Body and Fundus	Endoscopic
2	Male	Bulldog	1	Mango pit	Stomach	Antrum and Fundus	Endoscopic
3	Male	Bulldog	5	Ball of string	Stomach	Body	Endoscopic
4	Male	Bulldog	1	Peach pit	Stomach	Antrum	Endoscopic
5	Male	Bulldog	1	Mango pit	Stomach	Antrum and Fundus	Endoscopic
6	Male	Bulldog	1	Toy	Stomach	Antrum	Endoscopic
7	Female	Campeiro Bulldog	3	Rubber ball	Stomach	Body and Fundus	Gastrotomy
8	Male	Bull Terrier	3	Pieces of cloth	Stomach	Antrum	Endoscopic
9	Female	Bull Terrier	8	Mango pit	Stomach	Fundus	Endoscopic
10	Male	Bull Terrier	4	Hard plastic, wire	Stomach	Antrum	Endoscopic
11	Female	Bull Terrier	3	Pieces of cloth	Stomach	Antrum	Endoscopic
12	Female	Chihuahua	3	Peach pit	Stomach	Antrum	Endoscopic
13	Male	Cocker Spaniel	4	Wine cork	Stomach	Body and Antrum	Endoscopic
14	Male	Golden	1	Rocks	Stomach	Antrum	Endoscopic
15	Male	Golden	1	Electricity wire	Stomach	Body	Endoscopic
16	Male	Golden	3	Pieces of cloth	Stomach	Body	Endoscopic
17	Male	Siberian Husky	13	Metallic spoon	Stomach	Antrum	Endoscopic
18	Male	Siberian Husky	7	Clothespin	Stomach	Antrum	Endoscopic
19	Female	Siberian Husky	1	Pieces of cloth	Stomach	Antrum and Pyloric canal	Gastrotomy and enterotomy
20	Male	Labrador	6	Cloth and sticking plaster	Stomach	Body	Endoscopic
21	Female	Labrador	3	Mango pit	Stomach	Fundus	Gastrotomy
22	Female	Lhasa Apso	1	Chewing treat	Stomach	Body	Endoscopic
23	Male	Lhasa Apso	3	Ball of string	Stomach	Body	Endoscopic
24	Female	Lhasa Apso	7	Cloth, hair	Stomach	Fundus	Endoscopic
25	Female	Lhasa Apso	9	Wood, wire, cloth	Stomach	Antrum	Gastrotomy
26	Male	Lhasa Apso	2	Chicken bone	Esophagus	Esophageal hiatus	Endoscopic
27	Female	Lhasa Apso	4	Sock	Stomach	Body and Antrum	Endoscopic
28	Male	Lhasa Apso	3	Chicken bone	Stomach	Body	Endoscopic
29	Male	Pomeranian	1	Chicken bone	Esophagus	Thoracic inlet	Endoscopic
30	Female	Maltese	4	Pieces of sandals	Stomach	Body and Antrum	Endoscopic
31	Male	German Shepherd	2	Sock	Stomach	Body	Endoscopic
32	Male	German Shepherd	8	Pieces of cloth	Stomach	Body, Antrum and Pyloric canal	Gastrotomy and enterotomy
33	Male	German Shepherd	6	Pieces of cloth	Stomach	Antrum and Pyloric canal	Gastrotomy and enterotomy
34	Male	Malinois	8	Cloth and weed	Stomach	Body	Endoscopic
35	Male	Malinois	8	Plastic bag with numbing drug	Stomach	Body	Endoscopic
36	Female	Pinscher	2	Rubber part of a can	Stomach	Antrum	Endoscopic
37	Male	Pinscher	1	Pig bone	Esophagus	Esophageal hiatus	Endoscopic
38	Male	Pinscher	2	Fish scale	Esophagus	Cardiac base	Endoscopic
39	Male	Pinscher	2	Marble	Stomach	Antrum	Endoscopic
40	Female	Pitbull	11	Rocks	Stomach	Antrum	Endoscopic
41	Female	Pitbull	11	Corn cob	Stomach	Antrum	Endoscopic
42	Female	Poodle	-	Cloth, hair	Stomach	Antrum	Endoscopic

Tabela 1. Description of the sex, breed, age, foreign body, localization in the affected organ and the FB removal procedure in 88 dogs between 2013 and 2019.

43	Female	Poodle	13	Hair, pieces of hard plastic	Stomach	Antrum	Endoscopic
44	Female	Poodle	2	Plastic bag	Stomach	Antrum	Endoscopic
45	Female	Poodle	2	Cloth, string	Stomach	Body	Endoscopic
46	Male	Poodle	3	Plastic bag	Stomach	Antrum, Pyloric canal, duodenum	Endoscopic
47	Male	Poodle	12	Pieces of cloth, wire and wood	Stomach	Body and Fundus	Endoscopic
48	Female	Rottweiler	11	Chewing treat	Esophagus	Esophageal hiatus	Endoscopic
49	Male	Rottweiler	6	String	Stomach	Body	Endoscopic
50	Female	Rottweiler	3	Rubber pieces	Stomach	Body	Endoscopic
51	Male	Rottweiler	11	Pig bone	Esophagus	Esophageal hiatus	Endoscopic
52	Female	Schipperke	3	Pig bone	Esophagus	Esophageal hiatus	Gastrotomy
53	Male	Shih Tzu	3	Chicken bone	Esophagus	Cardiac base	Esophagotomy
54	Male	Shih Tzu	1	Sock	Stomach	Antrum	Endoscopic
55	Female	Shih Tzu	2	Metallic part of clothespin	Stomach	Antrum	Endoscopic
56	Male	Shih Tzu	12	Thread	Stomach	Pyloric canal	Endoscopic
57	Female	Shih Tzu	1	Trichobezoar	Stomach	Body	Endoscopic
58	Male	Shih Tzu	2	Mango pit	Stomach	Body	Gastrotomy
59	Female	Shih Tzu	1	Pieces of hard plastic	Stomach	Antrum	Endoscopic
60	Male	Shih Tzu	5	Pig bone	Esophagus	Esophageal hiatus	Gastrotomy
61	Male	Shih Tzu	6	Fish hook	Stomach	Antrum	Endoscopic
62	Male	Shih Tzu	5	Plastic milk packaging lid	Stomach	Antrum	Endoscopic
63	Female	Shih Tzu	1	Rubber toy	Stomach	Fundus	Endoscopic
64	Male	Shih Tzu	2	Sock	Stomach	Fundus	Endoscopic
65	Male	Shih Tzu	3	Pig bone	Esophagus	Esophageal hiatus	Endoscopic
66	Male	Shih Tzu	1	Sock	Stomach	Antrum	Endoscopic
67	Male	Shih Tzu	2	Clothespin	Stomach	Antrum	Endoscopic
68	Male	Shih Tzu	12	Thread	Stomach	Pyloric canal	Endoscopic
69	Male	Swergspitz	1	Chewing treat	Esophagus	Esophageal hiatus	Endoscopic
70	Female	Swergspitz	3	Pig bone	Esophagus	Esophageal hiatus	Endoscopic
71	Male	Mixed Breed	1	Metallic clamp	Stomach	Body	Endoscopic
72	Male	Mixed Breed	-	Fish hook	Esophagus	Cardiac base	Endoscopic
73	Female	Mixed Breed	2	Rubber toy	Stomach	Antrum	Endoscopic
74	Male	Mixed Breed	10	Cloth, stick	Stomach	Body	Endoscopic
75	Female	Mixed Breed	3	Pig bone	Stomach	Fundus	Endoscopic
76	Female	Mixed Breed	4	Pig bone	Esophagus	Esophageal hiatus	Gastrotomy
77	Female	Mixed Breed	10	Toothpick and pieces of cloth	Stomach	Body	Endoscopic
78	Male	Teckel	6	Plastic	Stomach	Antrum	Gastrotomy
79	Female	Teckel	7	Peach pit	Stomach	Antrum	Endoscopic
80	Female	Teckel	6	Cloth, hard plastic	Stomach	Antrum	Endoscopic
81	Male	Teckel	6	Mango pit	Stomach	Antrum	Endoscopic
82	Female	Teckel	3	Pig bone	Esophagus	Cardiac base	Esophagotomy
83	Male	West Terrier	2	Pig bone	Esophagus	Cardiac base	Esophagotomy
84	Male	Yorkshire	1	Pig bone	Esophagus	Cervical	Endoscopic
85	Male	Yorkshire	2	Fruits	Stomach	Body	Endoscopic
86	Female	Yorkshire	11	Fish hook	Esophagus	Cardiac base	Esophagotomy
87	Female	Yorkshire	1	Pig bone	Esophagus	Cervical	Endoscopic
88	Male	Yorkshire	2	Mango	Stomach	Body	Endoscopic

Graph 1. Localization of gastric FBs removed from 69 dogs between 2013 and 2019.

Graph 2. Localization of esophageal FBs removed from 19 dogs between 2013 and 2019.

Gastrointestinal FBs are a common diagnosis among dogs that are brought in for emergency veterinary care and yet pose a challenge [7]. Most (78%) of the FBs in the present study were located in the stomach, unlike previous studies that refer to the esophagus [6] or the small intestine [8] of dogs as being the most common site where FBs are lodged.

Removal of a gastrointestinal FB is the best example of the therapeutic potential of endoscopy [14]. In this study, it was found that endoscopy was successful; that is, the FB was orally removed in 83% of cases, corroborating the literature data, showing

success rates between 63.5 and 90% cases [6,8] if endoscopy was performed early. However, some authors report a preference for pushing the FB into the stomach, expecting it to be digested, reporting a low withdrawal rate (27%) [21].

Objects located in the esophagus were appropriately removed by endoscopy in 12 dogs (63%), a success rate similar to that described in previous studies [12]. The FB was moved into the stomach in three animals in the present study, a procedure that has been highlighted by some authors in previous studies [12,21]. Although removal of esophageal FBs is considered an appropriate therapeutic possibility, movement of these structures is not always possible because there are adhesions or perforations in the organ that prevent this. Faced with the impossibility of completely removing the FB from this organ, pushing it into the gastric lumen is suggested, leading the patient to undergo an open surgical intervention, gastrotomy instead of thoracic esophagotomy, as long as the case in question allows. Thoracic access to the esophagus, in addition to being a more elaborate technique than access to the stomach, may produce greater surgical morbidity and the possibility of worsening the patient's prognosis, since esophageal healing occurs

Graph 3. Complications presented during the endoscopic procedure for esophageal and gastric FB removal in 88 dogs between 2013 and 2019.

more poorly due to the absence of serosa, peristalsis, the impossibility of omentalization and the segmental irrigation of the organ [17]. Thus, the choice of upper digestive endoscopy in the diagnosis of esophageal FB is essential both in the attempt to remove the object completely and also to direct it to the stomach.

The main points of esophageal stenosis are in the region of the upper esophageal sphincter, chest entrance, base of the heart and near the region of the gastroesophageal junction [20]. We observed that most esophageal FBs were in the region of the esophageal hiatus (53%), corroborating what was described by other authors [6], but differing from another study in which 68.2% of FBs were found caudal to the base of the heart [12].

A prolonged time between the observation of clinical signs by the owner and the endoscopic procedure occurred with many patients in this study, which makes it possible to infer that the distal location of the FB in the esophageal lumen was a result of chronicity of the case and organ peristalsis. If there were early diagnosis and endoscopic intervention, it would be possible to find these objects in portions more cranial to the gastroesophageal junction. In addition, early diagnosis and treatment of these conditions would also influence the reduction of esophageal wall ischemic

processes due to FB and, consequently, reduce complications of ulcerations evaluated.

Regarding the FBs found, the results of the present study corroborate previously described results, in which animal bones as FBs had a high prevalence [6,12]. Fruit pits represented a high percentage in the present study (10%), especially mango (7%), unlike in previous studies [6,12,21]. According to the Companhia Urbanizadora da Nova Capital do Brasil (Novacap), there were on average of 500,000 mango trees of different species in the Federal District in 2016 [4]. Besides, it was forecasted that approximately 2000 seedlings would be planted per year, thus explaining the high prevalence of this type of FB in dogs in the region.

Most dogs were of small breeds (55%), corroborating literature data, which show a prevalence of 61.7 to 73% of esophageal FBs in small dogs [12,21]. However, some studies have shown that gastrointestinal FBs mostly affected large breeds such as Labrador retriever (13.6%), Golden retriever (5.3%) [8], Staffordshire terrier (30%) and English bull terrier (7%) [7]. It is important to highlight the high prevalence of Shih tzu (18%) and Yorkshire (6%) in the present study, agreeing with the prevalences found in previous studies in which Shih tzu represented between 11 and 18% and Yorkshire 9% [12,21]. The West Highland white terrier (WHWT)

breed, despite having reported gastrointestinal FBs ingestion [11,20], had a low prevalence in this study, representing only 1% of dogs. This can be explained by the low popularity of the breed in Brazil, where WHWTs are not among the ten most popular breeds in the country, while Shih tzu and Yorkshire occupy second and third place, respectively, following only mixed breed dogs [3]. Regarding the dogs of larger breeds, they were little representative in this study, which included Rotweiler and some UDB dogs, maybe due to the preference of dog owners in our region.

Dogs weighing less than 10 pounds have a higher rate of complications from FB ingestion [6]. It is believed that this relationship can be explained by the size of the FB compared to the size of the animal, i.e., the same FB is potentially more dangerous in smaller dogs. Complications observed in the present study included perforation (one case) and esophageal ulceration (eight cases). In contrast, esophageal perforation was the most common complication in a previous study, occurring in association with pneumomediastinum, a comorbidity not observed in the present study [6].

Young dogs are most commonly diagnosed with FBs and their ingestion should always be a suspect in puppies with acute or chronic vomiting [16]. Regarding age, 66% of dogs affected were between one and five years old, with most of them (22%) only one year old. This information is similar to that reported in the literature, where the age range of most dogs diagnosed with gastrointestinal FBs is between 2.5 and 4 years [5-7].

Risk factors associated with the clinical evolution of dogs with esophageal FB have already been established [21]. The main marker is the severity of esophagitis, as this is an important predictor of morbidity and length of hospital stay. It was observed that dogs with clinical signs for more than 19 hours showed severe esophagitis, which resulted in longer hospitalization and greater complications. Esophagitis can range from mild mucosal inflammation to ulceration and transmural involvement [19]. Esophageal FB movement causes repeated swallowing and relaxation of the lower esophageal sphincter. Repeated swallowing creates a refractory period when there is no peristalsis and food remains in the esophagus. Pressure necrosis occurs secondary to continuous peristaltic activity and damage extends from the mucosa to the submucosa. The resulting esophagitis affects the effectiveness of peristaltic activity with

reduced cardia tone and subsequent acid reflux [21]. Transmural esophageal necrosis may lead to overflow of food and toxins into the mediastinum and pleural space. Therefore, mediastinitis and pleuritis may cause severe systemic clinical signs [18].

Gastrointestinal tract obstruction results in disturbed water, acid-base and electrolyte balance due to hypersecretion and sequestration, which is exacerbated by vomiting and impaired ingestion of fluids and nutrients [2]. To make the diagnosis of obstruction by FB, it is essential to use imaging resources that help in the clinical confirmation of the existence of esophageal and gastrointestinal obstruction points, and thus establish the best form of treatment. It is well known that simple ultrasound and radiographic evaluations are often performed for this purpose. Despite the advantage of not requiring anesthesia, the identification of changes in the lumen of these organs through these imaging examinations may not be satisfactory, leading to a false negative diagnosis regarding the presence of esophageal obstruction [21]. Compared to radiography and ultrasound, endoscopy has the advantage of making tissue analysis feasible and being curative in cases of gastrointestinal FBs [15].

In one of the study patients, radiographic and ultrasound evaluations did not show the presence of a gastric FB. However, during endoscopic evaluation a bottle cap was found in the gastric body region that could be successfully removed. This finding is reinforced by data from a previous study in which, the FB was not observed with simple radiography in 91 (28.6%) of 318 dogs [8]. The use of barium for radiographic contrast is contraindicated if endoscopy is a possibility because this contrast impairs visualization [21]. In a study in which 22 dogs underwent radiographic examinations and esophagoscopy, the latter was considered the better diagnostic method [10]. Thus, it is inferred that endoscopy is considered a standard procedure in the identification of FBs in the esophageal and gastric lumen [20].

CONCLUSION

The results of this work indicated that dogs of small breeds, especially Shih tzu and Yorkshire, were more affected due to their popularity in Brazil. Males were more often affected than females, and the most common age was between 1 and 5 years old, especially 1 year old. The higher number of gastric compared to esophageal FBs was related to the long interval

between ingestion of the object and veterinary care. Although not the most prevalent FB, the high rate of mango pits can be explained by the vast number of mango trees in the Federal District. The complication rate was low compared to the success rate and these findings reinforce the use of endoscopy as the procedure of choice for the diagnosis and removal of gastric and esophageal FBs.

MANUFACTURERS

¹Aizu Olympus Co. Ltd. Fukushima, Japan.

²Rhosse Instrumentos e Equipamentos Cirúrgicos EIRELI. São Paulo, SP, Brazil.

³Jiuhong Medical Instrument Co. Ltd. Changzhou, China.

⁴Zscan Software Ltda. Goiânia, GO, Brazil.

Declaration of interest. The authors report no conflict of interest.

REFERENCES

- 1 Binvel M., Poujol L., Peyron C., Dunie-Merigot A. & Bernardin F. 2018.** Endoscopic and surgical removal of oesophageal and gastric fishhook foreign bodies in 33 animals. *Journal of Small Animal Practice*. 59(1): 45-49.
- 2 Boag A.K., Coe R.J., Martinez T.A. & Hughes D. 2005.** Acid base and electrolyte abnormalities in dogs with gastrointestinal foreign bodies. *Journal of Veterinary Internal Medicine*. 19(6): 816-821.
- 3 Doghero. 2018.** *Censo Canino 2018: top raças e nomes de cachorro*. Disponível em: <<https://love.doghero.com.br/dicas/censo-canino-2018-racas-nomes-de-cachorro-mais-populares>>. [Accessed online in August 2018].
- 4 G1. 2016.** *Pés de mangas em ruas do DF equivalem a 44% da produção do país*. Disponível em: <<http://g1.globo.com/distrito-federal/noticia/2016/11/pes-de-mangas-em-ruas-do-df-equivalem-44-da-producao-do-pais.html>>. [Accessed online in August 2019].
- 5 Guilford W.G. 2005.** Upper Gastrointestinal Endoscopy. In: McCarthy T.C. (Ed). *Veterinary Endoscopy for the Small Animal Practitioner*. Saint Louis: Saunders Elsevier, pp.279-321.
- 6 Gianella P., Pfammatter N.S. & Burgener I.A. 2009.** Oesophageal and gastric endoscopic foreign body removal: complications and follow up of 102 dogs. *Journal of Small Animal Practice*. 50(12): 649-654.
- 7 Hayes G. 2009.** Gastrointestinal foreign bodies in dogs and cats: a retrospective study of 208 cases. *Journal of Small Animal Practice*. 50(11): 576-583.
- 8 Hobday M.M., Pachtinger G.E., Drobatz K.J. & Syring R.S. 2014.** Linear versus non-linear gastrointestinal foreign bodies in 499 dogs: clinical presentation, management and short term outcome. *Journal of Small Animal Practice*. 55(11): 560-565.
- 9 Houlton J.E.F., Hertridge M.E., Taylor P.M. & Watkins S.B. 1985.** Thoracic oesophageal foreign bodies in the dog: a review of ninety cases. *Journal of Small Animal Practice*. 26(9): 521-536.
- 10 Jankowski M., Spużak J., Kubiak K., Glińska-Suchocka K. & Nicpoń J. 2013.** Oesophageal foreign bodies in dogs. *Polish Journal of Veterinary Sciences*. 16(3): 571-572.
- 11 Johnson G.F., Jones B. & Twedt D.C. 1978.** Gastrointestinal fiberoptic endoscopy in small animals. In: *Proceedings of the 28th Gaines Symposium* (New York, U.S.A.). pp.27-31.
- 12 Juvet F., Pinilla M., Shiel R.E. & Mooney C.T. 2010.** Oesophageal foreign bodies in dogs: factors affecting success of endoscopic retrieval. *Irish Veterinary Journal*. 63(3): 163-168.
- 13 Moore A.H. 2001.** Removal of oesophageal foreign bodies in dogs: use of the fluoroscopic method and outcome. *Journal of Small Animal Practice*. 42(5): 227-230.
- 14 Moore L.E. 2003.** The advantages and disadvantages of endoscopy. *Clinical Techniques in Small Animal Practice*. 18(4): 250-253.
- 15 Mourya A., Mehta H.K., Gupta D.K., Singh B., Tiwari A., Shukla P.C. Sheikh A.A. & Bhagat R. 2018.** Gastrointestinal Fiberscopy in Dogs: A review. *Journal of Entomology and Zoology Studies*. 6(2): 2330-2335.
- 16 Pratt C.L., Reineke E.L. & Drobatz K.J. 2014.** Sewing needle foreign body ingestion in dogs and cats: 65 cases (2000-2012). *Journal of the American Veterinary Medical Association*. 245(3): 302-308.
- 17 Radlinsky M.G. 2013.** Surgery of the Digestive System. In: Fossum T.W. (Ed). *Small Animal Surgery*. 4th edn. Saint Louis: Mosby Elsevier, pp.428-437.
- 18 Rousseau A., Prittie J., Broussard J.D., Fox P.R. & Hoskinson J. 2007.** Incidence and characterization of esophagitis following esophageal foreign body removal in dogs: 60 cases (1999-2003). *Journal of Veterinary Emergency and Critical Care*. 17(2): 159-163.
- 19 Tams T.R. 2005.** *Gastroenterologia de Pequenos Animais*. 2.ed. São Paulo: Roca, 472p.

- 20 Tams T.R., Rawlings C.A. 2011.** *Small Animal Endoscopy*. 3rd edn. Saint Louis: Mosby Elsevier, 682p.
- 21 Thompson H.C., Cortes Y., Gannon K., Bailey D. & Freer S. 2012.** Esophageal foreign bodies in dogs: 34 cases (2004-2009). *Journal of Veterinary Emergency and Critical Care*. 22(2): 253-261.
- 22 Zoran D.L. 2001.** Gastroduodenoscopy in the dog and cat. *The Veterinary Clinics of North America. Small Animal Practice*. 31(4): 631-656.