

## FOREIGN BODY IN THE GASTROINTESTINAL TRACT OF DOGS: A RETROSPECTIVE STUDY

### *CORPO ESTRANHO EM TRATO GASTROINTESTINAL DE CÃES: ESTUDO RETROSPECTIVO*

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#### SUMMARY

Foreign body in the digestive tract (FBDT) often affects the canine species. The clinical signs are nonspecific, thus it is necessary to perform complementary tests to obtain its diagnosis. This study objective was to evaluate 50 dogs of the Veterinary Hospital in the Universidade Federal de Minas Gerais (HV-UFMG), observing the racial predisposition, age, sex, types, topography, radiographic and ultrasonographic aspects of the FBDT occurrence. The diagnosis was obtained by the use of radiographic exams (37%), ultrasonographic exams (37%) or both of them (26% of the cases). No racial predilection was found, but male dogs were the most affected, representing 62% of the population. The average age of occurrence was  $5.8 \pm 4.5$  years. The most frequently site where FB was found were: stomach (42%) and jejunum (24% of the cases). The most common FBDT object were: fabric (16%) and fruit seeds (12%), but metal, bone, plastic and rubber objects were also found too. Radiographic and ultrasonographic examinations were efficient in isolation and /or in association, with 98% of cases of FBDT being successfully detected in dogs.

**KEY-WORDS:** Canine. Radiography. Ultrasound. Gastrointestinal diseases.

#### RESUMO

O corpo estranho no trato digestivo (CETD) acomete com frequência a espécie canina. Os sinais clínicos são inespecíficos, fazendo-se necessário realizar exames complementares para obtenção do diagnóstico. O objetivo do presente trabalho ao avaliar 50 cães atendidos no Hospital Veterinário da Universidade Federal de Minas Gerais (HV-UFMG) com CETD, foram observar a predisposição racial, idade, sexo e os tipos, a topografia e os aspectos radiográficos e ultrassonográficos dos CETD. O diagnóstico foi obtido por meio de exames radiográficos (37%), ultrassonográficos (37%) ou ambos (26%). Não houve predileção racial, mas cães machos foram os mais acometidos, representando 62% dos casos. A idade média de ocorrência foi de  $5,8 \pm 4,5$  anos. Locais onde os CE foram encontrados com mais frequência: estômago (42%) e jejuno (24%). Os CETD mais observados: tecidos (16%) e sementes de frutas (12%), mas também foram encontradas estruturas metálicas, ósseas, plásticas e de borracha. Os exames radiográficos e ultrassonográficos foram eficientes isoladamente e/ou em associação, sendo capaz de detectar 98% dos casos CETD em cães.

**PALAVRAS-CHAVE:** Canino. Radiografia. Ultrassom. Doenças gastrointestinais.

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## INTRODUCTION

Foreign body in the digestive tract (FBDT) is defined as any object ingested by the animal that has slow digestion or can not be digested. Therefore, they remain in the body at inappropriate sites and time, having an inflammatory, perforating and /or obstructive potential (FOSSUM, 2014; WEBB, 2015). The FBDTs have great importance in the clinical surgical veterinary and human medical routine. In the human medicine, FBDT is responsible for 21% of intestinal perforations (SEVILLANO et al., 2016).

Small dogs, due to their smaller intestinal lumen, are more susceptible to FB obstruction when compared to large ones (GIANELLA et al., 2009). Young animals are predominantly more affected as a result of their exploratory and playful habits (FOSSUM, 2014; WILLARD, 2010; NELSON & COUTO, 2015). However, in retrospective studies with a large number of patients, the adult number frequency exceeds youngsters one (HAYES, 2009; HOBDDAY et al., 2014). One of the main explanations for the foreign bodies' ingestion by adult dogs is the behavioral disorders, such as living under confinement, social life restriction and absence of a correct environmental enrichment. These factors increase the occurrence of stress, anxiety and obsessive compulsive disorders resulting in Pica Syndrome (NETO et al., 2011).

The FBs are generically divided into linear and non-linear types. The linear ones are described as objects which are anchored at an anatomic site inducing one or more intestinal folding (HOBDDAY et al., 2014). Numerous objects can assume a linear configuration in the digestive tract (DT). The most commonly found elements are carpet, plastic, rope (GONZALEZ et al., 2007), fabric yarns, sewing thread, fabric and dental floss (FOSSUM, 2014). Non-linear ones are defined as small objects that do not promote intestinal folding (HOBDDAY et al., 2014). The symptoms related to linear and non-linear foreign bodies are non-specific and depend on the object location in the DT and its obstruction degree (HOBDDAY et al., 2014).

The simple radiographic examination in three projections, such as right lateral, left lateral and ventrodorsal have great importance in the objects detection, and aim to locate foreign bodies taking as an advantage, the common gases presence in the digestive segment, acting as a natural contrast. Contrast radiographies with positive contrasts are used when the simple method does not allow a definitive diagnosis and there is not any perforation suspicion, for example when FB is small, located in a not well visualized area, and is radiolucent or poorly radiopaque (HOBDDAY et al., 2014).

Ultrasonography may be useful for FB identification, depending of their shape and echogenic properties. In addition, the exam allows pleating visualization, intestinal distension evaluation, liquid and /or gas accumulation register. It is also possible to evaluate the FB shape and its motility (GONZALEZ et al., 2007).

The FB has become a significant problem in the clinical-surgical veterinary routine when perforation, obstruction or intoxication caused by the FB occurs. Thus, this study objective was to evaluate the dogs attended at the Veterinary Hospital in the Universidade Federal de Minas Gerais (HV-UFGM), with a definitive diagnosis of FBDT, observing the topography, types and ultrasonographic and radiographic aspects of the foreign body occurrence in dogs.

## MATERIAL AND METHODS

A retrospective study was performed at the HV-UFGM during the period from January 1<sup>st</sup>, 2014 to October 20<sup>th</sup>, 2016 (32 months), in which a survey of 50 clinical patients' files available in the Hospital's internal system was performed. The dogs presented clinical signs of FBDT and the diagnosis was confirmed by means of complementary imaging tests (ultrasonography, radiography) or by exploratory laparotomy. The racial predisposition, age, sex, and types, topography, and radiographic and ultrasonographic aspects of FBDT were analyzed.

Regarding the breed, age, sex, FBDT type and topography and imaging aspects, the data obtained were available in the clinical file of each patient. The ultrasound device used to perform the abdominal ultrasonographic examination was the Esaote (MyLab 40). This equipment is a high resolution model, with linear (from 7 to 12 MHz) and microconvex (from 5 to 10 MHz) transducers. For the abdominal radiographic examination, the computed radiography system used was a VMI of 500 mA, with a Konica Regius Model 110 HQ digitizer and 14x17 cassettes.

Primary and secondary modifications were seen in the gastrointestinal tract caused by the FB presence. In the ultrasonography, echogenicity, texture, shape, parietal stratification, peristalsis, artifacts formation, intestinal folds presence, existence of alterations caused by the FB presence, such as free liquid and focal mesenteric reactivity, and FB visualization were considered. In the radiographic examination, density, natural contrasts visualization, radiopacity, topography, organ size and its contour, as well as the modifications caused by FB presence, such as dilatation, intestinal pleating, presence of paralytic and /or obstructive ileum, and the FB visualization when possible were taken into account.

## RESULTS AND DISCUSSION

The FBDT diagnosis in 49 (98%) of the 50 dogs was obtained through complementary imaging tests, being these radiographic and /or ultrasonographic exams. However, it was necessary the performing of abdominal exploratory laparotomy in 1 (one) patient to confirm the FB diagnosis. Among the 50 cases of FBDT reported in this study, 13 (26%) had associated the ultrasound and radiographic exams to confirm the diagnosis. The data above demonstrate the great ability of these imaging methods, when correctly chosen and

performed, to detect FB presence in dogs, even when are done in isolation.

Among the 50 dogs that presented FBDT, 31 animals (62%) were males and 19 (38%) were females. A study conducted with 499 dogs also found a similar percentage, observing the distribution between the genders of 67% for males and 33% for females (HOBDAÏ et al., 2014). Nevertheless there is no literature justifying such difference observed between the genders.

Regarding the patients' age, the mean age found was  $5.8 \pm 4.5$  years. This is similar to other studies that found a mean age of 4.3 years (HOBDAÏ et al., 2014) and 3.0 years (HAYES, 2009) and differs from other authors who report FBDT predominantly affecting puppies and youngsters due to their curious and active behavior (FOSSUM, 2014; NELSON & COUTO, 2015). Therefore, there is no consensus in the literature about the age group with the highest risk of FB ingestion.

One reason for the persistence of exploratory and playful behavior in adult dogs, which culminate in FB ingestion, may be related to confinement. In a study carried out in Rio Grande do Sul, it was observed a higher occurrence of FB in the winter months, when the dogs are more confined in their houses (BARP et al., 2013). Space restriction without adequate environmental enrichment is associated with reduced physical activity and poor social interaction with their owners and other animals. These factors reduce energy expenditure, increase stress, anxiety and the appearance of obsessive compulsive disorders that are directly related to the risk of FB ingestion by dogs (NETO et al., 2011; BARP et al., 2013).

About the animal distribution between the breeds, it was found that 10 (20%) dogs did not have a specific breed and 40 (80%) were defined breed dogs. Among the animals with a racial definition, 6 (12%) were Shih Tzu, 5 (10%) Poodle, 5 (10%) Yorkshire Terrier, 4 (8%) Golden Retriever, 3 (6%) Labrador Retriever, 2 Miniature Schnauzer (4%), 2 Bull Terrier (4%), 2 German Spitz (4%), 2 Boxers (4%), 1 (2%) Rottweiler, 1 (2%) Doberman, 1 (2%) Pointer, 1 (2%) Pekingese, 1 (2%) French Bulldog, 1 (2%) Pit Bull and 1 (2%) German Shepherd. The heterogeneity of breeds affected by FBDT observed in this study suggests that there is no racial predisposition, which differs from some studies where small breeds dogs were the most affected due to their smaller digestive organs diameter (GIANELLA et al., 2009).

The clinical signs in the present study were not evaluated. However, nonspecific symptomatology is expected, depending on the object location in the DT and its obstruction degree. The symptoms are related to vomiting, lethargy, anorexia, diarrhea and abdominal pain during palpation (HOBDAÏ et al., 2014). Thus, it is necessary to perform complementary imaging tests such as ultrasonographic and radiographic examination in the screening process to evaluate the FB diagnosis and the patients' prognosis (VENTER et al., 2005).

Regarding the topography of FBDT diagnosis, FB was observed in more than one location in 8 dogs (16%). The most frequent site was the stomach, which

corresponded to 21 dogs (42%), followed by jejunum in 12 patients (24%). FBs were also found in other segments of the small intestine, being the site not described in 8 dogs (16%) and in the duodenum region in 5 animals (10%). Cervical esophagus was the FB topographic site in 4 cases (8%), thoracic esophagus in 3 (6%), and large intestine in 4 dogs (8%). In 2 patients (4%), the FB anatomical location was not registered in their surgical record.

The results found in this study slightly differ from those described in the literature. In a retrospective study with 208 animals observed the jejunum (62%) as the mainly FB anatomical location, followed by the stomach (16%). The most common objects found were rubber, sewing thread and stone (HAYES, 2013). It is believed that the high FB incidence in the stomach in this study is due to the type and format of FB ingested, because some objects size and shapes have difficulty to progress to pylorus and consequently to duodenum and jejunum (DAVILA et al., 1987; WEBB, 2015).

Among the 50 FBDT cases, only 36 (72%) of the dogs had their FB identified in the postoperative files. It happened possibly due to a failure to fill in and update the patients' files during hospitalization. The types of objects removed in the surgeries were the most diverse, being fabric the most common one in 8 cases (16%), followed by the fruit seeds, especially mango and coconut seeds found in 6 patients (12%). Several metallic objects were also retrieved in 3 (6%) of the cases. Sewing needles, specifically, were found in 5 animals (10%), an equal number of the bones. Another 2 dogs (4%) had their obstructions caused by sand and stones. Silicon balls and many rubber articles were identified in 5 patients (8%). Plastic objects were found in 2 dogs (4%).

About the FB types, those observed in the study and identified after the surgery were predominantly non-linear ones in 27 (75%) out of 36 cases presenting FBDT with no potential to induce one or more intestinal pleats and 9 objects (25%) were classified as linear FB, such as fabrics and plastic bags (PAPAZOGLU et al., 2003; GONZALEZ et al., 2007).

The radiographic exam was efficient in the sewing needle, metallic objects (Figure 1, a), silicon balls (Figure 1, b), rubber objects (Figure 1, c) and bones identification. It is known that the density variation and object thickness provide a greater barrier to the X-rays penetration and as a consequence the FBs are seen as more radiopaque (white) structures in the obtained images, helping their identification. In some cases, only secondary findings of FBDT, such as distention and stacking of the intestinal loops, indicated an obstruction (Figure 1, d).

In the ultrasonographic exam, fabrics FBs, plastic or nylon composition objects were observed as linear hyperechoic structures in the intestinal lumen, sometimes forming posterior acoustic shading (Figure 1, e) associated with the pleating or intestinal loops occurrence. The fruits and coconut seeds were seen as smooth, convex, hyperechogenic surface with a strong distal acoustic shading (Figure 1, f) located in the intestinal lumen, and in some cases, it presented dilation of the anterior intestinal area. It happened as well as to

plastic objects, but with a variable reflecting surface due to their shapes.

Sand (Figure 1, g) and stones (Figure 1, h) were visualized both in the radiographic and ultrasonographic

examination, due to their superior density to the adjacent structures /organs and their echo reflection capacity, respectively.



**Figure 1** - (A) Right lateral abdominal radiograph, Labrador, male, 3 years old. An object with a compatible density to the metal weight was found in the small intestine. (B) Right lateral abdominal radiograph, Shih Tzu, male, 2 years old. The round radiopaque object visualized in stomach topography was compatible with a silicone ball. (C) Right lateral abdominal radiograph, German Spitz, male, 1 year old. Three objects with discrete radiopacity in the stomach (arrow) were compatible with rubbers objects. (D) Right lateral abdominal radiograph, Shih Tzu, male, 2 years old. Staking of the intestinal loops with large quantities of radiolucent gas were observed, indicating an obstructive process. The foreign body was identified as fabric during surgery. (E) Abdominal ultrasound image of a Bull Terrier, male, 8 months old. An echogenic surface can be seen in the cross-sectional image, creating distal acoustic shade, suggesting a foreign body made of fabric. (F) Abdominal ultrasound image of a male canine, mongrel, 5 months old. An echogenic, convex surface with distal acoustic shade is visible in the stomach, compatible with a mango seed. (G) Right lateral abdominal radiograph of a female canine, mongrel, 10 years old. A radiopaque area with an irregular surface in the stomach and a radiopaque object in the small intestine were seen in the topography. These were found to be compatible with sand and a stone respectively. (H) Right lateral abdominal radiograph, Shih Tzu, female, 5 years old. Radiopaque objects compatible with stones were observed in the stomach and small intestine.

## CONCLUSION

There is a FBDT patterns modification regarding the age group affected since the adult dogs were more predisposed to the FB ingestion in this study when compared to the youngest ones. There was no racial predisposition to FBDT occurrence. These modifications in the population distribution may be related to stress increasing, anxiety and obsessive compulsive disorders in the canine species.

Against what is observed in the literature regretting anatomical anchoring FBs topography in dogs, there were a greater occurrence in the stomach followed by the jejunum, and such alterations may be related to the FBs' size, hindering their progression to the pylorus.

The fabrics and plastic bags may behave as linear FBs in dogs, thus causing one or more intestinal folding. Radiographic and /or ultrasound examinations, when requested and performed properly, may be able to diagnose them in 98% of the cases.

In brief, there is an evident diagnostic plasticity between the ultrasonographic and radiographic examinations, being the ultrasound efficient in fabric and plastic detection and the simple radiographic examination effective in rubber and silicon balls detection. The ultrasonography and radiography association was necessary in a few cases, demonstrating that radiography or ultrasonography alone may have a satisfactory for FBDT detection in the most of dogs.

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