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CLINICAL AND ULTRASONOGRAPHIC FINDINGS IN THE GALLBLADDER MUCOCELE OF THE DOG

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Abstract

Gallbladder mucocele is a common extrahepatic biliary disease in dogs, often associated with high morbidity and mortality. The aim of this retrospective study was to describe the results of ultrasonographic examination in a series of cases with mucoceles of the gallbladder in dogs. The study included 18 small breed dogs, 7 males and 11 females, aged between 7 and 18 years (mean age = 11.67 years). Eleven of the 18 dogs (61.11%) were symptomatic and 7 dogs (38.89%) were asymptomatic.Ultrasonographic examination revealed an oversized gallbladder, showing an echogenic immobile content with a different appearance. Based on the ultrasonographic images the following prevalence was found: type I - 2 cases, type II - 4 cases, type II - 3 cases, type IV - 5 cases, type V - 4 cases. Type VI has not been identified. Also, gallbladder wall rupture was not observed in any of the cases examined. In conclusion, ultrasonography is the standard imaging method for the diagnosis of gallbladder mucoceles in dogs, revealing the presence of an enlarged gallbladder with an immobile bile pattern and variable appearance.

Key words*: dogs, gallbladder mucocele, ultrasonography.*

INTRODUCTION

The liver is the main gland of the digestive tract, which also has the role of synthesizing bile that is stored in the gallbladder (Gookin et al., 2023). As a result of mechanisms not yet fully understood, the gallbladder epithelium secretes an excessive amount of abnormal mucus, which accumulates in the gallbladder and undergoes continuous changes, resulting in a condition called gallbladder mucoceles (Kesimer et al., 2015; Mizutani et al., 2017; Codreanu & Popa, 2018). The accumulation of inspissated mucus in the lumen of the gallbladder can lead to its distention, accompanied by obstruction of the extrahepatic bile ducts and the onset of cholecystitis (Besso et al., 2000; Codreanu, 2010; Kesimer et al., 2015; Smalle et al., 2015; Rogers et al., 2020; Itoh et al., 2022; Jaffey et al., 2022). In addition, as a result of gallbladder distention, necrosis and/or rupture of the gallbladder wall may occur, leading to systemic inflammatory response syndrome and death of the patient (Smalle et al., 2015; Fuerst et al., 2019; Itoh et al., 2022). The death rate varies between 7% and 45% (Jaffey et al., 2019).

The aetiology and pathogenesis of the disease are not known and it is considered a multifactorial condition, including genetic and metabolic influences (Choi et al., 2014; Smalle et al., 2015; Fuerst & Hostnik, 2019; Jaffey et al., 2022). Among the risk factors for gallbladder mucoceles, hyperadrenocorticism, hypothyroidism, dyslipidemia, increased serum leptin concentration have been suggested (summarized in Butler et al., 2022). An increased frequency of this condition has been found in middle-aged and older dogs of pure breeds such as Shetland sheepdogs, Cocker Spaniels, Toy Poodles, Border terriers, Pomeranians, Chihuahuas, Miniature Schnauzers, Shih-tzu, Maltese and Beagles, as well as their mixes (Besso et al., 2000; Choi et al., 2014; Itoh et al., 2022; Jaffey et al., 2022). Although the disease may progress asymptomatically (Besso et al., 2000; Pike et al., 2004; Choi et al., 2014), the majority of patients present with a varied and often non-specific clinical picture, including anorexia, vomiting (following extrahepatic bile duct obstruction, or perforation/rupture of the gallbladder wall and peritonitis), hyperthermia and abdominal pain

(Worley et al., 2004; Choi et al., 2014; Smalle et al., 2015). Ultrasonographic examination highlights specific aspects of immobile bile material in the lumen of the gallbladder, which may show a stellate pattern or a fine striated pattern (so-called "kiwi fruit like" pattern)(Choi et al., 2014; Jaffey et al., 2022; Codreanu et al., 2022; Tudor & Codreanu, 2023), the definite diagnosis being established by histopathological examination (Besso et al., 2000). The aim of this retrospective study was to determine the types of gallbladder mucoceles in ultrasonographically examined dogs in order to guide therapeutic management.

MATERIALS AND METHODS

The medical records of dogs examined ultrasonographically in Link-Vet Veterinary Clinic, Bucharest, from 2017 to 2022 were retrospectively analyzed. Data retrieved from medical records referred to breed, age, sex, clinical signs and ultrasound examination result. At the time of presentation to the clinic, consent was obtained from the owners for the application of clinical and imaging assessment techniques to canine patients, as well as permission to use data from the dogs medical records. Ultrasonographic examination was performed using a General Electric Logiq S8 XD Clear 2.0 ultrasound machine, monitoring gallbladder size, gallbladder wall echogenicity and thickness, echogenicity and mobility of gallbladder contents, and distribution pattern of gallbladder contents. The presence of gallbladder mucoceles was established when the gallbladder was found to contain immobile material that did not move with gravity and had a fine striated and/or stellate appearance (Besso et al., 2000; Choi et al., 2014; Jeffey et al., 2022; Codreanu et al., 2022).

RESULTS AND DISCUSSIONS

Between 2017 and 2022, 995 dogs were registered, of which 294 had gallbladder disease. Of the dogs with gallbladder disease, 18 dogs were diagnosed with mucoceles (6.12%; 18/294). They were represented by 7 males (2 male-entire and 5 male-spayed) and 11 females (9 female-entire and 2 female-spayed), ranging in age from 7 to 18 years (mean age = 11.67 years). Breeds represented were mixed breeds (n=12), Beagle (n=2), Yorkshire (n=2), Miniature Schnauzer (n=1) and Pekingese (n=1) Seven of the 18 dogs were asymptomatic (38.89%), while 11 dogs (61.11%) were symptomatic, exhibiting vomiting (n=11), anorexia (n=8), hyperthermia (n=6), abdominal pain (n=7) and jaundice (n=4). Patients were diagnosed with gallbladder mucoceles by utrasonography, which is the current standard for diagnosis of this condition (Fuerst & Hostnik, 2019). As a result, ultrasonographically, the gallbladder was found to be distended, which showed an immobile bile content with a different appearance, on the basis of which each case was classified into one of the six known types, using the previously established classification (Besso et al., 2000). In 2 dogs (11.11%), a hyperechogenic, immobile, fine-structured content was found in the gallbladder lumen and classified as type I (Figure 1).

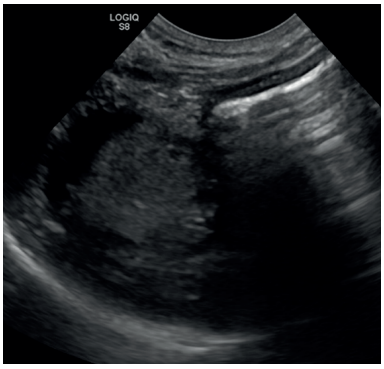

Figure 1. Type I, the gallbladder has an echogenic, immobile, non-gravity-independent bile content with a hypoechoic border

Four dogs (22.22%) were classified as type II (Figure 2), in which the biliary material has a hyperechogenic appearance with extensions adhering to the gallbladder wall giving a partially stellate appearance and a hypoechoic appearance at the periphery. In 3 dogs (16.67%) type III was identified (Figure 3), characterized by the accumulation of a viscous, hyperechogenic, stellate bile material on the hypoechoic background of the gallbladder, the so-called stellate pattern.

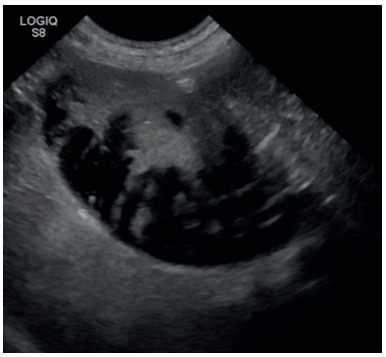

Figure 2. Echogenic biliary material shows a partially stellate pattern with adhesions to the gallbladder wall - type II

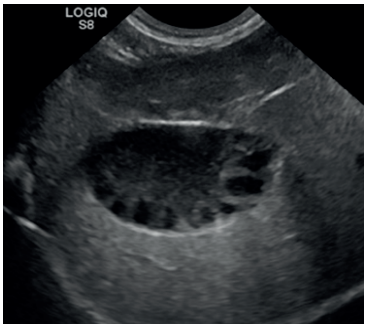

Figure 3. In the lumen of the gallbladder the echogenic, immobile bile content has a stellate appearance - type III

In 5 dogs (27.78%), type IV (Figure 4) was found, characterized by a combination of a stellate pattern (in which echogenic bile material located in the lumen of the gallbladder shows peripheral elongations, accompanied by peripheral hypoechogenicity) and a fine striated pattern (with thin hypoechogenic striations on the residual echogenic bile material), giving a kiwi fruit-like appearance in section. In 4 dogs (22.22%), type V was identified (Figure 5), in which the viscous and immobile contents of the gallbladder present the image of a kiwi fruit per section, with echogenic remnants. Type VI was not identified. Also, no rupture of the gallbladder wall was observed in any of the cases examined.

Mucocele is an abnormal accumulation of inspissated mucus produced in excessive amounts by the epithelium of the gallbladder wall, with increased viscosity, resulting in enlargement of the gallbladder (Choi et al., 2014; Codreanu & Popa, 2018; Tudor & Codreanu, 2023).

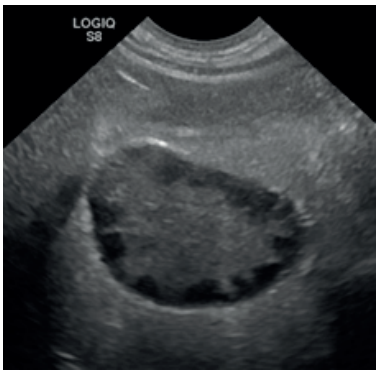

Figure 4. Type IV - gallbladder material shows a combination of stellate pattern and kiwi fruit-like pattern on section, gallbladder wall thickened

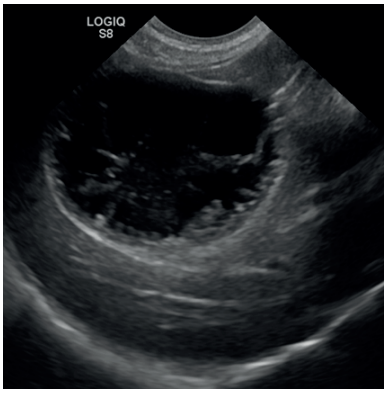

Figure 5. The bile material shows a characteristic kiwi fruit-like appearance in section, with echogenic debris

The aetiopathogenesis of gallbladder mucoceles is still uncertain and several hypotheses have been suggested (Choi et al., 2014; Jaffey et al., 2019). Among others, it has been suggested to be the consequence of a chronic inflammatory process of the gallbladder, mucinous hyperplasia of the gallbladder wall epithelium, biliary stasis or obstruction of biliary structures (Besso et al., 2000; Galley et al., 2022), however, no sufficient arguments were identifies to support one or the other of the suggested hypotheses, considering it a multifactorial condition (Smalle et al., 2015; Galley et al., 2022). In addition, it has been found that bile duct obstruction (either structural or functional in nature) can cause biliary stasis to occur, but mucocele does not form when bile content stasis is caused by structural obstruction (Besso et al., 2000).

Analysis of the results obtained in this study shows the presence of gallbladder mucoceles in 1.83% (18/995) of the dogs examined during the period evaluated, a condition characterized by the presence of immobile biliary material in the lumen of the gallbladder, which distinguishes it from biliary sludge (Mizutani et al., 2017). In addition, previous studies suggest that biliary sludge may represent a stage preceding the appearance of gallbladder mucoceles (Mizutani et al., 2017; Butler et al., 2022). Gallbladder mucocele has been identified in 5 small breeds, predominantly in mixed breeds, but purebred dogs such as Beagle, Yorkshire, Miniature Schnauzer and Pekingese have also been affected, as previously reported (Jaffey et al., 2019; Jaffey et al., 2022; Itoh et al., 2022). Regarding the age of the patients, in the present study, gallbladder mucocele was diagnosed in adult dogs, the average age recorded was 11.67 years, similar to those previously published in the literature (Choi et al., 2014; Jaffey et al., 2019; Galley et al., 2022; Jaffey et al., 2022; Itoh et al., 2022).

As in the previous studies (Choi et al., 2014; Jaffey et al., 2022), The present study found that the patients evaluated were both asymptomatic (38.89%) and symptomatic (61.11%), and the clinical signs were variable, mainly represented by vomiting, anorexia and abdominal pain. Ultrasonographic examination revealed the existence of bile material in the lumen of the gallbladder, which showed different patterns, especially type IV, without detecting type VI, characterized by the fine striated appearance of all bile material. In a previous study (Choi et al., 2014), it was found that in the 43 dogs evaluated ultrasonographically all biliary patterns were identified (30.23% showed type II, 25.58% type IV, 23.26% type I, 11.63% type III and 9.30% type V) except type VI. In contrast, in another study of 216 dogs, ultrasonographic examination was performed on 185 patients and all VI types of gallbladder mucoceles were identified (29.73% type II, 23.78% type IV, 17.3% type I, 14.59%, 9.73% type III and 4.86% type VI). A possible explanation for the differences observed in the present study compared to those previously published is the different number of patients examined. Although gallbladder rupture is a common complication in dogs with gallbladder mucoceles (Choi et al., 2014; Jaffey et al., 2018; Jaffey et al., 2022), in our study this change was not recorded.

Regarding the association between the clinical status of patients with mucoceles and the ultrasonographic type of gallbladder, previous studies have suggested that patients with severe clinical signs have an increased risk of a more advanced pattern of gallbladder mucoceles (Jeffey et al., 2022), this was also observed in the present study, in which symptomatic patients showed a more advanced pattern (IV and V). Identifying changes in the gallbladder in correlation with the symptoms expressed by the patient is of significant importance, helping to determine the appropriate therapeutic conduct for each patient. Previous studies have highlighted the association of gallbladder mucoceles in dogs with increased mortality if not diagnosed early and managed appropriately (Galley et al., 2022). The present study had some limitations due to its retrospective nature and the lack of information on patients subsequent outcome.

CONCLUSIONS

Ultrasonographic evaluation revealed characteristic changes in the gallbladder, recording its distention by an immobile bile content, with a variable pattern, stellate or finely striated, resembling a kiwi fruit in section. Based on the clinical manifestations in association with the type of gallbladder pattern identified ultrasonographical, the therapeutic management was established.

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