

Letter regarding “Evaluation of bronchial narrowing in coughing dogs with heart murmurs using computed tomography”

Dear Editor,

We read with interest the recent article by *Lebastard M et al. Evaluation of bronchial narrowing in coughing dogs with heart murmurs using computed tomography*.¹ For decades, veterinarians have noted that radiographs of older, small breed dogs with cough and with a severely enlarged left atrium because of severe mitral regurgitation appear to show compression of the left caudal (“left mainstem”) bronchus by the left atrium. However, such dogs are also prone to bronchomalacia and therefore the question has long been whether the cough is caused by the severely enlarged left atrium compressing a normal bronchus, the cough is caused by airway disease such as bronchomalacia (with the large left atrium merely highlighting the bronchial narrowing), or the large left atrium is compressing an already diseased left caudal bronchus and thus exacerbates the airway problem and the cough. One study has found that coughing, older, small breed dogs with large left atria have bronchomalacia and airway inflammation similar to that of coughing dogs lacking cardiomegaly.² Consequently, the only questions that remain are: (a) whether or not a severely enlarged left atrium can compress a normal left caudal bronchus; (b) whether or not a severely enlarged left atrium can compress a collapsed left caudal bronchus further; and (c) whether either of these can cause or exacerbate coughing. The study that is the subject of this letter¹ used computed tomography (CT) to provide further evidence that in older, small breed, coughing dogs with severely enlarged left atria, the bronchi are collapsed. In other words, it uses new technology to tell us what we already know (ie, that there may be an association between cardiomegaly and bronchial narrowing in older, small breed dogs). Unfortunately, this finding provides no new insight into the problem.

We have additional concerns about other aspects of this study.

INCLUSION CRITERIA

1. The authors searched a 4-month time frame 7 years ago. They indicated their goal was to identify dogs with cardiac murmur, cardiomegaly (defined as vertebral heart score [VHS] >10.5), and cough >2 weeks in duration. Although guidelines in veterinary

medicine for chronicity are lacking, recent guidelines in human medicine define chronic cough as being at least 8 weeks in duration in adults.³ We believe most veterinarians would consider 2 weeks as acute to subacute and likely would include an infectious etiology in the differential diagnosis.

2. Two of the 17 (12%) enrolled dogs were in stage B1 of myxomatous mitral valve disease, which, per definition, means they lacked cardiomegaly,⁴ and 3 dogs had a normal left atrial size (3 dogs had a left atrial-to-aorta ratio <1.6). All 5 of these dogs should have been excluded. This finding highlights the fact that many dogs without cardiomegaly have a VHS >10.5.
3. The description of heart murmurs was vague, and several dogs without left heart disease had to be excluded. A more appropriate inclusion criterion would have been a systolic murmur with the point of maximal intensity at the left apex.
4. The authors stated that they were not focused specifically on left atrial enlargement due to primary mitral regurgitation causing bronchial compression and cough and so included dogs with dilated cardiomyopathy. Inclusion of 17 dogs with primary mitral regurgitation and 3 with dilated cardiomyopathy makes any meaningful comparisons impossible. It would have been more appropriate if they had recruited a similar number of dogs with dilated cardiomyopathy and cough to determine if these dogs had a comparable degree of bronchial compression.
5. Apparently, presence of pulmonary abnormalities on imaging was not an exclusion criterion because most dogs had interstitial, alveolar, or bronchial infiltrates on CT, indicating that underlying respiratory disease or left heart failure (pulmonary edema) was likely present in many of these dogs. Consequently, neither cardiomegaly nor bronchial collapse was necessarily the cause of the cough.

CONTROL GROUPS

For a control group, the authors chose dogs without known cardiovascular disease that underwent thoracic CT during an unknown time period. Little information is provided on these dogs, and it is unclear if

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they were matched for age, breed, body condition score, and other factors. Including at least 2 other control groups would have been preferable: a group of dogs with cardiomegaly without cough, as was recommended in the discussion of a previous article on this topic,² and a group of coughing dogs without enlarged left atria or cardiomegaly.

IMAGING AND ASSESSMENT

The authors state that no significant association was found between CT findings of a bronchial pattern and the bronchial-to-aortic ratio; however, this does not rule out an effect of bronchial inflammation on cough.

We have several questions that arise from the imaging part of the paper:

1. Why was no comparison of radiographic and CT imaging findings included?
2. How and where (at what level) was the narrowest bronchial diameter identified and measured?
3. Why did the authors not perform contrast CT to precisely localize the left atrium?
4. Were the measurements on CT obtained during inspiration or expiration? Knowing is important because it has previously been shown that phase of respiration has a direct effect on CT measurements of airway diameter.⁵

UNANTICIPATED FINDINGS

As stated above, the classic debate is whether cough in an older, small breed dog with severe left atrial enlargement caused by mitral regurgitation is a result of the enlarged left atrium compressing a normal or a malacic left caudal bronchus, caused by bronchomalacia alone, a consequence of inflammatory airway disease, or a combination of disorders.^{2,6,7} Similar to the previous study,² the present study¹ found that numerous bronchi were collapsed. No one, however, has previously suggested that cough in these dogs is a result of compression of bronchi other than the left caudal bronchus. It is difficult to understand anatomically how a large left atrium could compress bronchi other than the left caudal bronchus, especially those on the right side, which are also commonly collapsed.^{1,2,8} Consequently, it seems more logical that the present study provides further evidence that many coughing dogs have widespread bronchomalacia.⁸

THERAPEUTIC ADVICE

The authors suggested bronchial stenting as possible treatment for dogs with cardiomegaly and bronchial narrowing, referencing a single case report on this procedure. We believe this suggestion is ill-advised given the controversy surrounding this topic and the fact that engineering of bronchial stents still is in the developmental stage.

We appreciate the opportunity to express our concerns regarding this study. We look forward to future studies of this topic that will enhance our understanding of the interaction between cardiac and respiratory diseases.

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REFERENCES

1. Lebastard M, Le Boedec K, Howes M, Joslyn S, Matheson JS, O'Brien RT. Evaluation of bronchial narrowing in coughing dogs with heart murmurs using computed tomography. *J Vet Intern Med.* 2021; 35:1509-1518.
2. Singh MK, Johnson LR, Kittleson MD, Pollard RE. Bronchomalacia in dogs with myxomatous mitral valve degeneration. *J Vet Intern Med.* 2012;26:312-319.
3. Morice AH, Millqvist E, Bieksiene K, et al. ERS guidelines on the diagnosis and treatment of chronic cough in adults and children. *Eur Respir J.* 2020; 55(1):1901136. <https://doi.org/10.1183/13993003.01136-2019>
4. Keene BW, Atkins CE, Bonagura JD, et al. ACVIM consensus guidelines for the diagnosis and treatment of myxomatous mitral valve disease in dogs. *J Vet Intern Med.* 2019;33:1127-1140.
5. Oh D, Lee S, Kim S, Choen S, Choi M, Yoon J. Computed tomographic bronchial collapsibility values over 50% may be detected in healthy dogs. *Vet Radiol Ultrasound.* 2019;60:28-37.
6. Ferasin L, Crews L, Biller DS, Lamb KE, Borgarelli M. Risk factors for coughing in dogs with naturally acquired myxomatous mitral valve disease. *J Vet Intern Med.* 2013;27:286-292.
7. Ferasin L, Linney C. Coughing in dogs: what is the evidence for and against a cardiac cough? *J Small Anim Pract.* 2019;60:139-145.
8. Johnson LR, Pollard RE. Tracheal collapse and bronchomalacia in dogs: 58 cases (7/2001-1/2008). *J Vet Intern Med.* 2010;24:298-305.