Tracheal and Airway Collapse in Dogs

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KEYWORDS

• Tracheal collapse • Airway collapse • Bronchomalacia • Chronic cough
• Tracheal stent

KEY POINTS

- Tracheal collapse is characterized by dorsoventral flattening of tracheal rings.
- Tracheal collapse affects the cervical and/or intrathoracic trachea and is seen most commonly in middle-aged to older toy and miniature breed dogs.
- Airway collapse or bronchomalacia affects large bronchi that contain cartilage and could be associated with similar cartilage defects to those seen with tracheal collapse.
- Medical management can include reduction of stress, weight loss, antitussives, bronchodilators, and possibly glucocorticoids and antibiotics.
- Surgical and minimally invasive treatment options are available when medical management fails.

INTRODUCTION

Tracheal or airway collapse is a common cause of cough in dogs and can affect the cervical trachea, intrathoracic trachea, or bronchial walls in isolation, or multiple regions can be affected concurrently. Tracheal collapse results from softening of the tracheal cartilage. It is typically characterized by dorsoventral flattening of the tracheal rings and prolapse of the tracheal membrane into the lumen. This prolapse leads to narrowing of the trachea whenever extraluminal pressure exceeds intraluminal pressure, causing airway collapse and impeding the passage of air. Clinically this results in a persistent dry, paroxysmal "goose-honk" cough, tracheal sensitivity, and varying degrees of respiratory difficulty. When the principal bronchi are also involved, the condition is termed tracheobronchomalacia. Bronchomalacia, which is recognized in people and in dogs, is a defect of the principal bronchi and other smaller airways supported by cartilage that causes narrowing and loss of luminal dimensions in intrathoracic airways and a reduction in ability to clear secretions. These changes result in bronchial collapse, causing chronic cough, wheezing, and intermittent or chronic respiratory difficulty.[1,2]

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CAUSE/PATHOPHYSIOLOGY

The cause of malacic airway disease is complex, incompletely understood, and likely multifactorial. In people, proposed causes include congenital conditions, endotracheal intubation, long-term ventilation, closed-chest trauma, chronic airway irritation and inflammation, malignancy, asthma, mechanical anatomic factors, and thyroid disease, but a definitive cause is unknown.[3–12] The cause of tracheobronchomalacia in dogs is also unknown and could be primary (congenital) or secondary to chronic inflammation (acquired). Given the common occurrence of tracheal collapse in small breed dogs, there could be a primary or congenital abnormality of cartilage with secondary factors playing a role in progression and development of clinical signs.

Tracheal collapse is associated with softening of cartilage rings due to a reduction of glycosaminoglycan and chondroitin sulfate, which leads to a weakness and flattening of the tracheal rings. Changes to the tracheal matrix and an inability to retain water lead to a decreased ability to maintain functional rigidity.[13,14] Extrinsic compression, chronic inflammation, and alteration in elastic fibers in the dorsal tracheal membrane and annular ligaments have also been considered as possible causes or factors that contribute to collapse.[15,16] Secondary factors that can initiate clinical signs include airway irritants, chronic bronchitis, laryngeal paralysis, respiratory infection, obesity, and tracheal intubation. It is critical to identify these factors for appropriate medical management.

Dynamic collapse of the airway perpetuates additional inflammation, tracheal edema, alterations or failure in the mucociliary apparatus, increased mucus secretion, and mucus trapping within the airways. The cervical trachea will collapse during inspiration and the thoracic trachea will collapse during expiration due to the pressures developed during the respiratory cycle. Tracheal collapse occurs almost exclusively in small breed dogs, while bronchial collapse occurs in both large and small breed dogs and most commonly involves the right middle and the left cranial bronchi.[1] In some dogs only bronchial collapse (bronchomalacia) is noted.

PATIENT HISTORY

Tracheal collapse is commonly seen in middle-aged to older miniature, toy, and small breed dogs. Age at presentation typically ranges from 1 to 15 years and signs have been present for years, although about 25% of affected dogs show clinical signs by the age of 6 months.[17] Breeds overrepresented include Yorkshire terriers, Pomeranian, Pugs, Poodle, Maltese, and Chihuahuas.[18] No sex predilection has been appreciated. Cats and large breed dogs are rarely diagnosed with tracheal collapse.

Bronchomalacia is reported in 45% to 83% of dogs with tracheal collapse[1,19] and has also been reported in dogs with eosinophilic bronchopneumopathy[20] or bronchitis. Bronchomalacia, unlike tracheal collapse, can affect any canine breed and can be seen in medium- and large- breed dogs,[1,2] suggesting that the underlying cause could be different from tracheal collapse, although histologic investigations are lacking. Within a population of coughing dogs, dogs with airway collapse are often older and lower in body weight, and have a significantly higher body condition than dogs without airway collapse.[1] Bronchomalacia and, specifically, collapse of the left cranial lobar bronchus, has been recognized in a large percentage (87%) of dogs with brachycephalic airway syndrome. In one report, Pugs were the most common brachycephalic breed affected with bronchomalacia, followed by English Bulldogs and French Bulldogs.[21]

Dogs with tracheal or airway collapse usually present to the veterinarian for evaluation of cough that is initiated by excitement, drinking or eating, or pulling on a leash with a neck lead. Prolonged clinical history is common and ranges from weeks to