

Tracheal Collapse: To Ring or to Stent

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Introduction

Tracheal collapse is a progressive, chronic, debilitating disease occurring primarily in middle-aged toy-breed dogs. Pomeranians, Poodles, Yorkshire Terriers, and Chihuahuas are most commonly affected. The clinical signs of tracheal collapse are a chronic nonproductive cough, exercise intolerance, and varying degrees of dyspnea. The cough often resembles a “honking-sound.” Clinical signs are exacerbated by excitement or anxiety and may proceed to collapse and syncope.

The dorsal membrane and cartilage rings are both involved in the degenerative process. The rings become hypoplastic or fibrodystrophic and cannot maintain the normal C-shaped configuration. Affected tracheas lack glucosamine glycan chondroitin sulfate resulting in loss of cartilage rigidity. The dorsal membrane is redundant and drawn into the cervical tracheal lumen during inspiration and into the thoracic tracheal lumen during expiration. The disease often progresses to involve the bronchi. The degree of collapse is classified from grade I (slight collapse with mild membrane redundancy) to grade IV (total collapse with the dorsal membrane lying on the tracheal ring).

Diagnosis

Palpation of the cervical region often reveals a flaccid, flattened trachea and stimulates a cough. The degree and severity of the collapse is best determined by radiography and tracheoscopy. Radiographs of the sedated patient during both inspiration and expiration will help to determine whether the collapse is in the cervical or thoracic trachea or both are involved. Tracheoscopy often gives a more accurate picture of the disease than does radiography. Flexible endoscopy provides the opportunity to evaluate the entire airway including laryngeal function, trachea, and bronchi. The need is to evaluate the entire airway including the bronchi where correction is not currently possible.

Treatment

Medical management includes weight loss, cough suppressants, bronchial dilators, and sedation

as needed to control anxiety and excitement. Medical management can result in long-term resolution of clinical signs in many cases as long as other medical problems are appropriately addressed. Some cases are refractory to medical care while others progress to a point of requiring surgical treatment.

Numerous techniques have been described for surgical correction of collapsed trachea. One of the first was dorsal membrane plication. This procedure results in significant reduction in trachea diameter. External splinting has been used for many years. Surgical placement of polypropylene C-shaped stents made from syringe barrels has been proven to be effective especially in dogs less than 6 years old.

Modification of the external ring technique includes a polypropylene spiral which attempts to provide a continuous support of the trachea. These rings and spirals are rather stiff and must be drilled for placement of sutures. Another modification includes the use of a polyvinylchloride ring made from intravenous drip chambers in place of the polypropylene rings or spirals. The rings can be purchased in various sizes commercially (New Generation) and are preferred over the home-made ones.

Tunnels are carefully dissected around the trachea preserving the tracheal blood supply and the recurrent laryngeal nerves. The trachea is sutured in four locations to the ring using 4-0 polypropylene suture. The sutures pull the collapsed trachea outward to the ring, relieving the collapse. A ring is placed every centimeter (every 3rd-4th ring) along the cervical trachea. Placing rings on the thoracic trachea is difficult. All of the external devices require some interruption of tracheal blood supply and dissection of the recurrent laryngeal. This can result in major morbidity and mortality. To overcome this latter complication, some have combined the rings with arytenoid lateralization. Over time the trachea tends to collapse between the rings or at the proximal or distal ends of the external rings. The collapse often proceeds to involve the bronchi.

Permanently implanted internal stents have been used to support human tracheas collapsed from malacia or cancer. These have recently been employed in cases of canine collapsed trachea. The Palmaz® stent was used but complications included pulmonary edema, stent migration, stent collapse, obstruction with granulation and cough. Better results were obtained from the use of Wallstent.®

We began to use the Ultraflex® stent (Boston Scientific) several years ago. We limited the use to dogs with either grade III or IV collapse who were severely compromised by their disease. Definitive diagnosis of collapsed trachea and the diameter and length of the collapse was determined by radiography and endoscopy. Endoscopy appeared to be more accurate at determining the severity of the collapse. The diameter of the collapsed trachea and the size of the stent to be placed was determined by placing a cuffed endotracheal tube in the larynx and applying positive pressure to the airway. The maximum tracheal diameter was then measured from a lateral radiograph with the trachea under positive pressure of 20 mmHg. A 4 to 8 cm long stent was chosen with the diameter equal to the maximum trachea size under positive pressure as determined by radiographs and endoscopy.

The dogs were anesthetized with injectable anesthetic (propofol) with oxygen provided through the endoscopy. The proximal and distal extent of the collapsed segment was determined with endoscopy. The stent catheter was positioned and the self-expanding stent was deployed. The positioning of the stent and dilation of the trachea were confirmed with endoscopy. Anesthesia was discontinued, and the dogs observed in the ICU overnight and then discharged the following day. Corticosteroid and antibiotics were administered for 14 days post-implant.

Stents can be placed in both cervical and thoracic trachea. The stents are available in various lengths and diameters. Most dogs will require only one stent, but some may require two placed end-to-end. Some stented patients do very well long-term with only a slight cough. However, others have developed some granulation tissue over the stent, and others have fractured the stent resulting in re-collapse.

Stents have many advantages over rings. Some of these include: no chance of damage to the segmented trachea blood supply or to the recurrent laryngeal nerve, can be placed quickly avoiding lengthy surgery, provide continuous support along the entire stented trachea, and subsequent stents can be placed if additional collapse occurs.

The disadvantages are that the stent is very expensive, proper application requires both endoscopy and fluoroscopy, chronic cough can occur if the stents are placed close to the cricoid, granulation tissue can build up at the ends of the stents, and the stents can fracture, resulting in recurrent collapse. A possible “best” approach might be to place rings on the cervical trachea to reduce expense and reserve stents for the thoracic trachea where rings are not feasible.

The Yorkie Angel Patrol Collapsing Trachea Support chat (YAPCTSupport)

is for pet owners who have dogs or had dogs with collapsing trachea. This group is comprised of members who can share their experiences and provide a personal view of life with a collapsing trachea dog both before and after surgery. We are here to help those in need.

To request an invite to join this group, go to:
YAPCTsupport-subscribe@yahoogroups.com