

Intraluminal tracheal stenting in dog with tracheal collapse : a case report

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Abstract

A 12-year-old female neutered dog was referring to the pet hospital for the chief complaint of syncopic episodes 3 times/day. The dog had history of severe goose-honking non-productive cough and tachypnea. The dog got worsen despite medical management was consist of antibiotic, mucolytic, bronchodilator, glucocorticoids and nebulization. The dog was not response to medication then develop to apnea due to obstructive breathing. The radiographs diagnosis from private clinic was redundant trachea with narrowing intrathoracic trachea. The surgical treatment was considered. The tracheobronchoscopy was confirmed Tracheal collapse at mid cervical to cranial thoracic part. Stenting was a treatment options in life-threatening period. The tracheal stenting was performed by place biliary stent under fluoroscopy guided. The cyanotic events disappear after stent placement. Postoperative complication in this case included pneumonia, coughing and gagging triggered by anxiety and excitement.

Keywords: tracheal collapse, stenting, dog, coughing

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Introduction

Tracheal disease is a common problem in small breed dog such as Poodles, Pomeranian, Chihuahua and Yorkshire Terriers (Johnson and Pollard, 2010). The normal trachea was seen to be circular on cross section. An open lumen is maintained during all phases of quiet respiration by the in complete dorsally cartilaginous tracheal rings, which are connected by fibroelastic annular ligaments to maintain flexibility. The tracheal membrane, consisting of tracheal muscle and connective tissue. Tracheal collapse refers to narrowing of the tracheal lumen resulting from weakening of the cartilaginous rings, redundancy of the dorsal tracheal membrane, or both (Hawkins, E.C., 2020). Clinical signs of tracheal collapse include respiratory problem such as a harsh cough, gagging and difficult breathing that can progressive to collapse. Medical treatment is required before surgical treatment such as reduce stress and anxiety, oxygen supplement, antitussives, bronchodilators, possibly corticosteroids for reduced airway swelling and elimination of environment triggers. Antibiotics were prescribed if it presented concurrent pneumonia. Surgical treatment can be considered in severe cases and refractory to medication. The patient that has history of collapse or syncope are the candidates for surgical interventions. Several surgical procedures for tracheal collapse treatment currently include the placement of an extraluminal prosthesis and an intraluminal stent. Postoperative stenting complications include intratracheal granuloma formation, stent migration, stent fracture and inflammatory tracheitis.

Materials and Methods

A 12-year-old female neutered Shih Tzu, weighing 5.6 kgs was referred to the pet hospital for the chief complaint of apnea 3 times/day. The dog with history

of severe goose-honking cough with non-productive, tachypnea and cyanotic episodes triggered by excitement. The previous medicine was amoxiclavulanic acid, marbofloxacin, bromhexine, acetylcysteine, aminophylline and dexamethasone. The dog was nebulized using salbutamol and budesonide 3-4 times/day. Despite receiving medication, the dog showed no improvement and eventually progressed to apnea, attributed to obstructive breathing. The dog was intubated with endotracheal tube for delivered oxygen and was sedated with 0.5 ug/kg/hr. dexmedetomidine. The radiographs diagnosis from private clinic showed redundant trachea with narrowing intrathoracic trachea and pneumonia was not present.

The physical examination, under anesthesia, revealed unconsciousness, BCS 4/5 and hypothermia. The slightly pink mucous membrane, and the capillary refill time was delayed. The audible heart sound was systolic murmur at 4/6 grading. Heart rate 60 bpm with arrhythmia. Blood pressure 100 mmHg. Respiratory rate 20 bpm. The lung sound was increased. Both femoral pulses were strong. The normal abdominal palpation and hydration status. The dog recovery, try to be chewing the tube, had led to cyanosis and collapse episode continued, was re-intubated for life saving.

During a critical emergency, an intubated patient underwent echocardiography for screening purposes. The findings unveiled thickened mitral valve leaflets characterized by an irregular nodular appearance, along with a mild degree of mitral regurgitation. The LA:AO ratio was 2.01(normal <1.6). The normalized left ventricular internal dimension at the end-diastole (LVIDd) was 1.9 mm. The cardiac dilatation may cause of increase preload. Results of blood tests showed unremarkable. Thoracic radiographs (pre-stenting) indicated narrowing intrathoracic lumen and pneumonia at left caudal lung lobe (Fig. 1).

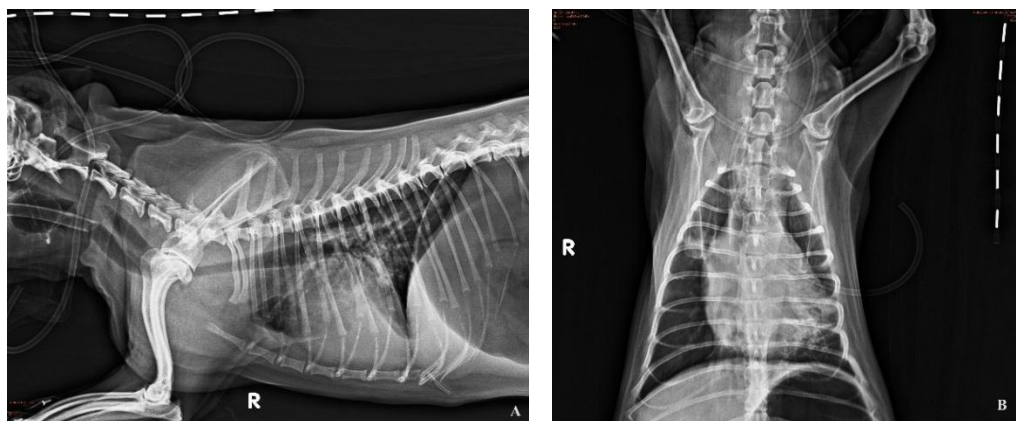


Figure 1 Thoracic radiographs (pre-stenting) indicated narrowing intrathoracic lumen, interstitial pattern at left caudal lobe and marked air hunger, (A); Right lateral view, (B); Ventrodorsal view.

The dog was anesthetized using 0.5 mg/kg morphine and isoflurane. The nasopharyngoscopy with 3.5 mm flexible bronchoscope appeared mild swelling, mild erythema mucosa without mass/polyp or thick secretion, not founded elongated soft palate, both glottises were moveable with respiratory rhythm and the laryngeal function, tonsils were normal.

Tracheobronchoscopy confirmed tracheal collapse grade 2-3/4 at middle cervical to cranial thoracic part and the dorsal membrane moving to obstruct the lumen on expiration (Fig. 2). Both main and bronchus were erythema, mild mucus secretion coated, mild collapse (grade1/4).

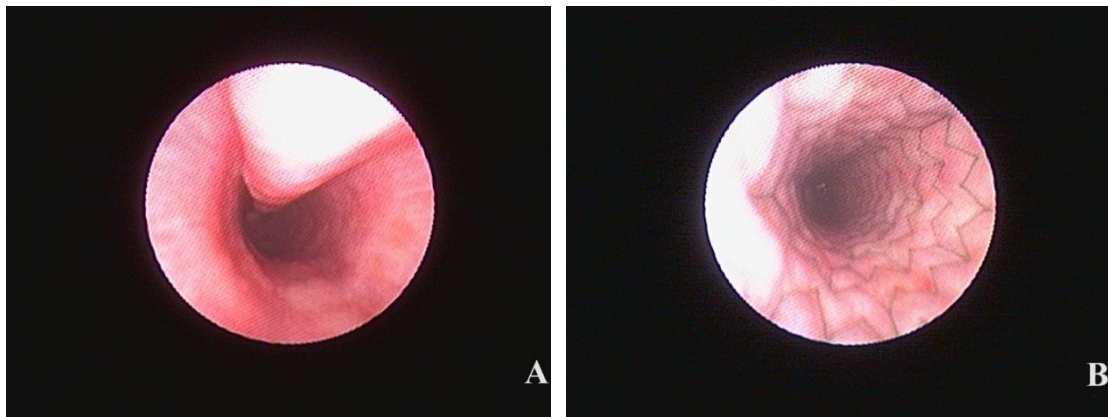


Figure 2 The tracheoscopy, (A); narrowing tracheal lumen and dorsal membrane. (B); post intraluminal stenting placement.

For stenting, the dog is positioned in lateral recumbency. The tracheal stenting was performed by place biliary stent (ZILBS-10-8, Zilver® Biliary Self-Expanding Stent, open-ended cylinder of nitinol, Cookmedical, Indiana, US) under fluoroscopic guidance. The stent was placed from cranial to

bifurcation segment to mid cervical, post stent scopy was good intact and fit stent to tracheal lumen (Fig. 3). Then bronchoalveolar lavage (BAL) with blind technique, retrieved 3 ml of mild cloudy fluid with small piece of white mucus. The dog recovered well from the procedure.

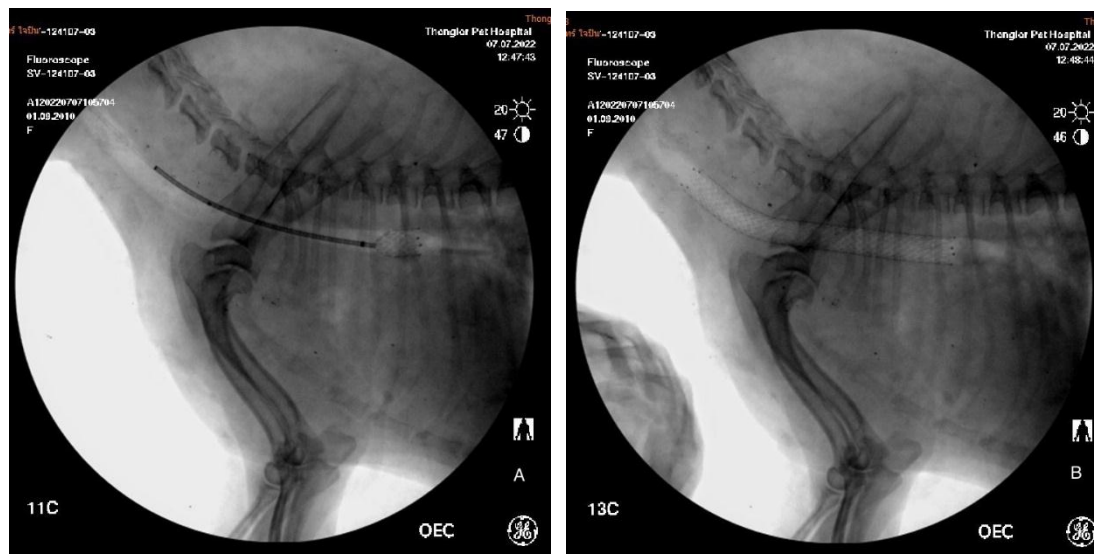


Figure 3 The stent and delivery system under fluoroscopy-guided, (A); The outer sheathing is released and deployed stent in area of tracheal collapse, (B); post intraluminal stenting placement.

Antibiotic therapy was initiated for treating pneumonia by using amoxi-clavulanic acid intravenously 20 mg/kg q8h and marbofloxacin 4 mg/kg then change to meropenem 15mg/kg q12h according to drug sensitivity results. The dog was also given doxophylline 20 mg/kg orally twice a day, carbosystetine 180 mg/dog for bronchodilator and mucolytic drug. Dexmedetomidine 0.5 ug/kg/hr combined with Fentanyl 3 ug/kg/hr was using for sedative and analgesia purpose. The dog was given a short-acting steroid used to alleviate airway inflammation was Dexamethasone at a dose of 0.1 mg/kg every 24 hours for a brief period, followed by a transition to Prednisolone at a dose of 0.6 mg/kg per day. Antitussive after stent placement levodropropizine (bronal®) 6mg/dog q12h in the first few days then change to codeine 2mg/kg q12h. In addition, the dog was administered gabapentin 10mg/kg q12h, omeprazole 1mg/kg q12h, alprazolam

0.04 mg/kg q24h and nebulization with salbutamol and budesonide.

Results

The dog exhibited a smooth recovery post-surgery. The next day, the dog markedly improved respiratory sign, pink mm and good appetite. On 5th day following admission, the chest x-ray revealed resolved pneumonia. The clinical presentation, on the 6th day treatment, the dog was gaging, barking and coughing a lot, controlled by fentanyl CRI 2 ug/kg/hr then prescribed clomipramine 2 mg/kg q12h and melatonin 2 mg/dog for control anxiety. The BAL bacterial culture identified Klebsilla spp. Unfortunately, the drug sensitivity test revealed susceptibility only to meropenem. The cytology revealed fibrino-suppurative exudate, the epithelial cells present with many cocci bacteria. The chest x-ray showed bronchial

lung pattern, resulting resolved pneumonia and no stent migration or fracture. The repeated echocardiography appeared moderate mitral valve regurgitation, resulting myxomatous mitral valve disease stage B1. The dog's eye was dry and ulcer that was controlled with eye topical medicine. At the follow-up 3 weeks, the dog was the significant improvement of breathing but severe depression and weakness. Unfortunately, the investigation showed anemia, hypoglycemia, hypoalbuminemia, elevated bile acid and increase D-dimer. The abdominal ultrasound indicated Hepatosplenic infiltrative tumor. The neoplasia was could not be ruled out. The dog passed away due to hepatobiliary failure and develop Disseminated intravascular coagulation (DIC) 30 days after surgery.

Discussion

This case was undergoing medical treatment for several weeks. The clinical sign had gotten worse and ineffective. The dog was apnea 3 times/day. In emergency crisis the dog cannot breathe by herself unless using endotracheal intubation. The surgical intervention was the options to improving respiratory failure. Therefore, tracheal stenting procedure was performed in the next day. The procedures were successful as suggested by normal breathing. The 1st week after stenting, the dog has significant improvements of breathing and no recurrence of cyanosis episode, although sometime harsh cough and gagging.

Full preanesthetic examination should be done. The owner should be informed about the risks of the surgical procedure, possible perioperative and postoperative complication. Postoperative complication in this case included pneumonia, coughing and gagging triggered by anxiety and excitement. All dogs undergoing intraluminal stenting should continue to receive the cough suppressant, steroid therapy to reduce airway inflammation and broad-spectrum antibiotic. Before stenting, laryngeal examination should be observe at induction and correction of laryngeal paralysis or staphylectomy should be done for elongated soft palate.

Recently, tracheal stenting has several different procedure and material. The alternative method that provided low postoperative complication. Based on the study of Suematsu M. *et al.*, 2019, it was shown that continuous extraluminal tracheal placement (CETP) in dog with tracheal collapse resulted in good outcomes. Preoperative dry, harsh cough resolved in 87% of the dogs after surgery. The dog undergone CETP placement should be observed breathing and voiced change to evaluated the development of laryngeal paralysis. Intraluminal tracheal stenting is minimal invasive, short anesthetic times and ability to used in any part of the trachea. Complications are common following extraluminal rings and intraluminal stents. The older dog or dog with main-stem bronchial collapse had a shorter survival time (Tinga S. *et al.*, 2015). This case was placed the self-expanding intraluminal stent to reconstruct the collapsed trachea. The successful intraluminal stent implantations result from the correct diameter and length of the stent. When

appropriately sized diameter stents are use under fluoroscopy, stent migration is minimal in the immediate, short-, or long-term periods (Raske *et al.*, 2018). At that emergency basis, we had intraluminal stents, designed for use within the biliary in people that it was a suitable airway stent from available options in our inventory. The report of using tracheal stent with a different brand of nitinol stent under bronchoscope placement showed the most common clinical signs during follow up included inflammatory tracheitis, bacterial tracheitis, and epithelial hyperplasia resulted from sliding of the stent lead to mucosal irritation (Durant *et al.*, 2012)

After 3 weeks of hospitalization, the dog was severe depression and died of Disseminated intravascular coagulation (DIC) after development of hepatobiliary failure. In the retrospective studies of Suematsu M. *et al.*, 2019 have reported that 98% of dogs survived to discharged after the CETP placement procedure except 1 death due to DIC after development pancreatitis and acute renal failure 16 days after surgery. Hamai *et al.* (2012) stated the outcomes of airway stenting in human with advanced esophageal cancer, the 2 patients died within 30 days of airway stenting due to multiple organ failure and DIC syndrome caused by cancer progression that death was not associated with airway stent-related complications. In this case, although airway stenting can remarkably improve the respiratory signs, it can also be complicated with concurrence systemic disease. The limitation of this case is that the dog was not investigated by necropsy and histopathology.

In conclusion, The surgery method for supporting the tracheal lumen was extraluminal polyurethane ring and intraluminal stenting therapy. Recently, both of all have several procedures, However, intraluminal stenting has been preferred due to it is less invasive and the shorter operation (Haynes *et al.*, 2017). Surgical treatment is considered when medical treatment is unsuccessful and dramatic clinical signs. That can improve quality of life but the prognosis remains guarded to poor. The dog will continue to need medical treatment for life and the more complications can occur.