Acute Respiratory Distress in a Brachycephalic Dog

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THE CASE

Yoyo, a 10-year-old neutered male Boston terrier, is presented to the emergency room for increased respiratory effort of 24 hours' duration. On presentation, the dog starts coughing and gagging, then develops wheezing that progressively worsens. He had been eating normally before onset of respiratory distress.

Yoyo has always been overweight but otherwise healthy and is not on any medications. The results of a routine physical examination and laboratory work performed 6 months prior are unavailable but were reportedly normal according to the owner. Yoyo has no history of vomiting or regurgitation.

On physical examination, Yoyo is bright and alert. Temperature (101.2ºF [38.4ºC]) and heart rate (120 bpm) are within normal limits. There is mild serous discharge from the left eye and increased respiratory effort with loud respiratory stridor and soft stertor on inspiration. Respiratory rate is elevated (66 breaths/min), and Yoyo wheezes on exhalation. Heart sounds are muffled bilaterally. His abdomen is pendulous, and BCS is 7/9.

The owner agrees to CBC, serum chemistry profile, and thoracic radiography. CBC and serum chemistry profile are unremarkable aside from elevated liver values (***Table***). Airway sampling for cytology and culture was discussed but not pursued, likely because of the patient's critical condition.

Thoracic radiographs (***Figure***) show an alveolar lung pattern in the ventral aspect of the right middle lung lobe that is most consistent with aspiration pneumonia

or bronchopneumonia. Hemorrhage, neoplasia, and bronchial obstruction are also on the differential list but are considered less likely. Hepatomegaly is present, as is radiographic evidence of possible palate/pharyngeal region swelling and aerophagia.

Yoyo is admitted to the hospital, placed in an oxygen cage at a fraction of inspired oxygen (FiO_2) content of 40%, and treated with ampicillin–sulbactam (22 mg/kg IV q8h), enrofloxacin (10 mg/kg IV q24h), terbutaline (0.01 mg/kg IV q12h[1]), and nebulization with 0.9% saline. He is placed on IV fluids at 50 mL/hr based on maintenance plus estimated subclinical dehydration, and his respiratory rate and effort are monitored every 2 hours.

What are the next steps?

THE CHOICE IS YOURS ...

CASE ROUTE 1

To continue hospitalization with supportive care, oxygen supplementation, and antibiotics for treatment of suspected aspiration pneumonia and to monitor the respiratory rate and effort and oxygen saturation via pulse oximetry, go to page 68.

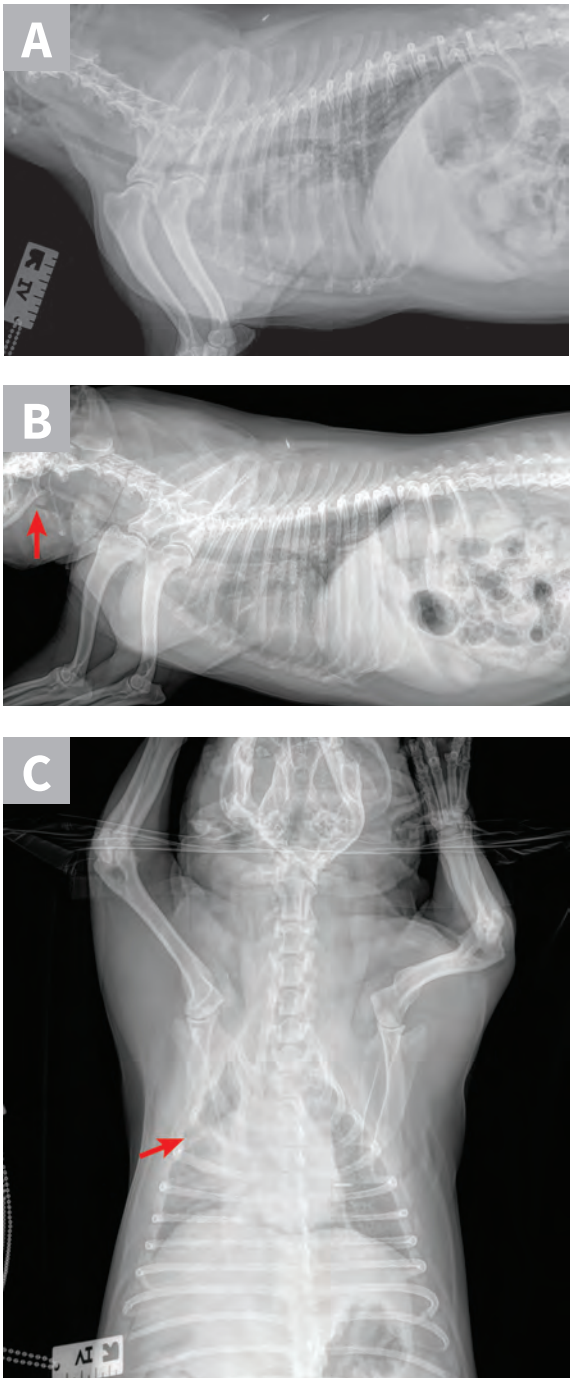
CASE ROUTE 2

To continue hospitalization with fluids and antibiotics for treatment of suspected aspiration pneumonia and to perform a sedated airway examination and CT scan to further assess the upper airway and lungs, go to page 70.

TABLE

ELEVATED LIVER VALUES

Test	Result	Reference Range
Alkaline phosphatase	924 U/L	0-140 U/L
Alanine aminotransferase	137 U/L	0-120 U/L
γ-glutamyltransferase	30 U/L	0-14 U/L



▲ **FIGURE** Right lateral (***A***), left lateral (***B***), and ventrodorsal (***C***) thoracic radiographs of the patient. Palate/pharyngeal region swelling can be observed (***B***; ***arrow***), as can an alveolar lung pattern in the ventral aspect of the right middle lung lobe (***C***; ***arrow***), which is most consistent with aspiration pneumonia or bronchopneumonia.

CASE ROUTE 1

You elect to continue hospitalization and supportive care, oxygen supplementation, and antibiotics for treatment of suspected aspiration pneumonia and to monitor the respiratory rate and effort and oxygen saturation via pulse oximetry.

Case Progression

After 72 hours of therapy, Yoyo remains bright and alert and continues to eat but remains oxygen-dependent. His respiratory effort remains increased, and he continues to have upper airway stertor and stridor. When attempts are made to decrease the FiO_2, Yoyo struggles to breathe.

Clinical Considerations

Numerous factors are contributing to Yoyo's respiratory distress. Radiographs show obvious pulmonary disease (aspiration pneumonia or bronchopneumonia; ***Figure***, previous page), which could explain the acute onset of respiratory distress and oxygen dependence. Stridor and stertor are persistent and relatively severe. Of note, stridor and stertor are signs of upper airway disease and will not occur with lower airway disease alone.

Brachycephalic airway syndrome could be contributing to the upper airway noise. Normal WBC count on CBC is not supportive of an infectious cause of pneumonia. Common findings in brachycephalic airway syndrome include stenotic nares, aberrant turbinates, nasopharyngeal collapse, everted laryngeal saccules, soft palate elongation and hyperplasia, laryngeal collapse, and left bronchus collapse.[2] Other differentials for upper airway noise include laryngeal paralysis, a foreign body in the pharynx, or a mass lesion causing partial obstruction.

Because Yoyo has lived with brachycephalic airway syndrome his entire life, it is reasonable to focus on the more acute pulmonary disease.

Outcome

Despite several days of supportive care and treatment for aspiration pneumonia, Yoyo shows no improvement in upper airway noise and remains oxygen-dependent. When attempts are made to take him out of the oxygen cage for walks or owner visits, upper airway stridor becomes pronounced and breathing becomes labored. The owner elects euthanasia because of the lack of improvement and poor quality of life.

Your Choice's Implications

Yoyo's persistent upper airway breathing pattern should have prompted a more thorough investigation of the upper airway. Physical examination findings are important when assessing respiratory patients. Breathing patterns can be used to localize respiratory tract lesions.

Audible breathing noises (eg, stridor and stertor) on inspiration are associated with upper respiratory tract disease. Stridor, or high-pitched noise on inspiration, is associated with upper airway obstruction[3] and disease of the oropharynx or larynx.[4] Stertor is a lower-pitched noise similar to snoring that occurs with disease of the nasal cavity or nasopharynx.[4] Inspiratory distress without audible noise can occur with severe abdominal distention or pleural space disease.[3] Respiratory distress on expiration is often caused by pulmonary parenchymal disorders.

Yoyo had physical examination findings associated with both upper and lower airway disease (ie, stridor and stertor on inhalation combined with wheezes on exhalation, respiratory distress, and hypoxia). He did not improve with treatment for pulmonary disease alone, and only one of the 2 major respiratory problems was addressed. Further assessment of the upper airway (ie, sedated laryngeal examination +/- CT scan and bronchoscopy) would have been necessary if the owner had elected to continue treatment.

FiO_2 = fraction of inspired oxygen

CASE ROUTE 2

You elect to continue hospitalization on fluids and antibiotics for treatment of suspected aspiration pneumonia and to perform a sedated airway examination and CT scan to further assess the upper airway and lungs.

Case Progression

After 2 days of treatment for pneumonia with fluids and antibiotics, Yoyo's respiratory effort is improved, but he is still uncomfortable without supplemental oxygen. He continues to have upper airway stridor and stertor on inspiration and can only spend short periods of time on room air without becoming distressed. The risks of anesthesia in a patient with pneumonia are discussed with the owner. The owner authorizes a sedated upper airway examination and CT scan of the head, neck, and chest to look for the cause of the upper airway disease.

The sedated laryngeal examination shows absent movement of the arytenoid cartilages bilaterally that is consistent with laryngeal paralysis. The soft palate is elongated. There is no evidence of everted laryngeal saccules on examination. The CT scan shows extensive periodontal disease, tonsillar and laryngeal saccular eversion, and nasopharyngeal stenosis. The lungs show atelectasis of the left cranial and bilateral caudal lung lobes.

Yoyo undergoes airway surgery the following day. A soft palate resection and rhinoplasty are performed. No evidence of laryngeal saccule eversion is noted during surgery. An attempt is made at arytenoid lateralization to treat the laryngeal paralysis; however, surgical correction is not possible because of chondromalacia of the arytenoid cartilages.

Yoyo is treated postoperatively with ampicillin–sulbactam (22 mg/kg IV q8h), enrofloxacin (10 mg/kg IV q24h), hydromorphone (0.08 mg/kg IV q6h), acepromazine (0.01 mg/kg IV as needed), and dexamethasone (0.1 mg/kg IV q12h). Oxygen supplementation is continued.

Clinical Considerations

Brachycephalic airway syndrome is likely contributing to the patient's respiratory distress. Common abnormalities of brachycephalic airway syndrome include stenotic nares, aberrant turbinates, nasopharyngeal collapse, soft palate elongation and hyperplasia, laryngeal collapse, everted laryngeal saccules, and left bronchus collapse.[2]

Many brachycephalic dogs can compensate for their anatomic abnormalities and function well for a period of time; however, with time, the increased effort and negative pressure necessary to breathe can result in laryngeal and pharyngeal inflammation and hyperplasia, which can worsen airway obstruction.[5] Any additional respiratory compromise (eg, pulmonary disease, warm and humid ambient temperature) may not be well tolerated in these breeds because of their already compromised respiratory tract. Because of the progression of upper airway dysfunction in these patients, middle-aged and older dogs with brachycephalic syndrome may still benefit from surgical intervention.[2] Small corrections in the airway via surgical intervention can help relieve the patient.

Outcome

Approximately 36 hours postsurgery, Yoyo begins eating and is transitioned to oral medications. For the first 5 days postsurgery, he has moderate stridor and is most comfortable in oxygen. Postsurgery pain medication, IV fluids, antibiotics, and sedation are continued as needed.

Stridor and stertor are consistent with upper airway disease.

Yoyo is discharged from the hospital 6 days postsurgery on amoxicillin–clavulanic acid (12.8 mg/kg PO q12h), enrofloxacin (11 mg/kg PO q24h), prednisone (0.4 mg/kg PO q12h), and tramadol (4 mg/kg PO q8h).

On recheck examination 2 weeks later, the owner reports that Yoyo is doing well. He tolerates long walks, and his breathing is significantly improved. He pants when excited but does not cough. Persistent but improving pneumonia is identified via radiography. Antibiotics are continued for an additional 2 weeks; many clinicians empirically treat with antibiotics for at least one week past resolution of clinical signs and radiographic evidence of pneumonia.[6]

One month after surgery, Yoyo is rechecked and is reportedly doing well. Radiographs show complete resolution of bronchopneumonia. No further treatment is pursued.

Your Choice's Implications

A number of compounding factors were affecting the patient's ability to breathe normally. Addressing the pulmonary disease alone was not enough to provide relief, as upper airway obstruction was severe enough to cause hypoxemia.

Stridor and stertor are consistent with upper airway disease; noting the phase of respiration during which respiratory abnormalities or noise occur is vital to pinpointing the cause of respiratory distress and making a diagnosis. Correcting upper airway disease in this patient provided enough relief that he was able to return to normal life once the pneumonia was resolved.

Noting the phase of respiration during which respiratory abnormalities or noise occur is vital to pinpointing the cause of respiratory distress and making a diagnosis.

References

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