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Approach to the Dyspnoeic Cat

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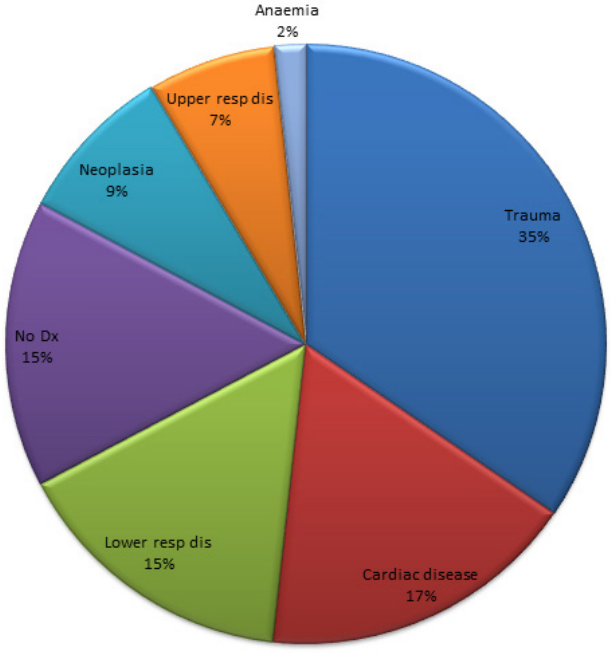
Introduction

Dyspnoea (defined as laboured or difficult breathing) is a fairly common reason for presentation of feline patients. Early clinical signs may be missed by owners and cats are often presented as an emergency. Some cases are presented for seemingly other clinical signs and the clinician may note tachypnoea and/or hyperpnoea. The author examined the records of 58 cats that were presented to Hillcrest Veterinary Hospital (HVH) with dyspnoea and reviews the initial approach to these cases.

Causes of feline dyspnoea

As can be seen from Table 1 (not a complete list), the potential causes of dyspnoea are many and varied. However, studies have shown that, excluding cats with trauma, the vast majority of cats with dyspnoea have a pleural effusion, heart disease (with or without pleural effusion) or asthma. A large proportion of cats in the study at HVH had a traumatic incident, usually either mauled by a dog/s or motor vehicle accident and injuries varied from lung contusions, to pneumothorax, haemothorax, diaphragmatic hernia and rib/sternal fractures. Note that the owner was not always aware of the traumatic incident. A 2010 study found the most common causes for pleural effusion to be feline infectious peritonitis (FIP), congestive heart failure, pyothorax and neoplasia. A study published in 2018 included 108 cats presented with dyspnoea in which a definitive diagnosis was made in 92 patients, with 65% cardiac disease, 16% respiratory disease, 11% neoplastic and 8% traumatic. In another study of 90 cats the aetiologies were similar with cardiac disease 37% of cases and respiratory disease one-third of cases. Etiologies in the study at HVH are reflected in Figure 2.

Fig 2 Diagnosis



As mentioned above, the proportion of trauma cases were much higher than studies from overseas, probably reflecting the fact that cats in South Africa are often kept together with large dogs and are seldom confined to the indoors. Excluding trauma cases, cardiac disease, lower respiratory disease and neoplasia made up the large majority of cases as in the other studies mentioned above. In about 15% percent of cases no aetiological diagnosis was made mostly because the patients died or were euthanased before any diagnostics were performed.

Table 1. Causes of Feline Dyspnoea	
Upper airway disease	Rhinitis
	Nasal neoplasia
Trachea & lower airways	Tracheal rupture
	Chronic Bronchitis
	Allergic bronchitis/Asthma
	Foreign body
Cardiac disease	Congenital
	Acquired
Mediastinal disease	Neoplasia
	Infection (FIP, pyothorax)
	Toxin (warfarin, paraquat)
Pulmonary parenchyma	Bronchopneumonia
	Intrapulmonary hemorrhage
	Pulmonary neoplasia
	Pulmonary thromboembolism
	ARDS
	Non-cardiogenic lung oedema
	Pulmonary fibrosis
Pleural disease & trauma	Pleural effusion
	Diaphragmatic hernia
	Pulmonary contusions
	Pneumothorax
	Haemothorax
	Fractured ribs/sternum
Extra thoracic disease	Anaemia
	Heatstroke

Approach

It is most important to keep in mind the extreme fragility of these patients and that even a brief examination can be fatal for some. Any visible cyanosis means severe hypoxia as it indicates that there is more than 5g/dl of deoxygenated haemoglobin. Thus, the first step should be to immediately provide oxygen therapy, preferably by oxygen cage, as it is the least stressful method. Sedation with intramuscular butorphanol can be helpful, particularly if the patient is very distressed. Many cases will stabilise to some degree with oxygen and sedation only and any diagnostic tests should be delayed until then. Pulse oximetry, if the patient will allow placement of the probe on a pinna or toe, can be used to estimate the impact of oxygen therapy. For non-trauma cases that do not stabilise it is reasonable to give empiric treatment for the two most common conditions involved (congestive heart failure and asthma) with furosemide and a bronchodilator such as a salbutamol inhaler (as long as it does not cause too much stress) and/or a fast acting corticosteroid such as dexamethasone. Injectable terbutaline is a good option where that drug is available. Once the patient is deemed stable enough a more thorough clinical exam and diagnostics can be started. History, signalment and the clinical exam may provide useful information. Siamese and Burmese cats are prone to chronic bronchial disease,

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while Maine Coon, Ragdoll and Norwegian Forest cats are predisposed to cardiac disease. A young cat with a history of coughing and increased expiratory effort is more likely to have asthma. An old cat with lots of chest movement is more likely to have a pleural effusion.

Inspiratory dyspnoea more likely localises disease to the upper airways and expiratory dyspnoea to lower airways, but it is not always easy to evaluate. An expiratory "push" may be seen with some asthmatic cats. On thoracic auscultation a murmur and/or gallop rhythm increases the likelihood of cardiac disease, but up to 50% of cats with congestive heart failure do not have a murmur or gallop rhythm on presentation, so their absence does not rule out cardiac disease. Note that hypothermia is often observed in cats with congestive heart failure. Wheezes indicate airway narrowing while crackles indicate alveolar disease (alveolus snapping open and closed). Most asthmatic cats have harsh lung sounds in all fields, pleural effusion may result in quiet ventral sounds, harsher dorsal sounds and muffled heart sounds. Pneumothorax may have muffled lung sounds dorsally.

Diagnostic tests

Ultrasound

Ultrasound should be considered as the first imaging modality: It is less stressful than radiography, more sensitive to detect small volumes of pleural effusion and allows accurate thoracocentesis when indicated. The patient can be scanned in a standing position and one can make use of intercostal, subcostal and thoracic inlet windows. A small footprint curved probe works best, and it is useful to flex the patient's thorax to increase space between the ribs. In case of pleural effusion, the echogenicity of the fluid can provide some clues: Pyothorax and haemothorax appear more hyperechoic, whereas transudate, modified transudate and chylothorax appear anechoic or hypoechoic. Ultrasound can further detect mediastinal, pleural or pulmonary masses where pleural fluid may cause obscuring on radiographs.

If no pleural effusion is present, the lungs can be evaluated for B-lines, which are comet-tail like artifacts that appear perpendicular to A-lines (which are the normal reverberation artifacts parallel to the pleural line in normal lungs). B-lines can indicate pulmonary oedema, diffuse interstitial or alveolar disease.Next a screening echocardiographic exam can be done to identify left atrial enlargement, left ventricular hypertrophy and pericardial effusion. If dyspnoea is due to heart failure, the left atrium is almost always substantially enlarged. Identification of an enlarged left atrium, subjectively on a right parasternal (RPS) long axis and using the left atrium/aortic root diameter ratio (n=<1.5) from a right parasternal short-axis view at the base of the heart is useful and learning the technique is not too difficult.

Feline proBNP

The Feline proBNP test is a useful test to help distinguish between respiratory and cardiac disease where the imaging results remain unclear. However, when a dyspnoeic cat has a high value on the laboratory test or a positive SNAP test (IDEXX proBNP SNAP), it remains impossible to know if the cat is in heart failure or has primary respiratory disease with subclinical, moderate cardiomyopathy. The laboratory test is furthermore not very practical because of the time delay in obtaining results. Thus, the test can be used to support other diagnostic findings but should not be evaluated in isolation.

Radiography

When there has been known or suspected trauma, radiography is the preferred first modality. CT, when available, is the modality of choice for diagnosing pneumothorax followed by radiography, while a combination of radiographs and ultrasound is usually sufficient to diagnose diaphragmatic hernia. Radiographically feline asthma classically results in lung fields that appear over-inflated with a variable bronchial pattern and flattened diaphragm, but some cats will have completely normal appearing lungs. Bronchial disease can also appear quite similar to metastatic disease in some cases. Pleural effusion will cause variable effacement of intrathoracic structures. Pulmonary contusions, pulmonary oedema and pneumonia can present with an alveolar pattern. Early pulmonary oedema may only show an interstitial pattern. Cardiogenic pulmonary oedema is often patchy, and the location is variable, unlike in dogs. Acute respiratory distress syndrome (ARDS) may result in non-cardiogenic oedema.

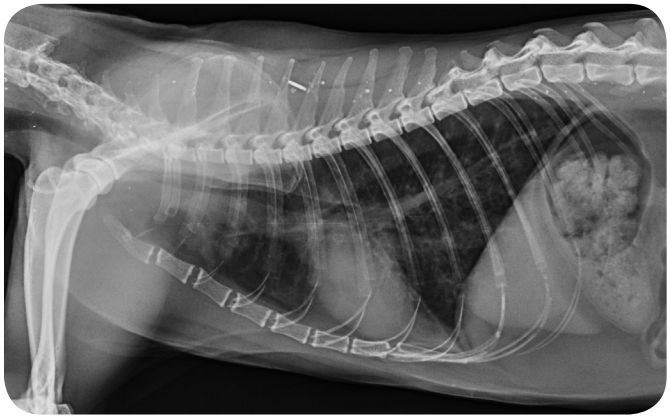
Thoracocentesis

Thoracocentesis of effusion or air will provide immediate patient relief and stabilisation and can be performed if effusion or pneumothorax is suspected, even if their presence has not been confirmed by ultrasound and/or radiographs. Fluid analysis including cytology, culture, FIP PCR, will be needed on a case by case basis. Further diagnostics, if needed, such as blood tests, detailed echocardiography, bronchoscopy, trans-tracheal aspiration, lung aspiration and biopsies are delayed until the patient is clinically stable.

Conclusion

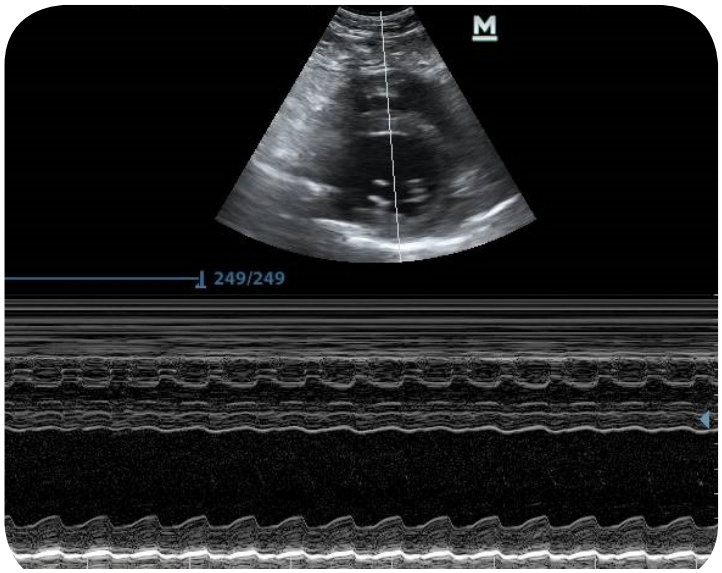
It is frequently needed to manage cats that present with dyspnoea as an emergency and to apply the principal of "treat first, diagnose later", which is somewhat contrary to our inclination to try and make a diagnosis as soon as possible. Regardless of the underlying cause, the initial prognosis should always be very guarded as a high percentage of cats will not survive. Survival rates to discharge of 63% were reported in one study and more than 50% of cats died or were euthanised in the study at HVH.

Case images

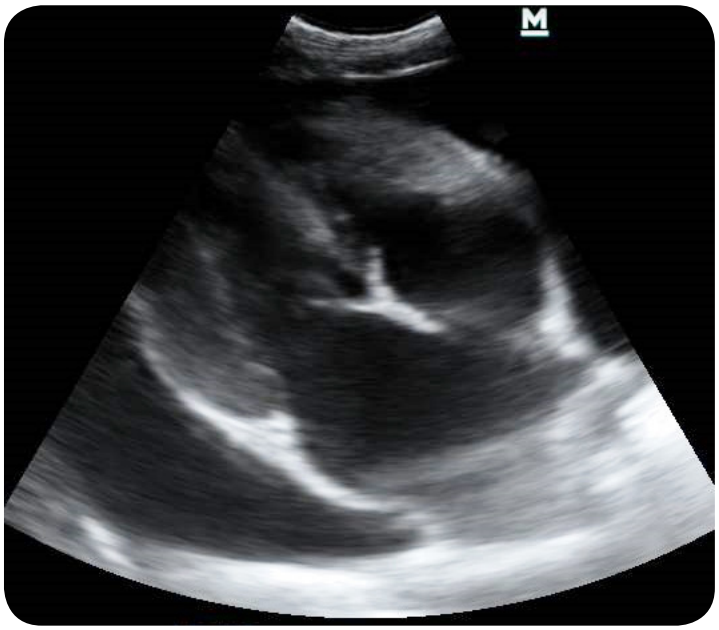


Case 1: Bronchial asthma: diffuse bronchial pattern & flattened diaphragm

Case 2: Pulmonary contusion post trauma – focal alveolar pattern left caudal lung

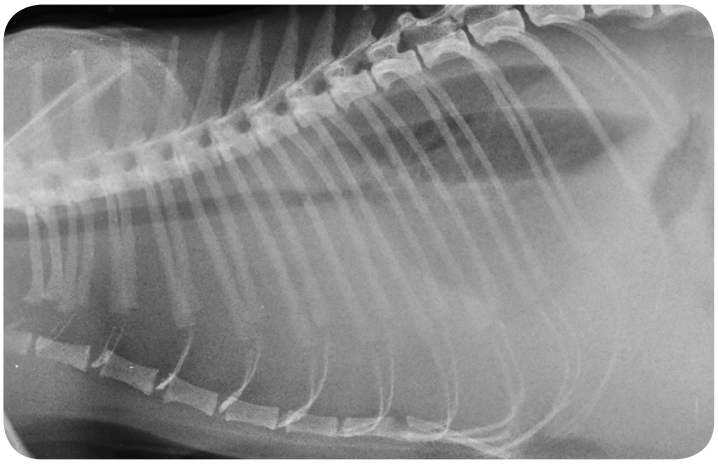


Case 3: Dilated cardiomyopathy - M-mode, fractional shortening = 12.4%

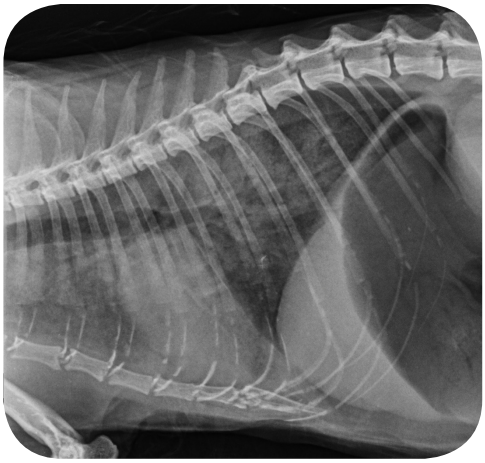


Case 4: Hypertrophic cardiomyopathy – Pleural effusion, biatrial dilation, thickened LV wall

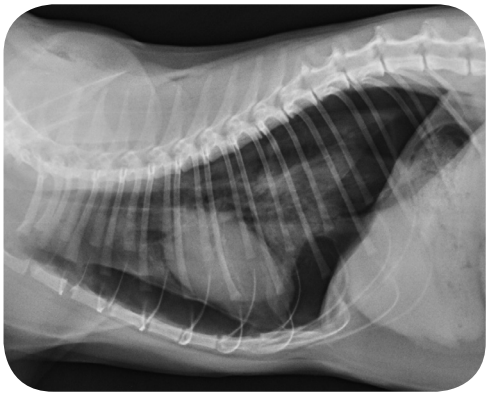
Case 5: Mesenchymal lung tumour



Case 6: Severe pleural effusion – complete effacement of intra-thoracic structures12.4%



Case 7: Pneumonia resulting in marked diffuse alveolar pattern



Case 8: Pneumothorax

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MULTIPLE-CHOICE QUESTIONS

QUESTION 1

Regarding causes of dyspnoea in cats (excluding trauma), which statement is false?

a. Pleural effusion, heart failure and asthma form the vast majority of cases
b. Common causes of pleural effusion include heart failure, neoplasia and FIP
c. A cat with a history of coughing is more likely to have cardiac disease
d. Bacterial pneumonia is uncommon in cats
e. In the study at HVH cardiac disease was the most common cause

QUESTION 2

Visible cyanosis approximates haemoglobin deoxygenation of ___

a. <5g/dl
b. >10g/dl
c. >1g/dl
d. >5g/dl
e. <10g/dl

QUESTION 3

The first action to take when presented with an emergency dyspnoeic cat is:

a. Take radiographs
b. Perform thoracic ultrasound
c. Collect blood samples for hematology and chemistry
d. Perform thoracocentesis
e. Provide oxygen therapy

QUESTION 4

Regarding clinical examination, which statement is false?

a. An old cat with lots of chest movement is more likely to have a pleural effusion
b. The presence of a murmur or gallop rhythm confirms heart failure
c. Pleural and/or pericardial effusion may result in muffled heart sounds
d. Asthmatic cats may have harsh lung sounds in all fields
e. None of the above

QUESTION 5

Empiric treatment may include

a. Salbutamol inhaler
b. Terbutaline injection
c. Furosemide
d. Corticosteroid
e. All of the above

QUESTION 6

Regarding ultrasound as an imaging modality, which statement is false?

a. The patient can be scanned in a standing position
b. It is more stressful for the patient than taking radiographs
c. It is sensitive to detect small volumes of pleural effusion
d. It allows accurate thoracocentesis
e. The echogenicity of pleural fluid can provide clues as to the cause

QUESTION 7

Regarding screening echocardiography of dyspnoeic cats, which statement is false?

a. It can identify left atrial dilation, ventricular hypertrophy and pericardial effusion
b. Left atrium: aortic root diameter ratio is measured from a RPS short axis view
c. If dyspnoea is due to heart failure, the left atrium is almost always substantially dilated
d. A left ventricular diastolic wall thickness of 8mm is normal
e. None of the above

QUESTION 8

Regarding the Idexx Feline proBNP test, which statement is false?

a. A positive test confirms heart failure
b. It is useful to distinguish between cardiac and respiratory causes of dyspnoea
c. The laboratory test is not very practical because of the time delay in obtaining results
d. Can be used to support other diagnostic findings
e. None of the above

QUESTION 9

Regarding radiography, which statement is false?

a. Should be the first modality in trauma cases
b. Asthma can resemble metastatic disease
c. Contusions, oedema and pneumonia may result in an alveolar pattern
d. Cardiogenic pulmonary oedema is typically peri-hilar in cats
e. Acute respiratory distress syndrome (ARDS) may result in non-cardiogenic oedema

QUESTION 10

Regarding thoracocentesis, which statement is false?

a. Removal of air or fluid provides immediate relief to the patient
b. Must only be performed after confirming the presence of air or fluid
c. Fluid analysis may include cytology, culture, FIP PCR
d. FIP effusion is typically a high protein, non-septic exudate
e. None of the above

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