The Tricky Cat Thorax: How Helpful are Radiographs?
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General principles of thoracic radiography in cats
As with thoracic radiographs of the dog it is important to obtain radiographs in maximum inspiration. In the cat the diaphragm will generally be at the level of T13 to L1 on an inspiratory view. A minimum of two orthogonal views should be obtained (three views often recommended). Accurate positioning is important as obliquity can mimic disease, particularly when evaluating the cardiac silhouette.

Variations that are specific to the cat include a change in the position of the cardiac silhouette on the lateral radiograph as the cat ages. In most cats the cardiac silhouette is vertically positioned on the lateral radiograph. In some older cats the heart will “lie down” and become more horizontal in position, which results in an increase in sternal contact. Additionally, the aorta may be redundant or tortuous in appearance on the lateral view. This will result in a fairly discreet round bulge at the 1 to 2 o’clock position on the VD view often referred to as the aortic knob.

Obese cats present a challenge for evaluation of the thoracic cavity, particularly the cardiac silhouette. Typically these obese cats will have a large amount of pericardial fat, which will result in indistinct margins of the cardiac silhouette, particularly on the VD or DV views. On the lateral view it is sometimes possible to distinguish between the fat opacity and the true cardiac margin.

The cat heart should be very petite on both views. There is usually 1 intercostal space between the apex of the heart and diaphragm (unless the cat is obese). The normal VHS (vertebral heart score) is < 8 in the cat.

Feline pulmonary pathology
Allergic airway disease in cats has a bronchial pattern. Due to the small airway size in cats bronchial disease will sometimes mimic a nodular pattern as seen with fungal disease. Particularly close evaluation of the caudodorsal lung fields for the classic linear parallel lines (tram tracks) and donuts (bronchi in cross section) is important. Cats with allergic airway disease may have concurrent right middle lung lobe syndrome (alveolar increased soft tissue opacity throughout the lung lobe) and air trapping (caudal displacement and flattening of the diaphragm with a barrel-shaped appearance).

Pulmonary metastatic disease and primary pulmonary neoplasia in cats is similar to that seen in dogs. Recall in cats you may see lung-digit syndrome with the cat presenting for clinical signs related to digit disease. Always take radiographs of these cats to rule out concurrent pulmonary pathology (generally bronchogenic adenocarcinoma). A solitary mass is most common, but a multitude of appearances have been described. Primary pulmonary neoplasia often will metastasize to the pleural cavity; therefore, concurrent pleural effusion is not uncommon. Pulmonary lymphoma is not very common in the cat, but has a highly variable radiographic appearance.

Granulomatous disease generally has a diffuse structured nodular pattern that is miliary (very small nodules giving a snowstorm appearance). Concurrent lymphadenopathy in the tracheobronchial region may be present.

Cats with parasitic infections, such as heartworm disease and Toxocara cati, will have an interstitial to bronchial/peribronchial pattern with some cats also having concurrent pulmonary artery enlargement.

Feline mediastinal pathology
Mediastinal lymph node enlargement is the most common mediastinal pathology in cats. Lymph node enlargement, depending on severity, may be seen as an increased soft tissue mass cranial to the cardiac silhouette and ventral to the trachea. A mass effect is seen with severe enlargement with dorsal displacement of the trachea and caudal displacement of the carina, which is typically located at the 5-6th intercostal space. The cranial mediastinum will be wide on the ventrodorsal view and there can be concurrent caudal displacement and reduction in size of the cranial lung lobes. Thymic enlargement can mimic lymphadenopathy; however, thymic disease will generally be more left sided on the ventrodorsal view rather than midline as the lymph nodes are. Concurrent pleural effusion can be seen.

Mediastinal cysts are immediately cranial to the cardiac silhouette and ventral in location. Confirmation of an anechoic thin-walled structure with thoracic ultrasound is useful as these cysts are typically incidental findings.

Feline cardiac pathology
Enlargement of the cardiac silhouette in cats can be due to numerous causes including fat as described above, cardiac chamber enlargement, pericardial disease (such as effusion and peritoneopericardial hernia), and masses (uncommon).

Cats with hypertrophic cardiomyopathy (HCM), restrictive, and unclassified cardiomyopathies can have normal radiographs; therefore, if cardiac disease is suspected and the cardiac silhouette appears normal echocardiography is recommended. In general cats
with HCM will have varying degrees of left atrial enlargement. Cats with restrictive and unclassified disease tend to have biatrial enlargement. A valentine shaped heart on the ventrodorsal view is primarily due to left atrial enlargement in cats. Right atrial enlargement generally only changes the heart shape on the VD view if there is concurrent, severe left atrial enlargement.

In cats with dyspnea if the VHS can be performed (cardiac silhouette well visualized) and is < 8 cardiac disease is unlikely as the cause of dyspnea. A VHS between 8-9.3 is equivocal and echocardiography is recommended. If the VHS is > 9.3 cardiac disease is likely the cause of dyspnea. Echocardiography would still be recommended to determine the underlying cause of disease.

**Feline pleural pathology**

There are numerous causes of pleural effusion in cats including chylothorax, transudates (often secondary to heart disease), exudates (including infectious and neoplastic causes), and hemorrhage. All effusions have a similar opacity on radiographs; however, differentials may be prioritized based on concurrent disease. Ultimately thoracentesis with cytologic evaluation is recommended for confirmation. In cases of chronic pleural effusion the lung lobe margins may be rounded. This is a poor prognostic indicator as it suggests some degree of fibrosing pleuritis.