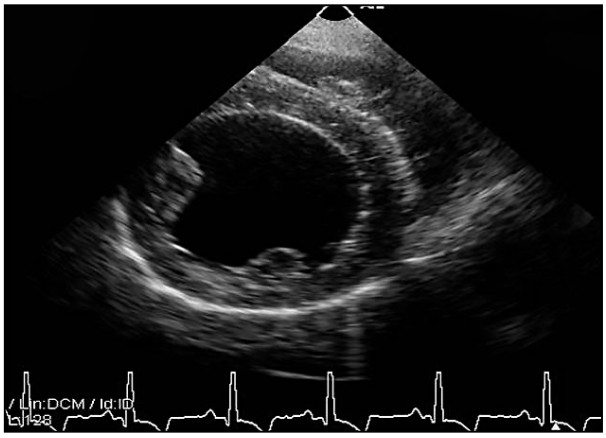
Winter 2021 / Volume 5, No. 1

Imaging Services

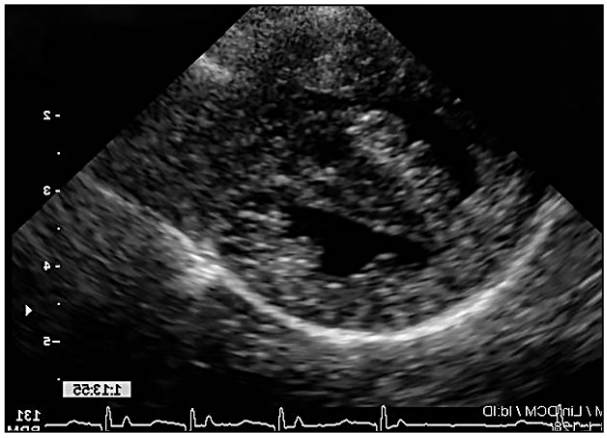
ANTECH IMAGING NEWS

Feline Hypertrophic Cardiomyopathy

Screening for HCM in feline patients



Cross section through normal left and right ventricles.



Hypertrophy at cross section through right and left ventricles. (Flipped horizontal for comparison with image on left)

Hypertrophic cardiomyopathy (HCM) is the most common heart disease in cats and can lead to increased morbidity and mortality. Cats are often screened for HCM when a murmur or gallop rhythm is first heard on physical examination; however, screening for breeding purposes has also become more common. HCM is defined as hypertrophy of a non-dilated left ventricle in the absence of abnormal loading conditions capable of producing the magnitude of wall thickening. In people, hypertrophic cardiomyopathy is associated with mutations in sarcomere-encoding genes and is considered the most common familial genetic heart disease. It is suspected that HCM in the feline patient has a similar genetic basis. HCM has been reported to be familial in certain feline breeds such as American Shorthair, Main Coon, Norwegian Forest, Sphinx, and Persian cats.

Heart murmurs are common in cats, although not all cats with heart murmurs have heart disease. Additionally, auscultation abnormalities (such as a heart murmur, arrhythmia, and gallop sound) are not

Continued on next page

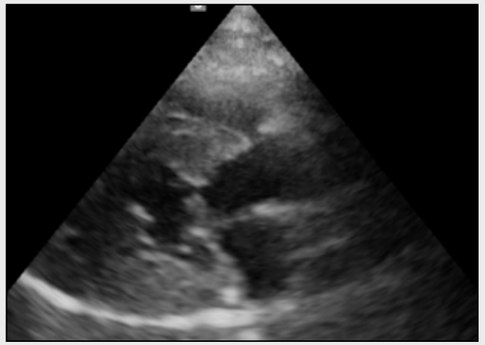
VD radiographs showing a valentine-shaped cardiac silhouette in two feline patients.

always present in the affected feline patient. Additionally, auscultation alone is not a sensitive or specific screening test for HCM. In the more significantly affected patient, physical exam findings such as syncope, abnormalities associated with congestive heart failure (pale or blue gums, increased respiratory rate/effort, muffled lung sounds or pulmonary crackles), or abnormalities associated with aortic thromboembolism (limb paresis, cold limbs, poor femoral pulses) can also be seen.

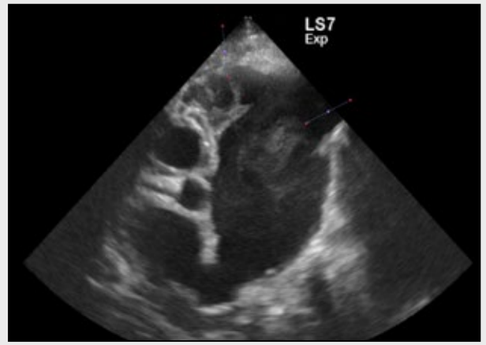
A diagnosis of HCM is based on the presence of LV hypertrophy in the absence of abnormal loading conditions or other possible causes of hypertrophy. Therefore, abnormalities such as hyperthyroidism, systemic hypertension, and aortic stenosis should be ruled out as possible causes of left ventricular wall hypertrophy. Additionally, there can be pseudo-hypertrophy if the patient is significantly dehydrated. However, most of our healthy patients would not have this degree of dehydration when presenting for cardiac evaluation.

The concept of the blood-based test to detect cardiomyopathy is attractive for several reasons. These tests are widely available, do not require advanced training, and biomarker concentrations can be objectively quantified, with NT-proBNP being the most widely evaluated biomarker for HCM screening. It should be noted though, that NT-proBNP measurement may not be sensitive enough to deduct mild or early forms of HCM. However, this can be a helpful screening tool for further recommendations of an echocardiogram if this value is elevated.

Thoracic radiographs are useful for evaluating the presence of congestive heart failure and abnormal cardiac size (i.e., the classic 'Valentine' shaped heart). However,



A long axis image showing systolic anterior motion of the mitral valve causing a dynamic left ventricular outflow tract obstruction.



Example of spontaneous contrast in a dilated left atrium and left auricular appendage.

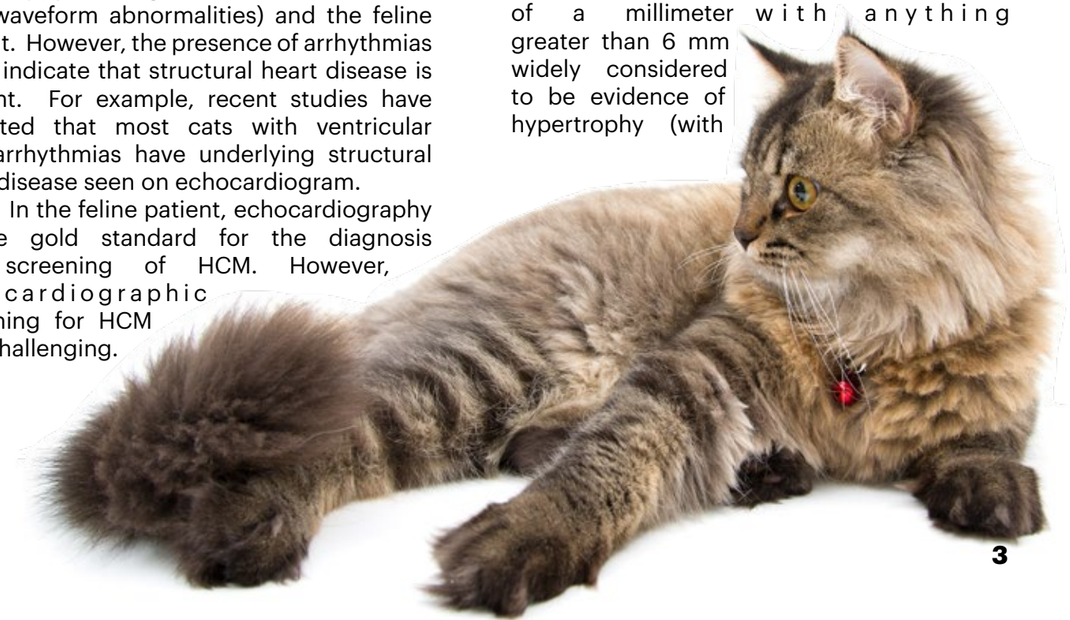
radiography may not be sensitive for diagnosing mild to moderate HCM in the feline patient. Cats with congestive heart failure frequently develop pulmonary edema and/or pleural effusion, with respiratory distress being the most common clinical complaint. As opposed to the canine patient, cats with left-sided cardiac disease (increase left atrial pressure) may develop pleural effusion (which is more commonly associated with right-sided congestive heart failure in the canine patient).

Electrocardiography (ECG) is a relatively insensitive test for assessing for ventricular hypertrophy (findings of axis deviations and QRS waveform abnormalities) and the feline patient. However, the presence of arrhythmias could indicate that structural heart disease is present. For example, recent studies have indicated that most cats with ventricular tachyarrhythmias have underlying structural heart disease seen on echocardiogram.

In the feline patient, echocardiography is the gold standard for the diagnosis and screening of HCM. However, echocardiographic screening for HCM is challenging.

The vast improvements in ultrasound technology over the years has led to better image quality and resolution. Still, adequate echocardiographic skills and consistent technique on the part of the operator is essential.

HCM is characterized by a broad range of phenotypic patterns ranging from localized segmental thickening to extremely generalized hypertrophy. In localized forms, the entire ventricular wall (interventricular septum or free wall) may be affected or just a specific region. Additionally, the area of hypertrophy can be the difference of a fraction of a millimeter with anything greater than 6 mm widely considered to be evidence of hypertrophy (with



A short axis view showing a large thrombus in the left atrium along with pleural effusion in the feline patient.

5.5 mm considered to be the upper limit of normal). Most of the controversy regarding normal versus abnormal left ventricular (LV) wall measurements is regarding cats with LV measurements between 5 and 6 mm.

With a small range of normal to abnormal, measurements in 2-D can be helpful (and sometimes necessary), especially with cases of mild and focal hypertrophy. This is used in addition to the standard application of m-mode measurements (which is widely used in measuring the left ventricle in animals). It should be noted that m-mode has many advantages (excellent temporal resolution, high-frame-rate, and widely-used feline reference intervals). Still, it should not be the only modality used in assessing HCM as it may underestimate wall thickness (by missing focal hypertrophy) or may overestimate myocardial thickness as a result of erroneous cursor positioning across papillary muscles (which can be very difficult to avoid in this modality). Aside from LV wall hypertrophy, there are other common echocardiographic abnormalities consistent with HCM. Papillary muscle hypertrophy is a common feature of HCM. Additionally, dynamic obstruction of the LV outflow tract is another common finding in cats with HCM. This refers to systolic anterior motion (SAM) of the mitral valve, which is characterized by systolic displacement of the anterior mitral valve leaflet towards the septum. This causes a narrowing of the LV outflow tract, turbulent blood flow, and mitral valve insufficiency. SAM can also be associated with an increased aortic outflow tract obstruction when studies with Spectral Doppler. SAM is commonly associated with a heart murmur.

In more progressive cases of HCM, left atrial dilation can be seen secondary to increased atrial pressure from diastolic dysfunction of the left ventricle and/or significant regurgitation across the mitral valve associated with SAM. When there is slow-moving blood flow in the left atrium/auricle, spontaneous contrast or 'smoke' can also be seen in the left atrium. This slow-moving blood flow is commonly the cause for the development of a left atrial thrombus, which is the most common cause for aortic thromboembolism in the feline patient. When these findings are caught early, anti-platelet therapy can be initiated to reduce the patient's risk of thromboembolism.

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Feline HCM Word Search

Find the words below from this month's article!

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          C T H S E P T U M M O I         K C O S Z J N K I R H L
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S D D P H X R J D R V A R X W T A E S J X L X E C R A K O J
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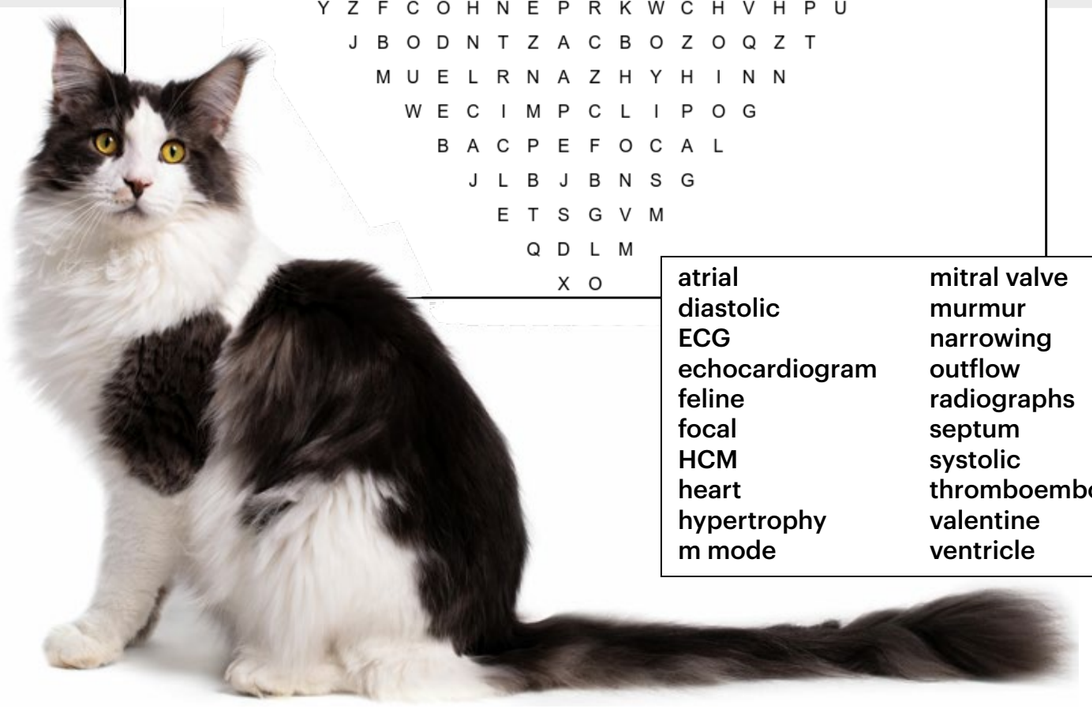

atrial	mitral valve
diastolic	murmur
ECG	narrowing
echocardiogram	outflow
feline	radiographs
focal	septum
HCM	systolic
heart	thromboembolism
hypertrophy	valentine
m mode	ventricle

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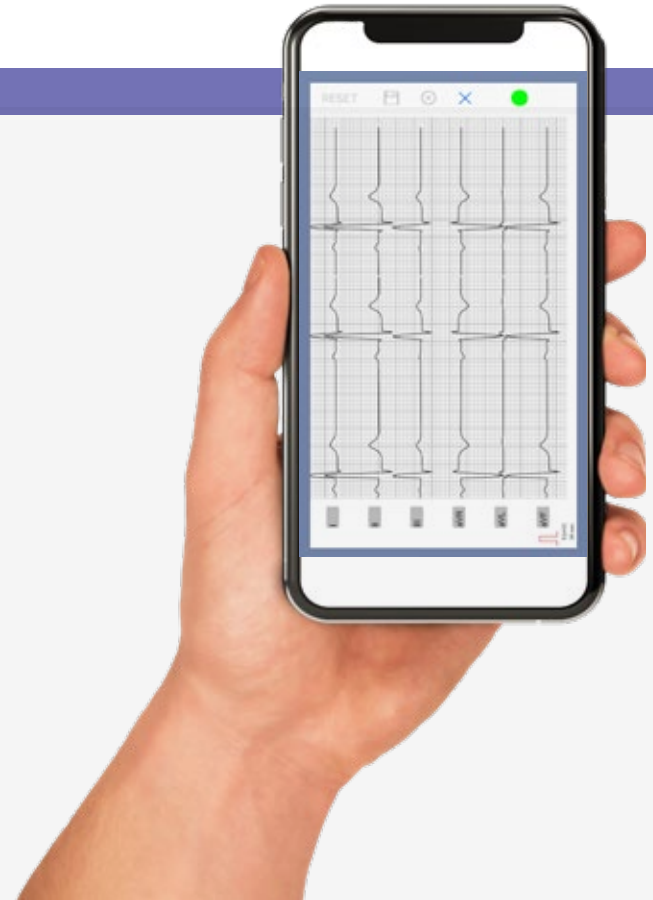

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