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Approach to the exotic cardiology patient

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Cardiac disease in non-traditional pets is poorly documented. Often, disease goes unrecognized or undiagnosed until post-mortem evaluation. Clinical signs may differ from those identified in domestic species. However, the approach to evaluating exotic species is similar to that for traditional pets or humans, with several modifications.

Knowing Normal

The most important factor in identifying cardiac disease in exotic species is the understanding of normal physiology in that species. While we learn "what is normal" for most domestic species in veterinary school, little, if any, information is provided about non-traditional species. However, in order to identify "abnormal", one needs to discriminate it from "normal". Normal physiology for many of the more common non-traditional pets is reported in the relevant literature. Cardinal signs, such as heart rate, respiratory rate, temperature can often be found. Less easily found are reference intervals for cardiac imaging modalities, such as radiography, electrocardiography, echocardiography. In situations where either such information is inaccessible, or simply unavailable, the best option is to perform comparative examinations – examine an "affected" individual and an "unaffected" individual simultaneously, and using the same imaging standards, so that abnormalities may be more easily recognized. This requires accurate phenotypic identification of "affected" and "unaffected" individuals, which can be difficult if disease prevalence is high.

For clinicians commonly dealing with non-traditional species, either relevant texts for these species should be acquired, or personal familiarization with the species of interest should be sought by performing multiple examinations of "normal" subjects.

History and Signalment

History can be revealing to the astute clinician, although it requires the understanding and recognition of client-described clinical signs that may allude to cardiac disease. For instance, in snakes, a persistent swelling in the cranial quarter of the snake's body may suggest cardiomegaly. Sudden death in research colonies has been identified as a clinical sign of cardiac disease, and should act as a warning signal for clinicians. More vague signs, such as loss of appetite, cachexia or malaise, are often reported with severe cardiac disease, but are non-specific findings. Diet can be an important consideration in animals that are susceptible to nutritional cardiomyopathies.

Signalment may or may not be informative. Obviously, knowledge of breed predispositions for cardiac abnormalities helps stratify the preliminary differential list. However, in many situations, no breed predisposition is apparent or reported, or the clinician may be unaware of predispositions in the species at hand.

In some instances, valuable historical information can be obtained from pathological evaluations of colony animals. Repeated observations of cardiac abnormalities by trained pathologists allow the clinician to determine the clinical prevalence and antemortem findings in affected individuals.

Physical findings and clinical signs

In most mammalian and some non-traditional species, auscultation can provide the first clues about cardiac status. Murmurs can often be ausculted, and heart rate and rhythm can be determined. In others, the physical examination may be limiting or unrewarding because of either access to the heart (e.g. chelonians, fish), or because of difficulty in restraint or technical considerations (e.g. auscultation in mice is virtually impossible because of the size of the patient. As stated earlier, knowing “normal” allows the clinician to determine “abnormal”. If the client has an unaffected pet of similar signalment, comparison of auscultatory findings may help in elucidating the clinical abnormalities. With severe heart disease, heart rate is usually elevated due to increased sympathetic tone. If congestive heart failure is present, respiratory rate will usually be increased, or third-space fluid accumulation may be observed. Pericardial effusions may muffle heart sounds, while extrasystoles may be identified by auscultation. Species occurrence of sinus arrhythmia needs to be known to avoid confusion, as does the maximum and minimum heart rates for a particular species. For example, a heart rate of 600-700 bpm is normal in a mouse, while a rate of 45 bpm is tachycardic in most snakes.

Electrocardiography

Most non-traditional species that are kept as pets have published ECG reference intervals. The primary use of ECGs is to identify arrhythmias. Chamber enlargement patterns are less consistent and require validation with standard lead positioning and examination of many “normal” animals. Electrode placement can be “non-conventional” for identification of many arrhythmias. Often a single lead is acquired for arrhythmia detection. Electrocardiography can be used to identify metabolic status of chelonians (ie dead or alive) with base-apex leads.

Holter and telemetric monitoring is rarely performed on non-traditional pets, but has been used in research settings.

Radiography

Radiography can permit the clinician to identify cardiomegaly in some cases. Again, normal radiographic anatomy must be known to correctly identify cardiomegaly. Pulmonary or coelomic/abdominal effusion can also be identified in some cases. Contrast angiography has been extensively utilized to examine circulation of reptiles, but is not often utilized in evaluation of clinical patients.

Echocardiography

Echocardiography offers a non-invasive view of the heart in many animals. Reference intervals are being established for many of the more common non-traditional pets. In research colony settings, investigators must be certain that examined subjects have a low prevalence of cardiac disease so as not to inappropriately identify animals as “normal”. 2D imaging allows estimation of systolic function, likelihood of congestive heart failure as the cause of clinical signs (based on atrial size), pericardial effusion, and potentially endocarditis lesions. Color Doppler echocardiography permits clinicians to study direction of blood flow, valvular insufficiencies or stenoses, septal defects. Anesthesia or sedation may be necessary in some patients for diagnostic imaging, while others may require patient restraint. If anesthesia is employed, effects on cardiac function should be considered. In species where no standard views have been validated, the clinician should record the method of examination to allow repeatability (for comparing serial examinations in one patient and to compare results between patients). If possible, successful imaging techniques should be published to permit other clinicians to similarly examine affected patients of the same species.

Molecular Diagnostics

Most biochemical markers of cardiac disease have been examined in a limited fashion in laboratory animal species (rodentia, ferrets, primates), but remain unexamined in non-laboratory non-traditional pets. Troponins and natriuretic peptides remain largely of research interest.

In research settings, cardiac disease in a colony may be evaluated genetically via linkage analysis or SNP analysis in species with complete genomic information. Specific breeding strategies allow candidate genes associated with the trait to be identified. These are often of little value in clinical practice.

Therapy

Therapy of cardiac disease in most species is empirical and based on the presence of clinical signs. In many species, drug metabolism is poorly understood for many of the cardiac drugs. Newer drugs, such as pimobendan, have been explored in non-traditional mammalian species, but little information is available on efficacy or toxicity. Diuretics are variably effective, as are angiotensin converting enzyme inhibitors. Dietary correction sometimes offers the best therapy (when dealing with nutritional heart disease).

Specific cardiac diseases of non-traditional species

The most common cardiac diseases described in non-traditional species is cardiomyopathy. Dilated cardiomyopathy (myocardial failure) has been described in ferrets, aotus monkeys, syrian hamsters, various transgenic and spontaneous mouse models and arctic foxes (where it has been associated with taurine deficiency). Ferrets and aotus monkeys have also been identified

with hypertrophic cardiomyopathy, although much less frequently. Toxic cardiomyopathy has been anecdotally reported in snakes. Occasional reports of valvular insufficiencies and congenital defects exist in many species. Pericardial effusions have been reported in chelonians, although no single cause has been identified. The speaker has examined cardiotoxicity and sudden death in woodchucks on antiviral medications. Pet birds have been identified with valvular stenosis and insufficiencies. Primates in research colonies have been identified with aortic aneurysms.

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