The Silent Killer: Atherosclerosis in Pet Birds

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Atherosclerosis is a devastating disease common in older birds and often associated with sudden clinical decline and unexpected death. Other than humans, birds appear more susceptible to atherosclerosis than any other mammalian species. The reported incidence rates in avian species range widely from 1.9 to 91.9%

Risk factors

Suggested risk factors for atherosclerosis in birds include age, gender, species, increased plasma concentrations of lipids and lipoproteins, high energy diets, physical inactivity, genetics, and coinfection with *Chlamydia psittaci*.

Age

Increased age has been shown to be a significant risk factor for the development of atherosclerosis in parrots in retrospective studies.

Gender

Female gender was shown to be a statistically significant risk factor in a recent multi-center case review. Estrogens are associated with increased plasma concentrations of cholesterol, triglycerides, lipoproteins, and calcium for the production of eggs. Reproductive diseases were found to be significantly linked to an increased rate of atherosclerosis in female parrots.

Species

African grey parrots (*Psittacus erithacus*), Amazon parrots (*Amazona* spp.), Quaker (monk) parakeets (*Myiopsitta monachus*), and cockatiels (*Nymphicus hollandicus*) appear especially susceptible to the disease. Cockatoos (*Cacatua* spp.) and macaws (*Ara* spp.) seem to be somewhat resistant to disease. Explanations for the variability in species susceptibility are speculative at best, but the disease may be associated with differences between captive and wild lifestyles, stress factors, dietary requirements, or genetics.

Plasma lipids and lipoproteins

African grey parrots and Amazon parrots tend to have higher plasma concentrations of cholesterol compared with other psittacine species. In one study, parrots with atherosclerotic lesions had a significantly higher median plasma cholesterol concentration than control birds. Experimentally induced atherosclerosis caused by adding cholesterol to the diet was associated with increases in plasma cholesterol concentrations in Quaker parakeets and budgerigars (*Melopsittacus undulatus*) and increased low-density lipoproteins (LDL) in Quaker parakeets. In Quaker parrots, plasma cholesterol concentrations were correlated with the severity of the atherosclerotic lesions.

Coinfection with Chlamydia psittaci

The association between infection with *Chlamydia pneumoniae* infection and atherosclerosis has been investigated in humans but remains a controversial topic. Research in birds has yielded conflicting results and evidence for a correlation is lacking. Research in birds using PCR for *C. psittaci* did not find a positive association between the two diseases but a case-control study using immunohistochemistry and specific anti-*C. psittaci* monoclonal antibodies did. However, anti-chlamydial antibodies are known to cross-react with ceroids and other atherosclerotic plaque lesions in humans, and this may have affected the results in this study.

Pathologic lesions

Atherosclerotic lesions consist of accumulations of fats, cholesterol, cellular debris, and inflammatory cells within the vascular media and intima. Lesions are classified into 7 categories depending upon histologic findings and severity. Type 4 lesions (atheroma) contain a lipid core; type 5 lesions (fibroatheroma) are covered by a fibrous cap; complications are present with type 6 lesions, such as thrombosis, fissures, and hematomas. Complications and clinical signs usually result from stenosis or plaque disruption leading to thrombosis or hemorrhage. Stenosis is common in birds, while atherothrombosis and thromboembolic disease appear rare or may be underdiagnosed.

Most lesions are found in the great vessels at the base of the heart, including the brachiocephalic arteries, ascending aorta, and pulmonary arteries. Lesions in the descending aorta and peripheral vessels are less common. However, lesions in the carotid and coronary arteries have been reported in parrots. Atherosclerosis can be associated with lesions in other organ systems, such as myocardial hypertrophy and fibrosis, and pulmonary congestion and fibrosis.

Clinical signs

The most common clinical finding with atherosclerosis is unexpected death. When clinical signs are seen, they are often associated with stenosis of the major vessels or carotid arteries. Clinical signs often are seen in the cardiovascular, neurologic, and pulmonary systems such as congestive heart failure, dyspnea, exercise intolerance, ataxia, lethargy, behavior changes, stroke, and intermittent claudication (eg. pelvic limb ataxia).

Diagnosis

Bloodwork

The diagnosis of atherosclerosis in the living bird is challenging at best. Although dyslipidemia and hypercholesterolemia are associated with disease in parrots, elevated plasma concentrations of cholesterol, triglycerides, and lipoproteins are not necessarily diagnostic for the disease. For example, there are wide fluctuations in plasma concentrations of these substances throughout the reproductive cycle of the normal health female parrot.

Noninvasive indirect blood pressure (NIBP)

Measurement of the noninvasive indirect blood pressure (NIBP) can help detect chronic hypertension associated with atherosclerosis. However, current methods for the measurement of NIBP in parrots such as Doppler probe techniques and oscillometry are considered unreliable. At best, NIBP in parrots may be useful for identifying extreme (very low or very high) values and trends over time and in response to therapeutic measures.

Imaging

If severe calcification of the great vessels is present, this may be seen on plain survey radiographs. The two brachiocephalic arteries, pulmonary arteries, and ascending aorta can be visualized on plain films and also by computed tomography (CT). However, because of factors such as heart and patient movement and because of the fact that many cases of atherosclerosis in birds are not associated with blood vessel mineralization, plain radiography should be considered an insensitive diagnostic tool. Selective angiography and associated tools such as fluoroscopy and CT are better able to detect stenotic changes in blood flow associated with atherosclerosis in birds. Ultrasonography, particularly using the transesophageal method, may be useful for imaging of the aortic root and to detect changes in aortic outflow velocity. Hyperechoic changes to the aortic wall can be detected. Elevations in the pressure gradient across the right atrioventricular valve seen by ultrasound imaging can be suggestive of pulmonary hypertension. Cerebral complications such as ischemia or hemorrhagic stroke can be detected with CT or magnetic resonance imaging (MRI).

Medical management

Clinical management of arteriosclerosis in birds is currently empirical at best. Treatment should be aimed at addressing underlying causes and contributing factors (if known) as well as managing complications such as systemic hypertension or congestive heart failure. Statins are anecdotally used in birds but remain controversial as few to no pharmacokinetic studies have been done for this group of drugs and target plasma concentrations of cholesterol and LDL are not yet known for birds. Rosuvastatin administered at 10 to 25 mg/kg PO failed to achieve consistent target plasma concentrations in Hispaniolan Amazon parrots (*Amazona ventralis*) in one unpublished study. Other treatments with reported use in birds include pentoxifylline or isoxsuprine for the anectodal management of peripheral arterial disease in Amazon parrots. Antihypertensive agents such as angiotensin-converting enzyme (ACE) inhibitors and beta-blockers may help relieve clinical signs of hypertension, although their effectiveness for this purpose have not been studied in avian patients. Antithrombotic agents are not commonly used in parrots as atherothrombosis appears to be rare.

Prevention

Because atherosclerosis in birds is still poorly understood, it is not clear yet what preventative measures are effective. However, by evaluating the risk factors for human and avian disease, several options seem possible to reduce the likelihood of developing the disease. Birds should be provided ample opportunities for exercise and activities such as foraging, and even flight, if considered safe for the bird. Excessive energy content in the food should be avoided, such as excess carbohydrates and fats. Bird should receive regular preventative veterinary care with periodic bloodwork monitoring.

Suggested reading

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