

## **FELINE HYPERTENSION**

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Systemic arterial hypertension is defined as a persistent elevation of the systemic arterial blood pressure inducing target organ damage. It is the most important cardiovascular disease of the aged cat. Therefore the practitioner should be familiar with its associated clinical signs, the diagnostic approach, the associated underlying diseases and treatment options. Systolic blood pressure (SBP) has been defined as the blood pressure measured at the peak of systole. Diastolic blood pressure (DBP) has been defined as the blood pressure measured at the peak of diastole. The mean arterial blood pressure represents a mathematical average of two times the diastolic and once the systolic blood pressure ( $2 \text{ DBP} + 1 \text{ SBP}/3$ ). Since cats suffer mainly from increased systolic blood pressure, and very little is known about the importance of diastolic hypertension in the cat, this lecture will only focus on systolic systemic arterial hypertension.

The ACVIM consensus panel has divided the blood pressure status of cats into normal (SBP < 140 mm Hg), pre-hypertensive (SBP 140-159 mm Hg), Stage 1 hypertension (SBP 160-169 mm Hg) and Stage 2 hypertension (SBP  $\geq$  180 mm Hg). In daily clinical practice a cut-off of 175-180 mm Hg, obtained via the Doppler technique, during repeated examinations, is often used to confirm the presence of systolic hypertension.

The pathophysiology of feline hypertension is complex and remains poorly understood. However multiple studies have indicated an important role for the renin-angiotensin-aldosterone system (RAAS) and an additional role for the sympathetic nervous system.

Although the exact incidence of systemic hypertension in the feline population is unknown, literature data report that 20 to 65% of cats with chronic kidney disease (CKD) are hypertensive and 5 to 87% of cats with hyperthyroidism develop hypertension. Other conditions which are also thought to be associated with hypertension in cats include primary hyperaldosteronism,

pheochromocytoma, hyperadrenocorticism and a high salt diet. Diabetes mellitus and acromegaly only very rarely predispose to the development of feline arterial hypertension. Primary or idiopathic hypertension has been considered for a long time to be rare in cats. However, with more routine screening in our geriatric population the numbers appear to be increasing up to 20%.

The eye, the brain, the heart and the kidneys are, because of an intrinsic auto regulatory protective mechanism, able to protect their microcirculation against pressures lower than 60 and higher than 160 mm Hg. Once 160 mm Hg exceeded the target organs will be affected and organ damaged can be noticed (TOD). The eye is the most vulnerable organ. Clinically this is represented by retinal arteriolar tortuosity, retinal oedema, haemorrhage, retinal detachment and hyphema. It often results in blindness which will be permanent if blood pressure is not controlled vigorously. Hypertensive encephalopathy has been reported in 29% to 46% of hypertensive cats and is the most underdiagnosed TOD. These cats are mainly presented with stroke-like clinical signs. The cardiac changes (left ventricular concentric hypertrophy) are fully reversible and lead rarely to congestive heart failure. However a systolic murmur, a gallop rhythm or an arrhythmia can be detected during clinical examination. The damage to the kidneys is a reflection of the vicious circle of increased gomerular capillary pressure, proteinuria and glomerulosclerosis, leading to a deterioration of the renal filtration and concentration status. Other clinical signs associated with hypertension are less specific and often associated with the underlying primary condition such as polyuria/polydipsia, or polyphagia and weight loss in for example hyperthyroid cats.

The ACVIM consensus panel has stratified the risk for target organ damage:

<b>Risk category</b>	<b>Systolic Blood Pressure (mm Hg)</b>	<b>Diastolic Blood Pressure (mm Hg)</b>	<b>Risk of future target-organ damage</b>
<b>I</b>	< 150	<95	Minimal
<b>II</b>	150-159	95-99	Mild
<b>III</b>	160-179	100-119	Moderate
<b>IV</b>	• 180	• 120	Severe

Definitive diagnosis is made by repetitive measurement of arterial blood pressure either directly (intra-arterial direct puncture or telemetry) or indirectly (oscillometric and/or Doppler devices). Because of the invasiveness and the technical difficulties associated with the direct method, indirect systems are used in the clinical setting. Both oscillometric and Doppler devices have pros and cons. However, Doppler has proven to be the most efficient, accurate, sensitive, reproducible and least expensive method in cats compared to other methods.

The rationale for treatment of hypertension is based on the risk stratification for target organ damage and on the knowledge of the underlying ethiopathophysiology. Multiple treatment options are available and include calcium channel blockers (amlodipine), ACEI, betablockers and diuretics. The results of recently conducted studies will be presented and treatment guidelines will be discussed.

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