Diagnosis and management of hypertension in cats

Hypertension is a common problem in older cats which causes significant damage to kidneys, eyes, brain and myocardium. Early diagnosis and appropriate treatment minimises long term target organ damage so routine blood pressure measurement is recommended for all “at risk” cats. Treatment with amlodipine (62.5 mg once daily initially) is indicated if systolic blood pressure is consistently > 160 mmHg and/or there is evidence of target organ damage.

**Key Words:** feline, hypertension, target organ damage, doppler, high-definition oscillometry, amlodipine

### Introduction

Hypertension is a common problem in older cats and is closely associated with chronic kidney disease (CKD) and hyperthyroidism. Hypertension may be a contributing cause of CKD as well as a complication of it, and is also a cause of vascular damage in the eye, heart and central nervous system (CNS).

Current guidelines (Brown et al. 2007) recommend regular screening of all “at risk” cats (see Box 1) with the aim of identifying those with systolic blood pressure persistently above 160 mmHg so that treatment can be initiated. Accurate assessment of blood pressure in the conscious cat poses significant challenges and, in a busy practice, it can be difficult to introduce widespread blood pressure screening for cats in a way that is affordable to clients. Nevertheless, recognition and management of feline hypertension is a critical component in the care of older cats and blood pressure measurement should become a routine part of their preventive healthcare.

The International Society of Feline Medicine (ISFM), in association with Ceva Animal Health, has recently published a set of “Practical Recommendations on the Indirect Measurement of Blood Pressure in Conscious Cats” with full text free to access at www.icatcare.org/vets/guidelines/hypertension-cats and supported by four illustrative videos available at www.youtube.com/user/iCatCare. These recommendations provide a wealth of practical information aimed at making blood pressure measurement in cats achievable and reliable.

### Causes of systemic hypertension

The pathogenesis of systemic hypertension is multifactorial, but likely involves renin–angiotensin–aldosterone system (RAAS) activation, altered sodium excretion, increased sympathetic activity, altered prostaglandin/bradykinin production, altered production or response to nitric oxide and other endothelial-derived factors, renal secondary hyperparathyroidism (RHPPTH), and arterial structural changes.

In cats, systemic hypertension is most commonly associated with CKD although the reported incidence varies widely between different studies, ranging from 19% to 65% (Stiles et al. 1994, Syme et al. 2002). The likelihood of hypertension in cats with CKD is not proportional to the degree of azotaemia and affected cats often have only mild or no azotaemia (Brown et al. 2007). A recent study (Bijsmans et al. 2015) has also demonstrated that cats with CKD that are normotensive at the time of diagnosis have a significantly increased risk of developing hypertension at a later date (incidence 17%) compared to age-matched healthy cats (incidence 9%).

Systemic hypertension is also common in hyperthyroid cats with a reported incidence ranging between 14% and 87% (Kobayashi et al. 1990, Williams et al. 2010). Additionally hyperthyroid cats that are normotensive at the time of diagnosis remain at increased risk of developing hypertension even after good control of hyperthyroidism has been achieved. This appears to occur in around 20% of cases (Stiles et al. 1994, Morrow et al. 2009), so ongoing monitoring of blood pressure is important.

Other known associations include primary hyperaldosteronism, hyperadrenocorticism and phaeochromocytoma.

“Idiopathic” hypertension, in which no underlying cause can be identified, is also common, accounting for 18-20%
of cases (Maggio et al. 2000, Elliott et al. 2001), however many of these cats will be found to have low urine SG (<1.030) and are likely to have pre-azotaemic CKD (International Renal Interest Society (IRIS) Stage 1 and early Stage 2).

Consequences of systemic hypertension

Chronic systemic hypertension damages organs that have a rich arterial and arteriolar supply, most notably the eye, kidney, brain and heart, and hence these have been termed “target organs”. Chronic hypertension causes vascular smooth muscle hypertrophy, vascular wall fatigue and elastin molecule fracture, and eventually smooth muscle necrosis, which allows plasma and blood to leak from vessels, and also results in reduced vascular compliance. It is important to note that these more advanced changes are not reversible, so ongoing signs of target organ damage may be seen even after control of hypertension.

Common clinical signs of target organ damage (TOD) include:

• **Ocular effects:** Hypertension causes hyphaema (Figure 1), retinal haemorrhage, retinal detachment (Figure 2) and blindness. More subtle changes in the retina, including focal retinal exudates, focal retinal haemorrhage and tortuosity of the retinal vessels (Figure 2), will be recognised in the early stages of disease.

• **CNS effects:** Altered cerebral perfusion can cause behaviour changes that may mimic or exacerbate senile cognitive dysfunction. Altered behaviour, nocturnal vocalisation, disorientation and “insecurity” are common. In humans headaches are a common sign of hypertension, and while we cannot identify this in our feline patients, some do exhibit lethargy and/or short temper which may be a

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**Figure 1:** Hyphaema due to hypertension in an elderly DSH cat

**Figure 2:** Hypertension can cause retinal haemorrhage (white arrows), retinal detachment (circled) and retinal vessel tortuosity (black arrow)

**Box 1:**

**Which cats are candidates for blood pressure measurement?**

Blood pressure measurement is indicated in cats when there is a high index of suspicion of hypertension. Additionally, because it is a common problem in older cats that produces few if any clinical signs in its early stages, regular screening of older cats is advocated as part of their routine preventive healthcare.* There are therefore three categories of cats for whom blood pressure measurement is indicated:

1) **Blood pressure should be measured in ALL cats that present with clinical abnormalities that could indicate hypertensive target organ damage (TOD)**

   See main text for more detailed description of TOD

<table>
<thead>
<tr>
<th>Kidneys</th>
<th>Progressive CKD, proteinuric CKD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye</td>
<td>Acute onset blindness, retinal detachment, bleeding in the eye (retina, posterior chamber, anterior chamber), retinal vessel tortuosity, perivascular oedema, retinal degeneration</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>Lethargy, nocturnal vocalisation, altered behaviour, altered awareness, disorientation, vestigial signs, seizures, ataxia, paresis</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Systolic heart murmur, gallop rhythm, reduced ability to tolerate intravenous fluids, left ventricular hypertrophy</td>
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2) **Blood pressure should be measured in ALL cats that have a disease that is associated with hypertension**

| Chronic kidney disease   | Note: Cats with low urine specific gravity (< 1.030) but normal serum creatinine may have pre-azotaemic CKD (IRIS Stage 1 and early Stage 2 CKD). Blood pressure measurement is indicated if there is no other evident cause of polyuria. (IRIS - International Renal Interest Society) |
| Hyperthyroidism          | Note: Cats that are normotensive at the time of diagnosis commonly become hypertensive once their hyperthyroidism has been controlled. Ongoing monitoring of blood pressure is recommended in all hyperthyroid cats |
| Hyperaldosteronism       | An uncommon endocrinopathy in cats most commonly manifesting as refractory hypokalaemia +/- hypertension |

3) **Routine blood pressure measurement recommended** in all older cats as part of their regular preventive healthcare plan

| Cats aged 7-10 years     | Consider annual blood pressure measurement |
| Cats aged > 10 years     | Annual or twice yearly blood pressure measurement recommended |