EFFECT OF AMLODIPINE ON BLOOD PRESSURE IN CATS WITH CHRONIC RENAL FAILURE

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Summary

The study was made on seven cats aged between seven and fourteen years, diagnosed with chronic renal failure and secondary arterial hypertension. The blood pressure was measured by oscilometric method at the level of the median artery, with cuffs width of between 30-40% of the limb circumference, placed in the forearm region. For each cat, the systemic blood pressure value was calculated as the mean of five consecutive measurements. Amlodipine was administrated in all cats in dose of 0.625 mg/cat once daily (0.1-0.2 mg/kg), and blood pressure was measured before drug administration and after seven and thirty days of therapy.

Amlodipine decreased blood pressure gradually and significantly (p<0.05) in cats with chronic renal failure and had no significant influence on the renal blood biochemical profile in the present study.

Key words: chronic renal failure, cats, amloidipine

In cats, secondary arterial hypertension is often associated with chronic kidney disease (CKD) and hyperthyroidism (5, 6). Sustained hypertension can lead to irreversible damage in the target organs, including kidneys, eyes, heart and central nervous system (1, 2, 6). Based on the available data the prevalence of hypertension in cats with chronic renal failure varies between 20% and 65% (7, 10). Due to its regulating role in volemia and vascular resistance, the kidney is equally a cause and a victim of the arterial hypertension. Renal diseases can lead to arterial hypertension through sodium and water retention which will cause extracellular fluid volume expansion, and through activation of the renin-angiotensin-aldosterone system. On the other hand, arterial hypertension causes glomerular hypertension and hyperfiltration, proteinuria, and arteriosclerosis, completing this vicious cycle through self-perpetuating renal damage (2). In renal insufficiency, the most frequently recommended antihypertensive agents are vasodilators because of dilating effects on intarenal arterioles. Angiotensin converting enzyme inhibitors and calcium channel antagonists are the therapeutic agents that have proven renoprotective effects (1, 2).

Amlodipine is a dihydropyridine compound and belongs to the pharmacological family of calcium channel blockers. These blockers elicit a decrease in calcium entry into the cell and lead to an inhibition of vascular
contraction, cardiac inotropy and sinoatrial pacemaker activity. The dihydropyridines are more active on vascular smooth muscle calcium channels than cardiomyocytes or sinoatrial cells. (11)

The aim of this study is to determine the amlodipine effect on the blood pressure and on the renal function in cats with chronic renal failure.

Materials and methods

The study was made on seven cats aged between seven and fourteen years, diagnosed with chronic renal failure and secondary arterial hypertension at Veterinary University Clinics of Timisoara. Blood pressure (BP) was measured using oscillometric blood pressure monitor (Cardell Model 9401) that was previously validated for use in dog and cats. This automated oscillometric device indirectly measures systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and pulse frequency. The inflatable cuff was positioned around the forelimb, between the elbow and carpus, at the level on the median artery. For each cat, a cuff width of between 30-40% of the limb circumference was chosen. Blood pressure was measured with owner present, after a period of acclimatization, before the physical examination, to reduce the magnitude of “white coat” hypertension. For each cat, the systemic blood pressure value was calculated as the mean of five consecutive measurements. Arterial hypertension was defined in this study as SBP/DBP ≥ 150/95 mm Hg.

Amlodipine was administrated in all cats in dose of 0.625 mg/cat once daily (0.1-0.2 mg/kg), and blood pressure was measured before drug administration and after seven and thirty days of therapy.

Chronic renal failure was diagnosed by physical examination, clinical signs and routine blood profile to confirm renal disease. Blood and urine samples were collected from each cat before and after 30 days of therapy. Biochemical blood parameters (creatinina, urea, phosphorus, potassium, total protein and albumin) were determined using usual methods.

Results and discussions

Before the treatment of amlodipine all cats had SBP/DBP ≥ 165/110 mm Hg. Amlodipine administration gradually reduced the BP, without causing hypotension. Thus, we have noticed a mean reduction of 12.06% in SBP after 7 days of therapy, and of 19.33% after 30 days. The same decreasing tendency was noticed in DBP and MAP, who was reduced with 15.28% and 14%, after 7 days of therapy, and with 23.63% and 21.78% after 30 days of therapy (fig.1).
Fig. 1. Dynamics of the mean blood pressure values in cats treated with amlodipine

Comparing the BP values measured before the amlodipine administration with the BP values obtained after 7 and 30 of therapy we have observed that were significant differences (p≤0.001) in SBP, and also in SBP and MAP (Table 1). After a month of treatment the mean values of SBP/DBP have been sensitively close to what we consider today to be a target value in the antihypertensive treatment in cats (SBP/DBP <150/90 mmHg) (1).

Table 1

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Standard Error Mean</th>
<th>95% confidence interval of the difference</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBPₐ – SBP₇</td>
<td>22.00</td>
<td>6.70</td>
<td>2.53</td>
<td>15.79 – 28.40</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SBPₐ – SBP₃₀</td>
<td>35.28</td>
<td>10.24</td>
<td>3.87</td>
<td>25.81 – 44.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBPₐ – DBP₇</td>
<td>18.57</td>
<td>6.18</td>
<td>2.33</td>
<td>12.84 – 24.29</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBPₐ – DBP₃₀</td>
<td>28.71</td>
<td>9.41</td>
<td>3.55</td>
<td>20.01 – 37.41</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MAPₐ – MAP₇</td>
<td>19.71</td>
<td>5.90</td>
<td>2.23</td>
<td>14.25 – 25.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MAPₐ – MAP₃₀</td>
<td>30.85</td>
<td>9.00</td>
<td>3.40</td>
<td>22.52 – 39.18</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* - Systolic/Diastolic Blood Pressure before treatment;  
** - Systolic/Diastolic Blood Pressure after 7 days of treatment;  
*** - Systolic/Diastolic Blood Pressure after 30 days of treatment.
In fact, most reports about hypertension in cats point out the fact that amlodipine decreases BP efficiently and relatively fast, down to certain values at which the risk of appearing the hypertensive injury in the target organs becomes minimal. Thus, in a retrospective study carried out on 30 cats with natural cause arterial hypertension, Elliot et al. (3) noticed the SBP decrease from a mean value of 202.5±16.8 down to 153.2±21.6 mmHg in the first 50 days of amlodipine treatment. Similar findings are shown by Snyder et al. (9), who obtained a decrease in SBP from a mean value of 217±25 to 142 ± 27 mmHg after 3 months of amlodipine treatment on 13 cats with spontaneous arterial hypertension. Likewise, Henik et al. (4) underlines that in 12 cats with arterial hypertension under amlodipine treatment in a dosage of 0.625 mg/kg, SBP reduced from a mean value of 198 mmHg to 155 mmHg, without significant changes in blood potassium and creatinine levels.

Renal blood biochemical profile obtained after 30 days of treatment did not change significantly (p>0.05) in comparison to the values obtained before amlodipine administration (table 2).

Table 2

<table>
<thead>
<tr>
<th>Biochemical parameters</th>
<th>Units</th>
<th>n</th>
<th>Mean ± standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Before treatment</td>
</tr>
<tr>
<td>Creatinina</td>
<td>mg/dl</td>
<td>7</td>
<td>2.78 ± 0.84</td>
</tr>
<tr>
<td>Urea nitrogen</td>
<td>mg/dl</td>
<td>7</td>
<td>76.85 ± 18.16</td>
</tr>
<tr>
<td>Albumin</td>
<td>g/dl</td>
<td>7</td>
<td>2.64 ± 0.26</td>
</tr>
<tr>
<td>Total protein</td>
<td>g/dl</td>
<td>7</td>
<td>6.65 ± 0.85</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg/dl</td>
<td>7</td>
<td>6.01 ± 1.28</td>
</tr>
<tr>
<td>Potassium</td>
<td>mEq/l</td>
<td>7</td>
<td>4.38 ± 1.18</td>
</tr>
</tbody>
</table>

Conclusions

Amlodipine administration decreased the blood pressure gradually and significantly in the cats with chronic renal failure in this study.

Amlodipine had no significant influence on the renal blood biochemical profile in this study.

References
