



INTER-DAY, INTER-OBSERVER AND INTRA-OBSERVER VARIABILITY OF ARTERIAL PULSE WAVE VELOCITY MEASUREMENTS USING PULSED WAVE DOPPLER IN HEALTHY HORSES

Introduction

In human medicine, measurement of pulse wave velocity (PWV) is used as gold standard test to quantify the arterial wall stiffness (AWS) in order to assess vascular health. In horses a standard method to assess the AWS and thus the vascular health is not defined yet. Therefore, feasibility and variability of arterial PWV measurements was tested in this study.

Methods

In six adult Warmblood horses spectral pulsed wave Doppler was used to capture the arterial pulse wave and the heart rate (HR) during 9 cardiac cycles, at three different sites: the proximal and distal carotid artery, and the femoral artery. The time delay between the R wave of the synchronized ECG and the foot of the waveform was measured. The proximal carotid to distal carotid PWV (PWV_{c-c}) and the proximal carotid to femoral PWV (PWV_{c-f}) were calculated ($\Delta\text{distance (m)}/\Delta\text{time (s)}$). Mean arterial blood pressure (MAP) was recorded non-invasively from 10 cardiac cycles. Horses were examined on two different days by the same observer, images from the first day were also measured by a second observer.

Results

PWV_{c-c} and PWV_{c-f} measurements showed a relatively low inter-day (15% and 12%, respectively), inter-observer (15% and 9%) and intra-observer variability (15% and 9%). No significant change in MAP, but a significant ($P<0.001$) decrease in HR was observed between day one ($34.8\pm 3.9\text{bpm}$) and day two ($32.1\pm 4.2\text{bpm}$), which resulted in a significant decrease in PWV_{c-c} ($7.0\pm 1.8\text{m/s}$ versus $6.1\pm 1.8\text{m/s}$) ($P<0.05$) and PWV_{c-f} ($11.2\pm 2.9\text{m/s}$ versus $10.2\pm 3.6\text{m/s}$) ($P<0.001$).

Conclusion

Measurement of PWV in horses using pulsed wave Doppler is feasible. PWV_{c-f} showed off as being the parameter with the lowest coefficients of variation. In this preliminary study the slightly higher values for inter-day variability could be explained by the small decrease in HR, resulting in a slightly lower PWV. Studies in a larger population are needed.

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