

So far pulse wave analysis was only used in emergency and critical care patients as it was limited to invasive intervention. Non invasive pulse wave analysis (PWA) is nowadays available through HDO (High Definition Oscillometry) blood pressure measurement technology. This technique not only allows for accurate measurement of systolic, diastolic and mean arterial pressure, it further displays each single pulse wave in realtime on screen. Due to the fact, that HDO is based on information deriving from the arterial wall oscillations during the measurement cycle, the pulse waves show characteristic changes depending on stroke volume (SV) and stroke volume variances (SVV), cardiac output (CO), systemic vascular resistance (SVR) and of course rhythm/arrhythmia.

Preliminary data comparing HDO pulse wave analysis with Gold standard methods (Picco, Lithco and Vigilance) show a clear correlation of pre-systolic amplitudes with SVR and single amplitudes with SV. Having this information additionally available, a patient can be assessed in much more detail, easily accessible, non-invasively.

With kidney disease, RAAS is sooner or later activated leading to an increase in Angiotensin II. Angiotensin being a growth factor itself but also activating growth factors like but not limited to TGF-beta, finally contributing to glomerulosclerosis, interstitial fibrosis and tubular atrophy (Wolf, 2006). Angiotensin II receptors on glomerular podocytes play a major role in the development of proteinuria, whereas the severity of protein leakage correlates with the grade of hypertension. Both further contributing to interstitial fibrosis. All are resulting in a faster progression of the disease. As increased AII levels are leading to systemic vasoconstriction, arterial compliance will be affected. Initially this is a transient mechanism which can be addressed with an ACE-Inhibitor or an angiotensin receptor blocker. Over time, chronic diseased animals tend to develop changes in the arterial wall structure (Humphrey, 2008) leading to a permanent impairment of arterial compliance resulting in a permanent increase of SVR. This of course is indicative for a more progressed disease. Thus evaluation of arterial compliance may add valuable information when looking at the prognosis of kidney disease. Further, long lasting hypertension due to kidney disease can damage organs, such as the eyes, CNS and the heart. Particularly cats are susceptible to developing hypertensive left ventricular hypertrophy. These animals may have a sudden onset of a heart murmur, SV will be affected leading to a higher SVV and sometimes even arrhythmia. Arrhythmia and SVV can again be addressed with non invasive pulse wave analysis, so secondary damage to the heart is likely to be detected if present, supporting the overall assessment of a patient.

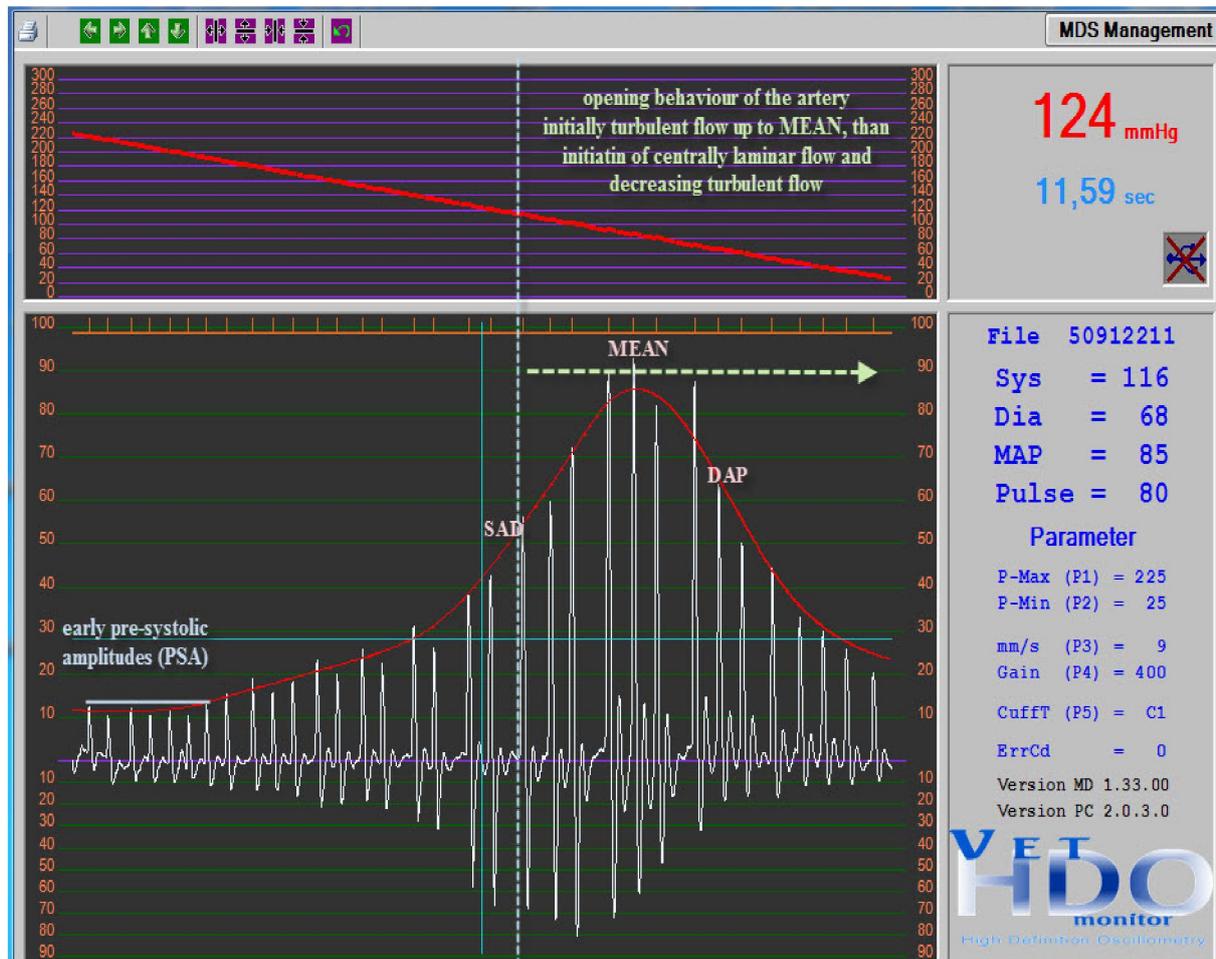


Fig. 1 shows a normal pulse wave distribution reflecting the opening behavior of a peripheral artery of a healthy, 3 y old Golden Retriever with respiratory sinus arrhythmia. Early pre-systolic amplitudes are looked at for information regarding SVR, pulse wave – pulse wave interval is reflecting the rhythmic situation, pulse wave variances are indicating SVV.