VENTRICULAR, VALVULAR, AND VASCULAR ADAPTATION TO AORTIC VALVE STENOSIS. INTEGRATED FREQUENCY-DOMAIN AND WAVE-INTENSITY ANALYSES IN EXPERIMENTAL CHRONIC DISEASE

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The central role of the vascular compartment in the physiology of AS is progressively recognized. However, vascular functional changes during disease progression have never been studied.

Methods: Nine dogs underwent a surgical procedure of cusp restriction and flow probe implantation. Simultaneous high-fidelity pressure, flow, and Doppler-echocardiography measurements were performed after surgery and compared to values obtained after 6 weeks of follow-up. Signals were processed using time-, frequency-domain and wave-intensity (WIA) analyses.

Results: Valve area fell by almost 0.1 cm², resulting in a progressive decrease in dP/dtmax and prolongation of tau. A significant increase in characteristic impedance (Z0) and compliance (C) was observed, as well as a reduction in effective arterial elastance (Ea) and systemic vascular resistance (SVR). WIA showed that the forward compression wave decreased, and was directly related to valve area (R= 0.52; p<.01) and dP/dtmax (R= 0.61; p<.01). The forward expansion wave correlated to tau (R= 0.40; p<.01) and was also reduced. No changes were observed in backward travelling waves, wave speed, or wave reflection distance. Zva obtained by ultrasound very poorly correlated with pulsatile parameters of vascular function.

Conclusion: Typical arterial pulse characteristics of AS are caused by a reduction in forward travelling waves secondary to outflow obstruction and impaired LV chamber function. With disease progression SVR falls, whereas Z0 and C increase.