Automated calculation of ventricular outflow from right ventricular pressure curves

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The right ventricle can be modeled by a hydromotive pressure source and internal impedance, first described by Elzinga et al. [1]. The right ventricular outflow can then be calculated using Ohm's Law as QRV = (HMP(t)-RVP(t))/Rs.

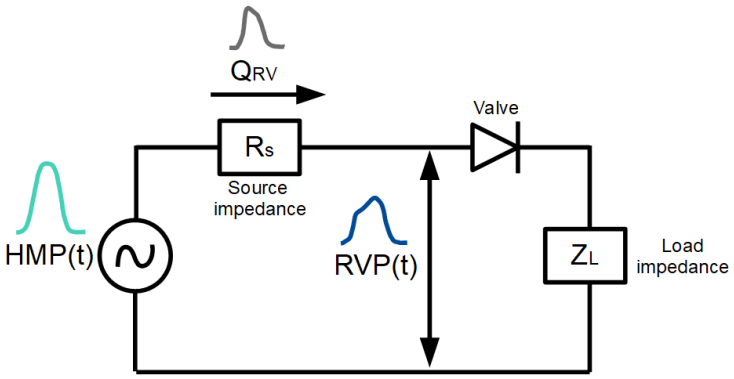

Figure 2: The model of the ventricle as hydromotive pressure source and source impedance first described by Gabe, Elzinga et al.

After constructing the HMP(t) curve, for example, by using non-linear regression first described by Sunagawa et al. [2] the pressure difference HMP(t)-RVP(t) can be calculated for estimation of the right ventricular outflow waveform. Implemented with software like CorLog App this can be used for online beat-to-beat calculation of stroke volume and cardiac output.

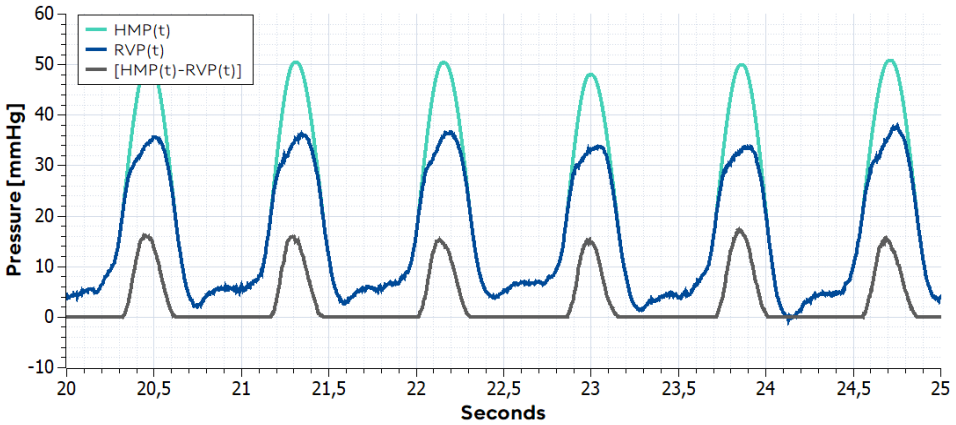

Figure 3: Calculation of pressure difference HMP(t)-RVP(t) from right ventricular presure curves.

[1] Elzinga, G. and Westerhof, N., 1974, January. End-Diastolic Volume and Source Impedance of the Heart. In Ciba Foundation Symposium 24-Physiological Basis of Starling's Law of the Heart (pp. 241-255). Chichester, UK: John Wiley & Sons, Ltd.

[2] Sunagawa, K., Yamada, A., Senda, Y., Kikuchi, Y., Nakamura, M., Shibahara, T. and Nose, Y., 1980. Estimation of the hydromotive source pressure from ejecting beats of the left ventricle. IEEE transactions on biomedical engineering, (6), pp.299-305.