

The Effect of Phenylephrine on Peripheral Pressure Volume Loops

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Introduction: The left ventricular pressure-volume area (PVA) represents the total mechanical energy generated by ventricular contraction. The meaning of peripheral pressure-volume area is to be determined. The compliance of the PV loop is related to the slope of the loop¹. While the “fish-tail” of the loop appears to correspond to venous pulsations.² Phenylephrine is a direct-acting, predominantly α (1) adrenergic receptor (AR) agonist, produces systemic vasoconstriction. The present study compared the changes before and after the use of phenylephrine bolus on peripheral arterial PV loop and peripheral venous PV loop.

Methods: With IRB approval, this observational study was conducted. Arterial blood pressure (BP), finger PPG were recorded at 100 Hz from clinical monitors (GE; Fairfield, CT) with a data acquisition system (Collect 5/S – GE; Fairfield, CT). We used LabChart 7.37 (ADInstruments, Boulder CO) and Mathematica 10.4.0.0 for analysis and calculation. Arterial BP and PPG high pass (derived from PPG waveform) are mixed to form the arterial pressure-volume loop. PVP low pass (derived from PVP waveform) and PPG low pass (derived from PPG waveform) were mixed to calculate venous PVA, as shown in Figure (1).

Results: As shown in Figure2, after bolus of phenylephrine, there was significant increase in the arterial (2-A) PVA with significant reduction the venous (2-B) PVA (p values<0.001) Figure 2 showed an example of the effect of phenylephrine on both loops. There is a strong negative correlation between arterial PVA and venous PVA($r=-0.88$).

Conclusion: Simultaneous analysis of the arterial and venous loop provide more information about the compliance and the volume status.

References: 1. J Clin Monit. 1997 Jul; 13(4):223-8.
2. J Clin Monit. 1993 Sep;9(4):283-7.

Figure 1

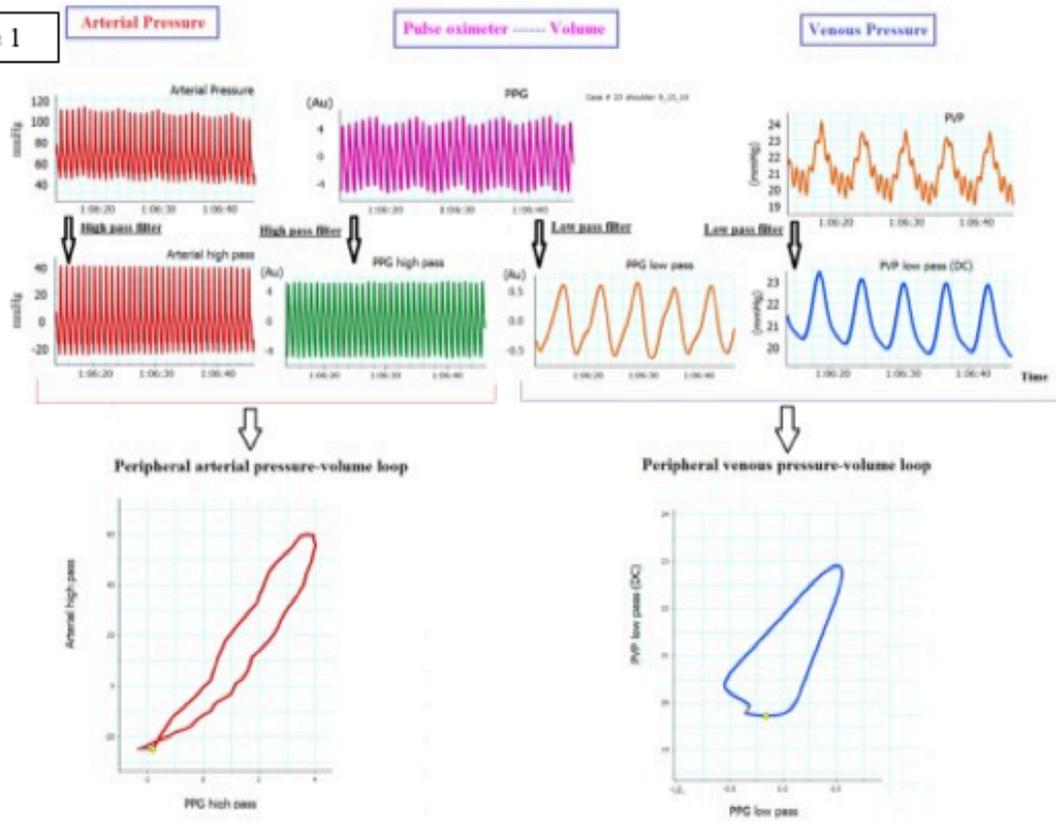
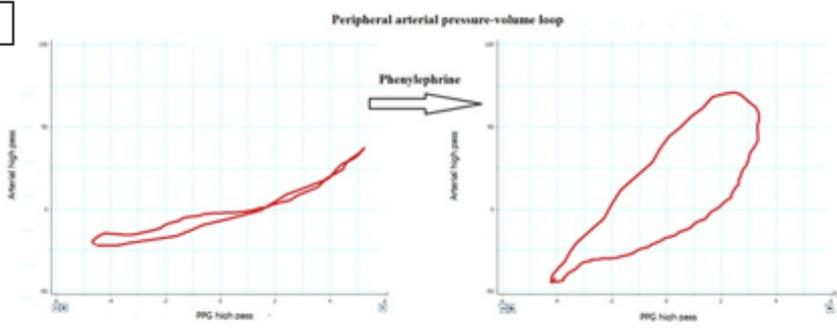


Figure 2

A



B

