

Effect of Phenylephrine on PPG Augmented Index and Local Vascular Compliance

Presenting Author: Tiantian Shi, M.D.

Co-Authors: Tiantian Shi, M.D., Kirk H. Shelley, M.D.Ph.D., David G. Silverman, M.D., Aymen A. Alian, M.D. Anesthesiology, Yale University School of Medicine, New Haven, CT, USA.

Introduction: The pulse oximeter is one of the standard monitors used in the operating room. It is designed to monitor the patient's arterial oxygen saturation and heart rate. Study of the pulse oximeter waveform (PPG) provides valuable information regarding patient physiology.

Phenylephrine is a direct-acting, predominantly $\alpha(1)$ adrenergic receptor (AR) agonist, produces systemic vasoconstriction.

The position of the dicrotic notch of the arterial waveform is a sensitive indicator of vascular tone.¹We are calculating Augmented Index (AI) from the PPG waveform as shown in figure(1) to describe the notch position.

The present study compared the PPG augmented index, arterial compliance (PPG amplitude/arterial pulse pressure), together with other vital signs (heart rate and blood pressure) during multiple episodes of phenylephrine administration.

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) to analyze these waveforms. PPG augmented index is calculated as shown in figure (1) for 20 successive PPG beats. Comparisons were made with Wilcoxon signed-rank test. P value<0.05 was considered significant.

Results: After bolus of phenylephrine, BP and AI are all increased and compliance is decreased (all p values<0.05). HR didn't significantly change (p value=0.26). PPG augmented index tracked well the changes in the Systolic BP (SBP), Diastolic BP (DBP), Pulse BP (PP) and Mean BP (MAP), the correlation was 0.83, 0.81, 0.83 and 0.82 respectively. There was a very good negative correlation between the arterial compliance derived from PPG and SBP, DBP, PP and MAP, the correlation was - 0.96, - 0.94, -0.97 and - 0.96 respectively. The correlation between compliance and AI was 0.87(Figure2).

Conclusions: PPG waveform provides valuable information about local compliance and vascular tone.

References: 1. Am Heart J 138 (3 Pt 2), 220-224. 9 1999

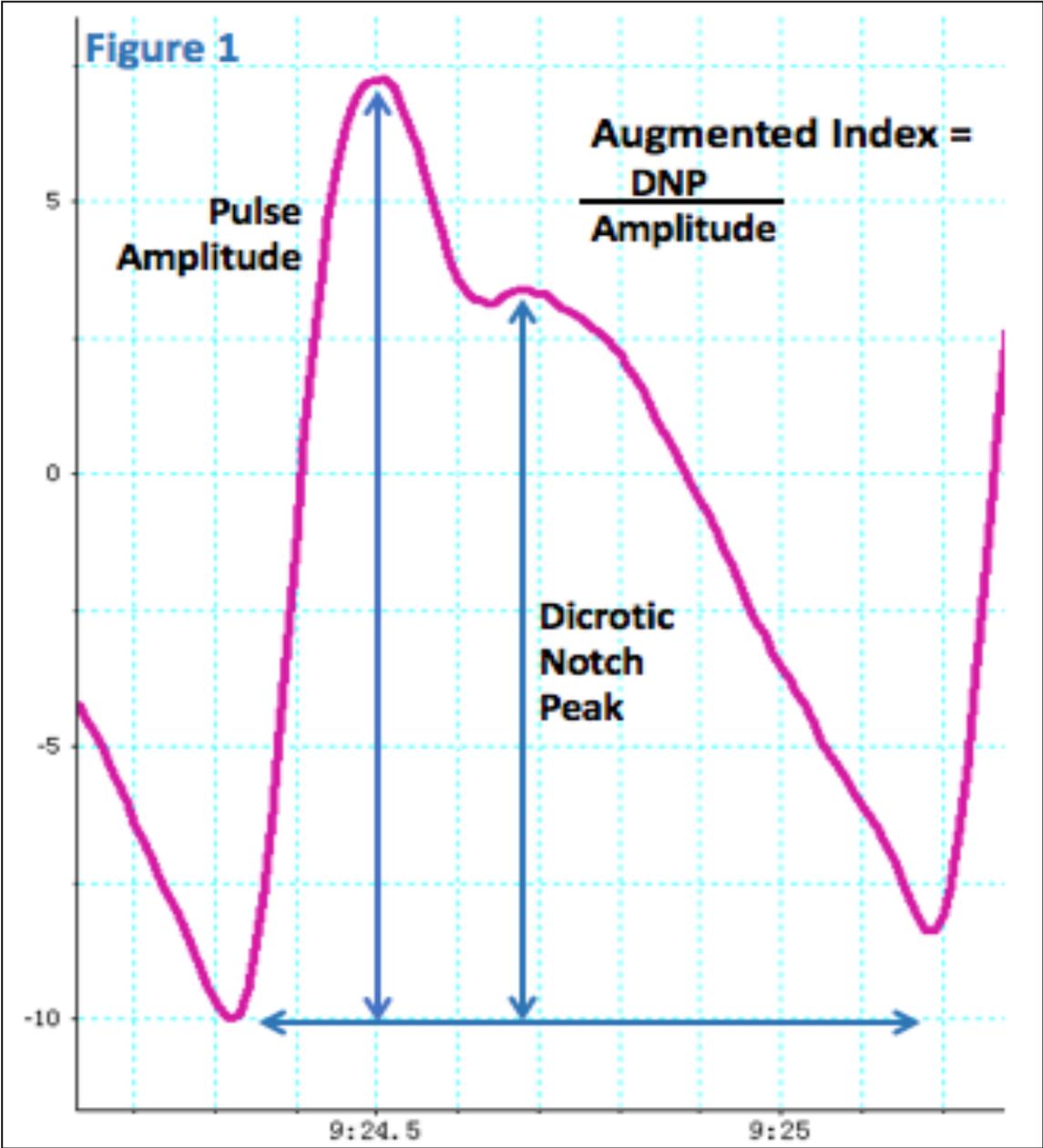


Figure2

AI vs Compliance

