

PVI: A New Fluid Responsiveness Parameter

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Introduction

New predictors of fluid responsiveness have been obtained from plethysmographic waveforms displayed on pulse oximeters. However, they require recordings on a PC and off line operator-dependent analysis. A new parameter called PVI has been proposed by a pulse oximetry manufacturer to be used for the purpose of fluid responsiveness. Its advantage is the automatic calculation and display on the screen of the pulse oximetry monitor. The aim of the study is to test the accuracy of this parameter to predict fluid responsiveness in critically ill patients.

Methods

Septic shock patients fully adapted to their respirator and on sinus rhythm were included. Data collection included simultaneous recording of invasive blood pressure, a raw plethysmograph waveform, and PVI from Masimo® Radical-7. Echocardiography was used to calculate velocity-time-integral (VTI). We infused fluid (500 ml of saline) in patients with pulse pressure variation (ΔPP) $\geq 15\%$ and performed passive leg raising (PLR) in patients with $\Delta PP < 15\%$. We compared PVI with ΔPP and sought the best threshold PVI value that predicted $\Delta PP > 15\%$. Patients who increased their VTI by more than 15% in response to fluid or to PLR were defined as responders. The significance of the PVI threshold to distinguish between responders to non-responders was examined.

Results

In the first step, 25 patients were enrolled. Fifty (50) paired values were analyzed. The r coefficients between ΔPP -PVI, ΔPP_{leth} -PVI and ΔPP - ΔPP_{leth} were: 0.90, 0.89 and 0.87, respectively. A threshold PVI value of 20 identified patients with $\Delta PP > 15\%$ with a sensitivity of 84% and specificity of 90%.

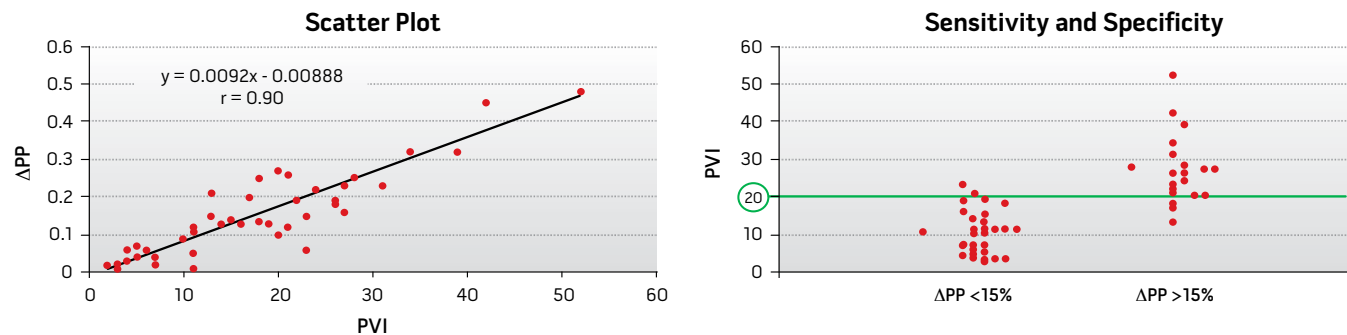


Figure 1: Step 1 results - a threshold PVI Value of 20 identified patients with PP $> 15\%$. Sensitivity = 84%, Specificity = 90%

In a second step, 18 other patients were enrolled. All patients with a PVI > 20 ($n=8$) were fluid responders and 10 patients with PVI < 20 were PLR non-responders.

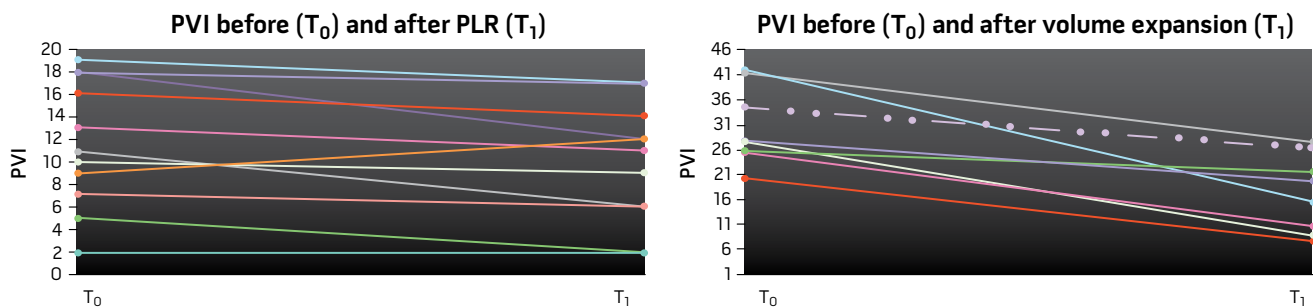


Figure 2: Step 2 results – All patients with PVI > 20 were fluid responders. PVI < 20 were not fluid responders

Conclusions

PVI automatically obtained from a pulse oximetry device seems to be an accurate index of fluid responsiveness. The numerical value of 20 distinguished responders from non-responders with good sensitivity and specificity.