

Comparing Pleth variability index (PVI) variation induced by passive leg raising and Trendelenburg position in healthy volunteers.

Demirci OL, Çıkrıkçı Işık G, Çorbacıoğlu ŞK, Çevik Y.
Am J Emerg Med. 2019 May 7. pii:
S0735-6757(19)30326-2. doi: 10.1016/j.ajem.2019.05.015.

Hypovolemia, which is the main cause of circulatory failure in emergency medical settings, can often be managed by volume expansion [1]. However, the fluid responsiveness (FR) varies between the patients, and volume status of the patient can be evaluated by some predictors. Studies have demonstrated that static hemodynamic measurements (e.g., central venous pressure, mean arterial pressure) were of little value in discriminating between the patients who will or will not respond to volume expansion, and dynamic indices (e.g., arterial pressure wave form, stroke volume) were more accurate in evaluating volume status [1]. However, dynamic indices were also found to be operator dependent, more invasive, and not universally available [1,2]. A predictor of fluid volume that has become popular in recent years is the pleth variability index (PVI).

PVI is a non-invasive, dynamic measurement that helps clinicians assess the volume status of patients and manage their FR. It continuously measures changes in the perfusion index (PI) that occur during a complete respiratory cycle [3]. PI is calculated as the pulsatile infrared signal indexed against the non-pulsatile infrared signal. A high variability in PI means a higher PVI number, thus meaning that the patient is more likely to respond positively to a fluid infusion [4]. The reasonable ability of PVI to predict FR in mechanically ventilated patients has already been evidenced [3]. In spontaneously breathing patients, however, evaluating the dynamic indices is more complicated. Since it is not possible to standardize the tidal volume in each breath, the reliability of dynamic measurements based on heart–lung interactions, such as PVI, will be reduced [5].

Another common method used to predict FR is the endogenous fluid challenge. Passive leg raising (PLR), which causes approximately 300 ml of blood to return to the central venous compartment, induces a reliable change in cardiac output (CO), regardless of ventilation mode [6]. It is also known that the Trendelenburg position (TP) causes an increase in CO, with a mechanism similar to PLR [7]. The changes in CO due to positional changes are already known. However, there has been insufficient research into their effects on PVI. Thus, the aim of this study was to determine and compare PVI variation induced by PLR and TP maneuvers, which cause endogenous fluid challenges in spontaneously breathing, healthy participants.

This study demonstrated that both PLR and TP caused an increase in PVI values. However, when the direction of change in PVI was evaluated, in more than half of participants, there were no changes in PVI values. This finding differed from the findings of previous studies. To conclude, when the results of previous studies and the inconsistent direction of change in PVI values in the present study are considered, we deduce that PVI is not a consistent or reliable predictor of volume status changes stimulated by PLR or TP in spontaneously breathing, healthy patients.