Placement in the prone position predisposes patients to a near volume-response state. A plethysmographic comparison of two prone positions using the Pleth Variability index.

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Plethysmographic analysis of pulse variation is used to evaluate preload changes in systolic volume during cyclic positive pressure ventilation [[1], [2], [3]]. Different prone position has been associated with cardiac output decrease, mainly because of venous-return reduction [4,5]. Here, we performed a prospective observational cohort study to describe the plethysmography variation induced by changing between the supine and flat position versus Georgia prone position.

After hospital's clinical research review board approval (ref: OAIC N°866/17), we included patients older than 18 years old, with American Society Association (ASA) classification I or II scheduled for elective lumbar disc herniation surgery at the Hospital Clinico de la Universidad de Chile. Patients treated with saline solutions before surgery, body mass index >35, and those who were pregnant were excluded. All patients provided writing informed consent. A sample size of 10 subjects per group was performed assuming a 40% difference between patients in the common and Georgia prone positions, with an alpha of 0.05 and a power of 80%.

After standard ASA monitoring were placed, a PVi® sensor connected to a Rainbow® Rad-87 (Massimo Corporation; Irvine, CA, USA) was installed. Following anesthesia induction, ventilation parameters were set to a tidal volume of 8 mL/kg (ideal body weight) and 5 cmH2O of positive end expiration pressure. The respiratory rate was set to an end-tidal CO2 of 35 to 40 mmHg. Our protocol included two sets of measurements; the first set was acquired immediately after tracheal intubation. PVi® values were registered each minute for 5 min to obtain a basal PVI® level after anesthesia induction. Then, the patient was placed in one of the two prone positions according to surgeon preference. After 10 min in the prone position (that allowed us to complete the positioning of the patients and avoid interference in the measurements due to position change), the second set of 5-minute measurements was completed, and the surgeries proceeded as ordinary.

A total of 24 patients were recruited. Four patients had a basal PVi® higher than 13% and were excluded from the analysis. The baseline PVi® mean in the supine position was 5.5 ± 0.2% (n = 100) (5.2 ± 0.3% in the flat prone position (n = 50) and 5.7 ± 0.2% in the Georgia prone position (n = 50)). In both groups, the change from the supine to a prone position induced an increase of 51.1% in the PVi® values (Fig. 1A). In the flat prone position, we observed a rise to 8.2 ± 0.5% (n = 50) ($p < 0.001$). In the Georgia prone position, the rise was to 8.1 ± 0.7% (n = 50) ($p < 0.001$). Contrary to our hypothesis, the change from the supine to the Georgia prone position resulted in equal PVi® rise than that observed in the change to the flat prone position ($p = 0.96$) with no differences found at any time point during the observation period (Fig. 1B).

Here, we used a practical, non-invasive preload evaluation using the PVi® to observe systolic variations when patients are moved from the supine to a prone position. We observed a rise in the PVi® in both groups after the prone position placement, which was not related to any surgical event. Interestingly, we found that the position of the legs had no clinical impact on the preload changes.

In conclusion, patients transition from a normal preload status to a near volume-response state when they are placed in a prone position. This can be easily monitored by use of the non-invasive plethysmography index.