Pulse Pressure

Pulse pressure variation (PPV), a physiologic occurrence secondary to cyclic changes in cardiac stroke volume (SV) during mechanical positive pressure ventilation, is a useful parameter in predicting the likelihood of improving SV or cardiac output (CO) with IV fluid expansion. This prospective crossover study evaluated the effects of dexmedetomidine (DEX) on changes in PPV when hemorrhage was induced and followed by volume replacement (VR). The hypothesis was that DEX, a vasoconstrictor, would cause a shift of blood flow from the periphery to the organs and minimize SV and changes in PPV. Anesthesia was maintained in 8 adult dogs during treatments using isoflurane (ISO) either alone or in combination with a continuous rate infusion (CRI) of DEX. Baseline data were recorded for PPV and CO. Hemorrhage was induced by collection of 30% circulating blood volume over 3 consecutive stages. Cardiopulmonary data were again collected at each stage. Autologous blood was transfused back into each patient for VR in 3 stages, followed again by data collection at each stage. In 4 of 8 ISO dogs, hypovolemia caused hypotension. PPV increased as a result of decreased SV and normalized or increased with VR. In the ISO with DEX CRI protocol, systemic vascular resistance was noted in both the normotensive and previously hypotensive dogs; this prevented increases in PPV when hemorrhage was induced. These results indicate that in patients given DEX, PPV may mask hemorrhage and thus should not be used to guide VR.

Commentary

Several aspects of this study deserve comment: 1) There is a need for monitoring response to fluid volume loading, as was done in this study following hemorrhage. This could apply to any patient receiving fluid therapy because overhydration can contribute to patient morbidity. Although the authors used direct arterial blood pressure to determine PPV, there is evidence that plethysmography variability index using non-invasive pulse oximetry may also be useful in assessing fluid load and would clearly be more practical in most hospitals; 2) The α-2 mediated vasoconstriction that limited PPV assessment is not surprising, but note that dexmedetomidine was administered as a CRI at the highest end of the recommended dose. The more common method of using dexmedetomidine as a single, clinically appropriate dose for premedication is unlikely to impact PPV because the vasoconstriction dissipates fairly rapidly.—Tamara Grubb, DVM, PhD, DACVAA

References


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