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PEEP decreases oxygenation of the intestinal mucosa despite normalization of cardiac output.

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OBJECTIVE: To evaluate if normalization of cardiac output reverses the attenuation of local intracapillary hemoglobin saturation (HbO₂) of gastric mucosa by PEEP (positive end-expiratory pressure) during IPPV (intermittent positive pressure ventilation). **MATERIALS AND METHODS:** Four healthy, chronically instrumented, anesthetized dogs were repeatedly studied (n = 7). Local HbO₂ of gastric mucosa was measured continuously by tissue lightguide spectrophotometry and cardiac output (CO) was recorded continuously by means of a precalibrated ultrasonic transit time flowmeter chronically implanted around the pulmonary artery. After obtaining baseline values during IPPV and ZEEP (zero end-expiratory pressure) 15 cmH₂O PEEP was added. To compensate the reduction of CO during PEEP ventilation, HES (hydroxyethyl starch 6%) was infused until CO reached baseline values during ZEEP. **RESULTS:** Despite of unimpaired systemic oxygen saturation, PEEP reduced HbO₂ of gastric mucosa from 55.1 +/- 4.2% to 42.1 +/- 4.7% (mean +/- SEM) and CO dropped from 67.7 +/- 4.9 ml.kg⁻¹.min⁻¹ to 33.9 +/- 4.6 ml.kg⁻¹.min⁻¹. Whereas infusion of HES during PEEP ventilation normalized CO to 65.1 +/- 6.2 ml.kg⁻¹.min⁻¹, HbO₂ reached only 48.1 +/- 3.3%, a statistically significant improvement compared to HbO₂ during PEEP ventilation before HES infusion (p < 0.03, Wilcoxon signed rank test), but still below baseline values (p < 0.04). **CONCLUSIONS:** Our findings demonstrate that the side effects of PEEP ventilation on cardiac output can be compensated by restoring preload, but normalizing CO did not completely normalize HbO₂ of the gastric mucosa. This further emphasizes that global measurements of variables of systemic circulation and oxygenation do not necessarily reflect regional abnormalities of tissue oxygenation. Therefore, in view of the importance of tissue hypoxia especially in the splanchnic region in the pathogenesis of multiple organ failure, monitoring of HbO₂ of the intestinal mucosa during PEEP ventilation may be particularly useful in the care of the critically ill patient.

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