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Effects of epinephrine on intestinal oxygen supply and mucosal tissue oxygen tension in pigs.

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OBJECTIVE: To study the effects of increasing dosages of epinephrine given intravenously on intestinal oxygen supply and, in particular, mucosal tissue oxygen tension in an autoperfused, innervated jejunal segment. DESIGN: Prospective, randomized experimental study. SETTING: Animal research laboratory. SUBJECTS: Domestic pigs. INTERVENTIONS: Sixteen pigs were anesthetized, paralyzed, and normoventilated. A small segment of the jejunal mucosa was exposed by midline laparotomy and antimesenteric incision. Mucosal oxygen tension was measured by using Clark-type surface oxygen electrodes. Microvascular hemoglobin oxygen saturation and microvascular blood flow (perfusion units) were determined by tissue reflectance spectrophotometry and laser-Doppler velocimetry. Systemic hemodynamics, mesenteric-venous acid-base and blood gas variables, and systemic acid-base and blood gas variables were recorded. Measurements were performed after a resting period and at 20-min intervals during infusion of increasing dosages of epinephrine (n = 8; 0.01, 0.05, 0.1, 0.5, 1, and 2 microg x kg(-1) x min(-1)) or without treatment (n = 8). In addition, arterial and mesenteric-venous lactate concentrations were measured at baseline and at 60 and 120 mins. MEASUREMENTS AND MAIN RESULTS: Epinephrine infusion led to significant tachycardia; an increase in cardiac output, systemic oxygen delivery, and oxygen consumption; and development of lactic acidosis. Epinephrine significantly increased jejunal microvascular blood flow (baseline, 267 +/- 39 perfusion units; maximum value, 443 +/- 35 perfusion units) and mucosal oxygen tension (baseline, 36 +/- 2.0 torr [4.79 +/- 0.27 kPa]; maximum value, 48 +/- 2.8 torr [6.39 +/- 0.37 kPa]) and increased hemoglobin oxygen saturation above baseline. Epinephrine increased mesenteric venous lactate concentration (baseline, 2.9 +/- 0.6 mmol x L(-1); maximum value, 5.5 +/- 0.2 mmol x L(-1)) without development of an arterial-mesenteric venous lactate concentration gradient. CONCLUSIONS: Epinephrine increased jejunal microvascular blood flow and mucosal tissue oxygen supply at moderate to high dosages. Lactic acidosis that develops during infusion of increasing dosages of epinephrine is not related to development of gastrointestinal hypoxia.

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