Dopamine-1-receptor stimulation and mucosal tissue oxygenation in the porcine jejunum.


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OBJECTIVE: To evaluate the effects of dopamine-1-receptor stimulation on intestinal mucosal tissue oxygenation. DESIGN: Prospective, experimental, controlled trial. SETTING: Animal research laboratory. SUBJECTS: Anesthetized domestic pigs (30 to 45 kg). INTERVENTIONS: A small segment of the jejunal mucosa and serosa was exposed by midline laparotomy and antimesenteric incision. Fenoldopam, a selective dopamine-1-receptor agonist, was infused in steps, exponentially increasing from 0.6 to 9.6 micrograms/kg/min via a central venous catheter (n = 8, fenoldopam group), whereas a second group (n = 6, saline group) was only given the solvent. MEASUREMENTS AND MAIN RESULTS: Systemic hemodynamics as well as systemic and jejunal acid base and blood gas variables were measured using an arterial catheter, a thermodilution pulmonary artery catheter, and a jejunal venous catheter. Jejunal mucosal and serosal tissue PO2 were measured by means of Clark-type surface oxygen electrodes. Oxygen saturation and relative concentration of mucosal microvascular hemoglobin were measured by means of tissue reflectance spectrophotometry. In the fenoldopam group, systemic oxygen delivery (12.5 +/- 0.8 mL/kg/min at baseline) increased by 56% (p < .001) above baseline values. Mean arterial pressure remained unchanged. Fenoldopam produced a 51% increase in mucosal PO2 (23.8 +/- 2.8 torr [3.2 +/- 0.4 kPa] at baseline; p < .001) and a 31% increase in mucosal hemoglobin oxygen saturation (55.4 +/- 8.3% at baseline; p < .001), but not change in serosal PO2 (58 +/- 4.8 torr [7.7 +/- 0.6 kPa] at baseline). CONCLUSIONS: Fenoldopam improves tissue oxygenation of the porcine jejunum in a dose-related manner. This effect is limited to the inner mucosal layer. Dopamine-1-receptor agonists should be evaluated in patients presenting with signs of intestinal mucosal ischemia.

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