

Improvement of arterial oxygenation by selective infusion of prostaglandin E1 to ventilated lung during one-lung ventilation.

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摘要

Abstract

BACKGROUND: One-lung anesthesia provides a better surgical field for thoracic procedures but also impairs the arterial oxygenation and venous admixture. During one-lung ventilation, pulmonary vasoconstriction is assumed to be present within both ventilated and collapsed lungs. We propose that arterial oxygenation could be optimized by offsetting the vasoconstriction within the microcirculation of ventilated lung. **METHOD:** In an anesthetized dog model, incremental doses of prostaglandin E1 (PGE1) were selectively infused into the main trunk of the pulmonary artery of the ventilated lung after one-lung ventilation for 60 min (PGE1 group, n = 9). Arterial oxygenation and calculated venous admixture (Q_s/Q_t) was also assessed in a time-course control group (Control group, n = 5). During two-lung ventilation (FIO₂: 0.66), arterial PO₂ and venous admixture was 44.2 +/- 3.5 kPa and 10.7 +/- 2.3%, respectively. One-lung ventilation (FIO₂: 0.66) with left lung collapsed reduced arterial PO₂ to 11.6 +/- 1.7 kPa and increased venous admixture to 40.7 +/- 5.8% (P<0.001). Venous O₂ tension also decreased from 6.3 +/- 0.7 kPa to 5.0 +/- 0.6 kPa with a slight increase in mean pulmonary artery pressure and pulmonary vascular resistance (P<0.05). **RESULTS:** During selective infusion of PGE1 at a dose of 0.04 to 0.2 $\mu\text{g kg}^{-1} \text{min}^{-1}$, there was a dose-dependent improvement in arterial PO₂ with a parallel reduction of venous admixture during one-lung ventilation. Arterial PO₂ increased to a maximum of 23.0 +/- 4.3 kPa, and the venous admixture decreased significantly to a minimum of 27.4 +/- 4.2% by PGE1 at a dose of 0.04-0.4 $\mu\text{g kg}^{-1} \text{min}^{-1}$ (P<0.01). PGE1 resulted in a small increase in cardiac output and decreases of pulmonary pressure and pulmonary vascular resistance at a relatively high dose of 0.4 $\mu\text{g kg}^{-1} \text{min}^{-1}$ during selective infusion (P<0.05). **CONCLUSIONS:** These results suggest that a selective pulmonary artery infusion of PGE1 to the ventilated lung within the dose range of 0.04-0.4 $\mu\text{g kg}^{-1} \text{min}^{-1}$ is practical and effective to improve arterial oxygenation and reduce venous admixture during one-lung ventilation.