

ORGAN BLOOD FLOW DURING ARTERIOVENOUS CARBON DIOXIDE REMOVAL

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Objective

This is an important safety study that determined organ blood flow during extrapulmonary CO₂ removal.

Study Population

5 female sheep.

Methods

Using color coded microspheres adverse hemodynamic effects were observed through out the study despite up to a 25% arterial venous shunt. Organ blood flow expressed and as a percentage of baseline at each level of shunt are summarized.

Results

No statistically significant differences were seen after analysis of the raw data. However, organ blood flow, expressed as percent of baseline measurements, revealed modest alterations in flow distribution. Cerebrum, cerebellum, stomach, ileum, colon, renal cortex, pancreas, and adrenal gland all demonstrated approximately a 10 % decrease in perfusion upon initiation of extracorporeal flow (at 5 % of CO), but remained stable at higher shunt flows up to 25 % of CO. The most marked decrease was seen in skeletal muscle perfusion, with a 23 % initial reduction followed by a sustained 30-40% decrease throughout the study. Conversely, myocardium and skin showed varying degrees of increased perfusion, ranging from 2–70 %. The liver revealed an increase that peaked at nearly 200 % over baseline at 25 % shunt. Despite a 25 % AV shunt, vital organ perfusion (brain, heart, kidney, and mesentery) is well maintained within 80 % of baseline in the conscious animal.

Commentary

In this study, the conscious animal, with all autoregulation mechanisms intact, was able to maintain all critical organs within 20 % of baseline perfusion, despite an arteriovenous shunt equal to one-fourth the resting cardiac output. Arterial blood gases and systemic pH remained consistently.

