



# The systemic and cerebrovascular effects of catecholamines under inhalational and intravenous anaesthesia

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## Abstract

Adrenaline, noradrenaline and dopamine are widely used in intensive care medicine and anaesthesia. Isoflurane is used as an anaesthetic and propofol as an anaesthetic as well as a sedative in intensive care. There may be interactions between these drugs that could adversely effect cardiovascular and cerebrovascular function.

In order to study these interactions, established methods in sheep were used whereby mean arterial pressure, cerebral blood flow and intracranial pressure were continuously measured. Cardiac output was measured intermittently and blood samples from arterial, pulmonary artery and sagittal sinus catheters were taken for determination of systemic and cerebral oxygen consumption.

In awake sheep, infusions of adrenaline, noradrenaline and dopamine produced significant and equivalent increases in mean arterial pressure and cardiac output. Systemic vascular resistance and oxygen consumption were not significantly changed. Dopamine increased cerebral blood flow and oxygen consumption during induced systemic hypertension.

Propofol was associated with a 55% reduction in cerebral blood flow whereas isoflurane did not significantly affect cerebral blood flow. Cerebrovascular reactivity under both propofol and isoflurane was significantly different to that in awake sheep, but was similar for both agents.

During steady-state propofol anaesthesia, catecholamine induced increases in cardiac output were associated with increased propofol clearance and reversal of anaesthesia.

Under propofol and isoflurane anaesthesia, all three catecholamines significantly increased cerebral blood flow, with dopamine demonstrating the most pronounced effects, particularly under propofol. Anaesthesia was associated with a reduction in cerebral oxygen consumption, suggesting preservation of flow metabolism coupling.

There was no difference between the slopes of the autoregulatory curves between cerebral blood flow and mean arterial pressure between the awake sheep and those under propofol and isoflurane anaesthesia. There were differences between the intercepts of these curves, consistent with the overall reduction in cerebral blood flow induced by propofol and, to a lesser extent, by isoflurane. The concomitant administration of catecholamines, propofol or isoflurane was not associated with altered autoregulatory function.