Title : HALOTHANE EFFECT ON CORONARY OCCLUSION REFLEXES IN THE DOG

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Introduction. Acute myocardial infarction in the intra- or perioperative period may produce serious hemodynamic consequences or in some instances may remain relatively unnoticed except for later changes in the ECG and serum concentrations of myocardial enzymes. Acute coronary occlusion (ACO) in animal models has been shown to produce either a pressor or depressor response initiated by receptors located in the myocardium and distributed throughout the left and right ventricles[1]. Some of the depressor changes in vascular resistance (VR) due to ACO occur in sinoaortic baroreceptor denervated animals[1]. This depressor reflex may also be reproduced by electrical stimulation of pericoronary afferent vagal fibers[2]. The objectives of the present study were twofold: 1) To study the effects of acute left circumflex or left anterior descending coronary artery occlusion on hindlimb or gracilis muscle VR; and 2) To study the effects of halothane (H) anesthesia on this ACO reflex.

Methods. Fourteen mongrel dogs (18-25 kg) were anesthetized with 20-25 mg/kg I.V. Pentothal; paralyzed with 0.1 mg/kg pancuronium; intubated; and ventilated with 50% N_2O/O_2 and H via a Fluotec vaporizer and Foregger anesthesia machine with CO_2 absorber. Moderate hyperventilation (PCO_2 25-35 torr) was achieved with a Bird Mark 7 respirator and Mark 4 anesthesia assistor/controller. A femoral artery was cannulated for direct blood pressure (bp) measurement. A femoral venous cannula provided a route for drug administration. The brachial arteries were cannulated and connected to a pressurized reservoir, allowing isobaric control of bp. Via a midline sternotomy, loose snares were placed on both the LAD and left circumflex coronary arteries. A Whitney length gauge was sutured to the epicardium of the left ventricle (LV). Carotid sinuses were either surgically denervated or perfused at constant pressure. For perfusion of the isolated hindlimb, the proximal femoral artery was cannulated, and all other collaterals to the limb ligated. The distal femoral artery was perfused via a Sarns roller pump at constant pressure using a servo-control system. Perfusion pressure, flow and resistance of the hindlimb were recorded on a Grass recorder. The isolated gracilis muscle preparation utilized a Holter pump delivering 8-12 ml/min at constant flow, with changes in perfusion pressure indicating changes in VR. Systemic bp, lead II ECG, LV length, and end tidal H concentrations were also recorded. ACO's were performed for 30-60 sec at 0, 0.5, 1.0 and 1.5% H concentrations.

Results. In both the isolated hindlimb and the isolated gracilis muscle preparation ACO produced a consistent 5-25% depressor response eliminated by vagotomy and associated with hindlimb decreased sympathetic efferent nerve activity. The depressor response produced by ACO correlated well with 50-150% increases in segmental LV length of the ischemic myocardium. H at 0% and 0.5% did not alter the reflex. 1 and 1.5% H blunted the depressor response, with little change in VR seen during ACO. At 1.5% H pre-occlusion VR had fallen and LV length had increased to levels comparable to those seen during ACO at 0 and 0.5% H. Cervical vagotomy eliminated most of the depressor response initiated by ACO. At 0 and 0.5% H, the vagotomy produced only a transient elevation of VR. At 1 and 1.5% H cervical vagotomy produced a sustained 30-50% increase in VR as compared to non-vagotomized controls at the same H levels. This increase in VR with vagotomy was seen despite administration of 0.4 mg/kg atropine and 1 mg/kg propranolol which blocked cardiac responses to efferent nerve activity.

Discussion. ACO produces regional myocardial dilation, activates LV mechanoreceptors, and via cardiopulmonary vagal afferent pathways, depresses VR. Increasing depth of H anesthesia appears to blunt the degree of reflex vasodilation initiated by ACO. This may occur due to pre-existing vasodilation due to H depression of central sympathetic outflow, direct H vasodilation, or reflex vasodilation initiated by a H induced increase of up to 200% in segmental LV length. H produces dose related increases in LVEDV[3], and in LVED length as seen in our study. The interruption of vagal cardiopulmonary afferents under 1 and 1.5% H anesthesia increases VR 30-50%, suggesting that H produces 30-50% of its depression of VR via reflexes initiated by myocardial dilation. This reflex H effect may alter the clinical appearance of intra- or perioperative myocardial infarct. (Supported by Grant HL 16511 and the Med. Research Service of the VA).

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