Title: VERAPAMIL - DIFFERENT CARDIOVASCULAR RESPONSES DURING N_2O ANALGESIA AND HALOTHANE ANESTHESIA

Authors: E. A. Norfleet, M.D., K. R. Heath, B.S., V. J. Kopp, M.D., D. H. Sprague, M.D., B. C. Corke, M.D.

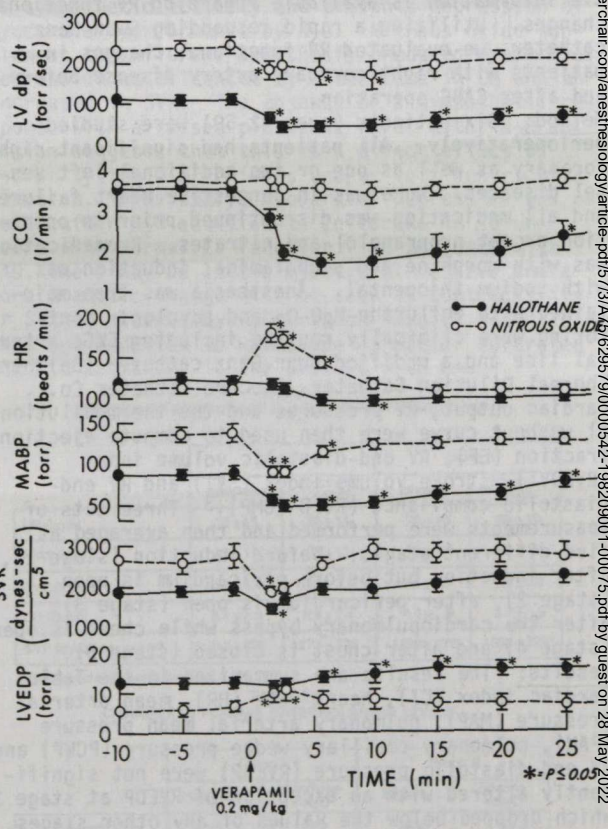
Affiliation: Department of Anesthesiology, University of North Carolina, School of Medicine, Chapel Hill, North Carolina 27514

Introduction. The interaction of calcium antagonists and anesthetic drugs has the potential of producing a variety of adverse cardiovascular responses. Acute effects of verapamil in combination with some depressant inhalational anesthetics have been reported[1,2]. However, no comparative analysis has been made with less depressive anesthesia techniques. Therefore we examined the acute effects of verapamil during N_2O/O_2 analgesia and halothane/O_2 anesthesia in swine.

Methods. Twelve swine (26±2 Kg) were initially anesthetized with halothane (H), N_2O and oxygen; then were paralyzed with metubine (0.3 mg/Kg). After intubation, ventilation was controlled (P_aCO_2 41±1 torr); an infusion of metubine (0.2 mg/Kg/hr) was started. A femoral catheter was used to obtain arterial pressures. A Millar catheter was inserted into the left ventricle (LV) to determine LV pressures and dp/dt. A Swan Ganz catheter was used to obtain cardiac outputs, central venous pressure and pulmonary artery pressures. ECG Lead II and temperature were monitored. End tidal H and N_2O were measured with a mass spectrometer. After placement of monitoring devices, the animals were randomly divided into two groups. One group received halothane/O_2 and the other received 70% N_2O/30% O_2. After equilibration for at least an hour, the end tidal H was 0.90±0.01% in the H group and less than 0.02% in the N_2O group. Cardiovascular measurements were then recorded prior to and after a two minute intravenous infusion of 0.2 mg/Kg of verapamil.

Results. Data are presented as mean ± S.E. After verapamil, in the N_2O group: dp/dt decreased 31%, mean arterial blood pressure (MABP) decreased 34%, cardiac output (CO) did not change and heart rate (HR) increased by 64%. In the H group: dp/dt decreased 64%, MABP decreased 46%, CO decreased 51% and HR decreased 12%. In both groups systemic vascular resistance (SVR) decreased but soon returned to control. LV end diastolic pressure (LVEDP) increased in both groups but remained elevated longer in the H group. Statistical significance from control was determined using Student's paired t-test.

Discussion. Control cardiovascular functions were different between groups. Following verapamil parallel changes occurred in dp/dt, MABP and SVR, with greater depression occurring in the H group. Remarkable differences occurred with HR and CO. In the H group the decrease in HR may be contributing to the severe reduction in CO. This decrease in HR is most likely related to suppression of the S.A. node by H and verapamil[3]. Sympathetic and baroreceptor activity may also be modified by H. In the N_2O group, the increase in HR appeared to be an early compensatory mechanism in maintaining CO. This response is likely to be related to catecholamine release and intact baroreceptor mechanisms. In swine, the combination of N_2O and verapamil produced severe tachycardia in all animals. This observation raises the question of safety with this combination in humans. Although CO was maintained, the resultant tachycardia has the potential of being detrimental to myocardial oxygen balance.



References.
1. Kapur PA, Flacke WE: Epinepherine-induced arrythmias and cardiovascular function after verapamil during halothane anesthesia in the dog. Anesthesiology 55:218-225, 1981.
2. Kapur PA, Flacke WE, Olewine SK, et al: Cardiovascular and catecholamine responses to verapamil during enflurane anesthesia. Anesthesiology 55(3):A14, 1981.
3. Kampine JP, Bosnjak ZJ, Turner LA: Effects of halothane on SA node - Role of calcium. Anesthesiology 55(3):A58, 1981.