

Negative Dromotropic Effects of Epinephrine-Halothane Combination in Canine Purkinje Fibers Depend on the Sequence of Exposure

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Aim: The effects of epinephrine, halothane and their combinations on Purkinje fiber conduction were analyzed in order to determine their possible contribution to dysrhythmias occurring after epinephrine administration in halothane anesthetized patients. Observed conduction slowing was investigated with respect to drug administration sequence, possible mechanisms of slowing, and its dose dependence and clinical relevance.

Methods: Eight canine Purkinje fiber in vitro preparations were exposed to 5 mmol/L of epinephrine followed by epinephrine combined with 0.75 mmol/L of halothane. After a completed wash out period, the same preparations were exposed to halothane alone and then in combination with epinephrine. Each of additional 8 preparations was exposed in random order to 2 different concentrations of halothane and 4 doses of epinephrine added to halothane. Conduction time and action potential characteristics were recorded every minute, and changes were measured, calculated and statistically analyzed.

Results: Halothane alone decreased conduction velocity from the control value of 2.1 ± 0.2 m/s in a continuous manner. Epinephrine added to halothane caused marked conduction slowing to 1.9 ± 0.4 m/s in the first 5 minutes of combined exposure. This action was transient. In contrast, epinephrine alone caused oscillation of conduction velocity from a control value of 2.1 ± 0.1 m/s to a maximum of 2.1 ± 0.2 m/s. Addition of halothane produced a conduction velocity decrease from 2.1 ± 0.2 m/s to a minimum of 1.8 ± 0.3 m/s during combined exposure, similar to the decrease caused by single halothane exposure.

Conclusion: The negative dromotropic action of halothane potentiated by epinephrine administration may cause marked conduction delay at Purkinje fiber level, resulting in cardiac dysrhythmias. The maximal negative dromotropic effect of a halothane-epinephrine combination is related both to epinephrine and halothane concentrations, although it is more sensitive to halothane concentration. A significant decrease of conduction velocity was observed with 1.5 minimal anesthetic concentration (MAC) of halothane combined with 0.2 mmol/L of epinephrine, suggesting the clinical relevance of the observed effect.

Key words: *epinephrine; halotane; heart conduction system; Purkinje cells*

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