NEUROSCIENCES AND ANESTHETIC ACTION—POSTER

A371

Title: ISOFLURANE'S POTENCY DURING CARDIOPULMONARY BYPASS AS COMPARED TO ENFLURANE, AND HALOTHANE


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Introduction. During cardiopulmonary bypass the blood pressure can be decreased in several ways, either by administering a vasodilating drug, decreasing pump flow or by adding a volatile anesthetic gas into the pump oxygenator. The latter method is quite easy to perform and the side effects are not long lasting. When comparing intravenous agents, halothane effectively reduces blood pressure by vasodilating selected parts of the peripheral vascular system.1 Previous studies have not compared isoflurane to enflurane, halothane or intravenous agents to ascertain its vasodilating capabilities. Therefore, we measured the reduction in pump volume produced by these agents during cardiopulmonary bypass.

Method. We studied 62 patients in this preliminary study (with informed consent and approval by the Research Committee, Harbor-UCLA Medical Center, Torrance) undergoing open heart surgery using cardiopulmonary bypass. Patients were premedicated with morphine sulfate (0.1 mg/kg) and diazepam (0.1 mg/kg) one hour before surgery, anesthetized with morphine sulfate (1 mg/kg), paralyzed with pancuronium (0.1 mg/kg) and ventilated with 3L N₂O:3L O₂. Fifteen minutes before the start of bypass the N₂O was turned off and no additional narcotic was given. After the institution of cardiopulmonary bypass, and the aorta cross-clamped, the blood flow, mean BP and temperature were allowed to stabilize for a 20 minute control period. Each patient then received at random MAC equivalents of either enflurane 0.8%, 1.6%, 2.5%; halothane 0.5%, 0.8%, or 1.6%; and isoflurane 0.65%, 1.28%, or 1.8%. Eight patients acted as controls; 5, 4, and 7 patients received halothane 0.5%, 0.8%, and 1.5% respectively; 2, 7, 11 patients received enflurane 0.8%, 1.6%, 2.5% respectively; and 5, 7, 6 patients received isoflurane 0.65%, 1.28%, 1.8% respectively. All the gaseous agents were vaporized via the bypass machine by vaporizers attached to the O₂ line. A Shiley oxygenator was used in all cases using a calculated flow rate of 2.2 L/m² - 2.4 L/m². The initial control period (20 min.), the reservoir volume, and temperature were recorded. After instituting the anesthetic, the reservoir volumes were recorded every 5 minutes for the 25 minute observation period.

Results. The four groups had no significant difference in height, weight, age and sex. The use of drugs such as beta-blockers, nitrates, and antihypertensives were also similar in all groups. We found that isoflurane and enflurane decreased the blood volume remaining in the extracorporeal reservoir to a greater degree than halothane (P < .01). Isoflurane decreased the blood volume remaining, more than enflurane, although this difference was not statistically significant. The dilating potency of isoflurane over enflurane is noticeable at the 1/2 MAC range as noted in the graph.

Discussion. This study suggests that although the pharmacodynamics or pharmacokinetics of volatile anesthetic gases are not well defined during cardiopulmonary bypass, it appears that blood volume and vasodilation changes during CPB can be more readily manipulated when using isoflurane anesthesia than with other potent volatile agents. The mechanism for this effect may be due to a more potent reduction in the systemic vascular resistance by isoflurane. We have shown that isoflurane is a more potent vasodilator than halothane, and shows a trend toward being more potent than enflurane. Should additional subjects be entered in a subsequent study the trend may become more significant.

Reference: