Cardiovascular Actions of Common Anesthetic Adjuvants During Desflurane (I-653) and Isoflurane Anesthesia in Swine

Richard B. Weiskopf, MD, Edmond I. Eger II, MD, Margot A. Holmes, BS, Nobuhiko Yasuda, MD, Brynte H. Johnson, MS, Alexander G. Targ, BS, and Ira J. Rampil, MD

WEISKOPF RB, EGER EI II, HOLMES MA, YASUDA N, JOHNSON BH, TARG AG, RAMPIL IJ. Cardiovascular actions of common anesthetic adjuvants during desflurane (I-653) and isoflurane anesthesia in swine. Anesth Analg 1990;71:144–8.

To determine the cardiovascular actions of drugs commonly combined with inhalation anesthetics, we administered one drug from each of several classes of adjuvants to seven swine already anesthetized with equipotent concentrations (1.2 MAC) of desflurane, formerly I-653, a new inhaled anesthetic, or isoflurane. Succinylcholine (1 and 2 mg/kg), atracurium (0.6 mg/kg), and atropine (5 μg/kg) plus edrophonium (5 mg/kg) had no cardiovascular effects. Fentanyl was given in amounts that decreased MAC for the inhaled anesthetics by 25%–35%. A dose of 50 μg/kg IV had no cardiovascular effects during either anesthetic, whereas 100 μg/kg IV modestly increased systemic vascular resistance without changing other variables. Naloxone (100 μg/kg IV) during infusion of fentanyl decreased systemic vascular resistance and increased cardiac output during both desflurane and isoflurane anesthesia, increased heart rate during only isoflurane anesthesia, and did not affect mean arterial blood pressure during either anesthetic. Thiopental (2.5 and 5.0 mg/kg IV) decreased mean aortic blood pressure, cardiac output, stroke volume, and systemic vascular resistance during both anesthetics without altering heart rate or left- or right-sided cardiac filling pressures. The addition of 60% nitrous oxide caused no cardiovascular changes during desflurane anesthesia, but increased systemic vascular resistance and decreased cardiac output and stroke volume during isoflurane without altering heart rate or cardiac preload. We conclude that the usual clinical doses of adjuvants commonly administered during anesthesia have no untoward cardiovascular actions during 1.2 MAC desflurane or isoflurane anesthesia in swine.

Key Words: ANESTHETICS, VOLATILE—desflurane, isoflurane. ANALGESICS, FENTANYL. NEUROMUSCULAR RELAXANTS, ATRACURIUM, SUCCINYLCHOLINE. ANESTHETICS, GASES—nitrous oxide. ANTAGONISTS, NEUROMUSCULAR—edrophonium. PARASYMPATHETIC NERVOUS SYSTEM, ATROPINE.

Intravenous administration of anesthetic adjuvants is common during inhalation anesthesia. Nitrous oxide (N_2O) and narcotics may be added to decrease the volatile anesthetic requirement or to modify the circulatory response to noxious stimuli; depolarizing and nondepolarizing neuromuscular blocking agents are given to augment relaxation; ultra-short-acting barbiturates are used to induce anesthesia or transiently increase anesthetic depth; anticholinesterases are combined with anticholinergic agents to decrease the intensity of neuromuscular blockade achieved using blockers; and naloxone may be used to antagonize the effects of narcotics. The cardiovascular actions of these drugs alone are known, but their effects during inhalation anesthesia are not, excepting those of N_2O. In this study, we have determined the cardiovascular actions of clinically applied doses of one adjuvant from each of these classes during desflurane and isoflurane anesthesia.

Materials and Methods

With permission from our Committee on Animal Research, we prepared seven female swine (age,

Supported by the Anesthesia Research Foundation and a grant from Anaquest, Inc.

Received from the Departments of Anesthesia and Physiology, and the Cardiovascular Research Institute, University of California, San Francisco, California. Accepted for publication April 13, 1990.

Address correspondence to Dr. Weiskopf, Department of Anesthesia, University of California, San Francisco, CA 94143-0648.