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TITLE : ACUTE CARDIOVASCULAR TOXICITY OF LIDOCAINE, BUPIVICAINE AND ETIDOCAINE IN ANESTHETIZED, VENTILATED DOGS

AUTHORS : P. Liu, M.D., H. Feldman, B.Sc., and B.G. Covino, M.D., Ph.D.

AFFILIATIONS: Departments of Anaesthesia, Harvard Medical School, Boston, MA 02115 and University of Massachusetts, Worcester, MA 01605, and the Departments of Anesthesiology, Affiliated Hospitals Center, Boston, MA and University of Massachusetts Medical Center, Worcester, MA

Recent clinical reports[1,2] concerning sudden cardiac arrest after inadvertent intravascular injections of clinical doses of bupivicaine and etidocaine have called attention to the need for more precise information concerning the toxicity of local anesthetics. The threshold of CNS toxicity in animals[3] and man has been established. However, speculation that bupivicaine and etidocaine may cause cardiovascular collapse coincidently with the onset of CNS seizures and without antecedent hypoxia indicates the necessity to define the cardiovascular toxicity of these local anesthetics. This requires prevention of toxic CNS effects and subsequent hypoxia from seizures.

This study was undertaken to determine the dose-response for cardiac toxicity for lidocaine, bupivicaine and etidocaine. Anesthetized and artificially ventilated dogs were utilized so that CNS toxicity and hypoxia secondary to seizures would not interfere with cardiac response.

Methods. Adult mongrel dogs of either sex were anesthetized and maintained with intravenous pentobarbital. After intubation ventilation was maintained with a Harvard animal ventilator and oxygen enriched air. Arterial blood gases were sampled and the animals were maintained at normal CO_2, O_2 and pH. Two venous cutdowns, an arterial line, a Swan-Ganz catheter, EKG, rectal temperature probe and heating blanket were utilized. Arterial BP, heart rate, P-A pressure, cardiac output, and arterial and venous local anesthetic levels were determined.

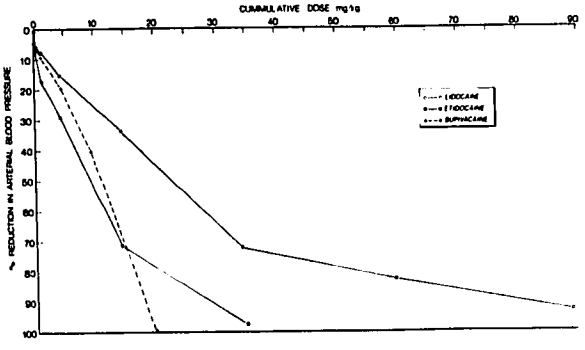
Five animals were studied in each group. After a control period each dog received increasing dosages of intravenous local anesthetic at 30 minute intervals. Heart rate, BP, mean arterial BP, cardiac output, stroke volume, systemic vascular resistance, P-A pressure, mean P-A pressure and pulmonary vascular resistance were determined.

Results.

	cummulative lethal dose(mg/kg)*
Lidocaine	76.3 ± 15.1
Etidocaine	40.4 ± 6.0
Bupivicaine	20.4 ± 2.4

*(mean ± S.E.)

The following figure indicates % decrease in mean arterial BP from pre drug control as the cummulative dose (mg/kg) increases.



Deterioration of other hemodynamic parameters with increasing dose of local anesthetic produces figures similar to the example presented above.

Conclusion. The in vivo cardiovascular toxicity of lidocaine, bupivicaine and etidocaine seem to parallel their intrinsic anesthetic potency. Comparison of the cardiotoxic dose in dogs to human clinical dosage suggests that cardiovascular collaspe due to cardiotoxic effects of local anesthetics alone is unlikely.

References.

1. Albright GA: Cardiac Arrest Following Regional Anesthesia with Etidocaine or Bupivicaine (Editorial). Anesthesiology 51:285-286, 1979

2. Prentiss JE: Cardiac Arrest Following Caudal Anesthesia. Anesthesiology 50:51-53, 1979

3. Munson ES, et al: Etidocaine, Bupivicaine and Lidocaine Seizure Thresholds in Monkeys. Anesthesiology 42:471-478, 1975