

and cardiac subjects. In some cardiac patients blood levels seemed adequate but buffering capacity, poor. Alveolar  $\text{CO}_2$  is said to be low in such subjects—this is being investigated. Test results showed poor buffering capacity in some normal individuals, in patients with congenital heart disease and restrictive or fibrotic pulmonary insufficiency. Good buffer capacity was found in most patients with cardiac valvular disease and pulmonary emphysema. Work completed to date has dealt with the blood chemistry changes only. Observations during this study tend to support our hypothesis that if blood buffer capacity can be shown to be impaired, thresholds for important clinical effects such as the cardiovascular response to changes in  $\text{CO}_2$  balance may be directly related. We have observed marked intolerance to minor increases in  $\text{CO}_2$  as evidenced by weakness and dyspnea greatly out of proportion to the stimulus in some of our subjects who had very low blood  $\text{CO}_2$  content. Our present work is designed to evaluate this hypothesis.

**Intravenous Lidocaine as an Adjuvant to General Anesthesia: A Clinical Evaluation.**

OTTO C. PHILLIPS, M.D., ALFRED T. NELSON, M.D., WILLIAM B. LYONS, M.D., THOMAS D. GRAFF, M.D., LEROY C. HARRIS, M.D., AND TODD M. FRAZIER, Sc.M. *Department of Anesthesiology, The Hospital for the Women of Maryland, Baltimore, Maryland.* The purpose of the present project was to evaluate further in a blind study the contribution of intravenous lidocaine to thiopental-nitrous oxide-succinylcholine anesthesia in humans. *Methods:* Two groups of white female patients were included in this study: those undergoing minor perineal procedures, and those undergoing major intraperitoneal pelvic procedures not including bowel surgery. The patients in the minor group were anesthetized with 200 mg. of thiopental, and then an intravenous infusion containing a coded vial of either water or lidocaine 250 mg. in a 0.15 per cent solution was allowed to run freely through a 18 gauge needle. Nitrous oxide and oxygen, 6 liters to 2 liters, was then administered by a semiclosed system. Anesthesia was induced in all patients undergoing major pelvic operations with thiopental, and an effort made to give each patient as

nearly as possible 500 mg. of this drug for the entire procedure. An intravenous infusion was then started, containing 500 mg. of succinylcholine (0.05 per cent) and a coded vial of either lidocaine 1 Gm. (making a 0.1 per cent solution) or water. Nitrous oxide and oxygen, 6 liters to 2 liters, were given in a semiclosed system, an endotracheal tube being used at the discretion of the anesthesiologist. *Results.* This blind study included 214 patients undergoing minor perineal procedures and 227 patients undergoing major intraperitoneal pelvic procedures. Preoperative medication, sex, weight, age and duration of anesthesia were either controlled or comparable. In the minor group the amount of thiopental necessary to accomplish smooth anesthesia was reduced by 52 mg. when lidocaine was used as contrasted to the placebo. In the major group the amount of succinylcholine necessary was reduced by 62 mg. when intravenous lidocaine was used. These differences are statistically significant, though not striking. The incidence of uneven anesthetics was lower in both groups in which lidocaine was used, and this suggests that lidocaine contributes to the smoothness of anesthesia. There were no significant differences between the lidocaine and placebo groups with regard to blood pressure changes, reaction time, and postoperative analgesia requirements. The results of this study of 441 patients showed that lidocaine used intravenously made a significant, though not dramatic, contribution to the maintenance of a thiopental nitrous oxide-succinylcholine anesthesia, that adverse effects on the circulation were not evident, and that the postoperative reaction time and analgesic requirements were not affected. [Mr. Frazier is Director, Bureau of Biostatistics, The Baltimore City Health Department.]

**Comparative Effects of Anesthetic Agents on Toothpulp Thresholds in Rabbits.**

C. B. PITTINGER, M.D., H. H. KEASLING, M.D., AND R. L. WESTERLUND, M.D. *Division of Anesthesiology, Department of Surgery and Department of Pharmacology, College of Medicine, State University of Iowa, Iowa City, Iowa.* Clinical experience with halothane anesthesia suggested a deficiency of the drug as an analgesic agent. This impression prompted the comparative study of the analgesic potencies of