

anesthetic management from regional (continuous spinal) anesthesia, previously administered in 88 per cent of the cases, to general anesthesia. Serious cardiac arrhythmias (bradycardia, frequent premature ventricular contractions, ventricular tachycardia or fibrillation) were observed in five patients during general anesthesia—three of the five episodes were associated with tracheal intubation. *Summary:* The hazards of general anesthesia in anephric patients are minimized by preoperative preparation.

Tracheostomy Cuffs: Physical Characteristics and Physiologic Sequelae. R. CARROLL, M.D., M. HEDDEN, F.E.A.R.C.S., and P. SAFAR, M.D., *Department of Anesthesiology, University of Pittsburgh School of Medicine, Pittsburgh, Penna.* Recent reports have implicated tracheostomy cuffs as the primary etiologic factor in the production of subglottic stricture and tracheoesophageal fistula. Departmental experience suggested that the potentials of the cuffs to cause injury varied with residual volume. *Methods:* To test this hypothesis, cuffs were evaluated with a special strain gauge directly implanted in the anterior wall of tracheas. *In vivo* measurements during intermittent positive-pressure ventilation (IPPV) were conducted, monitoring cuff sealing area, intracuff pressure, airway pressure, and lateral tracheal wall pressure. Pressures were measured dynamically *in vivo* in the intact dog, as well as in excised canine and human tracheas. All measurements were made after the cuff had been expanded just to the point of abolishing leak, and again after overinflation by one ml. *Results:* Cuffs could be grouped into four categories, depending on residual cuff volume and sealing surface area. Group A cuffs had high residual volumes so that only a small amount of air was necessary to nudge the cuff walls against the tracheal mucosa. The large Sanders and Auchincloss cuffs are seal-inflating, in that airway pressure equilibrates across the soft cuff wall, thereby cyclically raising the intracuff and tracheal-wall pressures to equal airway pressure. Group B₁ included orotracheal tubes with built-in rubber cuffs. Tracheal wall pressures averaged 37.5 mm Hg. Group B₂ cuffs were

built into plastic tracheostomy tubes and had tracheal pressures ranging from 55 to 160 mm Hg. Group C included narrow, very-high-pressure, unevenly-inflating, slip-on tracheostomy cuffs. Tracheal wall pressures always exceeded arterial pressure. *Summary:* Large-residual-volume cuffs allow IPPV at tracheal wall pressures never exceeding airway pressure, *i.e.*, usually of the order of capillary blood pressure. Small-residual-volume cuffs commonly produce tracheal-wall pressures in excess of arterial pressure. Double-cuff tubes offer no advantage, because they simply incorporate two narrow, low-volume, high-pressure cuffs.

Influence of Methoxyflurane on Myocardial Mechanics of the Digitalized Heart. P.-Y. CHEN, M.D., C. SHANKS, B.A., C. GAMBLE, B.S., and S. SHIMOSATO, M.D., *Department of Anesthesiology, Tufts University School of Medicine and New England Medical Center Hospitals, Boston, Mass.* Recently, we reported that methoxyflurane exerts a negative inotropic effect upon the contractile state of the intact canine left ventricle, as determined by the force-velocity relations (*ANESTHESIOLOGY* 29: 538, 1968). It has been shown that digitalis exerts positive inotropism in normal and diseased hearts, and that it may be used as a prophylactic measure to combat hypotension during anesthesia and surgery (*J. Clin. Invest.* 40: 52, 1961). This study was undertaken to ascertain whether the positive inotropic effects of digitalis counteract the negative inotropic effect of methoxyflurane on the performance of the intact left ventricle. *Methods:* Studies were performed in dogs anesthetized with chloralose-urethane given intravenously. Measurements of force-velocity relations were made before and following the administration of ouabain (0.05 mg/kg) and during methoxyflurane anesthesia at a mean arterial concentration of 17 mg/100 ml. *Results:* Methoxyflurane caused significantly less decreases in peak force in seven predigitalized dogs (-28 ± 4 per cent) than in eight nondigitalized dogs (-45 ± 4 per cent). Average changes in mean aortic pressure in predigitalized and nondigitalized dogs during anesthesia were -22 ± 3 per cent and -19 ± 2