

with BSP excretion, 4 showed slight retention varying from 8 to 11 per cent and 3 showed moderate retention varying from 13.6-25.5 per cent. Decreased BSP clearance has been shown to be due primarily to diminished hepatic circulation, for example, hypotension and secondarily to impaired hepato-cellular function. Of the 3 cases showing moderately impaired excretion, 2 had marked hypotension during anesthesia and 1 showed extensive metastatic carcinoma to the liver. Thymol turbidity tests showed no significant changes in 56 patients.

Urea clearance was employed to determine the effects of trifluoroethylvinyl ether on kidney function. Of 27 patients subjected to this test, 8 showed diminished clearance whereas 19 showed increased clearance as compared to preanesthetic levels. Urea is actively filtered by the glomeruli. Although it is reabsorbed by the distal tubules of the nephron, such process is passive. Several factors may diminish urea clearance, for example hypotension with concomitant hypoxia to the glomerulus, destruction of glomeruli, or decreased protein catabolism. Inasmuch as these patients underwent surgery, hypotension may have contributed to the diminished urea clearance in the 8 cases.

Cardiovascular System.—Electrocardiograms were obtained in 37 patients before and during anesthesia. Six showed tachycardia in third stage, first plane. Extrasystoles were demonstrated in 3 patients in planes 2 and 3. One patient in plane 3 showed a pulsus alternans. Of 145 patients that received trifluoroethylvinyl ether anesthesia, hypotension was manifested during maintenance in 8 patients. The degree of hypotension in one patient was directly proportional to the depth of anesthesia.

Central Nervous System.—Excitement was seen often during induction especially if trifluoroethylvinyl ether was employed primarily without thiopental or nitrous oxide. Out of 145 patients, 34 manifested mild excitement, 19 moderate, and 6 marked. Electroencephalograms obtained from 10 patients suggested a similarity to patterns established for diethyl ether.

Conclusions.—The toxic effects of trifluoroethylvinyl ether, if any, are comparable to those of other 100 per cent anesthetic agents and probably less toxic. It is a fairly good anesthetic agent.

The Electroencephalographic Manifestations of Amnesia and Analgesia Produced by N₂O and by Ether. JOHN F. SCHWEISS, M.D., M. JACK FRUMIN, M.D., AND ELI S. GOLDENSOHN, M.D., Departments of Anesthesiology and Neurology, Columbia University, College of Physicians and Surgeons, the Anesthesiology Service and the Neurological Institute, The Presbyterian Hospital, New York 32, New York.

EIGHTEEN patients were either medicated with 0.4 to 0.6 mg. of atropine or given no medication prior to anesthesia. Paralysis for endotracheal intubation and immobility during surgery was produced by an intravenous infusion of 0.5% succinylcholine chloride. Following induction with N₂O and O₂, anesthesia was maintained with a mixture of 65-80% N₂O in O₂ delivered by an intermittent positive pressure respirator. In most instances, the inflating pressure was servo-controlled in order to maintain an end tidal CO₂ tension of approximately 40 mm. Hg.

An 8 channel Model 3D Grass electroencephalograph recorded the brain waves continuously. Bipolar recordings from the scalp were obtained with needle electrodes from the frontal, parietal and occipital areas. With 65% N₂O, often only minimal changes occurred. Low voltage fast (18-24 c.p.s.) activity often increased and occasionally became dominant. Frequently, a mild (1-2 c.p.s.) decrease in the alpha frequency occurred and was accompanied by a voltage depression of as much as 50%.

The changes seen with 65% were accentuated with 80% N₂O. The voltage and incidence of the fast activity increased and often became dominant in all areas. Occasionally 6-7 c.p.s. activity became the most prominent feature particularly from the frontal areas. Most patients showed good electrical attention responses to auditory stimuli despite the complete amnesia.

In 7 additional patients, diethyl ether in oxygen was used in a conventional closed circle absorption system to produce a cooperative stuporous state. D-tubocurarine hydro-

chloride was added to provide the needed immobility and respiration was manually assisted. Amnesia was complete and surgical operating conditions were satisfactory. During the surgical procedure the patients appeared to be in good contact, responded to commands and denied experiencing pain.

In 3 subjects, the normal 8-10 c.p.s. activity remained the most prominent feature with some accentuation of the superimposed non-dominant fast activity. In 2 others, 5-7 c.p.s. activity was dominant. Higher concentrations of ether increased the depth of anesthesia clinically and produced dominant medium voltage rapid (18-24 c.p.s.) activity such as described by Bellville and Artusio for the analgesic state caused by ether alone. In 2 subjects, the dominant activity was rapid (18-24 c.p.s.).

Pulmonary Circulation in the Anesthetized Patient with Controlled Respiration.

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THE influence of respiration upon the pulmonary circulation and the problem of a steady state during anesthesia was investigated in the course of studies performed in the operating room. Not only would this serve as reference data in observing the effects of various drugs and gases upon the pulmonary circulation but alterations associated with controlled respiration could be evaluated.

Measurements were made on eleven patients with minimal pulmonary tuberculosis but otherwise in good general condition. Five were males and six were females ranging in age from 16 to 48 years. Cyclopropane was the anesthetic agent in five patients; thiopental, succinylcholine, and nitrous oxide in five, and ethyl ether in one. All patients were in the lateral position and had cuffed endotracheal tubes in place. Controlled respiration was utilized on all patients. In five, a Jefferson ventilator was employed with the setting varying from +20 to +5/-10 to -5 cm. H₂O. In the remainder manual control of the respiration was used with average inspiratory pressure of +10/0 cm. H₂O. The brachial artery was cannulated. The surgeon introduced two plastic catheters, via the vascular pedicle of the segment to be resected, into the main pulmonary artery and the left atrium respectively. Chest closure was then simulated by approximating the ribs, expanding the lung and applying suction to the pleural space. Pulmonary artery and left atrial pressures were recorded with Statham pressure transducers. Pulmonary blood flow was measured by means of a Stewart-Hamilton dilution curve obtained by drawing brachial artery blood through a Cohon densitometer after the injection of a known volume of Evans blue dye into the pulmonary artery. Arterial oxygen saturation was determined by the method of Nahas. All observations were made in duplicate.

Arterial oxygen saturation was 100 per cent in four of the five patients in whom the determination was made. It was 89 per cent in a fifth patient, where the mean pulmonary artery pressure was 40 mm. Hg and high pressures (+20/-5 cm. H₂O) were needed for adequate ventilation of the lungs. The mean pulmonary artery pressure averaged 20 mm. Hg (range 10-40 mm. Hg). The mean left atrial pressure averaged 7.4 mm. Hg (range 4-11 mm. Hg). The difference between the mean pulmonary artery pressure and the left atrial pressure averaged 12 mm. Hg (range 0-29 mm. Hg). These results are within the accepted range of normal values. In two patients complete absence of respiratory activity did not materially alter these findings. Pulmonary blood flow averaged 5.4 L/min./M² (range 4.1 - 8.6 L/min./M²) in the four patients where this function was measured. In these patients, the central blood volume between the pulmonary artery and the brachial artery averaged 983 cc./M² (range 611 - 1,250 cc./M²).

Although these figures are high for the resting unanesthetized state, they are within the accepted range of normal values. They compare favorably with data reported by others for cardiac index and intrathoracic blood volume under similar conditions. There was no apparent difference in the findings with manual ventilation as compared with