seen after intravenous administration of dTC to anesthetized patients.

In this study, MAP decreased significantly following Lilly's tubocurarine chloride but was unchanged after administration of the diluent. Similar decreases in MAP were seen after Abbott's or Squibb's tubocurarine chloride, while the simulated diluent was not associated with significant changes in blood pressure. In addition to sodium chloride and benzyl alcohol (9 mg/ml), the Abbott and Squibb diluents contain 1 mg/ml sodium metabisulfite and bisulfite, respectively. Since the bisulfites have been shown not to change myocardial contractility greatly, they were not included in the simulated diluent for Abbott's and Squibb's tubocurarine chloride. In addition, Lilly's diluent containing 1 mg/ml sodium bisulfite was not associated with hypotension.

We conclude that dTC, and not its preservatives, was responsible for the hypotension in our patients.

**Summary**

Intravenous administration of Lilly's, Abbott's, or Squibb's tubocurarine chloride to patients anesthetized with halothane-nitrous oxide-oxygen for elective operations was associated with a significant decrease in MAP. Injection of the corresponding diluent (Lilly) or a simulated diluent (Abbott and Squibb) without dTC produced no significant change in blood pressure. Hypotension was caused by the muscle relaxant, not by the preservatives in the diluents of the commercial dTC preparations.

The author acknowledges the generosity of S. B. Maxwell, M.D., Eli Lilly and Company, in supplying the diluent for Lilly's Tubocurarine Chloride.

**References**


---

**A New Inexpensive IPPV Exhalation Valve for Automatic Ventilators**

**Bela Eross, A.R.I.T.**

The Emerson piston ventilator is well accepted as a reliable apparatus effective in providing prolonged controlled ventilation for most types of patients with respiratory insufficiency. Like all other ventilators, the Emerson is not perfect and trouble-free. One problem is the relatively short life of the exhalation valve. After little use, the diaphragm becomes separated from the inner half of the exhalation valve housing, requiring rebonding or replacement. Due to the frequency of malfunction, upkeep of these valves becomes an expense as well as a nuisance.

In attempting to correct this problem, a new IPPV exhalation valve was designed and
prototypes made (fig. 1; cat. #115†). This valve is lightweight plastic and has three 22-mm o.d. ports. An easily replaceable Bennett diaphragm (cat. #2649†), inflated through small- or large-bore tubing from the ventilator, occludes the expiratory channel during inflations of the lungs.†

† Instrumentation Industries, Inc., 215 Thomas Drive, Pittsburgh, Pennsylvania 15236.

‡ Puritan Compressed Gas Corporation, Oak at Thirteenth, Kansas City, Missouri 64106.

The advantages of this valve over the Emerson ventilator valve presently supplied are: transparency, lighter weight, lower cost ($12 vs. $30) and greater durability. In addition, it can be inserted into the expiratory tube leading to the Y-connector, thus eliminating one of the long, bulky, large-bore breathing tubes (fig. 2).

Although this valve may be used in the position of the present Emerson valve, we prefer insertion at the exhalation tube distal to the
Y-connector (fig. 2, V)—preferably close to the patient. In this location the diaphragm is inflated through a small-bore tube (T) attached to the inspiratory port at the ventilator housing via adaptor (E).

The entire circuit we prefer is shown in figure 2. The inspiratory circuit includes the heated humidifier (H) and a device which automatically collects and dumps condensed water (D). Tidal volumes are monitored intermittently by a Wright ventilation meter connected to the expiratory port of the exhalation valve (V).

We have successfully used prototypes of this valve in our Intensive Care Unit for several months. This relatively minor improvement results in safer, more flexible application of the Emerson ventilator and reduced repair and maintenance costs. Additionally, the valve, with minor modifications, has proved to be a good exhalation valve with other types of IPPV assist-controller ventilators of both pressure- and volume-cycled types, provided there is a Y-piece at the patient's airway and the valve is inserted into the exhalation line coming from the Y-piece.

Comparison of Spinal and General Anesthesia for Lower Abdominal Surgery in Patients with Chronic Obstructive Pulmonary Disease

MARK B. RAVIN, M.D.*

There is no general agreement as to the anesthetic technique best suited for patients with chronic obstructive pulmonary disease who are to have lower abdominal operations. This study was undertaken to provide objective evidence which would help decide this issue. Serial values of arterial blood pH, Pco₂, and Pao₂ of patients who had general anesthesia were compared with these values in patients who had spinal anesthesia.

METHODS

Twenty-six male patients with histories of emphysema, scheduled for elective lower abdominal surgery (inguinal herniorrhaphy, suprapubic prostatectomy, hydrocelectomy), were screened for study (table 1). To confirm the presence of chronic obstructive pulmonary disease and to evaluate its severity, a slight modification of the criteria of Paskin et al.¹ was used. We reviewed each patient's medical history, electrocardiogram, and posterior-anterior and lateral roentgenograms of the chest. Pulmonary function studies were then performed with the patient in a sitting position (table 2).²,³ Predicted values, corrected for age, were obtained from the tables of Berglund et al.³ Only those 20 patients whose MVV's were less than 60 l/min and whose RV/TLC values were greater than 45 per cent were accepted for study. None of the patients was able to perform the "match test."⁴ Heparinized arterial blood samples were drawn with the patient supine, at rest, breathing air. Blood gas tensions (Pao₂ and Paco₂) and pH were measured with appropriate electrodes at 37 C.

On the day of operation, all patients received secobarbital (1.0 mg/kg body weight) and atropine (0.5 mg) intramuscularly 40-65 minutes prior to induction of anesthesia. General or spinal anesthesia was assigned by a random card-shuffling technique, with ten patients in each group.

General Anesthesia. General anesthesia was induced by intravenous injection of a 2½ per cent solution of sodium thiopental (average dose 175 mg, range 50 to 350 mg) to an endpoint of elimination of the eyelash reflex. The