Halothane was suspected to be a contaminant in a methoxyflurane vaporizer when unusual anesthetic depth was evidenced in a patient during induction with methoxyflurane. Liquid in the vaporizer chamber contained 7 per cent halothane. Such contamination might have occurred by inadvertent filling of the vaporizer with halothane. However, the question of contamination by transfilling of vaporizers in series also had to be considered. Therefore, a study was conducted to determine 1) the concentrations of component vapors delivered by a contaminated vaporizer, and 2) the amount of anesthetic contamination which could occur when vaporizers in series were opened simultaneously.

Methods

Outputs of individual calibrated Pentomatic and Fluomatic vaporizers containing varied proportions of halothane and methoxyflurane were determined at dial settings of 1.0 per cent with an oxygen flow of 6 l/min. Vaporizers were half-filled (visual fluid level indicator) with the appropriate mixtures and allowed to stand overnight.

The vaporizers were also connected in series in alternate sequence and the rates of contamination of liquid anesthetic in the downstream vaporizer (6 l/min oxygen carrier gas) determined with the following dial setting com-

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§ Fixed-needle Hamilton Microsyringe.
highest dial settings, with less than 0.05 per cent methoxyflurane present in the Flumotic chamber after the same interval (Fig. 4). After 60 minutes almost 10 per cent liquid halothane was present in the Pentomatic chamber.

The total amounts of contaminating anesthetic deposition in the downstream vaporizer during an hour at settings of 2.0 per cent for the Flumotic and 1.5 per cent for the Pentomatic were: 27.8 per cent (10.6 ml liquid) of halothane input to the Pentomatic; in the opposite sequence, only 11.5 per cent (3.0 ml liquid) of the methoxyflurane input was taken up by the Flumotic. Results obtained using Pentec and Fluotec vaporizers in this type of experiment were similar: 30.5 and 11.0 per cent deposition, respectively.
Discussion

Measurement of the rate of liquid contamination in the downstream vaporizer gave a low estimate of the total amount of contaminating anesthetic absorbed. For example, during a one-hour experiment with medium dial settings, 10.6 ml liquid halothane were deposited in a Pentomotic vaporizer which initially contained 125 ml methoxyflurane. At a 6-l/min oxygen flow, 28 ml of methoxyflurane should have vaporized during the hour, and the halothane in the remaining methoxyflurane should have been 9.9 per cent; yet, as is evident in figure 3, only 2.0 per cent was observed in the chamber. This discrepancy might be explained by the suggestion of Dorsch that halothane (the contaminant) dissolves first in the liquid on the wick and slowly equilibrates with the liquid in the chamber.2

Regardless of the source of contamination, it is now evident that a methoxyflurane vaporizer containing even small amounts of halothane can deliver anesthetic concentrations of this agent in addition to the expected methoxyflurane output at a 1.0 per cent setting.

A vaporizer designed to volatilize a low-vapor-pressure liquid (methoxyflurane) should not be placed in a downstream series position.
relative to higher-vapor-pressure anesthetic vaporizers (halothane). Also, every precaution should be taken to avoid charging a vaporizer with a higher-vapor-pressure liquid than it was designed for. If either of these recommendations is violated, a clinically dangerous situation may rapidly develop.

A Method for Ultrasonic Measurement of Blood Pressure in the Adult Leg

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Measurement of the popliteal blood pressure frequently has clinical significance. In many patients with extensive burns or multiple fractures, and during operations on upper extremities, indirect measurement of the brachial arterial blood pressure is not always feasible. Coarctation of the aorta and aortic-valve insufficiency are associated with disproportionate systolic pressure differences between arm and leg which should be determined to help confirm the diagnosis of either condition. It is advocated that the blood pressures in both the arms and the legs be determined in patients with hypertension or peripheral-artery disease. However, indirect measurement of the systolic and diastolic blood pressures in the leg has heretofore been unsatisfactory. The Korotkoff method is grossly inaccurate, the palpatory technique difficult, and the oscillographic approach unreliable. Ultrasonic kineticortiography is a new technique of indirect blood pressure measurement. Detection of arterial-wall motion forms its basis. When brachial arterial pressures were determined, it rivalled the intra-arterial technique and exceeded the Korotkoff method in accuracy. The aim of the present study was to develop and evaluate ultrasonic kineticortiography of the popliteal artery as a method for the measurement of blood pressures in the leg.

MATERIAL AND METHODS

An ultrasonic distance-measuring device was used to determine the depth of the popliteal artery below the skin. All measurements were made in the popliteal fossa of the right leg. The depths ranged from 3.0 to 6.0 cm, with a mean of 4.3 cm, in 17 adults, 20 to 59 years old. In nine children and adolescents, 4 to 13 years of age, the depths ranged from 2.5 to 4.0 cm, and averaged 3.4 cm. This information was necessary for the design of ultrasonic crystals with an appropriate energy focus. Two piezoelectric crystals, one a transmitter and the other a receiver, operating at a frequency of 2 MHz, are sealed separately into a plastic housing. The beam pattern of the transmitting crystal and the signal acceptane aperture of the receiving crystal are of a wide-angle design to provide effective signal reception from the area of the popliteal artery.

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