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The Esophageal Stethoscope and Operations on the Neck

To the Editor:—In a recent article, Schwartz and Downes reported inadvertent esophageal laceration where the esophageal stethoscope was misidentified as either endotracheal tube or ventricular–jugular shunt.[1] McLaughlin, in a Letter to the Editor, concluded that this complication was related to the skill of the surgeon.[2] We recently had an experience similar to that of Drs. Schwartz and Downes. The patient was a newborn with a cystic hygroma necessitating emergency tracheostomy whose esophagus was incised when the esophageal stethoscope was misidentified as the endotracheal tube. This case re-emphasizes the importance of the admonition by Drs. Schwartz and Downes to communicate with the surgeon about what catheters might be palpable when neck dissection is performed in a child.

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REFERENCES

1. Schwartz AJ, Downes JJ: Hazards of a simple monitoring device, the esophageal stethoscope. ANESTHESIOLOGY 47:64–65, 1977
2. McLaughlin DF: Esophageal stethoscope not hazardous. ANESTHESIOLOGY 48:382, 1978

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Routine Gastric Aspiration

To the Editor:—Since the advent of disposable, plastic, gastric sump tubes, orogastric aspiration of stomach contents is a readily accomplished maneuver. For several years, I have made frequent, almost routine use of this maneuver in patients undergoing general endotracheal anesthesia, except where it hinders the surgeon. In 500 to 600 such cases per year, I have had only one complication. In one patient, undefined bleeding from the distal esophagus or stomach occurred during a minor urologic procedure. The bleeding stopped spontaneously and there were no sequelae. During these several years, I have taken some amusement in showing the surgeons a suction bottle with various amounts of clear through various hues of green and brown acidic fluid while repeating the dictum I heard years back from my learned professors: "There ain't no such thing as an empty stomach!"

I have measured by suction bottle estimate the gastric contents aspirated from my last 90 patients undergoing general endotracheal anesthesia. These were mostly adult inpatients from a 225-bed suburban community hospital undergoing elective operations, with a few emergencies and outpatients. No obstetric or cardiovascular patient was included. From 58 patients I recovered 30 to 750 ml of gastric contents by aspiration and gravity drainage in the period immediately after induction. Of the remainder, five patients had no recoverable gastric contents and 27, as much as 25 ml of gastric contents. One patient, from whom I could recover no fluid, was obese. The 750-ml volume was aspirated from the stomach of a thin, nervous woman who, three days after a hysterectomy, underwent a cytoscopy and pyelography late in the day.

My conclusion is that my professors were right. We cannot predict the exceptional patient with an empty stomach. Most patients have some aspiratable gastric fluid. A cuffed endotracheal tube will protect them while it is in. Routine drainage of gastric contents may provide additional safety and lessen the discomfort of emesis in the early postoperative period.

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Homogeneous Gas Mixtures in the Bain Circuit

To the Editor:—Rayburn and Graves[1] state that if the minute ventilation is three times the fresh gas inflow into the Bain circuit, expired gases and fresh gas inflow will mix homogeneously. In a laboratory study of the Bain circuit (a coaxial version of the Mapleson D systems),[2] we recorded the oscillations of the indi-

cator needle of the capnograph caused by variations in carbon dioxide concentration during inspiration and expiration. Gas specimens were obtained both at the patient end of the system and at the junction of the ventilator hose with the circuit. Mean concentrations of carbon dioxide were measured by manually diverting an entire tidal volume into a 1-l bag. With a respiratory minute volume of 7,500 ml/min, a fresh gas inflow of 2,500 ml/min, and a simulated metabolic production of carbon dioxide of 100 ml/min, we found that: 1) inspired gases had an $F_{I_{CO_2}}$ of 3.2 per cent, oscillating between 3 and 5 per cent; 2) expired gases had an $F_{I_{CO_2}}$ of 4.5 per cent, oscillating between 3.5 and 5 per cent; 3) gases at the junction of the ventilator with the circuit had a mean CO_2 concentration of 4.3 per cent, oscillating between 4.2 and 4.8 per cent. It appears, therefore, that assumptions of Rayburn and Graves are not borne out by experimental data, since homogeneous mixtures do not cause oscillations.

The authors claim that a change in fresh-gas inflow brings about an instantaneous variation in arterial carbon dioxide tension, which is immediately reflected by a change in the carbon dioxide content of the circuit measured 180 cm away from the patient end. We fail to understand how this can happen so suddenly and feel that this change is probably caused by the dilution of the carbon dioxide in the circuit by the additional fresh gas volume.

We do not doubt that normocarbia can be obtained with the Bain circuit. This is not due to the creation of a homogeneous mixture but to the functional characteristics of Mapleson D systems, which deliver fresh gases ahead of expired gases,[2] and is used with large tidal volumes. The use of very low fresh-gas inflow with this type of system can lead to unpredictable inhaled gas compositions.[3] The excessive minute volumes used by Rayburn and Graves may have a potentially adverse effect on the patient's cardiac output, especially in the presence of halothane. In our experience, an almost homogeneous mixture is found only in the ventilator and at the machine end of the circuit, and not along the entire length of the circuit, as stated by the authors.

Finally, in their analysis of expired carbon dioxide concentration, they used a Goddard capnograph, but they fail to mention whether they zeroed their instrument with the nitrous oxide in oxygen mixture they used on their patients, and whether they applied a correction for the molecular broadening effect of nitrous oxide.[4] Failure to apply these corrections will introduce a sizeable error in the data obtained.

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REFERENCES

1. Rayburn RL, Graves SA: A new concept in controlled ventilation of children with the Bain anesthetic circuit. ANESTHESIOLOGY 48:250–253, 1978
2. Ramanathan S, Chalon J, Capan L, et al: Rebreathing characteristics of the Bain anesthesia circuit. Anesth Analg (Cleve) 56:822–825, 1978
3. Nunn JF: Applied Respiratory Physiology. London, Butterworths, 1977, p 233
4. Kennell EM, Andrews RW, Wollman H: Correction factors for nitrous oxide in the infrared analysis of carbon dioxide. ANESTHESIOLOGY 39:441–443, 1973

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In reply:—In our paper,[1] we suggested that if ventilation were three times the fresh-gas flow, this would theoretically provide good mixing in the exhalation arm of the Bain circuit when used for pediatric patients. However, Ramanathan, Gupta, and Chalon present data suggesting that this is not so, by having taken a laboratory model that incorporated a unidirectional valve[2] while apparently using large tidal volumes (not specified) and finding oscillations in the recorded carbon dioxide (CO_2) at various points in the circuit.

It is important first to point out that the mixing of gases occurs over varying lengths of the circuit, depending upon the tidal volume and, therefore, size of the patient. In pediatric patients, with mechanical tidal volume values less than the volume of the Bain circuit, the mixing of gases (patient-produced CO_2, fresh-gas inflow, and expired gases) takes place completely within the exhalation arm of the Bain circuit. This causes a constant mixed expired CO_2 tension ($P\bar{E}_{CO_2}$), which closely approximates arterial CO_2 tension (Pa_{CO_2}), to exit from the non-patient end of the Bain circuit.[1] In adults, since one tidal volume of the ventilator exceeds the volume of the Bain circuit, the mixing process extends beyond the non-patient end of the circuit. Therefore, one must measure further distally (either in the ventilator hose, or possibly in the ventilator bellows with very large tidal volumes) in order to obtain the smooth trace seen for children. The important point is that these gases do become well mixed before exiting the ventilation system, so that a known amount of CO_2 is eliminated per exhausted gas