Monitoring Ventilation during Computed Tomography Scan

To the Editor:—Electronic stethoscopes with wireless remote earpieces have been introduced into clinical anesthesia practice. We use such a device (Vitacomm, Inc., Orange, California), which has an infrared optical system linking patient to anesthetist. We recently found a situation in which it was indispensable.

A 5-yr-old girl was brought to the computed tomography (CT) suite for needle biopsy of the liver by CT localization. Anesthesia was maintained primarily by continuous ketamine infusion with spontaneous ventilation. Since the anesthesiologist cannot be present in the room during a scan, the patient and her monitors could be observed only from the control room through a leaded-glass window and by a video camera. Visible monitors included electrocardiograph, automated blood pressure cuff, and pulse oximeter. Although conventional stethoscopy was not possible, we taped the electronic precordial stethoscope to the upper chest with the transmitter near by and found satisfactory signal reception through the glass, enabling us to hear breath sounds.

Ventilation can be monitored remotely by observing chest motion or (with endotracheal intubation) motion of the anesthesia bag, which may be accentuated by attaching an object such as a tongue blade to act as a lever arm. However, observation of chest motion alone in a stuporous patient with an unprotected airway might fail to detect upper-airway obstruction. Auscultation of breath sounds permits better assessment of adequacy of ventilation and degree of upper-airway obstruction. One possible alternative is a stethoscope equipped with a microphone and loudspeaker, but this might be difficult to hear through x-ray shielding and over background noise. We recommend a wireless stethoscope system in such a setting.

Andrew J. Sarnat, M.D.
Assistant Clinical Professor
Department of Anesthesia
UCSD Medical Center H-770
San Diego, California 92103

John A. Kemp, M.D.
Senior Resident
Department of Anesthesia
UCSD Medical Center H-770
San Diego, California 92103

REFERENCES

(Accepted for publication July 22, 1985.)

Possible Pitfalls in Calculating Thoracic and Abdominal Volumes

To the Editor:—The study of Hedenstierna et al. illustrates two longitudinal sections of the thorax and abdomen. The first is a radiographic tomogram that shows clearly the shape of the diaphragm ascending from its insertion at the rib margin almost directly cranially to form its well-known domed configuration within the rib cage. This finding substantiates the reasoning of Mead and Loring that the rib cage is an important container of abdominal contents. This is because over a considerable range of lung volume the margins of the diaphragm are opposed to the inner wall of the rib cage and the abdominal contents lie within, rather than below, this part of the diaphragm. The second longitudinal section is a diagram that Hedenstierna et al. use to summarize the mean volume changes that were calculated to have occurred in their study. It shows a curved diaphragm with no apposition to the rib cage. This is a condition that would probably only exist when lung volume is very large and would not be expected in the conditions of this study. It may explain, however, the author's failure to consider a further source of the change in volume of the abdominal container necessary to account for the cranial movement of the diaphragm that they describe. It is quite possible that this cranial diaphragmatic movement, and hence shift of abdominal contents cranially, could be accounted for by the simultaneous reduction of the cross-sectional area of the rib cage that they noted. In fact, the lowest section of the rib cage that they measured is quite close to the dome of
the diaphragm and hence will reflect quite closely the top of the cylinder of abdominal contents that lies below. In essence, the abdomen could become longer, and less wide, after induction of anesthesia.

Mead and Loring\(^2\) show that these relative volume changes can be calculated, and they indicate that such a change in shape can take place with no change in the length of the diaphragm. Their analysis is more complex than that of Hedenstierna et al.,\(^1\) whose calculation of the volume of abdominal contents is misleadingly simple and could be in considerable error. For example, the most cranial section across the abdomen was only 14 cm above the lower margin of L4, which is about the lower margin of T12. Since at functional residual capacity in the supine subject the dome of the diaphragm may extend up to about T6, this uppermost section will not accurately reflect the volume of the abdominal container up to the dome of the diaphragm. Analysis of the results of this study is far from simple, and the authors should consider other muscles as well as the diaphragm in their analysis of the shape changes they describe.

G. B. DRUMMOND, F.F.A.R.C.S.
M. R. LOGAN, F.F.A.R.C.S.
Department of Anaesthetics
Edinburgh Royal Infirmary
Edinburgh Scotland EH3 9YW

REFERENCES


(Accepted for publication July 22, 1985.)

In reply.—Dr. Drummond indicates the difficulty of determining the change in thoracic and abdominal volume caused by a change in the position and shape of the diaphragm. We have also stressed that "no detailed analysis of the configuration of the diaphragm was undertaken in the present study; this would have required additional transverse projections through the dome which was not possible for radiation dose reasons." However, our method of calculating the thoracic and abdominal volumes (abdominal volume: transverse area times height of each abdominal segment, plus the maximum shift of the diaphragm multiplied by a factor of 0.75 times the transverse area at the level of the lowermost thoracic projection) turned out to be fairly accurate in various model analyses.

This calculation will include the abdominal content within the rib cage; thus we do not agree with Dr. Drummond that we have failed to consider it. The schematic drawing in figure 2, with no detailed or exact configuration of the diaphragm, should not be used for criticism of our analysis of the effects of a shift in the position of the diaphragm.

GÖRAN HEDENSTIerna
Department of Clinical Physiology
Huddinge University Hospital
S-141 86 Huddinge
Sweden

(Accepted for publication July 22, 1985.)

Histamine H1 Antagonist Alone Attenuates d-Tubocurarine-induced Hypotension

To the Editor.—Morphine and d-tubocurarine (d'Tc) have been widely used for anesthesia but are known to release histamine, which induces hypotension. Philbin et al. have shown that hypotension induced by morphine infusion was completely prevented by pretreatment with H1 and H2 antagonists when used in combination but not alone.\(^1\) On the other hand, it also has been suggested that the cardiovascular action of histamine is altered by the method of the drug administration, i.e., infusion or injection.\(^2\) We examined the efficiency of H1 and H2 antagonists, singly or in combination, in preventing hypotension induced by a bolus injection of d'Tc.

Twenty-four patients (ASA I or II), of either sex, ranging in age from 18 to 60 yr, who were undergoing peripheral orthopedic, gynecologic, or abdominal surgery, were studied. At the time of the study, the Human Ethical Committee for Research had not been established in our institution, however, after full explanation of the study,