A Not so Apparent Cause of Intraluminal Tracheal Tube Obstruction

To the Editor:—Tracheal tubes have been reported to be obstructed with blood, secretions, and a variety of foreign bodies including ascaris worms. Eccentric cuff inflation also has been known to result in airway obstruction by causing the bevel of the endotracheal tube to impinge on the tracheal wall.

External herniation of the cuff over the lower end of the endotracheal tube also has been reported as a cause of airway obstruction.

I wish to report intraluminal tracheal tube obstruction due to internal cuff herniation at the cuff site. A 30-year-old patient was intubated with a cuffed 9-mm Formex® endotracheal tube. The amount of air put inside the cuff was just enough to prevent leakage around the tube. When the patient resumed spontaneous respiration, it was noticed that the movement of the anesthetic reservoir bag was shallow, despite apparently good respiratory movements by the patient. A general check for kinking of any part of the anesthetic circuit was negative. The cuff of the endotracheal tube was deflated prior to extubation. It was then noticed that the movement of the reservoir bag improved considerably. The cuff was re-inflated and the reservoir bag movement became reduced again. The tube was then removed and replaced by another tube which gave no problem. Careful inspection of the first tube showed only a slight re-duction of the lumen at the cuff site when the cuff was inflated, but this became more noticeable when the tube was placed inside a snugly fitting plastic tube (simulating the trachea).

Subsequently, similar episodes occurred with a few other patients and it was then discovered that the same type of tube (recently acquired by us) was involved. These are the W.S.P.* FORMEX streamlined endotracheal tubes. This problem was, however, not encountered with all the Formex tubes.

The point worth noting here is that the usual pre-intubation inflation of the cuff to test for cuff integrity may miss this type of internal cuff herniation which becomes more apparent and significant when inflated inside the trachea.

DR. C. E. FAMEWO, F.R.C.P.(C)
Department of Anaesthesia,
University College Hospital,
Ibadan, Nigeria

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* W.S.P. = Warne Surgical Products.

Intraoperative Somatosensory-evoked Potentials

To the Editor.—Dr. Grundy’s single case report of somatosensory-evoked potential loss during spinal AVM excision is misleading.

The yield of useful clinical correlations between any evoked potential changes recorded intraoperatively and a predictable neurologic change postoperatively is low. Both false-positive and false-negative results occur. Interpretation of signal changes is complicated further by significant non-stationarity.

Equally important as any implied association between the neuroelectric events and subsequent neurologic function is the appreciation of the specificity of these sensory-evoked potentials. At best, somatosensory-evoked potentials, recorded as described, bear an incompletely defined relationship to the structural integrity and function of the spinal dorsal columns and dorsal spinocerebral tracts. The ventrolateral tracts have little influence on the evoked potential waveform. Only the non-specific later components (for which there are no putative neural generators) may be affected. This would limit interpretation of somatosensory-evoked potential change to dorsal column function only. To date, there is no effective way of recording motor function from the ventrolateral tracts.

Our experience at the Barrow Neurological Institute (BNI) is based on intraoperative somatosensory-evoked potential monitoring of 140 patients to date. In this initial group, technically satisfactory results were recorded in 88% (123/140). Variability, unrelated to surgical manipulation was present in 14% (20/140). False-negative results, i.e., loss of the signal without any neurologic change occurred in 6% (8/140). This is a function of both technical factors, such as loss of electrodes, equipment failure, and multiple intraoperative
influences. False-positive results, i.e., preservation of the signal despite significant neurologic deficits, such as quadriplegia, occurred in 2% (3/140). This is more uncommon but has been recorded in patients with syringomyelia and organophosphate poisoning. These problems reduce the reliability of the response and the confidence with which signal changes can be interpreted.

It should be emphasized that sensory-evoked potentials are an important and promising adjunct to the assessment of the neurologic status of the unresponsive patient. But the data to justify the simple relationship between loss of the evoked potential waveforms and the subsequent paralysis reported, are not established.

PETER A. RAUDZENS, M.D.,
Barrow Neurological Institute,
St. Joseph’s Hospital & Medical Center
Phoenix, Arizona 85001

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A Lung Model for Testing Respiratory Quotient Measurements

To the Editor.—In a recent issue of Anesthesiology, Damask and associates1 presented an article entitled, “A Systematic Method for Validation of Gas Exchange Measurements.” They evaluated the accuracy of two commercially available instruments for metabolic studies. This type of investigation is of great interest and we feel that it is very important to test this type of equipment. We also think that a similar test ought to be performed with instruments constructed for awake, spontaneously breathing patients. The test method presented by Damask et al.1 has certain disadvantages; for example, only a fixed RQ level can be tested and CO2 production and O2 consumption cannot be analyzed together. Also, the effect of heat and humidity on measurements cannot be controlled. These problems can be solved by using the oxygen-consuming lung model we have presented.2 In this lung model, oxygen consumption is achieved by burning hydrogen gas delivered via a precision rotameter.

\[2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}\]

Two volumes of H2 consume one volume of O2, which results in water vapor and heat. By the use of a cooling jacket around the lung model, the expiratory gas can be kept at 37°C and 100% water saturation. Carbon dioxide production is achieved through delivery of CO2 into the lung model. Thus, both O2 consumption and CO2 production can be altered independently, which means that any RQ level can be tested. This lung model also mimics the human situation as regards heat and humidity of expiratory gases, and can be used both for spontaneous and controlled ventilation.

OLA STENQVIST, M.D., PH.D.
HANS SONANDER, M.D.
Consultant Anesthetists
Department of Anesthesiology
Sahlgren Hospital
S-413 45 Gothenburg
Sweden

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