

Anesthesiology
72:577, 1990

A Contingency Plan for Tracheal Intubation

To the Editor:—We recently cared for a patient in whom tracheal intubation and ventilation of the lungs were both known to be impossible and who also needed a malfunctioning tracheostomy tube removed prior to rigid bronchoscopy through the tracheostomy stoma. Because it was possible that the rigid bronchoscope would not be passed correctly, it was essential to have a back-up emergency ventilation plan.

Our case involved a 2-yr-old girl born with Antley-Bixler syndrome. At 3 months of age she required emergency tracheostomy for respiratory distress due to upper airway obstruction. She was sent home with an open tracheostomy stoma that was kept open by intermittent tracheal suctioning. She now presented with recurrent respiratory distress. Her most recent attack had to be relieved by inserting an uncuffed 3.5-mm endotracheal (ET) tube through the tracheostomy site to the 8–9-mm mark in order to maintain a patent airway (a regular tracheostomy tube would not satisfactorily relieve the obstruction). The provisional diagnosis was a distal tracheal granuloma and the plan was to establish the airway from above (rigid bronchoscope per os to the proximal trachea) prior to removing the tracheostomy tube so that ventilation would be assured while the entire trachea was being visualized (and, perhaps, laser any resectable obstructing lesion).

After inducing anesthesia by administering isoflurane through the intubated tracheostomy site, numerous attempts to establish an oral-tracheal airway by multiple types and combinations of laryngoscopy and bronchoscopy were all unsuccessful; there simply did not appear to be an open connection between the pharynx and trachea.

Since the tracheal obstruction had to be relieved and the obstructed site was most probably distal to the tracheostomy stoma, the decision was made to try to visualize the lesion with a rigid bronchoscope passed through the tracheostomy stoma. This procedure, however, required removal of the 3.5-mm ET tube stomal airway. To ensure that the airway would not be completely lost if the rigid bronchoscope could not be passed through the tracheostomy stoma, an 0.021-G Cook PWG 2588 straight guidewire was easily inserted (without any resistance) through the 3.5-mm ET tube 15–18 mm into the trachea. The ET tube was then removed over the guidewire and an 18-G iv catheter was threaded over the wire and the tip brought close to the tracheostomy stoma. If re-establishment of the tracheal airway had then not been possible, the 18-G iv catheter could then be guided over the

straight wire and ventilation could be re-established by jet ventilation.¹ Fortunately the bronchoscope could be passed through the tracheostomy stoma alongside the guidewire and multiple large redundant folds of tracheal mucosa were visualized. After bronchoscopy, a new 3.5-mm ET tube was reinserted over the guidewire into the trachea, the guidewire was removed, and the patient returned to the intensive care unit.

In summary, we think that in situations where an airway cannot be established from above, and the only airway available is through a tracheostomy site, the tracheostomy airway should not be abandoned until at least a guidewire is placed within the trachea and, therefore, can be available for the establishment of TTJV if the airway is subsequently lost. The guidewire should be passed well into the tracheobronchial tree, and the iv catheter chosen should have an internal diameter nearly equal to the outside diameter of the guidewire. This combination of guidewire/iv catheter minimizes the chance of tissue obstruction and maximizes the likelihood of tracheal cannulation.

JOSEPH KROSS, M.D.
Resident in Anesthesia

JOANNE T. ZUPAN, M.D.
Resident in Anesthesia

JONATHAN L. BENUMOF, M.D.
Professor of Anesthesia

*Anesthesia Research Laboratory, T-001
University of California, San Diego
La Jolla, California 92093*

REFERENCE

1. Benumof JL, Scheller MS: The importance of transtracheal jet ventilation in the management of the difficult airway. *ANESTHESIOLOGY* 71:5 769–778

(Accepted for publication December 6, 1989.)

Anesthesiology
72:577–578, 1990

All Subjects of a Study Should Provide Informed Consent

To the Editor:—I enjoyed reading the article by Cook *et al.* describing their comparison between handwritten and automatic blood pressure records.¹ I was intrigued by one aspect of their study design: they appear to have obtained consent from the wrong people. They were quite obviously studying the behavior of the anesthesiologists and nurse anesthetists who were the unwitting participants in their study. Obtaining “informed” consent from the patients apparently served to distract the operating room personnel from the true purpose and the true subjects of the study.

Although it is presumed that no harm came to the anesthesiologists who participated in this study, ethical standards for human experimentation require informed consent for subjects (including physicians) who participate in human studies.² Even when the risks to the partic-

ipant are remote, informed consent is required “to respect individual autonomy by disclosing all germane information about the research and assuring the right of choice.”³

Compared with the flagrant abuse of human subjects that Henry Beecher publicized two decades ago, the oversight in this study is only a peccadillo.⁴ However, the human rights of medical personnel (and even residents!) must be respected when they are the subjects of clinical trials.

LEONARD J. SOLONIUK, M.D.
8 Whittier Place, Apt. 16D
Boston, Massachusetts 02114

REFERENCES

1. Cook RI, McDonald JS, Nunziata E: Differences between hand-written and automatic blood pressure records. *ANESTHESIOLOGY* 71:385-390, 1989
2. Helsinki II Declaration, quoted in Silverman WA: Human Experimentation: A guided Step into the Unknown. New York, Oxford University Press, 1985, p 156

Anesthesiology
72:578, 1990

In Reply:—We appreciate Dr. Solonuk's comments and agree that ethical standards are important and should receive the careful attention of all behavioral researchers. We did not observe the anesthesiologists' behavior but rather examined their records and, as we pointed out, took care to keep the identifiable characteristics of the data secure. There is a potential problem in detailed behavioral studies: were we to undertake a similar study today we should wish to make complete records of the anesthesiologist's behavior and we would obtain their consent in their role *qua* subjects. Our institutional review committee does not generally require informed consent for review of patient records, providing that appropriate safeguards are taken concerning con-

Anesthesiology
72:578, 1990

3. Lowe DU, Alexander DF: Informed consent and the rights of research subjects, *The Social Context of Medical Research*. Edited by Wechsler H, Lamont-Hawes RW, Cahill GF Jr, Cambridge, Ballinger, 1981, p 115
4. Beecher HK: Ethics and clinical research. *N Engl J Med* 274:1354-60, 1966

(Accepted for publication December 5, 1989.)

fidentiality. The anesthetic record is part of the greater patient record and, thus, would be covered by such a general practice.

RICHARD I. COOK, M.D.
J. S. McDONALD, M.D.
ENRICO NUNZIATA, M.S.B.M.E.
*Department of Anesthesiology
The Ohio State University Hospitals
410 West 10th Avenue
Columbus, Ohio 43210-1228*

(Accepted for publication December 5, 1989.)

Humidification of Inspired Gas

To the Editor:—We read the article by Bissonnette *et al.*¹ and are concerned that both the temperature and absolute humidity of inspired gas were not considered by the authors. When artificial methods of humidification of inspired gas are considered, it is essential to think in terms of absolute humidity (the mass of water vapor in unit volume at given temp) and temperature.² Relative humidity is the amount of water vapor present in a gas at any given temperature expressed as a percentage of the amount of water vapor that the gas would hold if fully saturated at that temperature. The relative humidity of inspired gas was at 90% with active airway humidification. When the heat and moisture exchangers (passive humidification) were used, relative humidity was 50% at the beginning of anesthesia and gradually increased to 80% after 90 min. Since temperature of inspired air was not mentioned, it is reasonable to assume that it was 37° C and 25° C with active and passive humidification, respectively. The mass of water vapor in inspired gas would be 39.6 (44 × 0.90) mg/l with active humidification and 18.4 (23 × 0.8) mg/l with passive humidification after 90 min of anesthesia.² The water content in the inspired gas with active humidification is twice that with passive humidification. This demonstrates that absolute humidity in the inspired gas with active humidification was significantly greater than that with passive humidification and it is incorrect to conclude heat and moisture exchangers "after

approximately 1.5 h of anesthesia, provided nearly as much airway humidification as active systems."

JOHN S. T. SUM-PING, M.D.
Visiting Assistant Professor

MAHESH P. MEHTA
Associate Professor

*Department of Anesthesia
University of Iowa College of Medicine
Iowa City, Iowa 52242*

REFERENCES

1. Bissonnette B, Sessler DI, LaFlamme P. Passive and active inspired gas humidification in infants and children. *ANESTHESIOLOGY* 71:350-354, 1989
2. Barnes PK. Principles of lung ventilators and humidification, *Scientific Foundations in Anaesthesia*. Edited by Scurr C, Feldman S. London, Heinemann 1982, pp. 533-544

(Accepted for publication December 6, 1989.)

Anesthesiology
72:578-579, 1990

In Reply:—Drs. Sum-Ping and Mehta are mistaken in stating that "it is essential to think in terms of absolute humidity." Clinicians may humidify respiratory gases to: 1) prevent tracheopulmonary damage; and 2) minimize hypothermia. Tracheal ciliary function is well preserved when relative humidity is >50%, at a wide variety of inspired gas temperatures.¹⁻³ Ciliary function is minimally dependent on absolute

humidity.⁴ Furthermore, inspired gas temperatures sufficient to provide the highest absolute humidities actually decreases mucociliary function, functional residual capacity, and pulmonary compliance.^{5,6}

Heat and moisture exchangers warm inspired gases as well as humidifying them (because the heat of condensed expired steam is absorbed and returned to inspired gas when the water evaporates).^{7,8}