

provided the exhalation valve of the respirator is capped. The two positions of the slide valve within the cannula may be seen in figure 3 and 4. The cannula functions as a common tracheostomy tube when the slide valve is locked in the inspiratory position and when the cap on the exhalation port of the respirator is removed. Under these conditions a negative phase during expiration can be used.

The slide valve does not completely occlude the outer portion of the cannula during expiration. This is important, as it allows the patient to create a subatmospheric pressure within the respirator. Assisted respiration of the patient is possible by appropriate adjustment of the sensitivity of the respirator.

The cannula contains no joints, only three movable parts and one spring. The piston is lubricated with silicon oil, and the humidity of the expired gas is sufficient for the lubrication of the slide valve. Cleaning of the cannula is easy, because the head, piston, and slide valve can be dismantled. The cannula can be sterilized in detergent or ethylene oxide.

The clinical trials with the cannula on five patients were encouraging. Only one patient was not able to talk for an unknown reason.

The cannula was used continuously for nine hours in one patient. If certain conditions exist and if a high pressure must be used for ventilation, the patient can talk after some air has escaped from his lungs. With the remaining air of lower pressure, he can then speak.

Assisted respiration seems to be more suited for speaking with this cannula than controlled respiration. The patient can prolong the expiration time and thus the time available to speak at will. The patients were able to say at least ten words distinctly during one exhalation period, and one patient was even able to sing. Some patients were able to clear their throat and to cough.

Coughing is important in the prophylaxis against pneumonia and atelectasis. However, the ability to cough with the cannula in place depends largely on the clinical condition of the patient. Coughing alone is not sufficient for bronchial toilet, and endotracheal suctioning is necessary. It can be performed when the slide valve is locked in the inspiratory position, and can also be accomplished by removal of the cork during the inspiratory cycle.

We believe this cannula provides definite advantages for patients during prolonged periods of artificial respiration.

Endotracheal Cuff Arrangement to Facilitate Topical Anesthetization

RICHARD R. JACKSON, M.D.*

There are occasions when it is desirable to maintain topical anesthesia of the tracheal mucosa for a longer period of time than is provided by a single application of the anesthetic agent. Such a technique allows the conscious patient to tolerate an endotracheal tube with less discomfort. It also decreases the incidence of straining ("bucking") when an endotracheal tube is used in the lightly anesthetized patient.

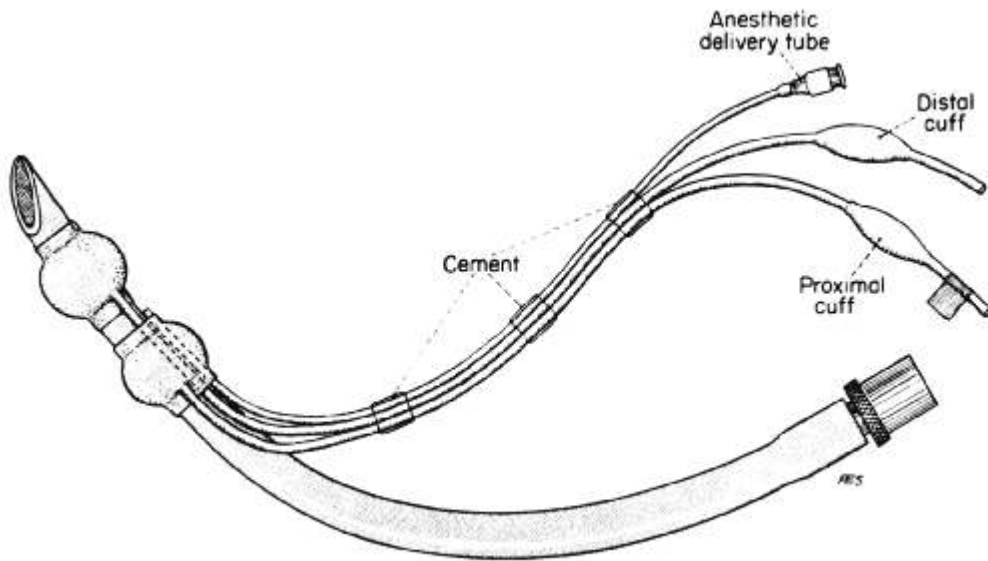
Smith and Bonner have accomplished this by using a standard cuffed endotracheal tube

*Department of Anesthesiology, Lahey Clinic, Boston.

with a spray tube built in.¹ This requires periodic deflation of the cuff for reapplication of the topical agent. In addition, rather large quantities of the topical agent are often required.

Described herein is an endotracheal cuff arrangement that permits efficient application of a topical anesthetic agent to the tracheal mucosa for an indefinite period of time.

Two tracheotomy cuffs are placed on an endotracheal tube as illustrated. An inflation tube from a discarded endotracheal cuff is passed along the concave surface of the endotracheal tube beneath the proximal cuff termi-



nating in the space between the two cuffs. The inflation tube of the distal cuff also is run along the concave surface of the endotracheal tube under the proximal cuff. All points of contact between tubes and cuffs are carefully sealed with Eastman 910 adhesive to prevent leakage of the agent under the proximal cuff. For convenience in handling, the three tubes can be fastened together with a drop of cement every 2 inches. The tubes should be marked for ease of identification while in use. A double cuff embodying these principles will shortly be available commercially.

The endotracheal tube is placed in the trachea in the usual manner using 2 per cent lidocaine jelly as the lubricant. The distal cuff is inflated with a measured amount of air until no gas can be heard to escape when firm pressure is applied to the breathing bag. An equal volume of air is now placed in the proximal cuff. This provides a closed chamber bounded by the tracheal mucosa, endotracheal tube, and the two small cuffs. Five cubic centimeters of 2 per cent lidocaine is then instilled into this area using a 10 ml. syringe. The injection should be alternated with aspiration several times during filling to eliminate air from the chamber between the cuffs. After the lidocaine is instilled, the filling tube

is clamped to maintain a slight positive pressure in the chamber. If the cuffs are properly inflated and air carefully removed to permit complete filling of the chamber, the topical anesthetic agent will spread over the surface of the cuffs and provide topical anesthesia for about two hours.

For operations lasting longer than two hours, 1 to 2 ml. of lidocaine is added to the chamber. Straining and "bucking" have been triggered by the instillation of a larger volume, probably due to the agent being forced around the distal cuff and running down onto the carina. At the end of the operation, any remaining lidocaine is aspirated before deflating the cuffs and removing the tube.

The device has proved most helpful in minimizing reaction to endotracheal tubes in the awake patient and the lightly anesthetized patient.

In addition, the arrangement can be used as a standard endotracheal tube with only one cuff inflated. This provides the safety feature of having a second cuff as a "standby" in case of failure on the first cuff.

REFERENCE

1. Smith, R. H., and Bonner, M. S.: Endolaryngeal topical anesthesia, *ANESTHESIOLOGY*, 20: 119, 1959.