# AN IMPROVED METHOD FOR ENDOTRACHEAL INTUBATION DURING ANESTHESIA

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THE increasing use of endotracheal intubation during general anesthesia has made deficiencies apparent in the usual pattern of endotracheal catheters. For example, each of the numerous endotracheal tubes requires a correspondingly sized metal adapter for connection to the gas machine, and the adapter itself may be one of many shapes as well as types of slip-joint connectors. Whenever the adapter is placed within the endotracheal catheter, it reduces the size of the lumen of the catheter, causes turbulence in the gas flow and thereby increases resistance of the flow within the system. Currently used endotracheal catheters are made of rubber or heavy plastic. They are rather stiff and tend to kink when they are bent (Fig. 1a, a′). These nonpliable tubes predispose to sore throat and coughing and, also, through constant pressure cause ulceration and edema of the patient's anterior tracheal wall[1] and ulceration of the posterior laryngeal commissure. Furthermore, the continual rubbing of the rough catheter surfaces against these structures during respiratory movements, causes aggravation and occasionally granuloma formation.[2,3]

We have overcome these disadvantages by using a nonkinking endotracheal tube*, which at body temperature becomes pliable and adapts itself easily to the anatomic configuration of the upper respiratory tract (Fig. 1b, b′), yet which possesses the necessary rigidity for intubation. The tube is made of clear vinyl plastic of a high molecular weight. The method of construction is similar to that of a latex catheter. Each tube is individually molded on a form that is dipped into the coagulated vinyl plastic material. The tube is then heat-cured in much the same way as is latex rubber. This process gives the tube many of the characteristics of latex rubber, such as resistance to heat, pliability, and smoothness. However, it has an advantage over rubber: there is more body to it and, as a result, in relation to its wall thickness it can form a larger lumen. It can be autoclaved satisfactorily at 15-pound pressure for 15 minutes, but does not tolerate so much heat as does rubber. By the end of the 15-minute sterilizing period some of the plasticizer has evaporated and the tube may become too stiff.

This endotracheal tube will not easily kink; therefore, when the tube emerges from the mouth or the nose it may be bent to conform to the contour of the face without compromising the airway (Fig. 2). The length is appropriate for connection to the gas machine at a point distant from the mouth or nose and yet the dead space is not increased over that of the usual connections. The flare end of the tube permits adaptation directly to the Y Adapter or to the Adams Adapter, and eliminates need for any slip-joint adapters.

*Manufactured by C. R. Bard, Inc., Summit, New Jersey.*

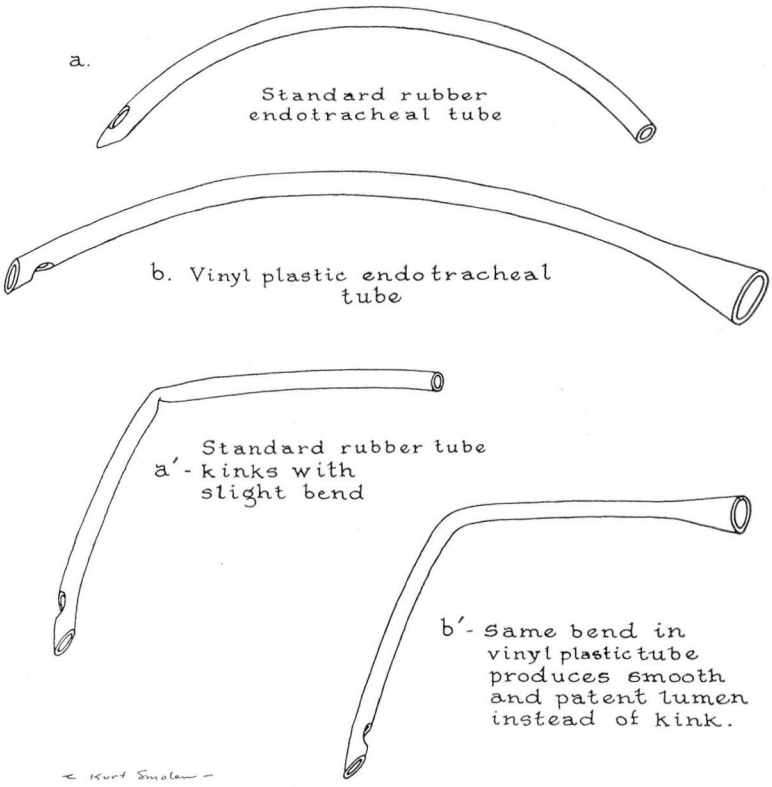


**Fig. 1.** (**a**) Standard endotracheal tube with molded curve. Adapters and slip-joint connectors are required to close the anesthetic system. (**a′**) Standard endotracheal tube kinks, and occludes the lumen when bent. (**b**) Vinyl plastic tube has a flare end for direct connection to Y or Adams Adapters. (**b′**) Vinyl plastic tube is resistant to kinking when bent.

We have used this vinyl plastic type of tube for the past year in more than 3000 cases. Originally it was designed to satisfy requirements in surgery of the head and the neck, but its numerous advantages became so apparent that now it is used generally in all types of surgery requiring endotracheal intubation (Fig. 3). The advantages of the tube are apparent: 1. Decreased bulk upon the face of the intubated patient; this is ideal for surgery about the head and the face. 2. Smooth surface and pliability of the tube. At body temperature the endotracheal tube becomes readily pliable and will adapt itself to the anatomic conformity of the upper respiratory tract. This helps to eliminate pressure points and decreases the irritation to the larynx and tracheal mucous membrane. 3. The lumen of the endotracheal tube is not reduced by the insertion of slip-joint connectors. The flare end adapts directly to the Y and the Adams Adapter of the circle-system. In most cases the lumen of this connection is much greater than the lumen of the endotracheal tube.

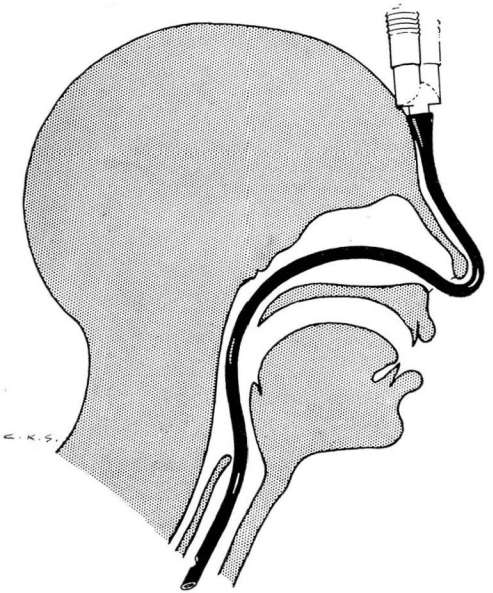

**Fig. 2.** The vinyl plastic tube introduced into the trachea via the nasal route and adapted directly to the Adams Adapter.

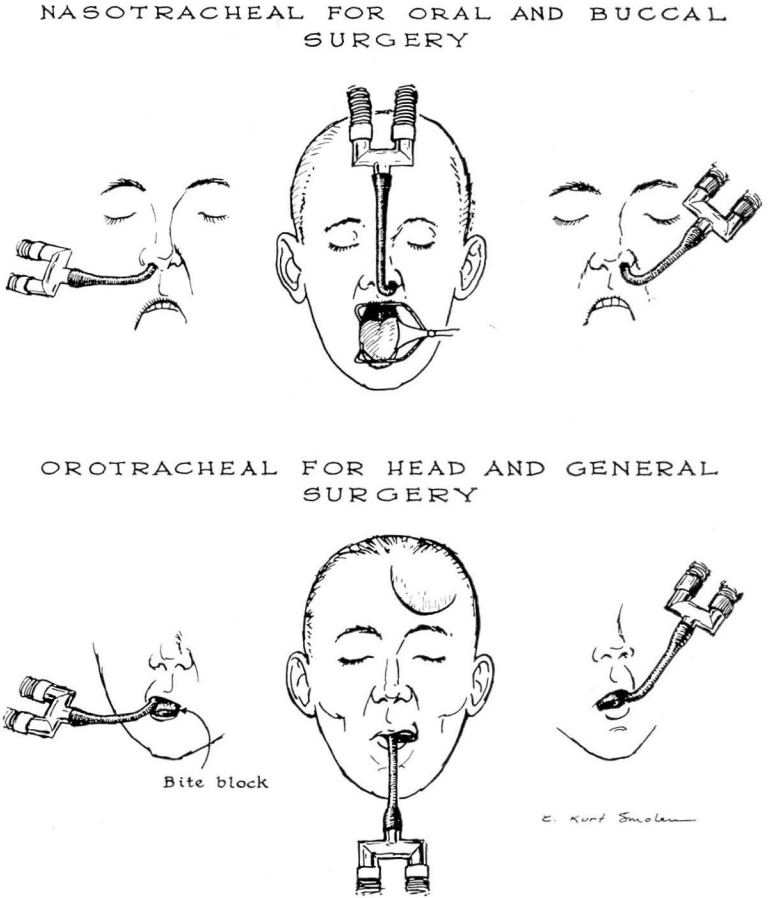


**Fig. 3.** Possible adaptations of the vinyl plastic tube for endotracheal intubation.

## Summary

An improved, nonkinkable, vinyl plastic endotracheal tube is described which has the advantages of uniform pliability and rigidity, and direct adaptation to the gas machine, eliminating use of connectors.

### References

1. Young, N., and Stewart, S.: Laryngeal lesions following endotracheal anaesthesia: report of 12 adult cases. Brit. J. Anaesth. **25**: 32-42, Jan. 1953.
2. Kamsler, P. M.: Laryngeal granuloma following endotracheal intubation. Anesth. & Analg. **32**: 51-56, Jan.-Feb. 1953.
3. Finer, G. H.: Granuloma of larynx following intubation. Anesthesiology **9**: 554-555, Sept. 1948.