



made by correcting the direction of the screw. As soon as one feels that the introducer is in the right direction, the screw is removed (fig. 2), the malleable German-silver needle is introduced along the groove and, if spinal fluid flows freely, the introducer itself is withdrawn.

I have used the modified instrument with success in a great number of cases, and have not experienced even as much difficulty or delay as with the introduction of the rigid steel needles used for the admin-

istration of the "one shot" spinal anesthesia.

In fig. 1, the slit of the bolt does not appear to be in line with the groove, but this is because the instrument is slightly rotated in the picture so that the "wing" of the Moore introducer is also visible, in a foreshortened manner.

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A NONRESISTING, NONREBREATHING VALVE

Increase of carbon dioxide in the blood during lengthy operative procedures in adults (1) and during any procedure on children is one of the "bugbears" of anesthesia. Even when the simple open drop ether technic is used with children, carbon dioxide quickly builds up in the dead space under the mask and in the blood stream unless the mask is frequently lifted from the face.

In addition, respiratory fatigue during anesthesia for infants and children must be avoided at all costs. Such factors as respiratory acidosis, already mentioned, and resistance in the system used to produce anesthesia should be reduced as much as possible. Of course, many will say that minimal resistance is provided by the open drop ether technic, and that it is the "new-fangled" gadgets that provide all the resistance. Perhaps there is some truth in that statement, but surgeons today are demanding anesthesia for children for operations about the mouth and face and for thoracic procedures in which positive pressure control of the pulmonary system is essential. Such demands cannot be met with the open drop ether mask.

In an attempt to solve some of these problems, particularly in anesthesia of children, the type of valve about to be described was developed. Its gradual evolution has been a composite effort, a growth from ideas of many passing through the graduate school of McGill University (2). As can be seen in the figures 1 and 2, the essential part of the simple mechanism is the thin molded rubber valve disk which is fitted securely by its center prolongation into the rubber seat (3). This provides an efficient and leakproof valvular mechanism. The inlet valve is in close proximity to a Foregger reservoir bag (2.5 liters for children, 5 liters for adults), and the exhalation valve is close to the endotracheal tube, which is essential in this method.

The advantages of such a mechanism are:

1. Carbon dioxide build-up is reduced to a minimum. In the first place, the position of the two valves prevents any rebreathing. The patient inhales only from the reservoir bag, and exhales only into the surrounding atmosphere. Secondly, dead space is cut down to the least

possible. The proximal end of the endotracheal tube is in close proximity to the exhalation valve. Almost invariably, the dead space is less than that present when a mask is used without a tube, or even when a mask is used with a tube.

2. Resistance to breathing is negligible. Because of the lightness and efficiency of the rubber valves, minimal effort is required to lift or close them. Because the valve disk is attached in the center, the patient has to lift only half the total diameter. It is commonplace to anesthetize infants 3 to 5 weeks old for one and one-half to two hours using this valve without any evidence of fatigue.

3. Artificial respiration and positive pressure-aided respirations are easily per-

formed with this valve. By placing a finger or thumb over the exhalation valve, with the other hand on the bag, one can perform artificial respiration at a moment's notice, or can manage aided or controlled respirations during intrathoracic operations.

4. The valve is mechanically sound largely owing to its simplicity. There is no chemical reaction with the inhaled gases, and the efficiency of the valve is not impaired by moisture collecting on the rubber disks. The rubber disks do not lose their resiliency quickly; one pair was in constant use for two years before replacement was necessary. The rubber disks and seatings are economical and easily replaced within the metal frame.

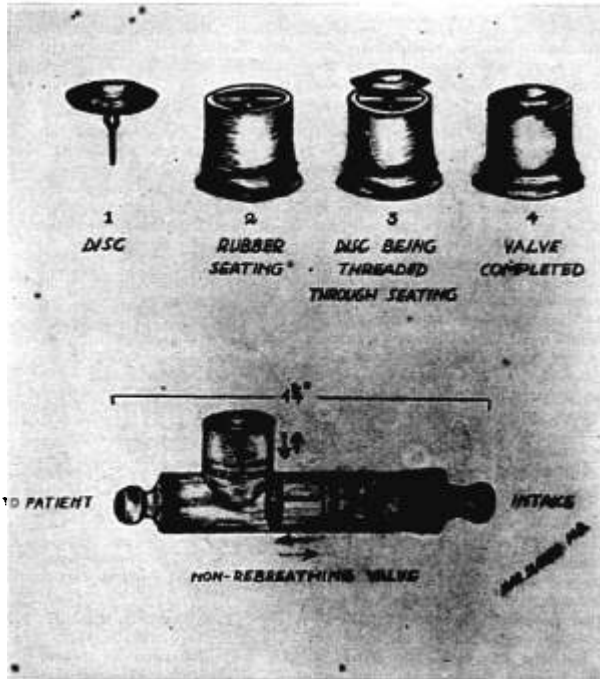


FIG. 1. Component parts of rubber valves and positions they occupy in the metal framework.

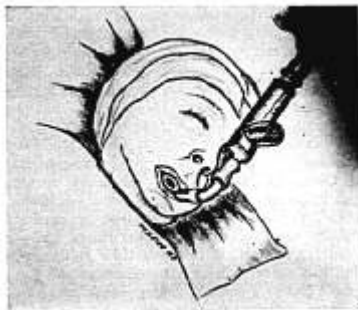


FIG. 2. Valve in actual use, with 2.5 liter bag at one end and endotracheal tube at the other end.

The disadvantages appear to be of a relative nature and, in practice, have not been important when compared with the increased well-being of the patient. These disadvantages are:

(a) Heat and water vapor are constantly being lost to the atmosphere. However, this is adequately taken care of, even in infants, if intravenous fluids are supplied and the body temperature is supported by means of hot water bottles and adequate temperature in the operating room.

(b) From the economic viewpoint, more gases are used than in a closed system. Gases are supplied in a quantity sufficient to keep the bag moderately full without being distended. A child requires from 5 to 7 liters and an adult 7 to 10 liters per minute.

This nonbreathing valve has stood the test of clinical usage. In over 1000 infants and children anesthetized with nitrous oxide, oxygen and ether, it has proved to be of great value. No child is too young for it to be beneficial. It has been used successfully in 3 children under three days of age for tracheo-esophageal operations and in one infant who weighed 10 pounds, for a two stage total pneumonectomy. The condition of children undergoing harelip, cleft palate and abdominal procedures remains close to the physiologic normal using such a technic.

It has also been used successfully in several hundred adults undergoing craniotomies for various neurosurgical pro-

cedures. Most of these operations are four to six hours in length; the longest in which it has been employed is twelve hours.

SUMMARY

A type of nonbreathing valve making use of a thin rubber disk and seat is described (4).

Its particular advantages for use in infants and children are pointed out.

Clinical usage has proved the value of a technic employing this valve.

REFERENCES

1. Dripps, R. D.: Immediate Decrease in Blood Pressure Seen at the Conclusion of Cyclopropane Anesthesia, *Cyclopropane Shock, Anesthesiology* 8: 15-35 (Jan.) 1947.
2. Particular mention should be made of M. Digby Leigh, M.D., Vancouver General Hospital, and W. V. Cone, M.D., Montreal Neurological Institute.
3. This valve and seat was designed by members of the MacIntyre Research Foundation, Ontario, for treatment of miners suffering from silicosis.
4. The valve completed for anesthetic use may be obtained by contacting the Department of Anesthesia, Children's Memorial Hospital, Montreal, Quebec, Canada.

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ENDOTRACHEAL INTUBATION

For some time now I have been increasingly annoyed, while performing oral endotracheal intubation with a Magill tube, by the lack of an adequate stilet for stiffening purposes. It is most disconcerting after a difficult exposure of the cords to be unable to direct the catheter between them for lack of control. Many previous attempts have been made to meet this need, but none have been completely satisfactory. In collaboration with Dr. Ansel Caine, I have devised and constructed the stilet described here.

It consists (fig. 1) of a metal shaft and handle. The distal end (fig. 2) spreads the tip of the tube, making it more like the shape of the laryngeal opening and also steadying it. This insures accurate directing of the tip of the tube.

The straight shaft (stiff wire, $\frac{1}{8}$ inch in diameter) and curved end facilitate intubation when the handle is held in the fingers like a pencil.

The handle is secured to the shaft by a thumb screw (fig. 3) which tightens against the flattened upper surface of the

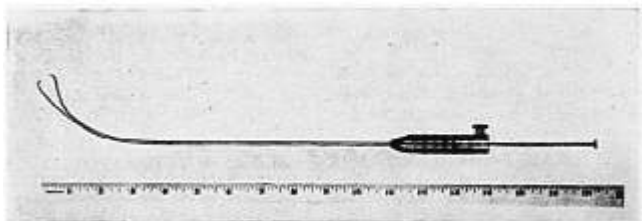


FIG. 1. Entire stilet.



FIG. 2. Close-up of bifid tip.

shaft, preventing rotation or sliding. The distal end of the handle is tapered to accommodate the proximal end of any endotracheal tube, and the plateau is milled to accommodate a metal coupling. This, too, prevents turning or wobbling of the tube.

After the tube is chosen, a lubricant is spread on the stilet tip and shaft and some placed in the proximal end of the tube. The stilet is then inserted easily into the tube, and it may be withdrawn without difficulty later.

The tube is fastened to the handle and the latter is adjusted so that the tip of the stilet is just inside the end of the tube. The thumb screw is tightened securely. The tube is lubricated and the patient intubated. The tube is then disconnected from the handle and the entire stilet withdrawn.

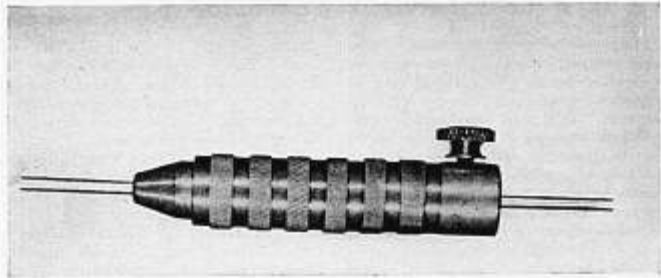


FIG. 3. Close-up of handle.

SUMMARY

Endotracheal intubation can be facilitated by the use of a stilet which will se-

curely fit into a Magill tube, thus affording accurate control during the procedure.

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GRANULOMA OF LARYNX FOLLOWING INTUBATION

Formation of a granuloma of the larynx is a rare complication of endotracheal anesthesia.

Although Griffith (1) mentions "5 or 6 benign papillomata" following intubation with "large semirigid silk tubes," a search of the literature to date reveals only 8 cases reported of granuloma of the larynx following intubation with soft Magill-type catheters.

Several features appear in these reports commonly enough to be significant. The case to be reported shares most of these features.

Almost all of the patients were intubated for comparatively long periods:

Author	Anesthesia Time
(2) Clausen	†
(3) Smiley	1 hr. 35 min.
(4) Luft	3 hrs. 45 min.
(5) Kearney	1 hr. 25 min.
(6) Gould	3 hrs. 10 min.
(7) Cohen	55 min.
(8) Barton	5 hrs.
(9) Farrior	3 hrs. 25 min.
(Present Case)	3 hrs. 40 min.

A second feature is the almost invariable location of the tumor—near the posterior

commissure, very often attached to the vocal process of the arytenoid cartilage. This is the portion of the vocal cord against which the endotracheal tube exerts pressure.

The time of onset of the outstanding symptom, hoarseness, varies from the immediate postoperative period to one month after operation. Most of the intubations were done under direct vision and most of the authors stated that there was no trauma during intubation.

In all cases the granulomas were eventually removed, with complete subsidence of symptoms. Two recurred once, but the patients were cured by a second excision. The pathologist's report in all cases was essentially similar to that for the case to be reported.

REPORT OF CASE

Miss I. D., a 54-year-old white woman, was anesthetized for laminectomy for excision of a ruptured intervertebral disk. Anesthesia was induced with cyclopropane, and the patient was intubated orally under vision without difficulty. A 35 French soft rubber catheter was used. Cyclopro-