NASO-ENDOTRACHEAL INTUBATION; ADVANTAGES AND TECHNIC OF "BLIND INTUBATION"

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CERTAIN fundamental principles seem important in blind naso-endotracheal intubation. An effort will be made in this article to enumerate and emphasize the fundamentals upon which uniform success in blind intubation depends.

Naso-endotracheal intubation was reintroduced during World War I. Two English anesthetists, I. W. Magill and E. S. Rowbotham, perfected the method while working with dual insufflation endotracheal tubes. Accidentally they found that a single large bore tube, passed transnasally, would frequently enter the glottis. They called this method of naso-endotracheal intubation "blind intubation" (1). Further development of improved endotracheal tubes, laryngoscopes, and direct oral intubation technics followed rapidly.

Two schools of thought regarding endotracheal technics developed in the United States. One group favored direct oral intubation, while the other preferred the blind method. McKesson and Clement became exponents of the blind technic, with nitrous oxide-oxygen anesthesia. Ralph M. Waters brought oral endotracheal anesthesia to full fruition by his development of the "carbon dioxide absorption" technic (2). In 1928, Waters and Guedel described the advantages of the inflatable cuff of Eisenmenger and others. The absorption technic and the inflatable cuff have become universally popular in this country (3).

The impression is inescapable that skill in direct oral intubation exists more generally than does skill in blind nasal intubation. Tyler observes that the blind technic has not been a complete success in his hands (4). An English anesthetist, J. U. Human (5), writes with enthusiasm of his methods and success with blind intubation. Prior to 1942, the personal attitude of the author was in accord with that expressed by Tyler. Experience with blind nasal intubation had proven relatively unsatisfactory and direct oral intubation had become the method of choice.

It became my good fortune to be associated with F. W. Clement, Maj., M.C., in military service. It rapidly became apparent that his claim of success in 75 per cent of the cases of blind intubation was an understatement (6). No failures were observed during an active anesthesia service of nine months' duration. The ease and simplicity with which intubations were accomplished were evident. No post-intubation sequelae were observed. Clement does not consider that sequelae occur frequently enough to be a serious consideration (7).

ADVANTAGES OF BLIND INTUBATION

The outstanding advantages of the blind method are the amazing ease and simplicity of intubation. This becomes a major consideration in military anesthesia. Essentials of anesthetic equipment as judged by civilian standards may not always be available. The shorter time required for induction and intubation is important in a press of work. The necessity for production of a deep plane of anesthesia to accomplish intubation is obviated.

DISADVANTAGES OF BLIND INTUBATION

More than considerable practice seems necessary to become adept in the method. Familiarity with direct oral intubation is an asset.

Obviously, there are cases of bilateral nasal deformities in which transnasal intubation cannot be performed. The complication of nasal bleeding will be encountered. Clement does not consider that bleeding occurs frequently enough to constitute an objection (7). The possibility of nasal hemorrhage can be minimized by observing certain details of technic. These will be described.

Upper respiratory infection obviously constitutes a contraindication to blind intubation, as does laryngeal disease.

CATHETERS

Tersely stated, the object of blind intubation is to introduce into the larynx a catheter with as large a bore as possible without trauma to nasal or laryngeal structures. The nasal passages of an average male adult will admit a catheter 12 mm. in diameter. In women, the passages accommodate a somewhat smaller tube, 10 mm. in diameter.

It is important to employ catheters having a certain degree of stiffness and yet not being rigid. Storing the catheters in a round container, 7 inches in diameter, preserves the essential curves. The type of catheter with a built-in nasal flange is preferred. The tube should be of sufficient length to extend from the nares to a point 1 or 2 cm. distal to the glottic opening.

PREPARATION FOR INTUBATION

It is advisable to determine the degree of patency of a patient's nasal passages before intubation. "Sniffing" through one nostril while the opposite one is held closed reveals the patent passage. As recommended by Magill, preliminary spraying of the nasal passages with 20 per cent cocaine solution effectively shrinks and anesthetizes the nasal mucosa. Opinions differ concerning the safety of various percentages of cocaine solutions. Jackson-Coates stated that a total dosage of 5/6 grain should never be exceeded (8). As this dose represents but one quarter of a cubic centimeter of 20 per cent solution, it is obvious that an atomizer which delivers a nebulous spray, and not coarse droplets must be employed. A few minutes should elapse between spraying and intubation. Deep inspiration during spraying carries anesthetic vapor into the oropharynx, larynx and trachea. This decreases the protective pharyngeal, laryngeal and tracheal reflexes.

Lubrication of the distal 2 inches of the catheter with an anesthetic ointment is a useful measure. The anesthetizing properties of the ointment obtund to a great extent the cough reflex resulting from a tube in the trachea. Cocaine solution can be sprayed directly into the trachea *via* the tube after intubation, if the cough reflex persists abnormally.

PREVENTION OF NASAL TRAUMA

As mentioned previously, the catheter should be small enough to pass through the nasal passage easily without the use of forceful manipulation. Gentleness in passing the tube is imperative.

Catheters are cut in such a manner that the bevel of the tip faces either to the right or left, when viewed from above with the concavity held uppermost. As the nasal conchae lie laterally, the bevel should be placed medially so as to slide smoothly along the nasal septum. Placing the bevel laterally exposes the tip of the inferior turbinate to trauma from the fenestra.

The direction of progress of the catheter must follow the anatomical floor of the nose. The tube must not be directed upward toward the vertex. Figure 5 illustrates the correct position of catheter and operator's hands on beginning intubation.

TECHNIC OF BLIND INTUBATION

Uniform success in blind intubation depends upon the exact control of four factors at the critical moment of intubation. These factors are:

1. Timing (proper plane of anesthetic level)
2. Respiratory activity (hyperpnea)
3. Respiratory phase (expiration)
4. Proper position of patient's head.

Timing is the first and without doubt, the most important single factor.—There is one critical period during the induction of anesthesia when blind nasal intubation is simplified. This favorable condition exists in the upper level of first plane of third stage anesthesia. Intubation can most easily be accomplished at this point. As Magill points out, blind intubation is easiest before relaxation occurs because the tonus of the neck muscles draws the epiglottis forward out of the line of the glottic opening (9). It is not contended that blind intubation cannot be accomplished in more profound anesthesia. It is felt that the percentage of success will be greater in light anesthesia.

Hyperpnea is the second factor essential to success. During exaggerated breathing, the glottic opening is at its maximum diameter as expiration occurs. The irritability of the larynx is reduced during hyperpnea. The hyperpneic response may be called forth by creating one or both of two physiologic conditions. The conditions are relative hypoxia and/or carbon dioxide excess.

The phase of the respiratory cycle most favorable for blind intubation is expiration. As mentioned, the reason for this is that the vocal cords are abducted most widely at this time. The protective laryngeal reflex is less active during expiration than it is during inspiration. Advance of the tube should be timed so that the tip presents in the glottis during expiration.

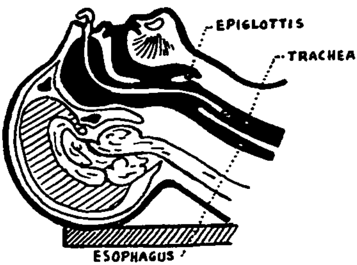

FIG. 1. Magill tube in proper position, using the intranasal intubation. Note metal elbow at proximal end of tube. This adapter is used to keep the tube from traversing into nose beyond reach for extubation. It also can be used to attach to anesthetic equipment.

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The most favorable position of the patient's head for intubation is described as "sniffing the air." Anatomically, it is produced by extension of the head at the atlanto-occipital articulation. Faulty position of the head alters the course of the catheter tip, as will be shown.

There are five incorrect locations into which the tip of the catheter can stray during attempted blind intubation. Figure 1 shows the catheter in the trachea correctly.*

Figure 2 shows the catheter tip resting on the closed glottis. It will be found that on occasion contact of the tip with the glottis produces glottic adductor spasm, preventing entrance of the tube. This condition manifests itself to the anesthetist in the following manner. The advancing tube is felt to stop abruptly and respiration either ceases or

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becomes high pitched or "squealing" in character. Active movements of deglutition may be transmitted to the tube, moving it up and down. Patient waiting without further effort toward intubation is often rewarded. Frequently with the first deep inspiration the tube is literally "inhaled" by the patient. Entrance of the tube into the glottis is usu-

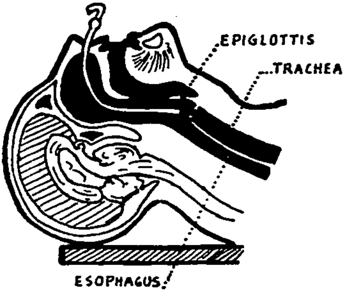

FIG. 2. The tube tip resting on the closed glottis.

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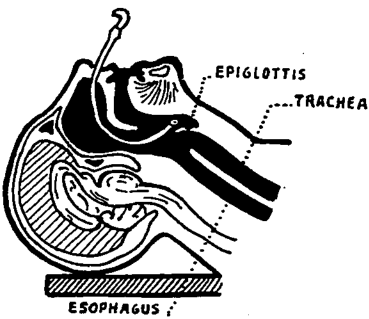

FIG. 3. The tube entering the sulcus between base of the tongue and the epiglottis.

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ally signalled by a violent explosive grunt or cough. Intubation may also be followed by a period of reflex apnea.

Figure 3 shows the tip of the tube engaged in the vallecula of the larynx. The anesthetist is informed of this event when the advancing tube abruptly meets an obstruction. Breath sounds heard through the tube are distant. Swallowing movements are not communicated to the tube. Overextension of the head or the use of a tube which is too abruptly curved is responsible. The remedy lies in the flexion of the head, slight withdrawal of the tube, and reintroduction.

Figure 4 shows the tip of the tube entering the esophagus. This condition results from the use of a tube possessing too little curve, or from excessive flexion of the head. If the tube has been introduced to its full length without entering the glottis or encountering obstruction,

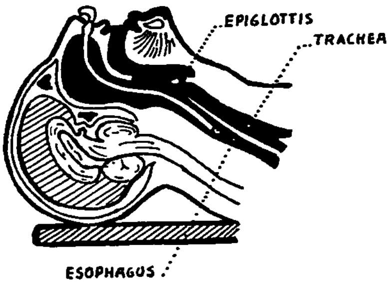

FIG. 4. This illustration demonstrates one complication, the tube in the esophagus. Reproduced through the courtesy of ANESTHESIA AND ANALGESIA 17: 304 (Nov.–Dec.) 1938.

the tip will be found in the esophagus. Breath sounds are not audible through the tube when this occurs. Moist sucking noises are heard. Frequently retching occurs. The remedy lies in withdrawal of the tube, sharp extension of the head, and reintroduction.

There are two additional possibilities of error not illustrated. The tip of the tube may deviate from the midline, and engage in either the right or left pyriform sinus. Progress of the tube stops abruptly when this occurs. Tubular breathing cannot usually be heard through the tube. The remedy lies in withdrawal, correction of the direction of the tube by rotation, and reintroduction.

BLIND INTUBATION WITH VARIOUS ANESTHETIC AGENTS

The basic principle of attempting blind intubation during light anesthesia remains unchanged during the administration of any anesthetic agent or combination of agents except pentothal sodium. The reasons for the exception will be discussed.

Obviously, blind intubation must be most rapidly accomplished during nitrous oxide-oxygen anesthesia. The propitious signs, as described by Clement, are: "vigorous automatic respiration, active eye reflexes, and anesthesia only to the point of diminishing reflexes" (7).

Human describes ideal conditions for intubation (blind) in nitrous oxide-oxygen ether sequence as follows: "Tenseness and violent breathing are the two essential requirements for successful blind intubation" (5).

FIG. 5. This drawing illustrates the manner in which "blind intubation" is started. Note position of head and curve on Magill tube.

Reproduced through the courtesy of Lea and Febiger, publishers, Nitrous Oxide Anesthesia, Clement, F. W., 1939, fig. 32, p. 173.

One or more abortive attempts at blind intubation during pentothal sodium anesthesia can result in severe glottic spasm. It is believed that intubation under direct vision is preferable in this instance. Careful and complete topical anesthesia of the pharyngeal and glottic structures are additional safeguards against glottic spasm. Full anesthetic relaxation must be obtained, and intubation accomplished with extreme gentleness.

All methods of producing hyperpnea through hypoxia must be restricted to the briefest periods. Careful observation of the patient is imperative to detect signs of deleterious effects resulting from hypoxia. Obviously hypoxia should *not* be produced in patients with hypertension, cardiac or toxic thyroid disease, or in patients depressed from shock or hemorrhage.

Hyperpnea may be otherwise produced by adding carbon dioxide to the inspired mixtures, or by retention of the patient's own carbon dioxide in the rebreathing circuit. The latter method, when properly employed, offers no element of danger.

SUMMARY AND CONCLUSIONS

1. "Blind" naso-endotracheal intubation is relatively simple in the majority of cases.
2. Spraying the nasal passage with cocaine solution a short time before intubation is advantageous.
3. The propitious moment for blind intubation is in early first plane of third stage anesthesia.
4. Four conditions must be fulfilled for uniform success in blind intubation. These are: (1) "light" anesthesia; (2) vigorous hyperpnea; (3) intubation during expiration, and (4) proper position of head in extension.
5. An acceptable degree of skill in intubating blindly can be acquired with practice and recognition of the principles involved.
6. The advantages of the blind nasal route of intubation will repay the anesthetist many times over for time expended in mastering the technic.

REFERENCES

1. Gillespie, Noel A.: Endotracheal Anaesthesia, Madison, Univ. of Wisconsin Press, 1941, p. 20.
2. Waters, R. M.: Clinical Scope and Utility of Carbon Dioxid Filtration in Inhalation Anesthesia, Anesth. & Analg. 3: 20–22, 26 (Feb.) 1924.
3. Guedel, A. E., and Waters, R. M.: A New Intratracheal Catheter, Anesth. & Analg. 7: 238–239 (July–Aug.) 1928.
4. Tyler, E. A.: Nitrous Oxide-Oxygen Anesthesia: Endotracheal Technique in Oro-Maxillofacial Surgery, Anesth. & Analg. 22: 177–179 (May–June) 1943.
5. Human, J. U.: The Secrets of Blind Intubation and the Signs of Anesthesia, London, John Bale Sons, and Curnon Ltd., 1938, p. 61.
6. Clement, F. W.: Nitrous Oxide-Oxygen Anesthesia, Philadelphia, Lea and Febiger, 1939, p. 174.
7. Clement, F. W.: Personal communications, 1943.
8. Jackson-Coates: The Nose, Throat and Ear, and their Diseases, Philadelphia, W. B. Saunders Co., 1930, p. 722.
9. Magill, I. W.: Technique in Endotracheal Anesthesia, Am. J. Surg. 34: 450–455 (Dec.) 1936.