AVERTIN

Avertin in selected cases if properly given, I believe has a very promising future. While my observations have covered only about 50 cases, for induction purposes, in the adult, I have not seen its equal. The quiet reposeful manner in which a patient glides off into that "Land of Dreams" is most gratifying to all interested parties.

In the very hysterical, apprehensive and alcoholic type of patients its use is of special value. It can easily be given as a retention enema while the patient is in bed. Using about five minutes time for injection the majority of patients cease to be concerned about themselves, and five minutes later may be transported to the operating room.

Sometimes avertin has more than a basal effect and considerable operating can be done before supplementing it with any other anesthetic; but usually the effect is analgesia and the required relaxation must be obtained with nitrous oxid—oxygen or ether. These anesthetics are preferable because of their stimulating effect, avertin being more or less a circulatory depressant.

THE INDUCTIONIST

"The wind and the waves are always on the side of the ablest navigator," and so the successful inductionist should be familiar with the symptoms of anesthesia, the effect of the agent or agents that is or are being employed, and a thorough understanding of the mechanical devices with which she is administering the anesthetic, also the necessary equipment at hand with which to maintain a free airway, and, likened to the proverbial "Oil Poured Upon the Troubled Waters" that may be used in due time to prevent minor difficulties from developing into those of major proportion, that her ship Patient may be brought to a safe landing.

She should, also, possess a natural aptitude for the work, be diligent and conscientious, abiding by the principle of the "Golden Rule."

CHAIRMAN FIFE: We have another very interesting paper on the program, "Endo-tracheal Anesthesia," by Helen Lamb, Director, Post-Graduate School of Anesthesia, Barnes Hospital, St. Louis, Missouri.

ENDO TRACHEAL INHALATION GAS OXYGEN ANESTHESIA

By Helen Lamb
Director, Post-Graduate School of Anesthesia
Barnes Hospital, St. Louis, Mo.

While the endo tracheal administration of anesthetics has only recently achieved its present high degree of popularity, it is far from a really new method, being in fact the development of a principle that has been evolving in slowly progressive steps during the past two hundred years.

As early as the 17th century experimental work was done on animals to develop a method of sustaining life during temporary periods when their normal respiration had stopped either from mechanical stoppage of the respiratory tract or as a result of failure of the respiratory center.

At that early time an experimenter named Robert Hook demonstrated a method of accomplishing this. His method consisted in blowing a
continuous stream of fresh air through the mouth, trachea and lungs of a dog — the dog's chest having been previously pierced to afford escape for the air which had been so blown into the tract. His experimental dogs were kept alive indefinitely by the mere passage of this fresh air through their pulmonary area, without the use of any respiratory movements at all.

While this man's work demonstrated clearly the fact that the usual physical movements of respiration are not in themselves actually necessary to maintenance of life, he failed to develop the principle any further; and it lay dormant for more than two centuries.

In more modern times (about thirty years ago, or in 1900, to be exact), the same principle was again touched on by a man named Nagel, who experimentally sustained life for two hours in pigeons which had been previously curarized and which were therefore without respiratory function. His method consisted in blowing a stream of air through the pigeon's humerus into its air sacs. (This route is possible in birds because of the fact that their long bones are connected with their air sacs).

Now it will be noted that while these men, Nagel and Hook, sent their experimental air stream in exactly reverse directions through the air tracts of their respective animals, they both sustained life by making use of the same principle and they both demonstrated exactly the same fact, namely, that thoracic and abdominal respiratory movements are not of themselves necessary to effect respiration, but that instead, respiration consists essentially in the exchange of gases locally in the pulmonary area, whether those gases are brought to that location by means of the usual breathing movements or by outside mechanical means.

The first practical application of this principle was made in 1909, when Meltzer and Auer experimented with it as a means of promoting artificial respiration; its appeal to them lying in its possible utility in cases where breathing had ceased (and death was supervening) as a result of pathological failure of the respiratory center.

These pioneers undertook extensive animal experiments to develop some practical method of mechanically delivering life sustaining air into the vital respiratory area and at the same time to carry away from that area the expired blood gases. This they finally accomplished by inserting a tracheal tube or catheter through the mouth, pharynx, larynx and into the trachea, through which tracheal catheter they blew a continuous stream of air under pressure deep into the respiratory tract and then caused it to escape or flow upwards and outwards along the outside of the tracheal catheter.

By this simple and direct stream of air under pressure they kept alive indefinitely dogs which had been previously curarized and which were therefore entirely without breathing function.

Having thus clearly demonstrated the effectiveness of mechanically delivering life sustaining gases into the deep respiratory area, these progressive researchers promptly recognized the probable utility of delivering anesthetic gases to that vital region in a similar way. They accordingly conducted a series of experiments anesthetizing dogs by blowing
ether vapor deep into the trachea in this same way, with such entirely successful results that their co-worker, Elsberg, in the following year (1910) experimentally used their method in anesthetizing a series of human patients who were undergoing surgery in a New York hospital. From that time on endo tracheal insufflation of ether vapor progressively developed and eventually became standard practice in many countries, for certain types of operations.

But several years of experience showed that while insufflation anesthesia was of certainly great value, it was still something short of perfect. Physiologically, it was costly of the patient’s hydration and carbon dioxide. Practically, it was wasteful and extravagant of the anesthetic gas, and, therefore, its use became largely limited to the use of ether vapor and air where non-costing air constituted 90 per cent or more of the anesthetic mixture that was used and wasted.

But experience had shown that there were definite types of surgery where the endo tracheal method of delivery was vitally desirable, but in which ether could not be used because of its irritant properties (in lung involvements, for instance), or where it could not be used because of its inflammability (where cautery was to be used). And so a problem was presented of combining the endo tracheal method of administration with the use of desired anesthetic agents such as nitrous oxide-oxygen. This was finally accomplished in the form of the method which is now known as endo tracheal inhalation.

While a technique covering this combination was developed by me in 1930, a reference to the literature shows that such a procedure in a simpler mechanical form was used experimentally by Magill of England as early as 1920.

While the practice of this method has been wider in the British Empire than in the United States, there is general agreement in both nations as to its preeminent merit for particular types of surgery, the greatest objection to its use being the considerable degree of skill which is required for the intubation or placement of the endo tracheal catheter.

Since the achievement of this skill is merely a matter of understanding the few special principles involved and then carefully and persistently practicing them, there is no reason why any well trained nurse anesthetist should fail to master this technique and to furnish her surgeons with the genuine anesthetic boon that this method affords.

That there is nothing formidable nor mysterious about the method will seem clearer if I point out that the chief difference between endo tracheal and the conventional method of administering gas anesthetics lies in the simple substitution of an endo tracheal catheter in place of the usual face mask. Excepting for this mechanical change, the methods are largely similar.

Briefly, the conduct of an endo tracheal inhalation anesthesia consists first in merely anesthetizing patient by the usual mask method, carrying him to either a moderate degree or to a deeper degree according to the length of time the anesthesia will be interrupted while the anesthetist is changing from face mask to catheter delivery.
When the patient has been carried to this predetermined degree of
narcosis, the mask is removed from face, the patient's head is extended
to the proper degree, his mouth is opened and through it an electrically
lighted laryngoscope is introduced into the pharynx, and with the tip of
the laryngoscope the epiglottis is raised, whereupon a clear view is
afforded of the glottis and of the vocal cords.

The vocal cords are seen to open upon inspiration, and to close
upon expiration. During the inspiratory period, while the cords are open,
the anesthetist passes a tracheal catheter between the vocal cords, and
down into the trachea until its distal end is within about one inch of the
tracheal bifurcation. The catheter has then reached its resting place.

Then the laryngoscope is withdrawn, the catheter is connected up
to the delivery hose of the anesthetizing machine and the flow of gases
is sent delivering deep into the trachea through the catheter. From this
point forward, the anesthetic is conducted upon regular inhalation prin-
ciples.

Now while the difference between ordinary inhalation and endo
tracheal inhalation is not great mechanically, the difference between the
two methods physiologically is extremely marked.

One has only to have struggled with a particularly difficult case, one
exhibiting recurrent respiratory interferences that do not respond to the
use of pharyngeal airway or changes in head and neck positions, or to
alterations in depth of narcosis, changes in pressures or to any of the
usual remedies, and then to change to endo tracheal administration and
have the respiratory embarrassment entirely cleared up, to realize the
great value of this method for indicated cases.

With reference to the cases in which this method is indicated, this
will vary with the anesthetist and with the types of surgery that she
comes most regularly in contact with.

While its value in mouth, nose and upper air passages is obvious, it
has been perhaps most widely used in upper abdominal and in thoracic
surgery; to which I would add my own recommendation, "for all pro-
cedures in which the patient is to be carried in the prone position."

Hewer and Griffith particularly urge it for gastric work, in which
procedures the incision is of course made at that part of the abdomen
where respiratory movements are naturally at their greatest and where
therefore it is particularly desirable to keep patient's respiratory excur-
sion within the shortest limits possible. In this connection I would point
out that endo tracheal inhalation permits anesthesia with minimum respi-
atory movements.

It is also to be remembered that in these gastric procedures surgical
traction upon diaphragmatic attachments frequently produces laryngeal
spasm, with consequent respiratory interference and a spastic operative
field. In this connection it is quite obvious that with an intact tracheal
catheter delivering oxygen and gases between the vocal cords such laryn-
geal spasm from peritoneal traction cannot occlude a patient's airway.

Endo tracheal inhalation has been recently urged for thoracic sur-
gery by Corryllos, who emphasizes the importance of securing an early
return of cough reflex to effect pus evacuation by the patient. In this regard it is to be noted that postoperative sleep is especially short following the light anesthesia that can be conducted by this method.

Graham uses the endo tracheal method routinely for all intra pleural procedures; and Arbuckle, emphasizing the importance of frequent and effective suction in these cases, commends the route of entry for the suction tube which is afforded by this deeply placed tracheal catheter.

In fact this modern method of administration has developed such a wide range of usefulness and has become so increasingly popular with leading surgeons during the past few years that no anesthetist can feel that she is doing her best work who does not include it in her armamentarium.

The method does not demand a great variety of special equipment although many helpful appliances have been developed and are available if desired. Any good anesthetizing machine may be used for it. I myself use the Metric, because of the exact control of volumes and percentages of gases which it affords and for its delivery at non-fatiguing low pressures — and yet with ample pressure always available for lung inflation if needed, and higher pressures for emergency resuscitation if called for. Incidentally the makers of that machine have devised an ingenious small breathing bag attached to a catheter expiratory valve which is especially valuable in this method of administration.

The endo tracheal catheters used are similar in shape to ordinary urethral catheters but have their opening at the extreme end, instead of at the sides. The exact size called for varies with the patient, the general rule being to use a catheter which is just slightly smaller than the size of patient’s glottis. The larger the lumen of the catheter that is used, the less interference with two way breathing through it. A silk, woven fibre type is very satisfactory, as is also Foregger’s modification of Flagg’s spiral, metal cannula. Careful investigation has demonstrated that trauma does not result from the use of these catheters when they have been properly placed.

A very valuable accessory is the Geulal and Waters inflatable cuff or balloon which when mounted around the catheter enables utter sealing off of the trachea, thus preventing the entry into trachea of blood, vomitus or other matter; and at the same time enabling the establishment of any lung inflation pressure desired. This device is in my opinion distinctly preferable to gauze packing.

And in speaking of pressure I might in passing mention my own experience that no greater positive pressure than 10 millimeters of mercury is ordinarily required for lung inflation, and that during ordinary periods of anesthetic administration pressure in the breathing bag seldom rises above one and one-half millimeters and usually averages about half that.

Now in closing this paper, I sum up the following as advantages which I see to the endo tracheal inhalation method:—

First — The assurance of a free airway at all times. This enables the anesthetist to maintain a light, even anesthesia with full oxygenation and
relaxed musculature. It permits perfect control of intra pleural pressures and affords quiet respiratory movements, both of which conditions are difficult if not impossible to govern under other methods of administration when an obstruction develops in the laryngeal area. In this connection let me remind you that the ordinary airway reaches only to the pharynx and is therefore of little value when an obstruction develops at a lower point, such as at the larynx.

Second — The trachea is protected from aspirated matter, such as blood, vomitus and other foreign substances.

Third — The non-compressible catheter reaching to the deep trachea affords direct entry to the lung area for suction of tracheal and lung exudate. It also affords a quick and very effective route to the deep vital respiratory region for artificial respiration or resuscitation in an emergency.

To offset these manifest and distinct advantages, the method presents one seeming disadvantage, this objection or disadvantage lying in the skill which must be acquired by the anesthetist in order to insert and place the tracheal catheter properly. But since this skill is easily within the reach of every ambitious anesthetist, it is to be hoped that this modern method of endo tracheal inhalation gas oxygen anesthesia will shortly become routine practice with all anesthetists, for those types of surgery to which it is particularly suited.

An active discussion developed following the technical papers, which brought forth the writers' ideas on different methods of administration.

The meeting was adjourned at 4:00 P. M.

BUSINESS SESSION

4:15 P. M.

The business session convened at 4:15 P. M. September 14, 1933, with Mrs. Gertrude L. Fife presiding.

The minutes of the organization meeting were read by Miss Dora Schmidt.

The treasurer's report was also read by Miss Dora Schmidt.

The report of the special committee formed to make contacts with the American Nurses' Association was read by Mrs. Gertrude Fife.

It was moved by Miss Anna Skully, seconded by Miss Gertrude Alexander, that all reports be accepted as read. Carried.

ELECTION OF OFFICERS: The chairman, Mrs. Gertrude Fife, appointed Miss Esther Meil and Miss Anna Willenborg to act as tellers.

Mrs. Louis Keith Boswell, chairman of the Nominating Committee, submitted the following resolution:

"Realizing that Miss Agatha Hodgins has been a great incentive to us all; and as this is the culmination of her life's work, aim and interest in us, I move that by a unanimous rising vote, we elect Miss Agatha C. Hodgins to the Honorary Presidency of the National Association of Nurse Anesthetists."

Seconded by Miss Cora McKay. Carried.

The election of officers resulted as follows: