

some slight amelioration. Blood transfusion was decided upon. Death occurred a few hours after the operation.

CASE 42. Mrs. A. G. A chill occurred the second day post partum. The febrile and septic symptoms continued to get worse for five days thereafter. When the patient was delirious and supposed to be hopeless, vaccines were requested. The first inoculation was followed by some amelioration of symptoms. Operation had already been decided upon and was performed on the 15th. Following this all symptoms steadily increased in severity and despite autogenous vaccines death occurred on the 22d.

CASE 43. Mrs. P. This patient was seen in her home, where she was considered to be beyond hope of recovery by a skilled consultant. Cultures showed streptococcus. Vaccines were given at intervals of three days and were followed by a slow but steady recovery.

CASE 44. Mrs. H. K. was delivered May 14, a breech presentation necessitating the use of forceps. Three days later chills and fever began and continued. Was admitted at the M. H. H. May 20 with temperature of 105° and pulse above 120. Curettage was performed as an almost hopeless procedure. Vaccines were begun the following evening and were continued for four days but without apparent effect after the second day, death occurring on the 30th. The only result here was a possible prolongation of life as there seemed to be a slight response from the first two inoculations.

CASE 45. Mrs. E. L. Delivered July 21 at home. Breech presentation—forceps. Child stillborn. On account of fever and chills was curetted by her physician July 28. Admitted to M. H. H. Aug. 2 with temperature of 100° F., and pulse 136, delirious and restless. One inoculation was given without apparent effect. Death occurred the following morning.

CASE 46. Mrs. D. Patient delivered Dec. 21. Pains in lower abdomen on the 25th, steadily increasing in severity. Streptococci were found in the uterus. On the 28th blood showed: Leucocytes, 12,000; neutrophils, 97%. She was practically moribund when the first inoculation was given. At first there was a distinct amelioration of symptoms, but this proved to be merely temporary, death occurring in about three days.

CASE 47. Mrs. B. A Russian who could not speak English. Admitted to the M. H. H. on Jan. 17. No history obtainable. On admission was moribund and showed a large, tender uterus, from the cavity of which were washed shreds of necrotic tissue. Not benefited by any method of treatment. Death occurred within a few hours of the first inoculation.

CASE 48. Mrs. A. G. This woman had been sick with the disease for five weeks prior to her admission into the hospital. She was practically moribund when admitted. Vaccines seemed to render some increased resistance and to give rise to slight temporary amelioration. Death occurred ten days later.

CASE 49. Mrs. B. A criminal abortion was performed a few days prior to admission into the M. H. H., March 30. She was found to have general peritonitis; also a uterus much enlarged and boggy. Uterine irrigation was attempted, but without result. On April 1 a single inoculation was given a few hours prior to death, but without apparent effect.

CASE 50. Mrs. J. G. This woman had high forceps delivery March 31. Admitted to M. H. H. April 3 in a semi-moribund state, when, after examination, it was decided that nothing could be done. Vomiting was almost continuous and the patient was evidently in much pain. Blood on the 5th showed: Leucocytes, 14,000; neutrophils, 95%. Death occurred the same day, no effect of the inoculation being apparent.

INTRATHORACIC INSUFFLATION ANESTHESIA: APPARATUS AND CASES.*

BY ALBERT EHRENFRIED, M.D.,

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SURGERY of the thorax is to-day passing through the same phase in its development that characterized abdominal surgery of thirty or forty years ago. Until recently the thoracic cavity was, to the surgeon, unexplored territory. Intervention was restricted to the use of the needle for exploratory purposes and for aspirating the pleural and pericardial sacs, to thoracostomy and rib resection for drainage of empyemata, and to occasional thoracoplasties. In rare instances adventurous souls had overstepped these limits, but without assurance. Within the past few years, however, a small group of pioneers have blazed a trail into this unknown land.

In abdominal surgery the main problem which confronted the experimenter was the providing against sepsis. Our technic has now encompassed that, and we face the strange difficulties of thoracic surgery with greater confidence. The first major problem, the control of the pressure within the lungs during operation, has already been satisfactorily solved, and it is of the methods of preventing collapse of the lung that I wish to speak.

The danger of pneumothorax after perforation of the parietal pleura has always stood as the greatest obstacle to the advancement of intrathoracic surgery. In so great awe has it been held that men like Bardeleben, Roser and Bilioth advised strongly against taking any risk of damaging the pleura in removing tumors of the chest wall. Krause and Tuffier originated the method of detaching the pleura and conducting exploration extrapleurally. Bazy made a small incision in the pleura and immediately plugged it with his exploring finger. Sencert tried to meet the danger by admitting the air gradually through a small puncture. Delorme advised the formation of adhesions between visceral and parietal pleura by the injection of a chemical irritant some time previous to operation. Pean and Roux incised the pleura, seized immediately the retreating lung and sewed it to the chest wall to prevent complete atelectasis; and so on.

Physiologists had long been aware that animals could be kept alive by blowing air into the lungs, if provision were made for its exit. On this basis had been constructed many appliances for the insufflation of air in asphyxiated persons. Some depended on intralaryngeal tubes; some on tracheotomy canulæ, made of metal, rubber or leather. Some had a simple bellows, others had compound bellows for alternately injecting and aspirating the air, which, in some of the apparatus, was warmed. Applying this principle to experimental lung surgery, Tuffier (1897) found that the lung could be kept inflated with the chest opened, and the intrabronchial pressure regulated, by insufflation through an intra-

* Read before a clinical meeting of the staff of the Mount Sinai Hospital, March 15, 1911.

laryngeal tube. Quénu accomplished the same results with a helmet or box, containing air under pressure, into which the animal's head was placed. Then Kuhn and Lotsch devised the double tube, which allowed for the back-flow of the insufflated air. Soon after, Volhard, Hirsch, Sollman and Robinson demonstrated that oxygenation of the blood could be maintained without inflation of the lungs by supplying a constant stream of oxygen directly at the bifurcation of the bronchi.

Matas, of New Orleans, was one of the first to apply the principle of insufflation to human surgery. With Bloom, he modified the Fell-O'Dwyer apparatus for intermittent intralaryngeal insufflation by adding a pressure manometer, air filter and provisions for supplying chloroform vapor or oxygen to the air. This apparatus was successfully applied by Parham in a case of sarcoma of the chest wall (1898). About the same time Doyen devised an apparatus, differing mainly in that it had a double-acting pump. This form of artificial respiration, useful, indeed, in an emergency, has not been found practicable for continued anesthesia with the thorax open.

The first important step in the advancement of human lung surgery was the introduction of the negative pressure chamber of Sauerbruch. He discarded the idea of inflating the lung by positive pressure within in favor of maintaining a negative pressure without. His cabinet was a room,—to which he added later a lock chamber for entrance and exit,—within which the surgeon and his assistants worked upon the patient, whose head was outside. The air within the chamber was maintained at a negative pressure of about 5 mm. of mercury by means of an electric pump. The patient was isolated against the negative pressure, except for his thorax, by means of a rubber collar about his neck, where his head was thrust through the window, and a rubber bag tied about the waist and enclosing the lower half of the body, connecting with the outside air. Communication with those without was by telephone.

From the first operation upon a human being in Sauerbruch's cabinet (performed by Mikulicz in 1904) dates the new era in thoracic surgery. The principle was adopted without reserve, cabinets were built in several institutions and operations were performed which a few years before had been deemed impossible, such operations as resection of the lung for tumors and bronchiectasis, exploration of the lung and mediastina, resection of the esophagus for carcinoma.

Under the stimulus of this new interest, means were sought to render the procedure more simple and thus more widely applicable, for the apparatus of Sauerbruch was both costly and cumbersome. Brauer found in his experiments that the original method of maintaining distention of the lung by means of positive pressure was less complicated and equally efficient. He accomplished this by placing the anesthetist and the patient's head within a cabinet, into which air was pumped under pressure, the operation being performed in the open room. Later the apparatus was

further simplified into a box or helmet containing the head of the patient and the hands of the anesthetist, and now positive pressure is usually applied by means of a mask which sets down over the patient's face.

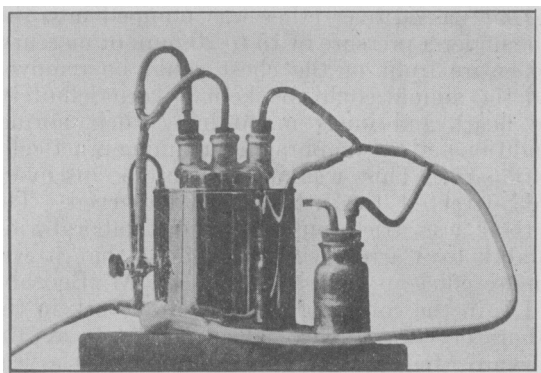
At first there was some hesitancy about accepting the positive pressure method from suspicion that it might have some deleterious effect upon the lung tissue, but Dreyer and Spannaus showed by their experimental investigations that physiologically there was no difference between positive and negative pressure in their effects. Willy Meyer, of New York, and Robinson, of Boston, have combined the advantages of the two methods in so-called "differential" cabinets adaptable for work under either positive or negative pressure. Otherwise, the positive pressure method is now generally favored.

Two years ago, Meltzer and Auer, working in the Rockefeller Institute, found that if a tube about two thirds the diameter of the trachea was passed nearly to the bifurcation of the bronchi, and air passed over ether was pumped into this tube under a pressure of 15 to 20 mm. of mercury, the entire front of the chest could be removed and the animal could be kept alive indefinitely, the heart and lungs maintaining their normal condition and the diaphragm remaining practically stationary. This was a momentous discovery and attracted the attention it deserved. The method was tried out in various laboratories, notably by Carrel, who announced that it was simple, efficient and safe. Dr. W. M. Boothby and I, in the course of experimental work in the Laboratory for Physiological Research at the Harvard Medical School, took it up about a year ago and were so favorably impressed with its advantages as to simplicity and safety over the cone method of anesthesia that we have adopted it as a routine in all animal operations, with a distinct lowering of mortality.

The adaptability of this technic to the human being was at once apparent. Elsberg, of New York, soon had an apparatus ready which was fitted for this use, and within a few months he anesthetized the first case by this method, a patient of Dr. Lilienthal's, with lung abscess. Last month he reported a total of thirty cases and described his perfected apparatus.

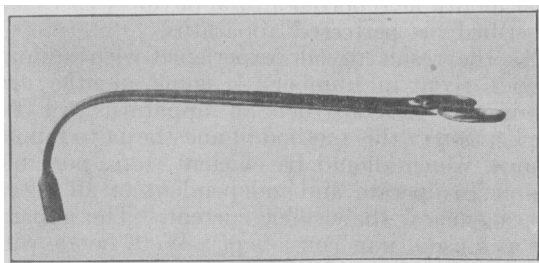
As the result of our experience with animals (about sixty in number) I, some months ago, attempted to construct an apparatus for the application of this method of anesthesia to human beings, which should be efficient, safe, portable, simple to operate and independent of all accessories, such as the electric current. The apparatus as I use it now consists of a Wolff bottle with three necks, sitting within a copper water jacket, and a foot bellows. By means of cocks on the outside of the jacket, the stream of air from the bellows can be carried through the hot water, over the top of the ether (contained in the Wolff bottle), or through the ether when a particularly strong vapor is desired. Air and ether vapor may be mixed in any proportion. Connected with the delivery end of the apparatus is a safety valve

and pressure regulator consisting of a bottle of mercury into which a tube is plunged. The depth of the tube in the mercury, which is adjustable, represents the maximum of pressure which is allowed within the apparatus; if for any reason, such as a spasm of the glottis, the pressure should rise, the valve "blows off" automatically and danger from interstitial emphysema is avoided. In our early experience we employed a dial manometer registering in millimeters of mercury, to record the pressure, but we have found that the pressure bottle answers as well for all practical purposes. The apparatus is provided with a device to prevent droplets of condensed ether being carried over into the larynx. The air or mixture is supplied at a practically constant temperature of about ten degrees above room temperature; if the operation is to last over half or three quarters of an hour, the contents of the water jacket should be replaced. The air supplied may be filtered and moistened.



Apparatus for intratracheal insufflation anesthesia.

For an intratracheal tube we use a French lisle catheter, 22 to 24 F., moistened in hot water to render it pliable, a new and sterile one for each case. Soft rubber tubes have the advantage of standing sterilization by boiling better, but they are less easy to introduce. The chief difficulty with this method of anesthesia so far has been the introduction of the tube. We now use a simple



Introducer, for the introduction of the tube into the larynx.

introducer, a laryngeal forceps with sleeves attached for grasping the tube near its extremity, similar in principle to the introducer of Doyen. After considerable pains to produce the proper curve, — working on frozen sections and cadavers, — we have made an instrument which can

be guided into the larynx in a matter of seconds, with the mouth gag in place and the left forefinger on the epiglottis, without the necessity of using a head mirror or electric illumination, or changing the patient on the table to and from the Rose position, as is necessary with the direct laryngoscope.

I have tried this apparatus now four times on human beings, as follows:

CASE I. Feb. 21. Patient of Dr. W. M. Boothby. Interscapulothoracic amputation. Ether, Dr. H. B. Loder. I introduced the tube on a stylet, properly curved. After some minutes it became evident that tube was in esophagus, and tube was removed, and no attempt made to reintroduce it. Recovery without complication.

CASE II. Feb. 28, Boston Consumptives' Hospital. Tuberculous synovitis forearm, necrosis skull. Ether, Dr. H. B. Loder. Patient given preliminary ether with difficulty, choking up with mucus to the point of cyanosis. Tube introduced readily with electrically illuminated Chevalier Jackson direct laryngoscope. Patient immediately became quiet, color improved, mucus disappeared and an easy anesthesia of one hour twenty minutes was maintained on 5 oz. of ether. The apparatus demonstrated how lightly anesthetized the patient could be kept and how effectively and quickly the grade of anesthesia could be controlled by means of the cocks. At the end of the operation ether vapor was blown out of the lungs by blowing in fresh air until no odor remained on the breath. Patient waked immediately to nearly full consciousness and suffered no nausea or vomiting. Patient doing well and no complication or untoward effect traceable to the etherization has developed.

CASE III. March 1, Boston Consumptives' Hospital. Massive empyema of long standing, cyanosis. Ether, Dr. Loder. The laryngoscope was in place when the lamp burned out. On account of extremely poor condition of patient, no further attempt made. Patient doing well.

CASE IV. A case of chronic empyema (Boston Consumptives' Hospital) several times previously operated, upon whom I did a radical and extensive thoracoplasty this morning (March 15). Ether, Dr. Boothby. The tube was readily introduced by means of the introducer already described. Condition was excellent throughout an etherization of one hour twenty-five minutes. Anesthesia quiet, without mucus and, although lying upon side of sound lung, no cyanosis. Gentle and rapid recovery, without nausea. Seven ounces of ether used.

The advantages of the method are apparent, even with so limited an experience. The air passages are kept dry of mucus, and inhalation of mucus, blood or vomitus is prevented by the return current of air about the tube. The anesthesia can be run at low pressure until occasion calls for higher, and after the occasion is passed it can again be lowered. The respiratory rate is an index to the amount of pressure. There are no bands of elastic constriction about neck or abdomen, and the anesthetist has free access to the patient's face and mouth without interfering with the pressure. No more ether is used than is needed within the lung; the ether vapor is washed out with air as soon as the anesthesia is over, and, therefore, recovery is rapid; the chance of excess ether or ether-laden mucus getting into the stomach is slight, accord-

ingly, recovery is gentle. The operator works under normal conditions, and his field is not limited by apparatus; the anesthetist may remain at some distance from the patient. There is no danger of the glottis falling back and closing the trachea. If the heart stops beating from any cause, the most efficient form of artificial respiration apparatus is immediately at hand. The apparatus is not complicated by machinery and requires no expert; with it there is no danger of overpressure.

This form of anesthesia has a wide scope of application outside of the field for which it was originally designed. In operations upon the face, mouth and neck it has obvious advantages. The operating field is unobstructed. Run at a low pressure, it will insure adequate ventilation of the lungs and obviate the possibility of aspiration of mucus or blood and thus lessen the frequency of secondary pneumonia following face and mouth operations in the elderly. Green reported a successful excision of epithelioma of the nose under its use, and Lilienthal has stated its advantages in cases of intestinal obstruction, obviating the danger of drowning in fecal vomitus, or of secondary pneumonia from the inhalation of septic matter. The apparatus is inexpensive and is adaptable for any form of vapor anesthesia, such as rectal ether, vapor-mask anesthesia, intra-oral vapor anesthesia and anesthesia through a tracheotomy opening (as for excision of the larynx). Complete with foot-bellows, it packs readily into a small suit case, and can be easily carried.

The apparatus as it stands represents a total expense of about twenty-five dollars. For about the same sum, one can add the inessential luxuries of an electric motor (one-eighth horse-power), rheostat and blower with a regulating by-pass to carry off the excess of air, to replace the foot-bellows, as well as some electric device for maintaining heat, — either an incandescent bulb within the water tank or a heating coil about the delivery tube. These are, however, unnecessary; they constitute an added complication and are advisable only where the apparatus is to be permanently installed, or where one is sure of having at his disposal the proper current.

THE EXTIRPATION OF THE TONSIL BY ENUCLEATION: PARTLY INSTRUMENTAL, PARTLY BY THE USE OF THE FINGER.

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HISTORICALLY, the method described herein is an old one. Too far back in the history of medicine has this operation been done for any one of the present day to claim originality in using it. The method is new only in its modifications, one of which is here briefly considered.

It is of interest to note that, so far as we know, the finger method was employed before any other tonsil operation. In the year A.D. 10, Celsus described a method of enucleation thus:

“Tonsils . . . should be loosened by working the finger around them and then torn out; but when this is not practicable, they should be seized by a hook and excised with a scalpel.”

From the time of Celsus to that of the most recent, literature makes no mention of the finger method. However, other forms of completing the tonsillectomy with forceps and bistoury are given from the earliest times. The use of the cold wire snare to complete the enucleation is not mentioned until late in the nineteenth century; but, what might, in a measure, be compared to it, is the employment, in early times, of the ligature before cutting off the freed tonsil. Ambrose Paré, 1509, mentions the ligature of hypertrophied portions of the tonsil, but does not advise excision. His pupil Guillemeau speaks of excision of portions after ligature but does not advocate the removal of the tonsil entire. After the ligature method had fallen into comparative disuse for nearly a century, it reappeared, after 1740, under the influence of Wiseman, whose method was to ligature portions and then to excise. Since then it has become one of the recognized surgical procedures.

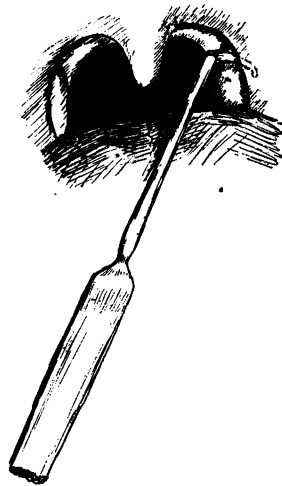


FIG. 1.

The purpose of this paper is to demonstrate the superiority over others of the finger method when combined with some of the present-day means for accomplishing tonsillectomy. The advantages in the use of this method have been found to be: the easy and quick separation of the tonsil from its bed; the ability to palpate with the finger behind the tonsil an abnormally large or malplaced artery; and the minimized chances of hemorrhage. The only disadvantage which this method may have is the somewhat slower healing observed in cases where the traumatism of blunt finger dissection between the tonsil and the soft palate structures has been more severe than usual. But with experience and care this condition may be forestalled.

The armamentarium consists of a mouth gag, one tonsil tenaculum, a tongue depressor, two Leland knives, — one right, one left, — one double-