

## ENDOTRACHEAL ANESTHESIA FOR EXTERNAL LARYNGEAL SURGERY \*

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GENERAL anesthesia has several advantages over local anesthesia for external laryngeal operations. The patient is relieved of strain and discomfort during the operation; the surgeon can work more satisfactorily with less trouble from movement and coughing by the patient. These advantages have been offset by the danger of respiratory obstruction during general anesthesia and in some cases by the awkwardness of having the anesthetist's apparatus in the operative field. Endotracheal anesthesia provides a technic which completely eliminates these objections and has several additional advantages over other methods.

It is a strange circumstance that although the use of endotracheal anesthesia for this type of surgery is not new, it is by no means generally applied. As noted by Gillespie (1) the first use of endotracheal anesthesia as we know it at the present day was by William MacEwen of Glasgow in 1880 for the removal of an extensive malignant growth at the base of the tongue. The further development of the endotracheal technic by Franz Kühn of Germany about the beginning of this century was "to provide the solution to the problem of anesthesia in operations upon the upper air passages by bringing the air in the trachea into direct contact with the outside air."

In the recent literature we find very divergent methods of anesthesia advocated for external laryngeal surgery. King (2), describing a new function-restoring operation for bilateral abductor paralysis of the cords, concluded after one alarming experience that inhalation anesthesia was dangerous and unsatisfactory. He advised a preliminary tracheotomy and the use of pentothal anesthesia for the cord operation. Seed (3), discussing the King operation, supported King's method and said, "Inhalation anesthesia would be difficult and local anesthesia would not abolish movements of the throat and larynx."

Kelly (3), reporting on extralaryngeal arytenoidectomy, recommended either local or general anesthesia, depending on the preference of the surgeon and patient. He stated, "General anesthesia is given through the tracheotomy tube. If the patient is not wearing a tracheotomy tube, a tracheotomy should be performed under local anesthesia."

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before starting the general anesthesia. . . . An intratracheal tube (Flagg) may be used to fix the arytenoid cartilage, but this is not necessary and, if it is used, more care must be exercised to prevent injury and rupture of the intralaryngeal mucous membrane (with the scissors)."

Wright (5) varies the Kelly technic somewhat. He said, "tracheotomy should be performed if this has not been performed previously. Intratracheal ether has been found to be the most suitable using a Flagg intratracheal tube size 5 to 7 mm. The intratracheal tube aids in fixing the arytenoid cartilage while it is being dissected and does not interfere with the field of operation. Anesthesia may be started through the tracheotomy tube and the intratracheal cannula inserted after anesthesia is complete. The tracheotomy tube is then removed. . . . When the arytenoid has been removed the intratracheal cannula is withdrawn and the larynx exposed with a direct laryngoscope. With an associate grasping the posterior extremity of the cord through the (operative) window, the excursions made by movement of the cord can be readily visualized. In this way the degree of abduction of the cord and the resulting improved glottic space can be easily determined."

For laryngofissure operations Lewis (6) uses endotracheal anesthesia.

Equen *et al.* (7), discussing laryngectomy for carcinoma, states, "We use sodium pentothal as an anesthetic. The tongue must be kept free and oxygen constantly administered. We have had no complications with this anesthetic."

Recently Browne (8) has described a technic of anesthesia for laryngectomy in which an orotracheal tube is used during the first part of the operation. This may be passed after general anesthesia has been established or may be passed under topical anesthesia before general anesthesia is induced. When the surgeon has freed the larynx the trachea is opened and a fresh endotracheal tube inserted through the surgical wound and passed under the drapes to the anesthetist for the continuance of the anesthesia.

It is evident from these references that the technic of anesthesia for external laryngeal surgery has not become uniform and that the advantages of general anesthesia and particularly of the endotracheal technic are not being recognized by all who are doing these operations.

On casual consideration it might seem that by the use of intravenous or rectal anesthesia the anesthetist could avoid encroaching on the surgical field. Whenever there is the problem of respiratory obstruction, however, the anesthetist must have access to the airway. Cooperation rather than competition between anesthetist and surgeon in handling the airway can be accomplished to the satisfaction of both by the use of the endotracheal technic.

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The several advantages of this type of anesthesia are presented as follows:

1. *A safe airway is immediately established and maintained throughout the operation.* The introduction of a rubber (Magill) tube between the cords permits good air exchange in spite of moderate compression which may be produced by the tumor or other process for which the operation is being performed. If the lesion is rigid, an Anode tube, whose lumen is maintained by a fine wire coil, is used. A Flagg or Woodbridge tube should be used only if the lesion prevents the insertion of the softer Magill type. Such establishment and maintenance of the airway eliminates the need of some emergency tracheotomies which might otherwise be necessary during the operative procedure; in other instances the tracheotomy may be postponed until the most favorable time, surgically, if the tracheotomy is considered necessary for the postoperative care of the patient.

2. *Contamination of the tracheobronchial tree by secretions and blood is prevented.* The inflation of a cuff on an endotracheal tube once the tube is in place, establishes a water-and-air-tight seal around the endotracheal tube which will not allow mucus or blood to enter the trachea beyond the cuff. There are several advantages to this point. It means that the cough reflex may safely be abolished to permit operation uninterrupted by coughing paroxysms. When such operations as laryngectomy are done with local or other types of general anesthesia, they are always complicated by the fact that the operative team is responsible for the airway and the tracheal toilet. With endotracheal anesthesia this responsibility is taken entirely away from the operator and his field.

3. *Pulmonary secretions may readily be aspirated at any time without disturbing the operation.* Small aspirating catheters may be introduced into the trachea through the endotracheal tube at any time. This compensates for the abolition of the cough reflex and keeps the field clear of contaminating secretions.

4. *The anesthetist and all apparatus are out of the field.* The elimination of the tracheotomy tube or the open trachea during such operative procedures as laryngectomy keeps the field clear of everything but the single tube leading from under the sterile drapes into the trachea. Aspirators, tracheotomy tapes, and so forth are eliminated.

The anesthetic may be introduced into the trachea by three different routes depending on circumstances.

1. An endotracheal tube may be inserted through the larynx in the usual manner, using either the nasal or the oral route. Since it is usually preferable to use a tube with an inflatable cuff the oral route is most satisfactory.

2. If the patient already has a tracheotomy this opening may be used for the introduction of the anesthetic agent. The anesthetic may

be administered by an open technic (open drop) or a closed system may be attached. One simple way is to attach the breathing apparatus to the inner tube of the tracheotomy set. A piece of rubber tubing about 2.5 cm. long and just large enough to stretch over the flange on the inner tube is used. Two small punctures are made on opposite sides of the rubber tube and about 0.3 cm. from the end. The lugs on the sides of the inner tracheotomy tube are passed through the holes and the end of the rubber tube is fitted over the flange. To the other end of the rubber tube is fitted a metal elbow connected to the breathing apparatus. This method, though useful in some cases, especially for induction of anesthesia, has the disadvantage that there may be considerable leakage of gas and also drainage of blood and secretions into the trachea. An alternative method is to remove the tracheotomy tube and introduce a suitable endotracheal tube with a cuff through the tracheostomy. A small Anode tube with its great flexibility is most useful because it can be bent sharply from the tracheostomy and carried downward over the patient's chest to the anesthesia apparatus. The sterile drapes may then cover the chest and neck to a point above the tracheostomy. Since the insertion of the tube into the tracheostomy may be painful or may stimulate coughing, it may be done after general anesthesia has been established by an open technic or in the conscious patient if a little 2 per cent pontocaine is first sprayed into the opening.

3. In cases of laryngectomy an orotracheal tube may be utilized during the early part of the operation as described by Browne (8) followed later by insertion of another tube into the newly made tracheostomy. As soon as the orotracheal tube is inserted, the patient is completely free of any dyspnea he may have had, and the entire larynx may be skeletonized without the need for a too early opening of the airway. When the trachea is to be opened, slightly deeper anesthesia is established and the usual opening is made through the cricothyroid membrane, or between the cricoid and first tracheal ring. The upper endotracheal tube is then removed through the mouth and the surgeon inserts a sterile tube, with a cuff, into the trachea through the incision. This is led directly below the sterile drapes to the anesthetist who may immediately attach it to his equipment and continue the anesthetic. Inflation of the cuff prevents the drainage of blood into the trachea and eliminates the coughing and constant use of a tracheal aspirator by an assistant. Aspirations of tracheal and bronchial secretions are constantly maintained by the anesthetist. A suction catheter may also be inserted through the mouth into the pharynx to keep it free from blood.

Emphasis on the advantages of endotracheal technics for laryngeal and tracheal surgery is seen in the recent widespread use of the bronchoscope or Mosher life-saver used to establish an airway for an emergency tracheotomy. While in neither instance are these instru-

ments used to administer an anesthetic, the fact that their introduction changes an emergency tracheotomy to a tranquil one illustrates the efficiency of this type of airway. This technic is especially successful in children since frequently the trachea is difficult to locate in cases of severe dyspnea, and the open, rigid airway serves as an easily palpable guide. In one case under our observation the anesthetist introduced a rubber endotracheal tube to relieve an emergency respiratory obstruction which followed the removal of a cerebellar tumor. This airway was tolerated more comfortably by the patient than either bronchoscope or a life-saver tube would have been, and its introduction obviated the necessity of doing a hasty tracheotomy in the child's room rather than taking him calmly to the operating room.

Endotracheal anesthesia eliminated the need of a tracheotomy in another of our cases. This patient had a large chondroma of the larynx (9) which caused sufficient obstruction to make any type of operative procedure hazardous without a tracheotomy. However, the endotracheal tube gave a sufficiently good airway so that the entire tumor could be removed, leaving the larynx resutured in its normal contour.

The use of endotracheal anesthesia in operative procedures designed to restore the airway in bilateral recurrent laryngeal paralysis such as that devised by King, presents several advantages. Anesthesia may be begun through the tracheotomy tube or by rectum, and, after the endotracheal tube is inserted through the mouth, the tracheotomy tube may be removed for the entire operative procedure. Thus the field is kept free of secretions, the need of keeping an assistant busy aspirating is eliminated since this is done through the mouth, and the field is free of the tracheotomy tube and tapes. In addition, the arytenoid is carried farther laterally by the tube itself. The larynx may be inspected from time to time with a direct laryngoscope, as is the custom in this operative procedure, by removing the endotracheal tube for a few moments and reinserting it.

With the use of a Magill tube during these operations we have noted any tendency to damage the intralaryngeal mucous membrane as described by Kelly. The difference may lie in the type of endotracheal tube used; the Flagg tube used by Kelly is metal and therefore rigid compared with the rubber Magill tube.

In all such procedures the smoothness and success with which they are carried out will depend largely on proper understanding between surgeon and anesthetist. The procedure must be planned in advance. The anesthetist must understand the requirements of the surgeon and the several stages of the operation. The surgeon must anticipate whatever steps he must take in collaborating with the anesthetist. When such cooperation is achieved the result will be found very gratifying to all concerned.

## SUMMARY

The use of general anesthesia by the endotracheal technic for external laryngeal operations is recommended. Technics of anesthesia for this type of surgery, as described in the literature, vary greatly and few emphasize the advantages of endotracheal anesthesia. Its advantages include: (1) establishment of a safe airway, (2) prevention of contamination of the tracheobronchial tree, (3) easy removal of pulmonary secretions by a route other than through the surgical field and (4) removal of the anesthetist and all apparatus out of the surgical field.

Several technics of administration are described. Success depends on proper planning in advance and complete understanding between surgeon and anesthetist.

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Our Section in the American Medical Association is young and therefore it is important that attention be directed as soon as possible to the fact that a good program requires that many papers be submitted for consideration. The more papers that are submitted to the Secretary the better the program. A joint meeting of our Section will be held with the Section on Orthopedic Surgery, and papers bearing upon anesthesia and orthopedic surgery are particularly desired. Exhibits, with or without papers, are also called for. It is hoped that our membership will submit possible presentations as soon as possible to the Secretary of the Section, Dr. John S. Lundy, 102 Second Avenue, S.W., Rochester, Minnesota. The final deadline for accepting papers is January 15, 1945. Dr. Urban H. Eversole, Lahey Clinic, Boston, Massachusetts, is section representative to the scientific exhibits.