deep recesses which might prevent the thorough curetting of the cavity. Upon this thorough curetting depends the success of the operating procedure. The transverse septa present should be broken down until one large cavity is obtained, and under no conditions is the external opening to be made larger than the tip of the forefinger, and in some cases smaller. Of course this opening is made above the brow and does not involve the orbital ridge. In some cases, one of which is illustrated by a plate I shall show you to-night, the frontal sinus has been so large that it projected over the eye to the opposite side, yet it has been successfully curetted from one opening.

Where there is an orbital cellulitis present, the orbital abscess is opened as a second procedure by a separate incision, usually in the most prominent point of the orbital swelling. In special cases the opening has been through the lid and a drainage tube passed through the lid and kept in for five or six days, leaving no scar which could bother the patient in the future.

Just to briefly state the conclusions which I have derived from my own operations.

First, in acute frontal infections, in mild cases, the use of the ice-bag over the sinus and an adrenalin spray is all that is necessary. In severer cases the patient should in addition be anesthetized and the middle turbinate or at least the anterior portion removed. I do not believe this should be attempted without anesthesia, as it is extremely painful under cocaine. The nose should not be packed.

Secondly, in chronic disease of the frontal sinus, and in all cases where the infection involves merely the frontal sinus and anterior ethmoidal region, with perhaps the antrum of Highmore filled with pus by drainage, the simple type of operation that I have been describing to-night should be performed, the antrum being in addition opened with a trocar and washed out at the time of operation. The best trocar for this is perhaps the hollow one devised by Dr. Tobey of the Massachusetts Eye and Ear Infirmary, by which you can, with the same instrument, puncture the antrum and wash it out as one process.

In chronic cases, where the frontal sinus disease is accompanied by an orbital abscess, and where the infection is through the floor of the sinus, the same operative procedure will be the best, combined with a simple opening of the orbital swelling. In all cases where there is caries of the ethmoidal plate of the orbit, or the sphenoidal sinus or posterior ethmoidal region is involved, the Killian type of operation will be the best one, — certainly in all hospital cases. I think by the use of this operation there will be slightly more external deformity, although not enough to make this a factor in making the decision.

As to complications, I have been so extremely fortunate as never to have seen a case of leptomeningitis follow any type of sinus or nasal operation. This is probably largely good luck, but I do think that a good deal of trouble can be avoided by not packing the nose at all and

not packing the sinus too tightly. Too tight a packing undoubtedly interferes with the natural channel for drainage.

Sepsis has been my only trouble. I have seen well-marked septicæmia several times for a number of days following an operation, but never except where it existed prior to the operation. It is quite common to see a good deal of edema of the brow and whole side of the face on the second or third day, but this has no significance. I never had any one complain of the deformity resulting from the operation, it has been practically nil. As far as I know, in something like seventy-five cases, a secondary operation has only been performed in three cases. Once I think the second operation was unnecessary, once there was an infection of the periosteum frontal bone evidently from pus getting under it at the time of operation. The sinus in this case did not have to be reopened, but this infection caused more pain than the original sinus abscess.

I also have one case, that of a physician operated upon for the relief of chronic trouble, in whom the supra-orbital nerve became involved in the scar tissue. I dissected the neuroma out, and found that the sinus was filled tight with fibrous tissue.

LARYNGOTOMY AND LARYNGECTOMY FOR CANCER WITH REPORT OF FOUR CASES.*

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PREVIOUS to the year 1888 radical operations on the larynx for malignant growths were justly to be regarded as among the most dangerous of surgical operations. As shown by the tables of Sendziak,¹ the mortality up to that time from the operation of total laryngectomy in 147 cases was 39%, and that from the operation of laryngotomy in 89 cases was 13½%. These figures represent a careful tabulation of the cases reported in medical literature up to the year 1888 and must be considered as understating the actual mortality. For, as is well known, the results of successful operations are more often published than those of unsuccessful ones.

The cause of this high mortality may be traced in the first place to a poor selection of cases with regard both to the extent of the local disease and to the general physical condition of the patient; in the second place to deaths from pneumonia, due to inhalation of blood during or after the operation, or from the inhalation of food into the lower air passages after the operation; and in the third place to operative or post-operative shock.

A comparison of the statistics just given with those collected by Sendziak since 1888 up to and including 1905 is most encouraging. We find, for example, in 257 cases of total laryngec-

* Read before the New England Otological and Laryngological Society, Nov. 20, 1908.

¹ Rev. Hebd. de Laryngol., d'Otol. et de Rhinol., Oct 26, 1907.

tomy done since 1888 an operative mortality of 22% as against 39% — a reduction of nearly one half; and in 210 cases of laryngotomy a mortality from the operation of only 2½% as against 13½% previous to 1888. The chief cause which has contributed to this remarkable improvement has undoubtedly been the opportunity for a more favorable selection of cases for operation. Cases are now more commonly recognized and operated upon at an early stage, when the chances for complete removal of the growth by a comparatively safe operation are the best. But an almost equally important cause of the improvement has been the advance made in the technic of the operations and after care, especially in respect to the avoidance of operative and post-operative shock and inhalation pneumonia.

The credit for these improvements belongs to many surgeons abroad and in this country. Solis-Cohen in this country, and Butlin and Semon in England, have been prominent in popularizing the operation of laryngotomy, which is now universally acknowledged to be the operation of choice in early intrinsic cancer of the larynx. In the more radical operation of total laryngectomy, Gluck and Kocher in Germany, and Keen and Jackson in this country, have been leaders.

I shall endeavor in this paper to bring out the important points in regard to the selection of cases and the technic of these two operations which have conduced to the remarkable diminution in mortality which has been obtained.

In the selection of cases, the physical condition of the patient aside from his local disease must be considered. Speaking broadly, chronic disease of the lungs contra-indicates radical operation on the larynx. So, also, of disease of the heart and kidneys, although some latitude of choice in these last may be permitted if the disease is not advanced. Few individuals over sixty are absolutely normal in this respect. But the preliminary examination should always include an investigation of the condition of the lungs, heart, kidneys and the blood. If the condition of these organs is found to be satisfactory, the next question is with regard to the extent of the local disease, which may be considered in connection with the choice of operation.

In cases of early cancer situated within the cavity of the larynx, the so-called intrinsic cases, it is now, as I have said, almost universally acknowledged by authorities here and abroad that the operation of choice is laryngotomy; that is, splitting the larynx in the median line and removing the growth with a margin of healthy tissue without removing the cartilaginous or bony framework. Cases of intrinsic cancer of the larynx, which have extended to or beyond the limits of the cavity of the larynx without glandular involvement, are suitable for laryngectomy. So, also, are cases of early extrinsic cancer of the larynx. Cases in which the growth has extended into neighboring tissues and those in which there is evident glandular involvement are not favorable for operation, and in such a palliative trach-

eotomy is usually the only operative interference to be advised.

The question of operation having been decided, the preparation for the operation is next to be considered. It is obviously important that the mouth, which is necessarily in close communication with the operative field, should be made as clean as possible. The teeth should be thoroughly cleaned, cavities filled and carious stumps extracted. The skin of the neck and upper chest should be sterilized as usual for any aseptic operation. The preliminary subcutaneous injection of ⅛ gr. of atropine to which is added ⅛ to ¼ gr. of morphine at least fifteen minutes before beginning anesthesia seems to be of great help. The atropine serves in the first place to greatly diminish the secretion of the bronchial mucous membrane, which is always stimulated by ether and is an embarrassing factor in its administration. In the second place, as shown by Crile, it serves to diminish the danger from shock, which is ever present in all operations on the larynx and trachea. On the other hand, morphine is of great help in producing a smooth ether anesthesia, an element of considerable importance in the ease and rapidity of these operations. I have experienced no difficulty in preventing the escape of blood into the lower trachea by the maintenance of the extreme Trendelenburg position as recommended by Keen, and am, therefore, of the opinion that the use of morphine is a distinct advantage. Ether may be given by mouth at first and later through the tracheal opening either by means of a sponge or by a funnel and tube connected with the trachea tube. Etherization by rectum as advocated by Cunningham and Brewer has its advantages. It removes the anesthetist from the field of operation and it gives less irritation to the mucous membrane of the trachea and bronchi and thus produces more quiet respiration and lessens the danger from pneumonia. These great advantages were strikingly brought out in the only case in which I used it. The disadvantages of the method are the fatalities which have resulted after its use and the fact that the rectal mucous membrane is left in a too irritable condition for use as an absorbing medium for saline and nutrient enemata. My own case died within twelve hours after the operation from collapse with uncontrollable bloody diarrhea. It may well be that this was due to faults in the technic of the administration, but I have not been inclined to give this method another trial. In my other three cases ether was administered by sponge or mask held over the tracheal opening without any great drawbacks during or after operation. It is, of course, essential that the etherizer and his apparatus be as sterile as the operator and his assistants.

At the risk of rehearsing what may be familiar to all, I will now give in some detail the technic of the operations of laryngotomy and laryngectomy. In the earlier operations, prophylactic tracheotomy a week or more before laryngotomy

or laryngectomy was considered advisable, but the experience of later years has shown that the danger of sepsis and pneumonia is less if tracheotomy is deferred until the time of the radical operation, excepting only the cases with dyspnea. In these preliminary tracheotomy under cocaine anesthesia is advised.

TECHNIC OF LARYNGOTOMY.

The position of the patient up to the time of opening the trachea is the horizontal dorsal position with a flat pillow under the shoulders. This brings the larynx and trachea into greater prominence and facilitates the dissection. When the trachea is opened a change is made to the extreme Trendelenburg position, the long axis of the patient's body being put at an angle of nearly 45° to the horizontal plane. In order to hold the patient in this position the legs must be securely attached to the foot of the table.

The first stage of the operation comprises the exposure of the larynx and trachea by a median incision extending from the hyoid to just above the upper end of the sternum, which is interrupted for an inch below the cricoid by a bridge of skin which serves to separate the tracheal and laryngeal openings. This detail, which was devised and advocated by Dr. Solis-Cohen, of Philadelphia, helps, in some measure, to prevent contamination of the upper wound by tracheal secretions and favors healing of the upper wound by first intention. The incision is carried down successively through the fascia, separating the sternohyoid and sternothyroid muscles until the trachea and larynx have been well exposed. The position of the patient is now changed to the extreme Trendelenburg position above described. This position is maintained throughout the remainder of the operation. The trachea is now opened below the thyroid isthmus and an ordinary tracheotomy tube inserted into the trachea and held in position with tape.

The second stage of the operation comprises the division of the thyroid cartilage in the median line and the removal of the growth. Before doing this the crico-thyroid membrane is opened by a short transverse incision and a 10% solution of cocaine applied on a cotton swab to the interior of the larynx. According to Crile this prevents stimulation of the inhibitory fibers of the pneumogastric, which he considers to be the cause of sudden death in operations in which the larynx and trachea are opened. The thyroid cartilage is next divided from below upwards. In young subjects this may be done with a knife, but inasmuch as in the majority of cases the thyroid cartilage has become ossified with age, it will usually be found necessary to use a saw or preferably bone shears with the blade set at an angle of about 135° to the handle. This step must be taken with great care in order to divide the anterior commissure without injuring the cords. The wings of the thyroid are now held widely apart with retractors or stout ligatures. I have found a small self-retaining mas-

toid retractor very useful here since it opens up the thyroid well and does away with the necessity of an extra pair of hands near the field of operation, which is already sufficiently crowded by the operator, his assistant and the anesthetist. As the larynx is opened up the upper end of the trachea may be firmly packed with gauze. The interior of the larynx is then carefully inspected under good illumination with a head mirror or head light and the limits of the growth made out. A strong solution of adrenalin 1:1000 applied to the region of the growth helps to define its limits. Two elliptical incisions are made surrounding the neoplasm and including fully one-half inch of apparently healthy tissue. These are carried down to the cartilage and the entire mass including the perichondrium stripped off the cartilage. The ensuing hemorrhage is not great and is controlled by pressure. The use of the thermo-cautery at this point is not evident, although it is advocated by some authorities. It is, of course, necessary before reapproximating the wings of the thyroid to make the wounds within the larynx dry. This can usually be accomplished by pressure, although it may be necessary to tie a few vessels.

The third stage of the operation consists in the closure of the larynx. The plug is removed from the upper end of the trachea and the cut edges of the thyroid cartilage placed in as accurate apposition as possible. They are held together preferably by silk sutures through the external perichondrium. The muscles and skin are next sutured in separate layers in the median line, and a small gauze wick is left in the lower end of the wound. A dry dressing is applied over the laryngeal wound and a light moist antiseptic dressing over the tracheal tube, which is retained for twenty-four hours. The after treatment of laryngotomy, which is important, will be taken up in connection with that of laryngectomy.

TECHNIC OF LARYNGECTOMY.

The position of the patient is the same as at the beginning of laryngotomy, that is, the horizontal dorsal position, with the shoulders slightly elevated by a flat pillow.

First stage.—The larynx and trachea are exposed by a median incision extending from the hyoid bone to the sternum as before, but here the incision is continuous and the trachea is exposed from the cricoid to the lower end of the incision. The isthmus of the thyroid gland is divided between ligatures and the cut ends retracted at either side. The larynx and trachea are now freed from their lateral attachments as much as possible by blunt dissection and with scissors, and the posterior wall of the upper part of the trachea separated from the esophagus. A 2% solution of cocaine is then injected into the trachea between the cricoid and the first tracheal ring, one on either side.

Second stage.—At this point the position is changed to the extreme Trendelenburg posi-

tion. The trachea is severed from the cricoid by a transverse incision, brought up into the wound and attached to the skin by three sutures, two lateral and one lower median. The interior of the larynx is swabbed with 10% cocaine solution. The larynx is then seized with double hooks from below and drawn upward and from one side to the other as the posterior wall is carefully dissected from the anterior wall of the esophagus. It is necessary to keep close to the cartilages of the larynx in order to avoid buttonholing the esophagus at this stage. The larynx having been freed from its posterior and lateral attachments, the upper attachments are separated as follows: A median incision is made through the conoid ligament just above the incisure of the thyroid cartilage. Through this incision curved clamps are inserted parallel with and close to the upper border of the thyroid cartilage, which grasp the hyo-thyroid membrane between their blades; then this membrane is divided at its thyroid attachment. That part which is held clamped contains the superior laryngeal vessels and should be tied off. This procedure is carried out on both sides. The upper posterior attachments of the larynx to the inferior constrictor muscles are finally severed and the larynx removed. The epiglottis is next drawn down into the wound from above and cut off from its basal attachments with scissors. The passage into the pharynx is walled off with gauze packing and the bleeding, which may be profuse, is controlled by ligatures and pressure. By keeping close to the cartilage in the foregoing dissection the operator avoids wounding vessels of any size with the exception of the superior laryngeal, the crico-thyroid and the posterior laryngeal arteries, which latter enter the larynx in the space between the arytenoids and the posterior borders of the thyroid cartilage and are the most troublesome to find and ligate. It is well to have all bleeding points carefully stopped before proceeding to shut off the cavity of the pharynx from the wound. The latter is done by suturing the anterior wall of the esophagus to the raw surface at the base of the tongue at the lower part of its attachment to the epiglottis by means of a series of longitudinally placed chromicized gut sutures. The deep soft tissues at the sides of the larynx are brought together and sutured, next the superficial muscles, and finally the skin. A small gauze drain is left at the lower end of the wound above the trachea. The mucous membrane of the trachea is carefully approximated to the skin of the edges of the wound by sutures and the tracheal tube retained. In those cases in which preliminary tracheotomy has to be performed on account of dyspnea, the technic is naturally modified. In my own case of laryngectomy, tracheotomy was done more than three weeks before the operation. I found the trachea at the later operation so adherent to the adjacent tissues, and so difficult of separation, that I left it *in situ* after severing it from the cricoid.

After care—In the after care of these cases the attention is especially directed to the avoidance of shock and pneumonia. Immediately after the operation the patient is put to bed with a flat pillow and the foot of the bed raised. This favors the expulsion of blood and secretions from the trachea and also conduces to the prevention of shock. A pint of normal salt solution is given by enema. In none of my cases did more stimulation than this seem to be indicated, excepting the one whose death I have attributed to rectal anesthesia. In none of the others was there any sign of collapse after the operation. The foot of the bed is kept elevated for twelve to twenty-four hours, according to the patient's condition and the severity of the operation. After laryngotomy the tracheotomy tube is immediately withdrawn by some operators. On the whole it seems safer to leave the tube in position for twenty-four hours, as by this means the drainage of blood and bronchial secretion is rendered freer and less likely to pass over the wounded surface in the larynx. After the removal of the tube it should be kept close at hand for an instant replacement if there is dyspnea. After laryngectomy the tube is of course permanently retained. The dressings over both wounds should be frequently examined and changed as often as they become soiled.

The problem of nourishment is a serious one, especially after laryngectomy. The two things to be avoided are the leakage of food into the laryngeal wound and tension on the stitches in the pharyngeal wound between the esophagus and the base of the tongue. These two conditions can best be avoided by rectal feeding. One of my patients was kept in good condition without undue loss of weight for ten days by this method of feeding. Three times in twenty-four hours at intervals of eight hours he received the following nutrient enema.

4 oz. of peptomized milk.

An egg.

$\frac{1}{2}$ dram of salt.

Midway between these feedings he received an enema of 8 oz. of salt solution. Each nutrient enema was preceded fifteen minutes by a cleansing enema. After the first twenty-four hours a patient on whom a simple laryngotomy has been performed may be able to swallow well. He is tested with a little sterile water first, and if this does not leak into the trachea feeding by mouth may be begun. It is well to feed the laryngectomy cases by rectum for at least five days to allow time for the pharyngeal wound to heal. At the end of five days sterile water may be tried by mouth. If it does not escape into the laryngeal wound, feeding by mouth may be instituted; otherwise rectal feeding may be continued for a few days or feeding by stomach tube may be employed.

The laryngotomy cases can usually sit up on the third day after operation, and the laryngectomy cases on the fifth to the tenth day. Following is a brief account of my cases, three of laryngotomy and one laryngectomy.

CASE I. Man, sixty-two years. Squamous-cell cancer of the left vocal cord. Histological examination by Dr. W. F. Whitney. Operation, Aug. 27, 1905. Tracheotomy and laryngotomy. Rectal anesthesia. Patient apparently in good condition at the close of the operation, but two hours later began to have copious bloody diarrhea which could not be controlled. Death from collapse eight hours after operation.

CASE II. Man, sixty-one years. Squamous-cell cancer of the right vocal cord. Histological examination by Dr. C. C. Simmons. Operation, Jan. 1, 1906. Preliminary tracheotomy under ether. Mild sepsis followed the tracheotomy. Operation, Jan. 12, eleven days later. Laryngotomy with removal of the growth and a margin of healthy tissue. Mild sepsis of laryngotomy wound followed, which healed slowly by granulation. Two years later no evidence of recurrence. Two and a half years after operation beginning occlusion of larynx by granulomatous mass at the site of original lesion. Tracheotomy. A portion of this mass removed and submitted to microscopical examination. Report from examination by Dr. F. C. Kidner: Recurrence. Patient refused further operation. He is still living and at work in apparently good health, a little less than three years after the original operation.

CASE III. Man, fifty-eight years. Squamous-cell cancer of left ventricular band and left vocal cord. Histological examination by Dr. W. F. Whitney. Operation, Aug. 5, 1907. Laryngotomy and tracheotomy at the same operation. One month and a half later, cavity of larynx became blocked by granulations starting from the anterior commissure. Repeated removal seemed to stimulate rather than prevent their formation. Microscopical examination by Dr. W. F. Whitney. Report, granulation tissue. Tracheotomy was performed Sept. 17, 1907, on account of dyspnea. No evidence of recurrence up to the present time. There is a stricture of the larynx from cicatrix. The patient is in good health and at work.

CASE IV. Man, fifty-two years. Squamous-cell cancer involving the greater part of the interior of the larynx, but not evidently extending beyond the limits of the laryngeal cavity. Histological examination by Dr. W. F. Whitney. Operation, April 18, 1908. Tracheotomy, May 18, 1908. Total laryngectomy. At the present time, six months later, there is a reddened indurated swelling about the tracheal wound especially marked above and to the right of the opening, with slight purulent discharge through the laryngeal wound. Probable recurrence.

CONCLUSIONS.

With attention to certain essential details in these operations, the mortality can be kept at a comparatively low figure. These details comprise

- (1) A careful selection of cases.
- (2) Attention to the cleanliness of the mouth.
- (3) The avoidance of shock by
 - (a) The use of atropine before operation.
 - (b) Local use of cocaine during operation; and
 - (c) The Trendelenburg position during the second stage.
- (4) The avoidance of inhalation pneumonia by
 - (1) The Trendelenburg position during operation, and
 - (2) Rectal feeding and elevation of the foot of the bed after operation.

The brilliant results obtained by Butlin and Semon in England, and Jackson in this country,

in the permanent cure of a large percentage of their cases of early intrinsic cancer of the larynx by laryngotomy should lead to the more general adoption of this method of operation in such cases.

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CARE OF FRACTURES IN GENERAL PRACTICE.*

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In this paper I simply intend to note a few of the fractures that have come under my care, pointing out the interesting points of each, together with the results and the conclusions which I have drawn. In the days when I was first practicing medicine, almost every family physician cared for the fractures which came to him in his regular business, considered that they were a part of his regular business and would have been amazed if any one had mentioned his not doing so, or had told him that any one else could do it better. With the introduction of the specialist, the general practitioner has been given to understand that he must at once give up doing anything which can be claimed by any one as falling into the province of any so-called expert. Of course one of the first things claimed by the specialist was the care of fractures. I feel from the results of the cases I have cared for myself, and from those I have seen cared for by others, both specialists and general practitioners, that the new régime produces results very little if any better than the old. It entails much greater expense on the patients and decreases very markedly the standard and usefulness of the regular family physician. It is rather unfair to compare the fruits of years ago with those of to-day, because of the aid which we now get from the x-ray, which can now be reached by any one near any large city. I have always found that I have had fractures often enough to keep my hand in and to feel that I could do my patients justice. One of my earliest fractures was a compound fracture of the tibia of the right leg. The patient was a healthy man of about forty years of age. He was riding his bicycle on a muddy night when the wheel slipped from under him and he fell, catching his leg in the frame. I was called at once, and on examination found a loose fracture of both bones of the right leg about three inches above the ankle-joint. There was an opening about an inch long, through which the upper fragment of the tibia protruded. I soaked the

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