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CURE,

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SURGEON TO THE N. Y. EYE AND EAR INFIRMARY, THE DEMILT DISPENSARY, (THROAT DEPARTMENTS), LATE CHIEF OF CLINIC TO PROF. STOERK, IN THE IMPERIAL UNIVERSITY OF VIENNA.

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REMOVAL BY SUBHYOIDEAN LARYNGOTOMY—CURE.

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The following contribution to the surgical therapeutics of the air-passages is made in the belief that the history of the case detailed possesses a sufficient number of unusual points to render it of general interest. These features are the remarkable and unique method of lodgment of the foreign body, the comparatively slight disturbance—both local and constitutional—that it has until lately caused, notwithstanding the length of time that it had remained within the larynx and in its peculiar location, and its very unusual nature—but one of a similar character having been reported among the very many cases on record of foreign bodies within the air-passages.

This one parallel case is reported* as occurring in the person of a young child who had inhaled a brass ring the size of a shilling. "It remained in the larynx for nineteen days, the symptoms being an occasional cough, attended by a croupy sound and a whistling noise during sleep. Tracheotomy was performed at the end of the period above specified, and the foreign body pushed upwards and seized by forceps at the opening of the larynx."

The operative procedure employed in our case for the removal of the ring is an unusual one, having been performed but five times, and as far as I am informed, never in this country and in the present case for the first time carried out for the removal of a *foreign body* from the larynx, although its applicability in such cases is spoken of by several of those who have written upon the subject.

The skilful use of the laryngoscope has almost entirely obviated the necessity of resort to operative measures of like character in the surgical treatment of the throat; but cases occasionally occur where, as in the present one, laryngoscopic treatment is unadvisable or impossible, and where we are compelled to

* Lancet, vol. i., 1852, p. 247.

employ other means for the relief of the patient than treatment *per vias naturales.*

The extra laryngeal methods of operating cannot therefore be lost sight of, but must remain now, as well as in the pre-laryngoscopic era, a valuable means of aid at our command, and any additions to our experience of them, no matter how slight that addition may be, will have a certain value.

Finally, the case affords an instructive illustration of the value of the combined methods of diagnosis by means of the stethoscope and the laryngoscope; for although the diagnosis of a foreign body within the air tract had been made in our case, and its location most accurately determined by the ear alone, still the laryngoscope rendered this diagnosis, by demonstrating the fact to the eye, an *absolute* certainty, and supplied, in addition, the details of position, form, and nature of the foreign body, and led to an intelligent appreciation of the indications for surgical treatment—important facts at which auscultatory science could only arrive by inference.

Case.—A. B., aged six and a half years. Four years ago (August, 1870), the child, while playing in the company of other children with an ordinary, medium-sized, brass finger-ring, broken at one point, placed it in her mouth, and a few moments later suddenly swallowed it. Urgent dyspnœa immediately followed; the child became deeply cyanotic, then unconscious, and suffocation seemed imminent, until one of the bystanders, passing her finger deep into the child's throat, felt the ring and pushed it downwards. This act was followed by immediate improvement in the respiration. The child recovered consciousness, and soon afterwards was able to move about at play.

On the physican's arrival, a short time later, various instruments were passed into the throat in order to seize the ring, but without success, and no foreign body being met with during the examination, it was supposed to have passed into the stomach, and further attempts at removal were desisted from.

Cathartics were administered and the evacuations carefully watched, but without finding the missing body.

The child's respiration is stated to have remained good during the remainder of the day of the accident; but the same night the mother noticed that it was decidedly stridulous, and says that it has since remained so. The child, however, slept quietly, and had no attacks of laryngeal spasm. Deglutition was not and has not been affected. The child, immediately after the accident, became partially aphonic, and has continued in the same condition during the subsequent period of time up to within six weeks. A short, hack-

ing cough made its appearance a few hours after the ring was swallowed, and has persisted since that time.

Several physicians were summoned at different times during the few weeks following the accident, and occasional instrumental examinations of the throat were made. (It may be here stated that no laryngoscopic examination had been made previous to the one made by me.) Emetics, laxatives, and cough-mixtures were ordered, and the mother was assured that the presence of the ring within the air-passages was extremely doubtful. The above narration of symptoms comprises the history of the case during the following period of time—nearly four years—up to six weeks ago. Within this time there was no change in the symptoms as described, nor were any new ones noticed, except that the child gradually lost flesh and strength.

Six weeks ago the child contracted a heavy cold. The respiration immediately became seriously embarrassed. The voice was entirely lost, and laryngeal spasm occurred for the first time, principally during the night. The attacks were prolonged and severe; the child becoming relaxed and cyanotic, then gasping for breath, and tearing at the throat with both hands; but the intensity of the spasm passing off in a few seconds, deep inspirations followed, the face assumed its natural hue, and the patient again fell into a natural sleep.

Lately these spasms have increased in frequency, so that she may have from two to six during the course of one night. Any exertion or excitement during the day will increase the number and severity of the attacks at night. A fit of crying alone has often provoked serious and protracted laryngeal spasm. Although the voice has been entirely lost for the last six weeks, and all of the symptoms have pointed to a very serious interference with the function of the larynx, deglutition has not been at all affected. The child does not, nor has not, complained of any pain during the process, and has always taken, with equal facility, solid or fluid food, a curious fact, to be noted when the location of the ring in its relation to the laryngeal parts comes to be described.

The condition of the child becoming so serious, the mother was advised by her friends to leave her home in the country and come to this city for medical advice.

She here consulted Dr. J. Lewis Smith, who upon making an auscultatory examination, detected the presence of the missing foreign body within the respiratory tract.

The doctor referred the case, as one of unusual interest, to Dr. J. R. Leaming, who, after making his examination, directed the case to me, for the purpose of having a laryngoscopic examination made.

My report having been made, the child subsequently was most courteously referred to me for treatment by Dr. Smith.

At my request Dr. Leaming has kindly made me the following interesting report of the result of his auscultatory examination:

"*Auscultation of the chest: Right side front.*—Obscure evidence of obstruction somewhere in the air-passages, not brought definitely to the ear.

"*Left side front.*—Loud whistling, of moderately high pitch over the region of the left bronchus, but without local point of intensity.

"*Right side posteriorly.*—Loud whistling, moderately low pitch, over the right bronchus, extending into the branches so far as to the third or fourth divisions, rising in pitch, but with no point of local intensity.

"*Left side posteriorly.*—Loud whistling over the left bronchus, of moderately high pitch, extending into the branches so far as to the third and fourth divisions, rising in pitch, but without local point of intensity.

"In all other respects the respiratory sounds of the chest are normal.

"*Diagnosis,*—Obstruction not in the chest.

"*Auscultation of the Trachea.*—Loud whistling of low pitch over the trachea, but without point of local intensity; no obstruction.

"*Auscultation of Larynx.*—Loud whistling of high pitch over the larynx, with local point of intensity.

"*Diagnosis.*—Obstruction in the larynx.

"The seat of the murmur is in the larynx, and is of high pitch. It is consonated in the trachea, bronchi, and branches, the pitch varying according to the size of the tube; consonated sounds in air-chambers assume the pitch fundamental to the chambers in which they are reformed.

"The murmur was not consonated in the true respiratory system."

The result of the laryngoscopic examination confirmed this diagnosis most fully. The mirror showed the left ary-epiglottic fold, together with the false cord of the same side, to have been the seat of old ulcerative action, and to have undergone considerable alteration in form and size from the results of inflammatory plastic deposit, and subsequent cicatricial contraction. The ary-epiglottic fold is greatly thickened, especially posteriorly, but still preserves its general outline and is distinctly recognizable. The false cord below it presents an irregular and nodulated outline, and by its protrusion forwards and inwards, diminishes the normal calibre of the larynx more than one-half, causing thereby a marked degree of stenosis. The surfaces presented to view in this part of the larynx,

although they show the evidences of superficial ulceration at points extending deeply into the tissues, have fully cicatrized and present a smooth exterior.

On the right side of the larynx the parts present their normal configuration. The right vocal cord can be seen, partly obscured posteriorly by the hypertrophied left false cord, lying far below in the laryngoscopic picture, and moving freely in phonation.

The ring lies, as shown in the drawing, with about one-third of its circumference hidden by the middle of the hypertrophied and nodulated false cord and ary-epiglottic fold of the left side, which lie above it. It reaches inwards at about the level of the vocal cords, until it overlies to a certain extent the right vocal cord, thus presenting a direct barrier or obstruction across the larynx, and interfering with and modifying in character the respiratory current of air.

Posteriorly it extends upwards and backwards, and lying against the posterior pharyngeal wall, is thus elevated above and lies free from contact with the left arytenoid cartilage. About two-thirds of the ring are therefore presented to view, being entirely uncovered by the laryngeal parts, and it hangs in position in the same manner as an ear-ring is held by the lobe of the ear.

The ring has undergone but little, if any corrosive action, it is discolored at points, at others the natural metallic lustre is plainly to be seen, and it presents no irregular or eroded surface, a circumstance readily explainable when it is remembered that foreign bodies situated within the larynx are much less liable to become incrusted with various kinds of matter than when they are lodged in the bronchial tubes. In the latter case the foreign body usually becomes invested by inspissated mucus, or even by earthy substances, principally the carbonate and phosphate of lime, in small quantities.

During respiration the natural motion of the laryngeal parts is confined to the right side of the larynx, and the corresponding cord is abducted from the median line ; no change, or but very slight irregular movement, being noticed upon the opposite side of the larynx.

In phonation action is again confined to the right side of the larynx, and the vocal cord approaches the median line and passes beneath the hypertrophied mass upon the opposite side. Owing to its presence, the fact of whether or no it meets its fellow cannot be demonstrated. During this process of phonation the ring rises up from its bed, leaves the posterior

pharyngeal wall, and stands in an oblique direction to the vertical axis of the larynx. On the completion of the act it falls back into its former position.

The process of deglutition cannot, of course, be practically demonstrated with the mirror; but simple efforts, the mirror being held in the fauces, show that during the act the position of the ring suffers no alteration. Both fluids and solids must therefore pass, to a certain extent, through the ring to reach the œsophagus.

In deciding upon the operative procedures necessary to be undertaken for the relief of the patient by removal of the foreign body, preference was given to the extra-laryngeal to the exclusion of the intra-laryngeal methods, and for the following reasons:

The age of the child—six and a half years– and its irritable, nervous temperament, increased certainly by the long continued abnormal state of the respiratory passage, and the consequent constitutional disturbances, and probably influenced by the many examinations and faucial explorations that it had from time to time undergone, rendered a perfect and satisfactory examination *utterly impossible*, owing to the child's unwillingness to submit to it. It was only after repeated examinations, and much time spent in reassuring the little patient, that the above results were able to be obtained.

The possibility, therefore, of the successful employment of the delicate operative manipulations required in the performance of any laryngoscopic operation,—manipulations demanding not only a *tolerance*, but also an active and intelligent *co-operation* on the part of the patient,—was in this case not to be expected.

Anæsthetics, valuable as they are in the other departments of surgery, render little if any service to the laryngoscopist in such cases as the one under consideration. The difficulty, not only of the examination itself, but much more so in carrying out the necessary instrumental procedures, is increased greatly, and in fact may be said to be rendered insuperable, by its employment in laryngoscopic surgery. As has been already said, intelligent co-operation on the part of the patient with the endeavors of the physician, forms an essential element in the skillful performance of any laryngeal operation. The patient being anæsthetized this co-operation is not forthcoming, and the operation, in a very large proportion of the cases where it has been employed, has entirely failed.

In addition to the reasons stated, other difficulties caused by anæsthesia employed during the performance of operations within the air tract, will suggest themselves to all surgeons, and need not be discussed here.

Then, again, the location and attachments of the foreign

body were unfavorable for its successful removal "per vias naturales," without ample opportunity and time were allowed to carry out the necessary manipulations for its removal in portions (and this has been shown to be impossible). The ring was located too deeply, was covered by too large an amount of firm cicatricial tissue, and included within itself too much of the laryngeal parts to allow of its being seized and forcibly torn from its bed by means of the laryngeal forceps.

The resulting laceration would have been great, and the danger of subsequent inflammatory œdema or tumefaction—a danger intensified by the already existing state of laryngeal stenosis—would have been too serious to have been incurred when other and safer means of removal were available.

Lastly, the indications for operative interference and removal of the foreign body, which by its presence was causing dangerous laryngeal spasm, were immediate.

These considerations deterred me, therefore, from attempting the removal of the ring by the natural passages, and as the best *substitute*, the operation of "sub hyoidean laryngotomy," or more properly, perhaps, "sub-hyoidean pharyngotomy," was selected.

This method of removal was especially indicated in the case under consideration; the ring being located at the superior opening of the larynx, it could be easily reached through an opening made in the thyro-hyoid membrane, and removed without difficulty or interference with the laryngeal parts proper. The operation is a much less serious one than thyrotomy, and the results in all published cases that I have been able to find, with the exception of one, have been good in its relation to life; while, of course, it presents none of the dangers of interference with the vocal function that thyrotomy does. No important structures are involved in its performance, nor can any large vessels, with care, be wounded; the most liable to this accident being the superior laryngeal artery and vein, which, however, enter the larynx so far posteriorly and behind the wing of the thyroid cartilage, that injury to them is almost impossible.

The other extra-laryngeal methods for the removal of growths or impacted foreign bodies,—"infra-thyroid laryngotomy" and "tracheotomy,"—as they are only applicable in the cases where the body to be extirpated is situated in the subglottic region, were not indicated in our case, and are therefore not considered here. The operation of "sub-hyoidean laryngotomy" offers so many advantages, therefore, that it is a matter of surprise that it has not oftener been performed, to the exclusion of other and much more dangerous methods which have been at times undertaken for the removal of growths, etc.,

situated either within the valleculæ, at the base of the tongue, on the epiglottis, the ary-epiglottic folds, or even upon the arytenoid cartilages, after the operation by the natural passages has been proved to be, from the nature of the case, unadvisable or impossible, or after attempts at their removal by the mouth have from any cause failed.

Vidal,* Malgaigne, Lewin,† Semeleder,‡ and Langenbeck recommend its performance in such cases as those indicated above, although I believe that it has never previously been done for the purpose of removing an impacted foreign body. Hyrtl§ objects to the operation on anatomical grounds, and states that a view of the interior of the larynx cannot be obtained through a wound in this region, an objection which experience has proved to be erroneous.

In the present case it was deemed advisable to modify the original operations by first performing tracheotomy, and thereby insure the patient a free and plentiful supply of air during the steps of the operation—a procedure rendered doubly advisable by the condition of laryngeal stenosis existing in the case, and the liability to laryngeal spasm (as shown in the previous history), as well as the danger of subsequent inflammatory action reducing still further the calibre of a larynx already diminished more than one-half from its normal condition.

It was proposed to make the presence of the tracheal tube but temporary, and it having subserved its first purpose of protecting the patient from danger during the operation, to remove it as soon as danger from the laryngeal inflammatory process had passed away.

The operation was accordingly undertaken July 7th, 1874, as follows: The head having been thrown backwards over pillows placed beneath the neck, and the position of the cricoid cartilage having been identified, an incision some two and a half inches in length was made over it, in the median line, and extending downwards over the superior portion of the trachea. The skin and superficial fascia being rapidly dissected through, the inner borders of the sterno-thyroid muscles came into view, and after drawing them aside by means of retractors, a few touches of the knife laid bare the cricoid cartilage, and with it the isthmus of the thyroid body lying immediately below, across the trachea,—in this case being unusually large and lying high up. During this dissection several medium-sized vessels were severed, and a halt was here made until they had been secured by torsion. The

* Velpeau, Medécine operat.
† Beiträge zur Laryngoscopie. Deutsche Klinik, 1862, No. 13.
‡ Die Laryngoscopie. Wien, 1863. P. 69.
§ Handbuch der topographischen Anatomie. Bd. i. p. 466.

isthmus was then displaced, partly by pushing it downwards and partly by tearing through its substance, a procedure which I have several times adopted and have never experienced any trouble nor unusual hemorrhage from its laceration, contrary to what I believe to be the generally held opinion. The isthmus being partly removed in this manner, the upper rings of the trachea became plainly visible, and all active hemorrhage having ceased, a hook was placed under the lower edge of the cricoid cartilage to steady the parts.

An incision was then made in the trachea, from below upwards, commencing at about the fourth ring, and continued up to the cricoid cartilage. The tracheal dilator (Trousseau) having been introduced and the lips of the incision held apart, the canula was readily introduced and secured in position.

Spasmodic cough followed, expelling a moderate amount of clear mucus untinged with blood, but ceased after the further administration of ether through the tracheal tube.

The second step of the operation consisted in, first, identification of the position and relations of the hyoid bone, a procedure not unattended by some difficulty on account of the small size of the parts and the close proximity of the hyoid bone to the thyroid cartilage, a limitation of the field of action which renders the performance of this operation upon a child much more difficult than upon the adult.

This point having been satisfactorily ascertained, an incision three inches in length was made parallel with the lower border of the hyoid bone and one-eighth of an inch below it, transversely across the neck, and the skin, subcutaneous cellular tissue, the superficial fascia with the internal fibres of the platisma myoides, the inner half of the sterno-hyoid and thyro-hyroid muscles being carefully divided on each side of the median line upon a director, introduced successively between the various layers, the thyro-hyoid membrane was reached and laid bare without difficulty and with very little hemorrhage, no arterial branches having been encountered. Two veins which lay across the track of the wound, immediately below the platisma, were of such a size as to render ligature advisable, and having been raised by dissection from their beds, were secured by double ligature and then severed.

The thyro-hyoid membrane being now divided by an incision of less extent than the one through the superficial parts, thus giving a funnel shape to the wound, the cushion of cellular and adipose tissue lying between the base of the epiglottis and the parts external to it, together with the laryngeal mucous membrane to either side of it, were disclosed, the latter being prolapsed outwards as soon as the tense pressure of the thyro hyoid membrane was removed, and could be seen to be drawn inwards with each inspiration.

The most important and difficult step of the operation now follows—important as regards the danger of wounding the epiglottis, and certainly rendered more difficult by the vagueness of the description given of its mode of performance by Malgaigne and others, and the omission of the consideration of important anatomical points which must influence it.

Malgaigne says,* and his description of the operation has always been considered the classical one, and is the one which has been followed by those who have performed the operation: "After incision of the the thyro-hyoid membrane and those fibres of it which go to the epiglottis, the mucous membrane is reached; seize this and divide it also; the epiglottis then presents itself."

Prat,† in describing the steps of his operation, says that he proceeded to divide the tissues, layer by layer, until he reached the thyro-hyoid membrane; after cutting this through, the epiglottis presented itself.

Follin ‡ states that he divided the cushion of adipose and cellular tissue which lay in front of the epiglottis (after cutting through the thyro-hyoid membrane), and lastly incised the *laryngeal mucous membrane* and opened the *cavity of the larynx*.

This stage of the operation would, according to these accounts, seem to be indeed a comparatively simple one; but I have not found it to be as described. My dissections and experimental operations upon the cadaver have shown me that, after the thyro-hyoid membrane has been divided transversely, a thick layer of cellular and adipose tissue, extending usually from the hyoid bone above to the thyroid cartilage below, forming the cushion of the epiglottis, and lying between it and the parts external, presents itself; to either side of this mass mucous membrane protrudes. This membrane consists of the broad anterior portions of the ary-epiglottic folds at about the point where they join with the sides of the epiglottis—is therefore *laryngeal mucous membrane*, and an incision made through it transversely and directly inwards, or even with the point of the knife directed upwards and backwards, would open directly into the *laryngeal cavity*, not alone by cutting through the anterior extremities of both these folds, but in so doing necessarily dividing also, by the transverse incision, the cellular and adipose mass lying in front of the epiglottis and between them, would cut through this cartilage at about its middle, or a short distance below that point.

Follin's description of the steps of his operation illustrates this point fully, and demonstrates the danger of such an in-

* Manuel de Medicine operatoire. 1871.
† Gazette des Hôpitaux, 1859. No. 103.
‡ Archives Générales de Médicine. Février, 1867.

cision; for by making it he cut across the epiglottis and penetrated directly into the laryngeal cavity.

It is needless to say that this accident is to be carefully avoided. Such an opening into the cavity of the larynx would render, according to several authors, a clear view of its interior impossible, and would certainly defeat, to a great extent, the purposes and advantages of the operation.

How, then, are we to avoid section of the base of the epiglottis? By, after having reached this point in the operation, inserting a tenaculum into the cellular and adipose mass described above, and by means of it drawing the epiglottis forcibly downwards. This puts its ligamentous attachments to the hyoid bone and tongue upon the stretch, draws it away from the former, and leaves an appreciable interval of space between them through which the knife, its point directed upwards and backwards, and kept near the hyoid bone, can be readily passed, and will be found to have penetrated the mucous membrane between the base of the tongue and the epiglottis, the aim of the incision.

The epiglottis being drawn downwards in this manner, mucous membrane will still present itself laterally; but a moment's reflection will show that this is no longer laryngeal. The displacement of the epiglottis has carried downwards with it both ary-epiglottic folds, and the mucous membrane which we now have presented is a portion of that situated between the base of the tongue and the epiglottis. The incision needs now only to be carried through it on either side, including the few ligamentous fibres which run from the epiglottis to the hyoid bone, and which are seen in the median line; to lay open the pharynx, and to have the epiglottis present itself uninjured to view. A digital exploration by the mouth, made previous to incision of these parts, affords an important aid in diagnosticating their relations. The size, form, and ligamentous attachments of the epiglottis, especially in its relation to the hyoid bone, vary greatly in different cases. If the index-finger of one hand, however, be introduced into the mouth, not only the tip, but also the base of the epiglottis can, in the majority of cases, be reached and felt: should two fingers of the other hand now be placed upon the hyoid bone, a diagnosis as to their approximative relation can be readily made, and will usually be found to be so satisfactory in its results, and will afford so much certainty to the operator during his future proceedings, that it should in no case be omitted.

In carrying out the further steps of my operation especial care was therefore given to this point, which I have endeavored to make clear in as few words as possible, and the importance of which I think merits careful attention on the part of the operator.

The parts immediately below the thyro-hyoid membrane having been exposed as described above, a tenaculum was inserted near the hyoid bone, into this thick cushion of cellular and adipose tissue, and strong traction downwards made to accomplish the purposes already mentioned. To insure still further certainty, a small incision was made into the left lateral projecting fold of mucous membrane, and a director was passed inwards, and then directly across, coming out at a corresponding point upon the opposite side of the wound, and through the projecting mucous membrane at that point. It should therefore lie in the groove or furrow between the base of the tongue and the epiglottis, and a digital exploration by the mouth confirmed the point.

Nothing now remained in order to complete the operation but to incise the tissues lying over the director. This was done, the direction of the knife being upwards and backwards, and the pharynx was opened.

The epiglottis immediately came into view, not, however, being pushed into the wound, as stated by Malgaigne, and was seized and drawn outwards through the incision. A perfect and most satisfactory view was now afforded of the superior laryngeal parts, and the ring was seen lying in the position as previously demonstrated by the laryngoscope.

In order to remove it with as little laceration of tissue as possible, my intention was to have cut through it at two points by means of a cutting forceps, and, having removed the upper fragment, to displace and bring away the remaining and smaller ones by drawing them out through the tissues in which they lay imbedded.

On attempting this, however, and making the firm pressure on the forceps necessary to cut through so thick a substance, the ring was felt to give and rotate slightly. This fact being ascertained, a moment's manipulation with a small bone forceps resulted in disentangling it from its attachments, and in bringing it safely out through the external wound.

An examination of the ring, in order to ascertain at what point it had been cut through, disclosed the fact that a piece was wanting. An examination of the tissues failing to find this missing portion, and the edges showing no evidences of having boen freshly severed, but one conclusion remained, that the whole ring had been removed; that the mother of the child had been mistaken in her description, and that the missing body was not a finger ring broken at one point, with the ends bent together so as to overlap each other and fit the finger of the child, as she had stated, but the ring of a watch or locket, thicker, heavier, incomplete, and with bevelled extremities; and this supposition was later confirmed by a jeweller, to whom it was submitted for examination.

Its singular mode of lodgment could now be more readily accounted for, the character of the foreign body giving the key to the explanation. My original view was, that the ring had lodged and become impacted in the left pyriform sinus at the time of the accident, and that it had from thence sunk inwards and downwards, ulceration having occurred as a result of pressure, and granulations formed over it, as the process proceeded, and subsequently cicatrizing, this action having continued until the level of the vocal cord had been reached, and that further ulceration had been delayed by its dense ligamentous character. The only difficulty was in reconciling the facts with the theory. A body of such a size and character as the one in the present case, lodged as I supposed it to have been lodged, would, I think, in a vast majority of cases, have been coughed up or dislodged during the efforts at vomiting, etc., or most certainly have been removed by instrumental interference at the time of the accident, or at least its presence recognized.

After having seen the ring, however, I think that it is reasonable to suppose that having lodged partly across the superior laryngeal opening at the time of the accident, in pushing it downwards, as was done, the left ary-epiglottic fold was caught between the lips of the ring and the latter then firmly crowded downwards, tearing its way into its position, a position which would render all attemps of nature to dislodge it unavailing, and would also cause a diagnosis as to its presence to be much more difficult, unless the laryngoscope had been used.

The corroded and discolored portion of the ring, as shown in the drawing, demonstrates that it must have subsequently changed its positions somewhat, and a still firmer hold on the tissues afforded by one of the free extremities having ulcerated its way inwards through and beneath the ary-epiglottic fold and false cord. This same change hid still further the ends of the incomplete ring, and allowed only an unbroken and rounded surface to appear to the eye, representing a complete circle.

In closing the wound I modified somewhat the methods of former operators, and I think with good result. The general practise has been simply to introduce three or four deep sutures, and then to keep the parts in apposition and at rest by flexing the head upon the chest. The method which was carried out in my case was: First, to unite carefully the divided edges of the *mucous membrane* by means of fine thread sutures, the knots being tied so as to lie inwards.

No difficulty was experienced in its accomplishment, and the good result was made manifest by the fact that at no time

subsequently, during the process of healing, was there escape of air through the external wound, nor discharge of fluids during deglutition, even though the latter process was at times, by order, forcibly conducted.

This having been done, deep wire sutures, three in number, were then introduced to bring together all of the deeper tissues, the ends being brought out through the external wound, and finally the latter closed by means of the interrupted suture.

The subsequent history of the case was most satisfactory and rapid in its progress towards a cure, and may be summed up in a few words:

On the second day after the operation it was found that upon closing the tracheal tube respiration could not be carried on through the larynx—a condition which I had anticipated—on account of the inflammatory swelling increasing the original amount of laryngeal stenosis, and to provide against which I had opened the trachea.

A laryngoscopic examination showed the cause of this condition to be due to the swelling of the epiglottis and of the tissues lying between it and the base of the tongue, the latter pressing the epiglottis backwards until it covered more than one-half of the superior opening of the larynx. The larynx itself, with the exception of the left ary-epiglottic fold, which was somewhat swollen and hyperæmic, was, as far as could be seen, free from any inflammatory action. Deglutition was easy, and unaccompanied by any pain.

On the tenth day, the inner tube being closed by the finger, respiration was readily carried on, and from this time until its removal on the thirteenth day, it was worn closed by means of a small cork, the latter being removed during the night and replaced in the morning. The patient's progress towards a recovery during this time was rapid, the greater part of the wounds had closed by first intention, and the remaining portions were granulating satisfactorily.

The common complication after tracheotomy, pneumonia, did not here occur, a circumstance that I attribute in great measure to the fact that no blood was allowed to enter the trachea and be drawn down into the bronchi, to remain a local cause of irritation, at the time of the operation, and not to any measures of special precaution against it that were adopted by me. Indeed I have found that cases in which the air-passages have been opened, do not develop pneumonia any more certainly or readily when they are treated without special refeerence to their surroundings, only using ordinary precautions against exposure, than when extraordinary measures—the high temperature, moist atmosphere, closed room, etc.—are carried out.

After removal of the tube, on the thirteenth day, the patient's respiration was found to be free, easy, and to have lost its stridulous character. The voice had been gradually assuming force and clearness during the last few days, and the tube being now permanently removed, was heard to be clear and distinct, but with a slight intonation, nasal in character.

A laryngoscopic examination made at this time shows that the hypertrophied and thickened portions of the larynx, especially the left ary-epiglottic fold and false cord, have undergone a rapid process of contraction, and at present, although still of a nodulated and irregular outline, approach very nearly their normal configuration and size. This change allows the left true cord, formerly invisible, to be seen, and it is found to present a normal appearance anteriorly and posteriorly, but on its middle superior surface to be covered by exuberant granulation tissue.

Its muscular action in phonation is deficient, and it does not reach the median line during the act; the right cord, however, in its excursion, passes beyond that point, and meets its fellow in close approximation. Subsequent examinations showed that this condition was improving, and approaching the normal performance of the act. The location of the line of incision through the mucous membrane at the base of the tongue could be seen fully cicatrized; the median glosso-epiglottic fold and the lingual sinuses have disappeared; but the pharyngo-epiglottic folds are intact.

On the twenty-first day, the external wounds having closed, and the voice having steadily improved in force and character since the removal of the tube, the patient was discharged cured.

In concluding this clinical consideration of the operation, a condensed report of the other cases in which the same operation has been carried out may not be without interest.

Considerable research through the surgical literature has resulted in finding the reports of but five cases (one of these having been complicated by the performance of thyrotomy subsequently). That my search has not been exhaustive, I am well aware, and shall be glad if any attention that I may have called to the subject will result in placing heretofore unreported cases, especially in this country, upon record, or in bringing to light any which may have escaped notice.

The cases are briefly as follows:

I. In 1859, Prat* performed the operation for the removal of a tumor situated upon the left side of the epiglottis, after attempts at its removal by the mouth had failed. The symp-

* Gazette des Hôpitaux, 1859, No. 103.

toms of extreme dysphagia, and some dyspnœa which its presence had caused, disappeared after its removal, and the patient died some time later of phthisis. On the autopsy no vestiges of the growth could be found.

II. In 1862, Langenbeck* undertook the operation for the relief of a patient who had previously had a large pharyngeal tumor removed by means of the galvano-cautery, the tumor recurring and causing excessive dyspnœa. It was again extirpated by the operation of supra-thyroid laryngotomy. The operation was a severe one, the hemorrhage profuse, and the patient died on the second day after.

III. Follin† operated, in 1863, for the removal of a number of myxomatous growths situated in the posterior commissure of the larynx and upon the arytenoid cartileges, laryngoscopic treatment having failed on account of the extreme irritability of the pharyngeal parts. The patient made a speedy and complete recovery.

IV. In 1863, Debron‡ performed the operation in order to effect the removal of a laryngeal tumor which he supposed that he could reach through an incision in the thyro-hyoid membrane. It was, however, found, during the operation, that the growth was situated partly within the right ventricle of the larynx, and that it extended downwards below the vocal cord; and thyrotomy was done in order to permit of its complete extirpation. The patient died on the seventh day after the operation, from bronchitis.

V. Langenbeck's§ second case, which occurred in 1869, was entirely successful. The tumor, the size of a pigeon's egg—for the removal of which, it was performed—was myxomatous in character, and was situated upon the left ary-epiglottic fold, reaching backwards to the left side of the pharynx, and involving the left arytenoid cartilage.

* Allgemeine Medicinische Zeitung, 1870, No. 8.

† Archives Generales de Medecine, Fevrier, 1867. Mackenzie on Laryngeal Growths, p. 99.

‡ Allgemeine Medicinische Zeitung, 1870. No. 9. Cohen, Diseases of Throat, p. 425.

§ Allgemeine Medicinische Zeitung, 1870, Nos. 9, 10.

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