

and enlisted men can not take the place of knowledge and experience; new levies of troops are, as a rule, ignorant of the first principles of camp sanitation, and reckless as to the consequences of their neglect of prescribed sanitary regulations. Therefore, training and discipline are essential factors in the preservation of the health of soldiers in garrison or in the field.

The value of the aphorism, "in time of peace prepare for war," has received additional support. This preparation should include a corps of trained medical officers larger than is absolutely necessary for the army on a peace basis, and systematic instruction in military medicine and hygiene for the medical officers of the national guard as well as for those of the regular army; also instruction of line officers in the elements of hygiene and especially in camp sanitation. It should also include the establishment of camping-grounds in various parts of the country, having an ample supply of pure water, a proper system of sewers, etc. If our volunteers could have been assembled in such camps during the late war a saving in lives and money would have resulted which would without doubt have demonstrated the economy of such preparation for war in time of peace.

## SURGERY OF THE TRACHEA.\*

### TWO UNUSUAL CASES.

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CASE 1.—ATTEMPTED SUICIDE BY CUT THROAT FOLLOWED BY COMPLETE CLOSURE OF THE TRACHEA BY A DIAPHRAGM ABOVE THE CANULA, PERSISTING FOR THIRTEEN MONTHS; BREATHING THROUGH THE LARYNX AND SPEECH ENTIRELY IMPOSSIBLE. OPERATION: DISSECTION OF THE DIAPHRAGM; SUTURE OF THE TRACHEA; RESTORATION OF NORMAL BREATHING AND VOICE.

*History by Dr. Jones.*—J. W., 30 years of age, a laborer, on Nov. 12, 1896, in a fit of despondency, attempted suicide by making a large cut in his throat with a penknife. He penetrated the trachea about the second or third ring, twisted the blade about and cut up and down an inch or more. He was taken to a hospital, where the wound was dressed, but not closed, nor was a tube inserted. One week later it was noticed that he could not breathe through the mouth when the wound was closed by pressure. It was deemed necessary to introduce a tracheotomy-tube; an anesthetic was given him, the tube inserted, and the wound stitched around it. Two weeks later, the surgeon attempted to pass a tube through the trachea and larynx from the tracheal wound, but did not succeed, the part being shut off. He was then sent home to allow the wound to heal before further operative interference was instituted. Nothing further, however, was done, and he was sent to me. The condition of the larynx was as follows: The right side was drawn slightly downward, the right-vocal band was in the median line and immovable, being fixed by scar tissue beneath it; the left side was normal in situation, the cord was freely movable and could be brought to the middle line perfectly. The entire left side was free for three-fourths of an inch below the vocal band, while the right side had a band of cicatricial

tissue just below the cord, which extended downward the same distance, and then spread out to the other side, completely occluding the trachea. The surface of the membrane was smooth and the lowest point was near the center. From below, the trachea was entirely closed above the tube, and the cicatrix was about one-half inch in thickness.

*Operation by Dr. Keen.*—When I first saw the man I was able easily to verify the facts observed by Dr. Jones. The patient had never breathed through his larynx nor had he spoken a word since the accident. He was still wearing a tracheotomy-tube. On removing this, one could look into the trachea very readily and see that the diaphragm observed by the laryngoscope below the glottis was not a horizontal one, but curved (Fig. 1), precisely fitting the curve of the tracheotomy-tube. In breathing, all the air passed through the tube. Naturally Dr. Jones and I first discussed the question whether this membrane could be punctured by an instrument passed through the glottis. If so, the opening could then be dilated and after the caliber of the trachea was restored, the tracheotomy opening could be closed. After considering this method of operation, we decided that it would be working too much in the dark in too narrow a space, and that it would be better to attack the diaphragm from in front. The result proved that this was a wise precaution.

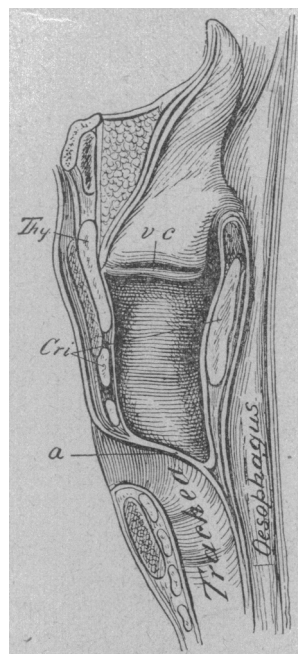


FIG. 1.—The apparent relation of the diaphragm (Thy.). Thyroid cartilage; (Cri.) cricoid; (v.c.) vocal chords; (a) the site at which I supposed an incision would open into the larynx and enable me to dissect away the diaphragm.

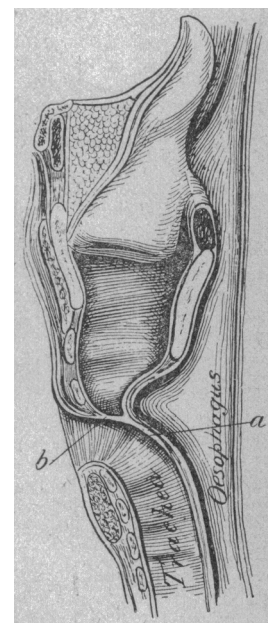


FIG. 2.—Showing the actual relations of the diaphragm and the forward displacement of the anterior wall of the esophagus. (a) The opening first made by error into the esophagus and at once closed; (b) the second opening entering the larynx from which I dissected away the diaphragm.

The operation was performed on Dec. 15, 1897. I made an incision in the middle line from the tracheotomy opening up to the cricoid cartilage. This incision was very cautiously carried downward in the middle line of the obliquely curved diaphragm, and a little above the middle of the incision in the diaphragm a small opening was quickly made. (Fig. 1, a). Just at that moment, however, he vomited, and through the opening there escaped frothy mucus tinged with bile. This showed that instead of opening through

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<sup>1</sup> From a former report in the JOURNAL, March 12, 1898, p. 697.

the diaphragm into the upper air-passage my opening communicated with the esophagus. It was clear, therefore, that the esophagus, by contraction of the adhesions, had been drawn forward and that my incision was at *a* in Fig. 2. It was important, therefore, to close this very small opening at once. I dissected back the mucous membrane from its borders and then closed it under the mucous membrane, as if it had been an opening in the intestine, with two series of Lembert sutures and then sutured the mucous membrane over them. I next made another small opening about 7 or 8 mm. above it, anterior to the opening which I had just made into the esophagus (Fig. 2, *b*), and found to my satisfaction that I had opened into the upper air-passage. A pair of curved hemostatic forceps passed into the mouth readily protruded through the opening in the diaphragm. I now dissected out the diaphragm completely. As soon as this was done the anterior wall of the esophagus, which had been drawn forward by the contraction, fell backward into its normal position and left in front of it a trachea completely divided into an upper and a lower portion (Fig. 3). The two ends of the trachea

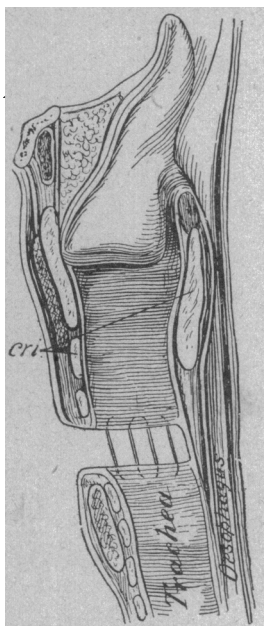


FIG. 3.—Showing the anterior wall of the esophagus fallen back into its normal position, and the complete severance of the trachea when the diaphragm had been dissected away. The lateral sutures uniting the trachea are indicated.

were now sutured together by four sutures on each side and two posteriorly. I found that the lower trachea was easily approximated to the upper, having fallen downward partly by its weight and partly by retraction, as if it were a spiral spring. The small anterior opening left was closed by three sutures. All the sutures were of silk. The sutures uniting the two ends of the trachea were passed completely through the thickness of the trachea, except posteriorly, where I was careful not to penetrate the esophagus. As I was fearful that there might be swelling, which would interfere with respiration and destroy the good results thus far obtained, or that some unforeseen complication might arise in so unusual a case, I continued my incision in the trachea below the site of the old tracheotomy opening, and inserted the tube into the trachea 2 cm. lower down. This made sure of easy breathing while the cicatrization of the recent tracheal wound above it was going on. If, then, the upper

part of the operation-wound healed, the simple removal of the tracheotomy-tube at a suitable time would be followed by complete spontaneous closure of the opening.

The entire operation was done with the patient in the Trendelenburg posture to prevent aspiration of wound fluids into the lungs, and after he was placed in bed, the foot of the bed was raised about eighteen inches. He lay without a pillow for the same reason. At the end of three days this inclined posture was abandoned. The nose and also the throat were sprayed every two hours with a boric acid solution, as they and the tracheotomy opening had been for two days before the operation. For three days he was fed entirely by the rectum in order to prevent motion of the larynx in deglutition. His temperature only once exceeded 100. After three days there was so little soreness that not only was his bed made level, but he was fed by the mouth, and on the fourth day he was allowed to be out of bed. On the sixth day I removed the tracheotomy-tube and found that he could breathe freely and speak audibly. I did not, therefore, replace the tube. The only dressing applied to the wound was gauze moistened with a bichlorid solution, 1-2000, sterile gauze being packed gently around the tracheotomy-tube and covering the opening of the tube. After the sixth day a simple dry gauze dressing with an apron of gauze hanging down over the second tracheotomy opening (from which the tube had already been removed, so as to protect it from dust, was used. The operation wound healed by first intention throughout. The tracheotomy wound, as soon as the tube was removed, gradually contracted and was entirely closed at the end of six weeks.

The sutures in the wound never gave him the slightest trouble. Only one of them was ever observed by the laryngoscope. His voice was slightly hoarse, but not to such a degree but that one would think it was his normal speech.

The present case, so far as we have been able to learn, is almost if not quite unique. We have seen a number of cut throats, but in those that recovered we have never seen any such membrane form. It must have been a result of the contraction following the extensive laceration, which drew the anterior wall of the esophagus over the curved upper surface of the tracheotomy-tube, for it exactly fitted its contour. Had an attempt been made to open it from above by any sharp cutting instrument, there would have been great danger of entering the esophagus, and one would not have had the facility, or even the opportunity, of closing it with ease. It has occurred to us that possibly if a blunt instrument, like a uterine sound, had been passed by the mouth between the vocal bands and made to bulge the membrane from above, one might have cut with a little more security and certainty through the diaphragm. On the whole, we are inclined to think that the mode of operation, by attacking it from the outside rather than by an intralaryngeal operation, was a fortunate one.

In the suicidal attempt the right recurrent laryngeal nerve was probably divided, or at least wounded. This accounts for the paralysis of the right vocal chord, which persists, and has resulted in a moderate hoarseness. At the present time, seventeen months after operation, his voice is almost normal and nearly free from hoarseness. The right chord is still paralyzed, the left freely movable; a slight narrowing of the lumen of the trachea at the site of the operation

is observed, but not appreciably sufficient to obstruct the breathing.

Föderl has a very excellent paper on resection and suture of the trachea, in which a number of cases are reported, but none of them at all resemble this. The bayonet-resection of Colley was not adopted, since it was found that the parts could be so readily approximated and the adjustment seemed to be perfect. Silk sutures were used, and yet reluctantly. But we thought that in order to get the narrow edges of the upper and the lower portions of the trachea to unite satisfactorily they must be held in place for a considerable time, which catgut would not do. Probably silk would not only hold them in position for a sufficient length of time to secure firm union, but if any of the sutures cut or ulcerated their way through into the trachea they would be readily expectorated. The result more than justified our hopes, for the silk was scarcely any source of irritation.<sup>3</sup>

CASE 2.—STRICTURE OF THE TRACHEA; SUCCESSFUL OPERATION BY DIVIDING THE TRACHEA LONGITUDINALLY, REFLECTING THE MUCOUS MEMBRANE, EXCISION OF THE STRICTURE, AND IMMEDIATE SUTURE OF ENTIRE WOUND; UNION BY FIRST INTENTION.

*History by Dr. Jones.*—Miss E. K., aged 21 years, of Smithville, N. J. Her parents, one brother and one sister are living and in good health. At the age of 7 she had measles and chickenpox, malaria at 8, and whooping-cough at 9. Since having the latter she has had more or less catarrhal inflammation of the nose and throat. Her menstruation began when she was 14, and is regular. In July, 1895, she sang during the evening, in open air. The following morning there was a little soreness on both sides of the throat at the base of the tongue. In the course of a few days the pain centered at a point immediately above the sternum. There was a tickling sensation which caused paroxysms of coughing. Her condition remained about the same for a month, when, after a visit of two weeks to the seashore, she returned feeling perfectly well. In the autumn of 1896, she noticed a whistling sound in the throat after slight exercise. From November, 1896, to January, 1897, she was kept on a strict milk diet to remedy an indigestion from which she suffered, her general health being in the meantime rather poor. In the spring of 1897, while attending a ball, she experienced great difficulty in breathing, after dancing. Ever since that time, slight exercise has caused considerable dyspnea. In December, 1897, she had an attack resembling spasmodic croup. After this the pain in her throat became more severe, and she had considerable expectoration, the sputa being white and frothy, but containing dark specks. In February, 1899, during the blizzard, she again had an attack of what was supposed to be spasmodic croup. From that time till now she has been suffering constantly from more or less dyspnea, especially marked on exercising. Even quiet respiration produces a slight sound, but after exercising, her breathing is distinctly audible and suggests stenosis of the air-passages at some point.

At this time, she consulted Dr. Jones, who immediately discovered the cause of her trouble. The

laryngoscopic examination showed, at a short distance below the vocal bands, a small, nearly round opening (Fig. 4), the diameter of which was about half the distance of the vocal bands from each other. Dr. Jones made several attempts at dilatation, but found that the throat was so irritable that the patient could not endure the procedure. In view of this and the very long treatment which it would require, which was very inconvenient for her, as she did not live in the city, he asked Dr. Keen to see her in consultation with a view to operation. After a careful examination, we reached the conclusion that the stenosis was but a little distance below the cricoid and extended over somewhat more than one ring.

*Operation by Dr. Keen.*—On March 31, 1899, I made a vertical incision from the middle of the thyroid nearly to the sternum, and was extremely careful to see that every bleeding vessel was tied before opening the trachea. The patient first took chloroform in the horizontal position. As soon as I was ready to open the trachea, I placed her in the Trendelenburg position and then split the trachea longitudinally for about six or seven rings, but found that to get free access to the stricture, it was necessary to split the

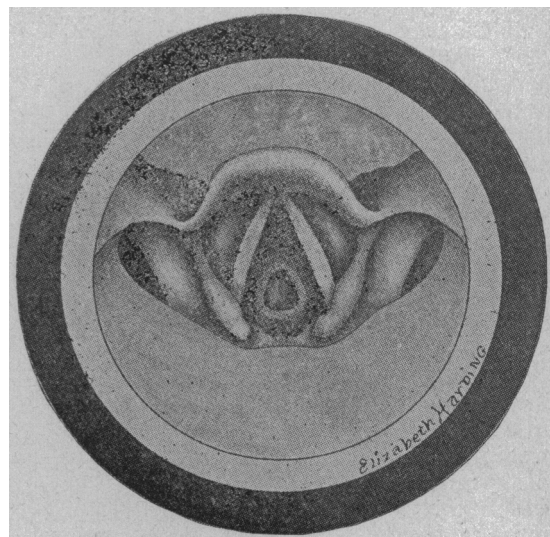


FIG. 4.—Appearance of the stricture in the laryngeal mirror.

cricoid. I then placed in the lower part of the incision in the trachea a tracheotomy-tube, and connected it with the chloroform inhaler by means of the inner tube of a Hahn tampon-canula 12 mm. in diameter, fastening the tube in place by disinfected tapes. The outer sponge-covered portion of the Hahn canula was not used. I then found that the upper border of the stricture was at the third tracheal cartilage and extended over the third and fourth and to the upper border of the fifth. The somewhat puckered appearance of the mucous membrane suggested that it might be the result of a local ulcer, though her history scarcely furnished a sufficient basis for such a belief.

I at first thought that I might do a Heineke-Mikulicz operation, but on making the incision and endeavoring to draw the sides apart, I found that the resistance of the submucous tissue was too great. Accordingly I dissected back the mucous membrane as two flaps upward and downward over all the area covered by the stricture. I next dissected out the fibrous tissue. By an unfortunate accident this was lost and so no microscopic examination could be made. During this procedure the sides of the trachea were held

<sup>3</sup> The following papers are of interest in connection with case:

Föderl: Wien. Klin. Woch., 1896, p. 1258.

Fischer: Deutsche Chir., Bd. xxxiv.

Noll: Deutsche Zeitschr. f. Chir., Bd. xxvii.

Schüller: Ibid., Bd. xii.

Colley: Ibid., Bd. xi, 150.

Gussenbauer: Sitz. k. k. Gesellschaft der Aertze in Wien, Jan. 22, 1875.

v. Eiselberg: Deutsche Med. Woch., 1896, No. 22.

apart partly by narrow retractors and partly by two silk sutures, which were held by assistants. These silk retractors served especially well. The hemorrhage was not severe, but was troublesome by obscuring the field of operation. It was sponged away with small pads of gauze. One vessel on the wall between the trachea and the esophagus spurted to such an extent that I tied it with catgut. This I afterward removed and twisted the vessel so as not to have the projection of the knot, which by bulging forward the mucous membrane might interfere with respiration. The wall of the esophagus was exposed at one point. I next sutured the mucous membrane with silk, but in the middle line I could not bring it quite together. A little gap was left there to granulate. The chloroform tube was now removed, and the trachea, which had been already partially sutured, was completely closed by catgut stitches passing through the perichondrium and pre-tracheal tissues. The skin was then closed with silkworm gut. The whole operation required about an hour and twenty minutes.

Her temperature on the afternoon of the operation rose to 100.4 F. After that it was never above 100, and by the second day had reached 99. The external sutures were removed a week after the operation, primary union having taken place without any untoward result.

The foot of the bed was kept elevated for forty-eight hours. On the third day after the operation she was on the lounge; on the fourth day she sat up in a rocking chair, and after that got quickly about. She was perfectly able to travel at the end of a week, but in consequence of the fear of possible complications, she remained in the hospital four days longer, leaving on the eleventh day. At this time Dr. Jones and I both examined her throat and found its lumen entirely normal. One silk suture could be seen partially loose when she went home. This annoyed her very little indeed, there being almost no cough. In fact, excepting for the soreness in swallowing, she suffered almost no pain whatever. For two days she was nourished by the rectum and then small quantities of liquid food were given her. On the fifth day she was able to take solid food. Her voice was never in the least affected.

Laryngoscopic examination on May 23, 1899, two months after operation, showed slight redness of the vocal chords. The tracheal stricture showed no tendency to return. Her voice and breathing are normal.

The method adopted in attacking this possibly unique case—for we have not found any similar one recorded—was most satisfactory. The easy access to the stricture; the dissection of the mucous membrane from the surface of the stricture, and its replacement and suture; the avoidance of any tracheotomy; the advantages of the Trendelenburg posture, and the primary union obtained, are the points upon which we would lay the most stress.

THE managers of the large Mount Sinai (Hebrew) Hospital, Lexington Avenue, corner of Sixty-sixth Street, New York City, have decided to move farther up town, and some time since purchased a site consisting of thirty city lots, between Fifth and Madison avenues and One Hundredth and One Hundred and First Streets. The cost of the land was \$400,000, and the estimated expense of the new buildings is \$1,000,000.

## CHRONIC MIDDLE-EAR SUPPURATION.\*

WITH PERMANENT RETROAURICULAR OPENING; RADICAL OPERATION.

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I present two cases that have been operated on, one two and a half, the other one and a half weeks ago, by the method of Professor Passow of Heidelberg. In each the healing process is far advanced and there is now little doubt of a speedy cure of the chronic middle-ear suppuration for which the operation was done. The cases are of special interest because they represent the first operations of this kind that have been done in Philadelphia.

In Passow's operation the radical mastoid operation is performed in the usual manner as far as the bone chiseling is concerned. A right-angled slit is then made in the cartilaginous meatus and the quadrilateral flap so formed is stitched into the bone cavity to form a skin covering for its ceiling. A large quadrilateral flap is dissected up from the skin behind the auricle and turned into the bone cavity to form a skin lining for its floor. When these flaps have adhered firmly in their new position and the parts have become comparatively dry, skin grafts are placed on the granulations between the flaps, and under favorable circumstances the whole middle ear with surprising quickness becomes a skin-lined non-secreting cavity. The healthy condition of this skin-lined cavity, its freedom from eczema and dermatitis, are maintained by the free access of air which the permanent retroauricular opening secures. If the object of the radical mastoid operation be to secure such a skin-lined cavity, it would seem that Passow's method would secure it most speedily and certainly.

While the average time required for a cure after the radical operation as performed by various operators is three to four months, the average time required by Passow's method is only eleven weeks, and in a percentage of his cases a cure resulted within four weeks. After the radical operation relapses are by no means unknown, and the attendance of an aurist is required to bring about a cessation of the discharge. Should a relapse occur in a case operated on according to Passow's method, the patient or his friends can readily keep the parts clean and apply sedative or astringent powders.

The objection to the operation is the disfigurement produced by a permanent opening. The opening is, however, not conspicuous, as it contracts during the after-treatment and becomes slit-like in character; only oval or round by pulling the auricle forward. It is possible at any time to close the opening by a simple plastic operation if its presence is disagreeable.

The advantages of the operation are that at all times free access is secured to the middle ear, all parts of which are plainly in view. Until the parts have epidermized, each day after a radical mastoid operation is a critic one, for exuberant granulations may form and adhesions and contractions occur that destroy, to a greater or less extent, the benefit to be derived from the procedure. With a posterior opening such processes are always easily visible and the adhesions can readily be broken down. If necessary, the curette, chromic acid or pressure may be used to bring about the desired result. The great advantage

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