CARCINOMA OF THE LARYNX.*

By S. E. SOLLY, M. D.,

COLORADO SPRINGS.

I present to you a report of a case of carcinoma of the larynx in which complete laryngectomy was performed. The patient died two months later. The direct cause of death was obscure, and is especially worthy of consideration.

L. F., aged 43 years, woman, married, white, native of Australia; occupation, laundress; residence, Nome, Alaska.

First Examination, September 10, 1904. History: Had always been healthy and unusually strong, active and temperate in her habits; no previous serious illness. Two years before began to get hoarse, till voice entirely disappeared. Three months ago dyspnea was first experienced, and it gradually increased. In consequence she gave up work and went to Tacoma, where she consulted Dr. Peleg Wing, who immediately sent her to me at Colorado Springs.

Present Condition: Marked dyspnea; general appearance healthy, well nourished; height 5 feet, 6 inches, weight 152 pounds. Before dyspnea began, weight had increased from her average normal weight of 145 pounds to 160 pounds.

Larynx: After spraying with adrenalin and cocain a good laryngoscopic image was obtained, showing a nodular tumor growing from the anterior wall of the larynx, and extending around two-thirds of its circumference. The upper surface of the growth was pushing up the false cords, so that they were tense and convex, but it did not extend above them. I removed a portion of the growth with a curette; it proved to be carcinoma. A curetting at the same time from the posterior wall showed normal membrane.

Sept. 5: The dyspnea became so serious that tracheotomy was done in an emergency by my colleague, Dr. Gildea.

Sept. 10: As Dr. W. W. Keen, of Philadelphia, happened fortunately to be in Colorado, I waited for him to perform a total laryngectomy. I had previously seen him do this operation. He very kindly operated the next day. His report is as follows:

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Operation, Sept. 11, 1904: I rigged up extemporaneously a Trendelenberg apparatus for the administration of the chloroform by carrying a long rubber tube into the tracheotomy tube, and, in order to prevent kinking of it at the opening of the tracheotomy tube, I wound a spiral spring for about four inches around that end, but I soon had to discard it and administer the chloroform on some cotton and gauze held by a pair of forceps over the tracheotomy wound.

In order to get room enough, I first made an incision in the middle line from the tracheotomy opening to the top of the sternum. The trachea lay at a great depth. I next divided three rings below the tracheotomy tube. This enabled me to displace the tube downward sufficiently to work above it, though, as I have already said, I soon had to dispense with the tube entirely. When I took the tube out, I passed a silk suture through the skin and the margins of the tracheal wound and drew apart the two margins of the wound, passing the sutures through the skin of the two shoulders, so that I was able to dispense with retractors. She was then placed in the Trendelenberg position. I then proceeded to do a total laryngectomy in the manner devised by myself (*Annals of Surgery*, July, 1899). As the epiglottis was entirely free from disease, I left it in place. Only two vessels were tied. A light packing of iodoform gauze was placed in the upper part of the wound where it was shut off by suture from the pharyngeal cavity; this was to be removed the next day.

The day after the operation, her temperature by the vagina was 101.8 degrees, its highest point. By the fourth day it had fallen to the normal, and after that fluctuated between the normal and 101 degrees. Nutritive enemata were given for six days afterward. She was annoyed by a considerable amount of discharge from the wound, which, of course, was infected in consequence of the already existing suppuration. Food was taken by the mouth on Sept. 15, the fifth day. She sat up in bed on the second day and was out of bed on the fourth day. Wound healed entirely by October 25.

The specimen removed by operation consisted of the larynx, the first ring of the trachea—the epiglottis was not removed—portions of the right thyroid lobe and of the isthmus, with these a parathyroid gland and a normal lymph gland; also portions of both sterno-thyroid muscles. Microscopical examination of the growth showed carcinoma of the squamous type.

Section of the right margin of the isthmus of the thyroid revealed carcinomatous invasion; none in the lobes or muscles.

Convalescence: There was never any evidence of communication between the mouth and wound. Improvements in all particulars appeared to continue for several weeks. Three weeks after the operation, it was noticed that she was beginning to whisper intelligently.

Relapse: About the middle of October there was some enlargement observed over the site of the right lobe of the thyroid. Dr. Keen telegraphed, urging removal of the portions of the thyroid gland not excised at the operation. The patient would not consent to a second operation, and therefore an X-ray treatment was given, three times a week. The treatment did not arrest the slow increase of the swelling, and dyspnea began to appear, though in a mild degree and slightly to increase. Upon November 6, two months after the operation, she received her last X-ray treatment, which she did somewhat reluctantly, as she thought it had lately caused her to breathe with more difficulty. She then walked up a flight of stairs to her room, but quickly began to walk up and down the room in an excited manner, exclaiming she could not get her breath. The house physician came almost immediately and found her sitting erect with very little movement of the chest and cyanosis coming on. The doctor could not then introduce the tube which the patient usually wore, but passed down a probe without encountering any obstruction. A little clotted blood in a watery secretion was ejected, and then her head fell forward and respiration ceased; the heart continued to beat for perhaps one or two minutes.

Post-Mortem, sixteen hours after death: A well developed and nourished woman at middle age. Tracheotomy opening in the neck. Incision above and below the tracheal opening healed, with the exception of a small granulating area immediately below in front. Tracheal opening smooth and admitting the tip of the little finger without difficulty. On the right side of the tracheal opening a hard mass was felt about the size of a pigeon's egg, and on the left a similar mass of smaller size. Connecting the two a bridge of infiltrated tissue could be felt passing immediately below the tracheal opening. Two glands about the size of almonds could be felt on the left side along the posterior border of the sterno-mastoid; the upper end of the trachea, esophagus, thyroid and adjacent

- A—Uninvaded lumen of larynx.
 B—Cornu of thyroid cartilage.
 C—Carcinoma.
 D—Thyroid (right tube).
 E—Site of emergency tracheotomy.

- A—Uninvaded lumen of larynx.
 B—Cornu and thyroid cartilage.
 C—Carcinoma.
 D—Right tube of thyroid.
 E—Site of emergency tracheotomy.

- A—Cricoid cartilage.
- B—Uninvaded lumen of larynx.
- C—Carcinoma.
- D—Right lobe, thyroid.
- E—Site of emergency tracheotomy.

- A—Cricoid cartilage.
- B—Uninvaded lumen of larynx.
- C—Carcinoma.
- D—Right lobe of thyroid.
- E—Site of emergency tracheotomy.

muscle were removed en masse. The trachea showed no appreciable changes or stenosis, esophagus negative. The lateral masses noted appeared to be intimately connected with the lobes of the thyroid. Heart and vessels normal except a few small atheromatous patches in the arch of the aorta. Pleuræ normal; lungs crepitant throughout; cut surfaces showed everywhere a large amount of dark frothy fluid. Fibrous adhesions between omentum and cecum, peritoneum smooth; no fluid. Left kidney small, less than 2-3 the size of the right one. Capsules stripped with difficulty; other viscera no gross changes.

Microscopical Examination: Kidneys and liver showed passive congestion and many small hemorrhages. Sections were made from the tissue on either side and below the trachea, including the upper end of the trachea for a distance of two or three rings. Section from left side including the left lobe of the thyroid showed nothing beyond dense round celled infiltration. Lower section showed small carcinomatous area on anterior mucous surface of trachea. Tissue external to trachea showed granulation tissue and muscle infiltrated with carcinoma. Right section showed no changes in trachea except desquamation of epithelium and round celled infiltration. Right lobe of the thyroid infiltrated with carcinoma of squamous type.

This is a summary of the facts.

There was a brilliant and successful operation, and except for the natural hesitancy of the operator to remove the entire thyroid body, which macroscopically appeared normal, there would probably have been no recurrence of the disease. The original tumor evidently began, as they so frequently do, in the thyroid angle, and remained confined almost entirely to the area covering the inner surfaces of the thyroid cartilages, but unfortunately it must have infected, through the cartilage, the thyroid gland. That the disease began intrinsic to the larynx accounts for its slow growth in two years, since it is usually rapid when its primary seat is extrinsic.

What was the cause of death? Suffocation? No, there was no chronic stenosis or even sufficient temporary swelling of the tracheal mucous membranes.

Acute edema of the lungs? No, there was not time for that, moreover the character of the respiration and the post-mortem appearances did not bear out this opinion; although

the frothy liquid which exuded on section of the lungs 16 hours after death may suggest it, it was too slight in amount.

The cutting of the pneumogastric nerve in the operation could not account for it, for the symptoms did not come on for two months. Excision of the pneumogastric, Dr. Keen tells me, is only followed by temporary disturbances of respiration.

Could death have been caused by suspension of the functions of the parathyroid glands?

As I find physicians generally are not well informed about the anatomy and physiology of these bodies, I venture to briefly speak concerning them. There are four parathyroid glands in man. They are found adjacent to the thyroid gland, two on each side of the neck. While variable in size and position, are of an average measurement of 6-7 m.m. in length, 3-4 m.m. in breadth, and 1.5 to 2 m.m. in thickness, and are oval in shape. They are apt to be mistaken for the accessory nodules of thyroid tissue which are variable in size, number and position. The parathyroids, while they may be mixed in with these, or even be enclosed within the capsule of the thyroid, are different in their structure, in which they resemble the pituitary gland, and are moreover quite distinct in function.

Experiments upon animals have demonstrated that if the thyroid alone is removed, a cachexia results, which leads on to myxedema. On the other hand, if the parathyroids only are excised there ensue entirely different symptoms of which polypnea, that is rapid breathing, and tetany are the most evident. When they are both removed, the parathyroid symptoms are less, but there appears a clinical picture resembling a complete case of exophthalmic goitre.

When parathyroidectomy is alone performed the symptoms are less, according to the number of glands removed, also if the animal is previously and even subsequently fed upon a vegetable or milk diet.

In connection with this influence of diet, it is well to note that the symptoms are very slight in Aves and Rodentia, are increased but still slow in the Ungulata. In the Anthropoidea there is well-marked chronic cachexia; and in the Carnivora the symptoms take an intensely acute and rapidly fatal course.

Chiefly for these reasons, the theory has been advanced that the parathyroid secretion is essential to an animal's well-being

and that it antagonizes some toxin formed during the metabolism of nitrogenous food.

Might not it be a possible and even probable explanation of the cause of death of this patient, that first the removal of one parathyroid in the operation, and then the gradual destruction by the carcinoma of the remaining three, brought it about mainly in consequence of the effects of their obliteration upon the respiration.

With respect to the possible part played by the X-ray treatments, I would suggest that as one of the immediate effects of the exposure of the X-rays is to cause a local hyperemia, therefore an increased pressure was induced and so an added difficulty in the proper functioning of these glands. This might account for the patient feeling worse after the treatments, or again as it has been demonstrated that X-rays cause the deterioration of glandular tissue, they may have accelerated the destruction of the parathyroids.

DISCUSSION.

Dr. Chevalier Jackson said the case reported by Dr. Solly was an exceedingly interesting one, and had been skillfully managed. Professor Keen's technique for total laryngectomy was well known, and could not be much improved, excepting in regard to the Trendelenburg anesthetizing tube, which he would probably eventually abandon. All the chloroform that was required could be very easily given on a gauze sponge held in a haemostatic forceps.

Dr. Keen had abandoned preliminary tracheotomy, and Dr. Jackson said he thought it was entirely unnecessary to keep these patients breathing through a tracheotomy canula for a week prior to the operation. The tracheotomy, if one was necessary, could be done at the time of the operation, the only argument against this being the advantage of a preliminary union of the trachea to the neck integument.

It was a good idea to have these patients sit up as early as possible after the operation, as many of the resulting pulmonary complications were the result of keeping them in bed too long, especially if supine. Morphin and deep anesthesia were the other two causes of pneumonia.

The speaker said there was one feature of the treatment described in Dr. Solly's paper that he wished to criticise, and that was the giving of nutrient enemata. He regarded them

as a delusion and a snare, although it was sometimes necessary to give them to satisfy the family. He did not think they were of any value as a means of prolonging life. While the rectum was a good thing to drink out of, it was a poor thing to eat out of. Thirst could be quenched, but hunger could not be appeased. A stomach-tube was harmless, and enabled the placing of food where it could do some good. The odor of rejected alleged nutrient enemata made one hope that none had been absorbed.

Dr. Jackson said that in one of his cases of total laryngectomy he removed the involved pneumogastric nerve and the common carotid and jugular, and the patient apparently suffered no ill effects from it. About four months later the malignant process for which the operation had been done recurred in a gland on the opposite side of the neck; this increased in size until it pressed upon the pneumogastric nerve on that side, with resulting cadaveric paralysis, so that the patient could not expectorate, and he literally drowned in his own secretions. With each respiratory movement, the secretions bubbled up into the larynx, and then receded into the bronchi, until cyanosis and death occurred.

While he regarded Dr. Solly's ingenious parathyroid theory plausible, and probably correct, he would ask if any nerve involvement had been noted.

Dr. H. W. Loeb, of St. Louis, said that of five cases of laryngectomy that had been under his observation, the first three died of a recurrence of the disease. In one of these there was a partial laryngectomy followed by a total laryngectomy, and finally death. In the other two, recurrence and death took place within six months after the complete operation. The fourth case was that of a stone-mason who had been treated by another physician for supposed syphilis of the larynx. The case proved to be one of carcinoma, as demonstrated by the microscope, and the entire larynx was removed. The man made an uneventful recovery, and was still enjoying good health, working at his trade, fifteen months after the operation, without any signs of a recurrence.

In the fifth and last case the larynx was removed without a preliminary tracheotomy. For a week after the operation the patient was fed by means of the stomach-tube. On the seventh day, while sitting up in bed, he had a sudden gush of blood from the mouth, and died. At the post-mor-

tem the operative wound was found to be in excellent condition, and death proved to be due to a pulmonary embolism.

Dr. John F. Woodward, of Norfolk, Va., said that in 1899 he was consulted by a man 40 years old who complained of hoarseness. There was neither swelling nor tumor, nor other apparent cause for the hoarseness. About three months later, however, a swelling was noticed between the true and false cords on the left side. He was treated for a time, and his symptoms improved, but subsequently he complained of dyspnea, and there was a swelling over the entire inner portion of the left larynx. A swelling of the thyroid was also noticed at that time. He was lost sight of again, and when he reappeared, about six months later, he said that he had visited the Johns Hopkins Hospital, where he had been told that he had carcinoma of the larynx and thyroid. At first he refused operation, but finally returned and begged to have something done for him. With the assistance of Dr. Joseph White, of Richmond, Va., a tracheotomy was done under cocain with considerable difficulty, on account of the thickened tissues. The patient returned to his work as a railroad man, and remained comparatively well for about eighteen months. The pneumogastric nerve then showed evidence of involvement by pressure, and the patient died by being drowned in his own secretions, as in the case reported by Dr. Jackson. Dr. Woodward doubted the value of late operations in these cases, inasmuch as tracheotomy seemed to promise as much comfort and prolongation of life.

Dr. Wendell C. Phillips, of New York, said that in connection with the discussion of Dr. Solly's paper, the fact should not be lost sight of that those men who operated with comparative frequency for the removal of the larynx, either partial or complete, advocated a preliminary tracheotomy, and they did so for the reason that their final results were better so far as the occurrence of septic pneumonia was concerned.

Dr. E. Fletcher Ingals, of Chicago, said we should not lose sight of the rule that laryngectomy should not be done in extrinsic cases; that is, when the disease had extended outward beyond the walls of the larynx, but in intrinsic cases the results were often very favorable. The speaker said he had in mind two such cases where the operation was done for him between two and three years ago. In both instances the laryngectomy was done by the Keen method; in one of them a

preliminary tracheotomy was done, and in the other it was not. Whether such a preliminary tracheotomy tended to prevent the onset of a septic pneumonia was doubtful. An interesting feature in connection with his cases was that both patients were able to enunciate very distinctly after the operation, although the trachea was stitched to the skin, and one of them had learned to talk so that he could be heard distinctly fifteen or twenty feet.

Dr. Solly, in closing, said that in the case he had reported, the condition was an intrinsic one, and very clearly defined.

In the case reported by Dr. Jackson, the patient's death was apparently due to pressure on the opposite pneumogastric, and this might have occurred in his own case, although no nerve elements were found in the tissues removed at the autopsy, and there were no evidences, during life, that the opposite pneumogastric was involved in the recurrent growth. The patient raised a little frothy secretion just prior to his death, and on section of the lungs, some frothy matter was found there. The post-mortem was very carefully made, and no thrombus nor embolus was discovered; neither were there any evidences of renal disease, although one of the kidneys was small.