

speaks of it most unequivocally (*sic*). Whether this will be satisfactory or not to Englishmen is immaterial—history must not be distorted (*Die Geschichte muss gerecht seyn*).”

We have seen, just above, how precise were Lange's views on the subject, and it is fortunate that the Library of the Surgeon General possesses his precious tract.

GERMANY

To tabulate the numerous operations for goitre performed by German, Austrian and Swiss surgeons (395 up to 1883) in the same elaborate manner as has been done for the British, French and Americans would require too much space; I have, therefore, merely enumerated them (*vid.* Table V) and have devoted the pages to the better purpose of tracing the mental processes of the world's leading surgeons in their journey towards the goal, hoping that it may be profitable and enjoyable to my readers to learn from the lips of the men who have created and perfected the operation for goitre the story of their progress. I have told in the foregoing pages enough to indicate that so far as the art of operating is concerned nothing of real significance was contributed by any of the four countries—France, Italy, Great Britain and America; but more important than the art was the science, the contributions to which from Great Britain and America made progress in surgery possible. Prior to the introduction of anesthesia, little surgery was done in the world; and after this, when operations soon had multiplied in every land, sepsis reared its head, and finally so dominated the situation that in some countries, particularly those where operating was done on the largest scale, hospitals had to be destroyed and operations, if done at all, had to be performed in pavilions. It was the fear of hemorrhage that deterred surgeons from operating for goitre, but it was from sepsis that most of the patients of the Swiss, Austrian and German surgeons died.

From the canvass which portrays the work of the resolute men, who at the outset went to the aid of the gasping victims of goitre, the figure of Hedenus looms in my eyes perhaps largest. At the very beginning of the nineteenth century he extirpated six suffocating goitres without a death, a feat which was not repeated for three-quarters of a century.

J. A. W. HEDENUS (Dresden). *Ausrottung der Schilddrüse*. *nal d. Chir. u. Augen-Heilk.*, Berlin, 1821, Bd. ii, p. 237.

Hedenus begins his communication thus:

“Although I have six times and successfully performed this tion, which on account of the arteries, veins and nerves is so difficult dangerous, I will relate the story of only the most important namely the second, notwithstanding the fact that the third, fifth sixth were not less significant.

“That the operation belongs to the most difficult of surgical takings is evident from this, that several authors maintain unachievable; thus Wichman says in his *Diagnostik*. ‘To extirpate a goitre as one would a scrofulous gland is equivalent German to nothing less than literally to cut off the neck.’ Even great and, for German surgery, unforgettable Professor Rich Göttingen, who for every physician and surgeon in Germany mortal, assured me verbally that on account of its great danger I never performed this operation and never will.”

P. 240: “Inasmuch as all of these patients operated upon I would have died of suffocation, . . . I resolved to interfere, notwithstanding the risk, and for the following reasons: In the first to relieve them of life-threatening danger and of some distress secondly, in order to demonstrate to my students what an op who is endowed with courage, determination, calmness, perseverance and patience, and who possesses the requisite anatomical and su knowledge, can accomplish with the bistouri for the good of man

Abstract of Hedenus's case 3: Male, *æt.* 21. Large goitre caused rattling in the throat.

Operation, October 8, 1800: Vertical midline incision. In aining the tumor sufficiently to expose the superior and inferior t arteries * “64 arteries were tied.” The thyroid vessels were doubly ligated and divided. The difficulties increased as the ope progressed, because always new arteries had to be ligated in the of the wound. Since arteries as large as the radial continued to p themselves the *pedicle of the tumor was transfixed with a double ture and tied off*.† The goitre was then cut away without fr bleeding. The operation required 1½ hours.

Stormy convalescence. Difficulty in swallowing, hoarseness, f of right arm, chills and high fever, delirium, extensive infecti wound, abscesses under scapula and hemorrhage from the stur

* It seems to have been the aim of Hedenus to tie the thyroid arte as early a stage of the operation as possible.

† Italian mine (W. S. H.). This method of treating the so-called I was followed in all countries for about 80 years. For notable exce see cases of Desautel and Dupuytren.

the eighth day; on the 17th day severe hemorrhage from the upper angle of the wound. On the 23d day the patient was permitted to get out of bed. Ultimate recovery.

I doubt if we can realize today what it meant in the year 1800 to perform in a fairly bloodless manner and without anesthesia an operation of such magnitude.

Considering the circumstances, are not, perhaps, these operations of Hedenus for goitre performed about one and one-quarter centuries ago as great as, if not greater than, any surgical accomplishments of the present day? We have only to bear in mind the warnings against performing this operation, from one-half to three quarters of a century later, of Dieffenbach, Liston, Velpeau, Gross, Mott and many others, including surgeons even of our time, and to recall the sensation made in this country by the relatively crude operations of the courageous Warren Greene, 70 years after Hedenus, to comprehend in some measure the credit due to this surgeon.

In striking contrast to the admirable operative procedures of Hedenus are the detestable performances of Klein (1815). "Do the chronicles of surgical horrors record a more revolting tragedy than the one staged by Klein in the case of the deaf and dumb child? The comments of this exultant operator on his foolhardy achievement accord well with his dolish savagery.

Dr. KLEIN (Stuttgart). *Ueber die Ausrottung verschiedener Geschwülste, besonders jener der Ohrspeicheldrüse und der Schilddrüse. Ausscheidung der Schilddrüse.* Jour. d. Chir. u. Augen-Heilk., Berlin, 1820, Bd. i, 120.

Case 1: Deaf and dumb boy, *æt.* 11 years. Delicate and very small for his age.

"Finally, in June, 1815, the child was brought to me, and I was astonished, as was everyone who saw it, at the remarkable nature of the growth. It occupied the whole of the left side of the neck extending from the ear to the third rib. Blood vessels, finger-thick, were spread over the surface of the tumor, which on account of its weight rather than from adhesions was quite immovable. At its base the transverse diameter was 6 inches, the vertical, 5; its transverse arch measured 16 inches, its longitudinal, 11½. It was very nodular, and here and there pulsation could be felt in the arteries which entered it. Since in this case no other measure was possible I decided upon extirpation in spite of the great difficulty and the manifest danger. I had to deal here with a child who could in no way be made to comprehend anything, who even while measurements of the tumor were being taken was unmanageable.

"The child was placed on a table because I dared not let him sit the lap of an attendant, since his breathing would have caused motion interfering with operative precision. One assistant held the head, two assistants, one on each side, held the arms, and two, the hair and feet. I stood on the right side, rapidly made two oval cuts over the tumor, and on each side dissected up a flap. From the many large vessels, everywhere cut, there came, as was to be expected, a considerable quantity of blood, but always fingers enough were ready to arrest hemorrhage. However, in the brief period, over ½ pound of blood was lost. The left lobe was quickly cut away; this could be done the moment it was ready, inasmuch as the incisions crossed above and below. An assistant now pressed a cork firmly upon the carotid above the collar bone. I pulled the tumor with the fingers forcibly upwards, keeping always on the under surface, using sometimes the fingers, sometimes the knife, and sometimes its handle, separated it from the entire length of the carotid, from the whole trachea and larynx and finally below upwards shelled out the right lobe. To do all this required who would believe it?—1½ minutes. Even I would not have believed it, for the time seemed to me very long, especially when I was stripping the tumor from the carotid. But several onlookers who counted seconds agreed as to the time elapsed.

"To our amazement, no bleeding followed; even the divided thyroid arteries did not bleed, and except for the hemorrhage from the divided superficial veins very little blood was lost during the operation. We were still more astonished to find the child lying there without a pulse on the wound and the face to be dashed with cold water; thereupon deep spasmodic breathing took place. I regarded it as a deep swoon. The boy let out a cry only when the first cut was made, at any rate one heard any further sound, and this was excusable considering the concentration of the operation. For about three-quarters of an hour the body was rubbed and brushed and splashed, and stimulants all the reviving means employed; during this time the heart, occasionally also an artery, could be felt to beat feebly, but the inspirations gradually decreased in frequency, and then without the slightest convulsive movement life was extinguished.

"The necessary routine precautions to be observed in case of a return to life were prescribed, but the child remained dead.

"Now arose the question, what could have been the cause of death? Loss of blood it certainly was not, nor was it injury to the carotid, for injury to the vagus could with equal certainty be excluded, because in the first place this is not fatal and, second, it presents a different picture. Entrance of blood into the larynx either by mouth or through an injury of the same or of the windpipe it could not be, other than there would at least have been violent coughing and a streaming of air. If we consider, furthermore, the short duration of the operation, the manner of death becomes more inexplicable.

"The next morning I examined the body. The edges of the wound all the way up to its upper angle could have been beautifully brought together. The carotid, the vagus, the vena jugularis were throughout their entire length covered with a thin layer of connective tissue. The sterno-cleido-mastoid, pushed far to one side, was cleanly dissected, but not injured. At the exit of the carotid from the aorta I made an incision and injected water upwards several times, but not a drop escaped from the carotid; it did, however, from the dilated thyroid arteries which had been cut off so long that their ligation would have presented no difficulties. The nervus vagus was dissected throughout its entire length and found to be nowhere injured—indeed it could not have been because the carotid was intact. Alongside of the carotid were four cervical vertebrae still covered with fascia (so deep had the tumor extended); the esophagus was bared for the same distance, and bared also were the windpipe and larynx which had been forced to one side. I slit them from below upwards through the glottis, but not a drop of blood did they contain. How difficult the enucleation must have been one can now comprehend, and one can conceive also how beautifully and rapidly the operation must have been performed.

"At any rate, the connoisseur in passing judgment upon a faultless operation is influenced not by the result but by the artistic manner of its performance; and in the present case I have for myself no reproach, but only congratulation.

"This is the first extirpation of a thyroid gland of this size which has come my way. I have never seen the operation performed; nor have I ever practised it on the dead body,* for the opportunity never presented, or else, perhaps, I did not embrace it. It would be presumptuous to make generalizations from one case, but I openly confess that I cannot understand why one stands in such awe of hemorrhage and I admit, just as freely, that I was not in the least apprehensive on this score, and that I performed this operation with absolute courage and with the consciousness that happen what might I should certainly be equal to the emergency.

"In all cases the thyroid arteries must be cut; in the first instance, the trunks; in the second, the branches. In the case of the latter, gum arabic, combined with continuous pressure against the cervical vertebrae and vigorous constriction of the basal surface, can be relied upon. In regard to the ligation of the arterial trunks as well as of all other arteries whether of skin or muscle which must necessarily be cut, I confess that I would not follow Desault or Richer among others who advise before ending the operation to tie each divided artery. The latter, in his lectures, gave this advice for all operations, even in ablations of the breast. I, too, followed him in the beginning, but soon wrote to my venerated teacher that, for various reasons, I should no longer follow his advice, and since then, too, I do so no more and find that I get along better."

* Unless, possibly, this operation was on the dead body (W. S. H.).

Case 3: Baron von T., *et. 22.* At the age of 14 years a circumscribed hard nodule appeared in the lower part of the right thyroid lobe. Increasing in size it finally caused difficulty in swallowing and a feeling of pressure in the head. He became despondent and resigned from the army. Other forms of treatment having failed to give relief he was told that an operation of a dangerous nature alone offered hope. His misery became unendurable when he had "the frightful misfortune to shoot to death in its cradle the only child of a much-beloved brother. Thereupon, overruling all my objections he insisted upon having the operation performed. Over the inner end of the right collar-bone, under the sterno-mastoid muscle I found a hard mass the size of a dollar. This disappeared completely at times and could only be recovered by lateral rotation of the head and repeated attempts to swallow, combined with the pressure of the neck against the clavicle. If seized quickly with the fingers one could force it up to the middle of the windpipe. The patient made his will, and insisted upon having the operation performed, so I resolved to do it notwithstanding its dangers. On the 4th of April [year not given] I performed the operation, to describe which will be as difficult as was the procedure itself. My intention was to cut directly down upon the upwards dislocated nodule. This was unachievable because the patient could not endure the pressure necessary to hold the tumor in position. I drew up, therefore, a fold of skin and made through it a 4-inch incision parallel with the sterno-mastoid muscle and down to its tendon. But now the lump could not be felt; it had withdrawn itself behind the collar-bone so far that I could barely touch its upper edge. It is really difficult to understand that so many futile attempts had to be made before the tumor could be seized. Finally, after various twistings of the head and repeated efforts of the patient to swallow, I succeeded in catching it with a double hook in one of the moments when it bobbed upwards. Now swiftly I transfixed it with a needle, made a sling of the thread and in this way held the hard lump. The overlying muscles, the sterno-mastoid included, were divided. But the omohyoid, which happened to be pierced by the loop of thread, I cut in two, because at the moment the latter was more important for me than the former.

"Partly by means of the very useful loop of thread, partly by the hook and partly by the fingers I succeeded in pulling forward the tumor, but as I progressed I had to cut with greater caution. The deeper I went the more I had to use blunt instruments. And now whether I pulled or dissected, the patient suffered either indescribable, transitory pains in the head, or spasms of the diaphragm, or a painful, uncontrollable tendency to swallow and vomit, so that quickly I had to change the direction of the tug or of the dissection; the enucleation was thereby complicated, and the more so because the tumor now proved to be much larger than I had thought. In the course of the delivery the superior thyroid artery was cut through and spurted

smartly; but as I intended to bring the operation rapidly to a finish the hemorrhage caused me no concern. After I had freed in this manner about two-thirds of the hard mass, the consequences of the tugging on the vagus and phrenic nerves became more and more pronounced and hence on this account and also because the operation had been so prolonged and the hemorrhage so great I concluded to tie off the tumor and cut it away distal to the ligature. But as I tightened the loop and thus pressed forwards the tumor, I squeezed it entirely free from its connections: the loop glided behind the growth which almost delivered itself as I continued to draw up the knot. Now, thought I, the game is won and I can alter my plans. Accordingly, I sliced away the tumor, but at the same time cut in two the unusually dilated inferior thyroid artery, whereupon the loop of thread followed after. The hemorrhage which ensued can be imagined. To ligate was out of the question—the hole from which the bleeding came extended 2 inches below the clavicle (to this depth I could pass my index finger). Pressure could not be brought to bear, the operation had lasted a quarter of an hour, the patient's condition was bad, the sponges employed became instantly soaked through with blood and cast out. It was high time to act promptly. There remained only one thing to do—to ram a sponge the size of a fist into the hole and to keep up the pressure on it by six assistants in turn. This availed; the bleeding ceased and therewith the consternation of all of us, who believed that I had severed the carotid, so great was the hemorrhage.

"There is nothing especial to be said about the dressings and the treatment. On the second day there was considerable fever; there developed a continuous cough, producing irritation with a very disagreeable sensation in the region of the diaphragm, and associated with this a distressing shortness of breath which compelled the patient to remain in a sitting position. These symptoms were clearly referable to the irritation of the nerves of the diaphragm caused by the sponge. It was surprising that neither the swallowing nor the speech was in the least affected.

"Each day the suppuration increased, but the sponge remained fixed, nevertheless. One dared not make forcible attempts to withdraw it, and I was six hours distant. On the ninth day the sponge began to show up above the surface of the wound; by cutting away the projecting part, by gently pulling in one direction and another, by twisting it on its axis, etc., I finally succeeded in bringing out the sponge which was indescribably swollen. Only an insignificant hemorrhage, from the edges of the wound, followed its withdrawal. Without exaggeration the sponge was one-third larger than at the time of its introduction; a more precise estimate of its relative size I am unable to give because the instant it was laid aside a hunting dog devoured it. (It is of course a digression, but still sufficiently remarkable to deserve mention, that this very large sponge did the dog no harm. We never knew whether the dog disgorged the sponge or not.)

"In the third week the wound was healed and our patient is one of the happiest of men."

VICTOR VON BRUNS. Almost the entire story of progress in the surgery of the thyroid gland for the third quarter of the last century may be found in the operative work of Victor von Bruns. In 1851 he removed successfully several nodules, from the size of a hen's egg to an apple, from the isthmus and both lobes of the gland. His second operation was in 1856; the patient died of septicæmia. Then each year, with few exceptions, he had either one or two cases until 1876 when he operated upon six. For 1862, 1869 and 1870 no case is recorded, but for 1864 there are three—28 cases * in all. Most of the operations were enucleations for "parenchymatous cysts"; two were total excisions (operations of great magnitude) for carcinoma. Of the six deaths, five were due to septicæmia and pyæmia, and the sixth to secondary hemorrhage, also, of course, the result of infection. Excluding the cases of carcinoma, there were only four deaths in 26 cases. The operation upon one of the carcinomata (1874) required four hours and 120 ligatures. A large piece of the left common carotid was excised. On the fourth day after the operation there was profuse secondary hemorrhage from the left common carotid which was controlled for three days by compression with the Esmarch crutch. On the ninth day there was a fatal hemorrhage from the same vessel. Thus, except for infection, von Bruns would, probably, have had no fatality to record from operation upon the thyroid.

It is noteworthy that, in contrast to other surgeons of his day, as early as 1868,† he used the cutting edge of the knife to dissect, carefully, the tumor from the trachea.

Bruns exercised great care in controlling hemorrhage. Operations which he considered quite bloodless might not, however, be so regarded today. He did not, apparently, discover that the blood vessels of the thyroid gland had a distribution which varied little from a norm; nor, indeed, did Kocher until some years later (1883)‡ direct attention to the regularity in the arrangement of the arteries and veins and

* In Stükand's paper²⁰⁰ these cases are tabulated, and 10 of the most important ones are recorded in detail.

† Desautel in 1701 and Dupuytren in 1808 (*vid. table*) carefully cut the isthmus away from the trachea. Then for 60 years and more, surgeons of all countries, fearing to dissect the isthmus from the trachea, treated it as a pedicle, with clamp and cautery, écraseur, transfixion, ligatures, etc.

recommend ligation of the thyroid arteries as a step in the operation preliminary to the excision of a lobe. Bruns ligated vessels only as they presented, liberating first the more loosely attached parts of the tumor.

His dissection was made bluntly, sometimes with specially designed tips which could be forcibly separated by pressing the handles of his polypsectum; or, the tissues to be divided were canalized layerwise with Cooper's scissors, the fingers or the handle of a knife. Along the passage thus made a ligature-needle would be passed, and the tissues, including vessels, would be divided between the two ligatures.*

I was pleased to find in Siskind's dissertation (l. c., 1877) a list of instruments employed by Bruns in his operations for goitre: "Several pointed bistouries, several forceps* (preferably toothed forceps), Cooper's scissors, one aneurism-needle (preferably the blunt, ligation-needle of Bruns), a Muzenx's hooked forceps† (Vulsella) or a fenestrated forceps, ligature-rods of Gräfe or Dupuytren, catgut and silk, sponges, water, blunt hooks."

No mention is made of artery forceps; this may be an oversight, for Bruns in his *Handbuch der chirurgischen Praxis*, vol. i, p. 29, says: "The ordinary forceps which are closed by finger pressure † can be held permanently closed by various devices, among which the Schiebervorrichtung of Fricke has proved to be best suited to the purpose. Most frequently such lockable forceps are employed for the tying of bleeding arteries and hence have been named artery forceps, although they are often used to grasp the cut edges of the skin or mucous membrane, or bits of sponge with which blood and mucus are wiped away. For all these purposes I use preferably the forceps represented in Fig. 37" (l. c., p. 29). Another forceps used by Bruns is figured on p. 240 of his book.

The above quotation convinces one that the artery forceps was not used very frequently, and that the idea of leaving two or more clamps hanging in a wound had not been evolved.

The contributions of Billroth to the surgery of goitre would not from his own pen seem to be nearly so important as Kocher's, but the significance of his work is reflected in the writings and contributions from his school—of his assistants, notably Wölfler, von Mikulicz, von Eiselsberg, von Haberer and Schloffer.

* Dissecting forceps is meant.

† Vulsella forceps was used for the hard tumors and a fenestrated forceps for the soft ones.

‡ Our thumb forceps.

Wölfler's voluminous and classic monographs on the development and structure of the thyroid gland and of goitre^{28, 29} resulted from the study of Billroth's operative material. Von Mikulicz gave to the world his method of resection of both lobes; from von Eiselsberg and from his school has come fundamental experimental work on transplantation of the thyroid and parathyroid glands; von Haberer has greatly stimulated interest in the thymus, and by his operative studies on the human subject has lent support to the views of Garre, Rehn and Klose, and of Garre's assistants notably Capelle and Bayer. Schloffer has developed an operation for goitre which closely resembles mine. In the early eighties Billroth had operated upon more cases of goitre than any one in the world, had emphasized the danger of wounding the recurrent laryngeal nerve in performing the operation of lobectomy, and had furnished many sad examples of tetany consequent upon total extirpation of the gland.

THEODORUS BILLROTH.* *Chirurgische Klinik, Zürich, 1860-67. Berlin, 1869, p. 167.*

"Fasse ich das Resultat meiner Kropfoperationen zusammen, ohne Rücksicht auf die besonderen Verhältnisse der einzelnen Fälle, so ist es kurz folgendes:

	Mal	Getheilt	Gebessert	Ungetheilt	Gestorben
1. Cystenkröpfe:					
Punction.....	2	1	..	2	..
Punction, Drainage.....	1	..	..	..	..
Incision, Verrückung von Cystenwand und Haut...	10	8	..	2	2
Punction, Iodinjektion...	20	18	..	..	..
2. Feste Kropfgeschwülste:					
Subcutane Zerreissung....	3	1	1	1	..
Aetzung.....	1	..	..	..	1
Tenotomie.....	2	..	1	..	1
Exstirpation.....	20	12	..	..	8
	59	40	2	5	12"

largely I have refreshed my memory of Billroth's experiences with the surgical treatment of goitre in the eventful days of his directorship of the surgical clinic of the University of Zürich; and I wish there were space to quote him at greater length.

* On the 1st of April, 1861, in his 31st year, Theodororus Billroth assumed the responsibilities of the surgical clinic in the University of Zürich. On the 21st of August, 1867, he was called to the chair of surgery in Vienna.

Billroth's account of his treatment of tumors of the thyroid by operation, "subcutane Zerreissung," which he performed in only three cases and abandoned after the first fatality, strikingly testifies to his earnest effort to cure his patients, to his zeal in carrying out personally every detail of the treatment, and to his desire at first to avoid operation with the knife. Of the 20 extirpations which he performed, eight of the patients died, although 18 of the operations were merely enucleations of circumscribed growths. In one case (No. 16) he performed successfully a one-sided lobectomy, and in one (No. 17) he excised the whole gland, with fatal result in 48 hours.

Case No. 17 (*l. c.*, p. 176): "Verena N., æt. 29. Excessive dyspnea. The trachea, especially at its entrance into the chest, was compressed by many nodules in the thyroid gland. Extirpation of the entire gland. After the operation the patient could not swallow. Collapse and death in 48 hours. At the autopsy the right recurrent laryngeal nerve was found to be included in the ligature about the inferior thyroid artery."

P. 179: "To him who has had little practice in these operations it can easily happen that he removes the entire half of the gland instead of merely the tumor, whereby the operation becomes very complicated and more dangerous. The extirpation of the entire gland is not so exceedingly difficult and can be accomplished without great bleeding; *but whether human beings can survive it has not yet been determined.*"*

The deaths following Billroth's operations were due to infection. One patient (No. 17), the only double lobectomy, died of "collapse"—probably from hemorrhage. Thus Billroth, who later, in Vienna, was to accomplish so much in the operative treatment of goitre, contributed little to its advancement during his 6½ years in Zürich.

BILLROTH'S CLINIC IN VIENNA. Reported by Anton Wölfler, *Zur Chirurgischen Behandlung des Kropfes*. Arch. f. klin. Chir., Berlin, 1879, Bd. xxiv, p. 157.

Believing that the operative methods of treating the various forms of goitre have been perfected, Wölfler thinks it would be unnecessary to write further on this theme were it not for the new questions raised by the advances made in the treatment of wounds. He confines his report to the consideration of cases of goitre treated in the clinic of Billroth in the academic year of 1877-78. A great number of patients with so-called parenchymatous goitres were treated with injections of iodine. Among these were not only the "diffuse hypertrophic forms"

* Italics mine (W. S. H.).

which Kocher considered the only ones suitable for iodine injections but also soft goitres ("struma follicularis mollis") and other varieties "which probably stand midway between the two." Certain cysts responded to iodine injections in a remarkably favorable manner others were uninfluenced by this treatment. Unqualifiedly condemnatory is the method of Mackenzie** (injections of chloride of iron) on account of the danger of embolism.

Wölfler reviews the use of the setaceum, the wick, the hair seton cannula, incision, thorough drainage, etc., and concludes as a result of their experience with the Lister treatment that incision with drainage of cysts has a promising future.

The physical characters of the goitre particularly interested the surgeon. Was it solid or cystic or vascular—a tumor suitable for parenchymatous injection, "Zerreissung," seton, drainage, enucleation or to be let alone?

It interests me to note that Wölfler strongly recommends the use of penghawar djambi* for checking hemorrhage in papillary cysts which bleed after incision. During this and the following year (1879 and 1880) I studied in Vienna, and observing that penghawar djambi was used quite frequently in the clinic of Billroth, I obtained some of it from Wölfler, who only a few years ago very kindly sent me a fresh supply of this curious natural styptic wool. I have never had occasion to use it.

Wölfler asks if it might not be justifiable to extirpate cystic goitre notwithstanding the vehemently adverse pronouncement of Gurlt and others and, finally, reports the results of seven extirpations of goitre with the antiseptic method of Lister. Prompt healing was obtained in every case. He wonders why so few operations upon the thyroid gland had been undertaken in America and France; and particularly in England, where ovarian cysts had been removed one hundred times as frequently as goitres; "whereas with us the contra-indications are becoming constantly fewer and the number of operations are steadily increasing." He finds the answer in the better control of hemorrhage in the antiseptic technique and in the new indication for operation based on the teaching of Rose that the tracheal rings become softened by the pressure of goitres. The intimation that the surgeon of England, France and America were not so advanced in their

* Palææ hæmostatica. Root hairs of the East Indian bullock tree (Baun farren).

art of controlling hemorrhage and in the science of the treatment of wounds was fully justified. Whereas most of the better surgeons of Germany and Austria and Switzerland promptly and eagerly accepted the teachings of Lister there were few in England, France or America who did so until nearly a quarter of a century later. Indeed, our surgeons were novices as compared with the Germans in the art as well as the science of surgery in those days.

But Wölfler's memory seems to have been short, for hardly more than a year had passed since Billroth, ever mindful of his disastrous experiences of the previous decade in Zürich, had ventured to operate again upon goitres; and the acquired confidence was based chiefly on results obtained with the antiseptic method of Lister, a gift from England.

In this series (1877-78) of Billroth were, for the first time, cases operated upon for cosmetic reasons and for moderate difficulty in breathing—"none because life was threatened." Also a definite method of operating had been evolved. The incision was made along the sterno-mastoid, and the division of this muscle abandoned. The sterno-hyoid, sterno-thyroid and usually the omo-hyoid muscles were divided transversely. The capsule was slit up on a grooved director, its veins being avoided as much as possible.

Clamps had come into use and Billroth was evidently learning some of the various purposes which they were to serve; for example, he divided tissues containing vessels between two of them and would leave a number hanging in the wound. Where the binding structures were short, an aneurism-needle was employed. The thyroid vessels were not sought for and isolated; all vessels were tied en masse as encountered. "The searching for special vessels did not seem worth while, because the operation would thereby be lengthened and be made bloodier than it was when step for step ligatures en masse were applied. And, moreover, it seemed questionable whether wound surfaces would unite primarily if 60 to 100 ligatures remained and in part came to be opposed to one another." In order to avoid the danger to which tying en masse exposed the recurrent nerve, Billroth included less tissue in the ligatures when working in the vicinity of the inferior thyroid artery and ligated this artery separately, as it was met with in the course of the operation.

Abstracts are given in this paper by Wölfler of the seven cases operated upon by Billroth in the academic year 1877-78.

These records have especial interest for me, because they tell the story of the early experiences with Listerism of Austria's great surgeon, and also for the reason that I was studying in Vienna (1879-80) and occasionally attended the clinic of Billroth at this period when the science of surgery was beginning to reveal promises of a marvellous future.

I regret that the early operations on the thyroid gland by Billroth are not reported in greater detail. From the data given I am quite sure that lobectomy, more or less complete, was performed on one side in three of the cases (Nos. 1, 6 and 7), and extirpation of a circumscribed tumor in three (Nos. 2, 3 and 4).

In case No. 2, a cystic papillomatous adenoma, the hemorrhage was so great from one of the deep-lying cysts that complete extirpation was impossible. The bleeding was stopped by stuffing with penghawar djambi.

In case No. 5, total extirpation of the gland was probably made, at least in the sense that no thyroid tissue was left unremoved. Both lobes had apparently been replaced by adenomata. The left recurrent nerve was paralyzed as a result of the operation.

In case No. 7, "Struma carcinomatosa," there were "ganz enorme Blutungen." Sudden collapse occurred from the entrance of air into a vein, but the patient recovered and the operation was completed. The internal jugular vein had to be ligated.

BILLROTH'S CLINIC IN VIENNA. Reported by Anton Wölfler. *Weitere Beiträge zur chirurgischen Behandlung des Kropfes*. Wien. med. Wochenschr., 1879, Bd. xxix, pp. 733, 758, 782, 810, 831.

This paper followed promptly the preceding one on the same subject and is continued through five numbers of the Wiener medicinische Wochenschrift. Nine more cases (Nos. 8 to 16) of successful goitre-extirpation are reported.

With the growth of Billroth's experience in operating and in the antiseptic treatment of wounds his confidence keeps pace, and we find in this report operations of greater magnitude than before—three total extirpations and one lobectomy plus an enucleation on the opposite side. Wölfler contrasts the work of his countryman with that of the surgeons of other lands, condemning particularly and quite properly the operative method of Warren Greene (*l. c.*), which he terms, not inaptly, an "énucléation à tout prix," and bestowing insufficient praise

upon Patrick Watson (*l. c.*) whom, true to the error of Stöckard, he credits to England instead of to Scotland. He justly criticizes Watson's extracapsular method, but he should have borne in mind the fact that Watson was scoring 5 consecutive recoveries from lobectomy and total extirpation of the thyroid gland (1871-74) in the years when Billroth, discouraged by the memory of his unfavorable results with operations upon the thyroid gland in Zürich (1860-67), was resting on his oars so far as thyroidectomies were concerned. Undeniably, Billroth's method in 1878 was better than Watson's in 1871-74; and in justice to Billroth it must be recalled that his deaths in Zürich were with one exception due to sepsis. On the other hand, Watson had to work quite without artery clamps; whereas Billroth, thanks to intercurrent inventions and to greatly increased operative practice following the advent of antiseptic surgery, had become, in 1878, fairly conversant with their uses.

We should particularly bear in mind, also, the important fact that in German-speaking countries patients were directed in great streams to the university hospitals and that Billroth was director of Austria's greatest surgical clinic; whereas in Great Britain adequate opportunities to operate usually came late in his life, if at all, to the surgeon and the number of cases at his disposal was pitifully small. Furthermore, Billroth's surgical activities were always in countries where goitre is prevalent.

Case No. 11 (*l. c.*, p. 760): *Totale Exstirpation einer strumösen Schilddrüse, definitive Heilung nach 20 Tagen*. This is Billroth's first case of tetany, and his first total extirpation with successful result. Wölfler writes of it:

"This case yields us several facts of clinical interest: it demonstrates that total extirpation of the thyroid gland seems under certain circumstances not only to be demanded, but also that the operation may be performed with as little danger as the simple shelling out of the goitre.

"It was further noteworthy that after extirpation the patient's voice became hoarse. Dr. Catti ascertained by laryngoscopic examination that there was right-sided paralysis of the vocal cord. Besides this, other symptoms appeared which led us to conjecture that these symptoms might be connected with the loss of the thyroid gland.

"A few days after the operation the patient surprised those around her by her singularly restless and dissatisfied demeanor; she complained continually of sleeplessness, and importuned constantly the physicians and attendants to do something to relieve her since her

condition was worse than before the operation. Since the local and general conditions seemed to leave nothing to be desired it was thought that she was feigning the symptoms of which she complained.

"On the evening of the sixth day the patient was seized with convulsions of the extremities, without losing consciousness. She was greatly agitated, cheeks red, pupils dilated, respiration labored, all extremities cool, pulse 65; at the same time she complained of pains in the head, dazzling before the eyes, roaring in the ears and a feeling of pressure in the chest.

"On the 19th of November the patient had a second attack, and on the 21st, a third; but these last were much milder than the first attack. The whole clinical picture tallied so completely with that which had been observed by Landois, and besides by Hermann and Escher in the experimental production of hyperemia of the brain, that one must conclude that the conditions of the circulation of the blood in the brain had undergone a change by the complete removal of the thyroid gland. Even though the correctness of this conception cannot at present be denied, it is, nevertheless, questionable, since the patient suffered from an antelexion of the uterus, and her ovaries, palpable per vaginam, were sensitive to pressure—symptoms suggestive of hysteria. There remained, nevertheless, as cause for suspension of judgment, the asseveration of the patient that before the operation she had never suffered from such attacks, and also the circumstance that during the subsequent four weeks of her stay in the hospital she was quiet and contented, that the attacks were not repeated and that sleep returned."

The symptoms described by Wölfler in this case seem clearly to signify tetany—the first, following operation, that I have found recorded. Indeed, so far as I am able to judge from a careful reading of the published cases, no one except Slick (*l. c.*, 1867) and Kocher (two cases, *l. c.*, 1874) had hitherto excised the thyroid gland so radically. The parathyroid glandules, consequently, had probably never before been destroyed unless possibly in Billroth's case of Veronika N. (*l. c.*), a patient who died too soon (48 hours) after operation for tetany to have developed.

"One of the patients (No. 16) of the series had to be tracheotomized in the course of the operation. In the act of dissecting off the isthmus the softened trachea suddenly bent on itself at an angle, the patient ceased to breathe, and all efforts to restore the respiration being fruitless the trachea was opened and the operation completed. By subsequent laryngoscopic examination it was discovered that there was paralysis of the left vocal cord; nevertheless, the movements of the epiglottis remained normal. Comparing this observation with that made before operation, it is found that the left vocal cord, which before the opera-

tion had acted more sluggishly than the right, was paralyzed, and that the epiglottis in this case was not affected by the paralysis. We shall return later to the explanation of this peculiarity.

"Four weeks later, when the wound in the trachea was cicatrized and the patient had begun to speak aloud, another laryngoscopic examination was made. It was interesting to discover that the opening of the previously compressed and softened trachea now appeared perfectly normal and that the closure of the glottis was now exact."

RÉSUMÉ BY WÖLFER (L. C., p. 832) OF THE 16 CASES OF BILLROTH'S

ANTISEPTIC SERIES

"In the last year and a half, as has been stated, Professor Billroth performed 16 operations for extirpation of goitre with antiseptic methods. In all the cases healing took place in from one to five weeks.

"The size of the goitres varied from that of a walnut to that of a man's head and over.

"The age of the patients was from 19 to 65 years.

"Total extirpation of the affected thyroid gland was undertaken in three cases; in one case the middle and right thyroid lobes were extirpated; in all the remaining 12 cases the tumor only was excised.

"The operation was most frequently performed on account of increasing difficulty in breathing; in about five less important cases it was for cosmetic reasons, and in some cases for both.

"In the case of a woman with papilloma of the thyroid gland severe hemorrhages necessitated rapid extirpation.

"The technique of the operation was, aside from some unessential variations, in most of the cases the same, and can, therefore, be briefly summarized as follows:

"1. Exact cleansing of the field of operation;

"2. Under thyroïd spray a linear skin incision along the inner edge of the sterno-cleido-mastoid muscle (in one case a flap was made);

"3. Division of the superficial and deep fascia of the neck on the director; double ligation of the superficial veins. For all ligations silk, boiled in carbolic acid solution according to the method of Czerny, was used, catgut, never;

"4. Splitting of the capsule on a director, or, when many veins were encountered, division between two clamps;

"5. Attempt to free the goitre bluntly; if this does not succeed;

"6. Divide all obstructing bands between two artery clamps and ligate en masse;

"7. Ligation of the superior thyroid artery; excision of the goitre from above downwards; isolation and ligation of the inferior thyroid artery;

"8. If total extirpation is undertaken, the same procedure is followed on the opposite side;

"9. Careful excision of the goitre with special attention to the freeing of the isthmus from the trachea; here, also, two clamps may

be employed; or, if the adhesion is slight, an aneurism-needle may be passed through on the proximal side and a clamp applied periphera to the goitre;

"10. Thorough washing out of the wound with thymol; introduction of two to three medium-sized drainage-tubes; stitching with three plate-sutures and a corresponding number of interrupted stitches;

"11. Application of an antiseptic dressing covering the che neck and head;

"12. The drainage-tubes and the plate-sutures are removed on the third or fourth day, the interrupted sutures on the sixth to the eighth day; later, the fresh scar is covered with an ointment bandage. Several of the above-mentioned procedures which have already become typical of our clinic have been described in our previous communication, there remain only a few other matters to be discussed in detail.

*Paralysis of the Vocal Cords Following Goitre-Extirpations **

"It appears quite remarkable that in each of the last six cases, which Dr. Catti made careful laryngoscopic examination after operation, a one-sided paralysis of the vocal cord was observed. In one case (No. 11) we could not be sure that paralysis of the vocal cord had not been present before operation; and also in case No. 16 it was noticed prior to operation that the left vocal cord, which became paralyzed later, acted more sluggishly than the right (atony of the vocal cord); in the other four cases, however, of one-sided paralysis of vocal cord closure of the glottis was exact before operation.

"It should be emphasized that in each of the three cases of extirpation of the thyroid gland paralysis of the vocal cord occurred on one side only.

"In the first days after operation a paralysis of the recurrent nerve may be suspected if the patient chokes in attempting to swallow fluid; this indicates that the epiglottis is no longer able to close the glottis accurately.

"Fortunately these one-sided paralyses of the epiglottis improved markedly after the first or second day. If such patients are later examined laryngoscopically, it is seen on phonation that only the edge of the epiglottis sinks which does not correspond to the paralyzed side and that the epiglottis must make a sort of twisting movement in order to close the entrance of the larynx. It was also noticed in several of the patients that in the course of four to six weeks the voice became less hoarse, or that the hoarseness almost entirely disappeared. Improvement in the speech, which is noticed in paralyses of the recurrent nerve produced by other causes, is not due to the restoration in short a time of the function of the paralyzed vocal cord, but to the fact that the healthy cord, being approximately gradually to the paralyzed one, effects an almost complete closure of the glottis; the voice, if

* L. C., pp. 833-6.

though not so hoarse, is still weaker than normal. This improvement in the speech may be the reason why so few authors have thought it necessary to make an examination of the vocal cords after extirpation of a goitre.

"The fact that one-sided paralysis of the recurrent nerve improves in this fashion is confirmed by many other observers (Türk, Mayer, Gerhart and others).

"A case very interesting in this connection was published by Klein (Jour. von Grafe-Walther, Bd. i, p. 130) in 1818: A young man had a goitre the size of an apple removed. During the operation he suddenly became speechless; thereupon the tumor was quickly ligated and cut off. The loss of voice lasted for three weeks; by degrees the patient began to speak again, 'his voice had changed into a harmonious bass.' It should be noted especially that sometimes a swelling of the arytenoid cartilage persisting for a time after operation likewise causes temporary incomplete closure of the glottis.

"The cause of these paralyses of the vocal cords is easily explainable if one remembers that in ligating the inferior thyroid artery the trunk of the recurrent nerve may be caught, ligated and cut through.

"This generally accepted explanation is justifiable only when, as in the three cases described by us, the one-sided paralysis is complete, where not only the one vocal cord, but also the corresponding half of the epiglottis is incapable of functioning.

"Ligation of a recurrent nerve in dogs produces paralysis not only of the vocal cord and the arytenoid cartilage, but also of the corresponding half of the epiglottis (Navratil, Berlin. klin. Wochenschr., 1871, p. 394).

"Therefore, if the vocal cord only is paralyzed then the trunk of the recurrent nerve cannot have been ligated.

"If one considers the anatomic position of the inferior laryngeal nerve and its topographical relation to the inferior thyroid artery, one sees that the trunk of the recurrent nerve, where it runs near the artery, lies so far inwards that it is not difficult to avoid it if one isolates the artery before tying.

"Based on the experience with the seven earlier cases of extirpation of goitre, Professor Billroth always makes it his particular aim to isolate the inferior thyroid before ligating it.

"It is remarkable that in spite of this precaution paralysis of the vocal cords occurred so frequently in our cases. Following the trunk of the recurrent nerve further upwards, one soon sees that it always rides over one of the branches of the inferior thyroid artery, and that, therefore, it is at this spot that there is danger of including it if the peripheral ligature is applied very near to the goitre.

"Therefore, no certain disproof can be offered that, in the three above-cited cases of complete one-sided paralysis, the recurrent nerve was not caught by the artery clamps.

"The cases of incomplete one-sided paralysis of the recurrent nerve (paralysis of the vocal cord only) cannot, therefore, be explained by the cutting of the trunk of the recurrent nerve.

"Following the recurrent nerve beyond its crossing of the branch of the inferior thyroid artery, it is seen that, gradually dividing into its filaments, the nerve runs along the posterior surface of the thyroid gland to the thyroid cartilage. If adherent to the capsule of the goitre, some of the fibres of the nerve may easily be torn in peeling out the tumor—a condition which may be responsible for most of the paralyses of the vocal cord.

"Thus, only, can one understand that sometimes there is an incomplete and at other times a complete paralysis of the recurrent nerve.

"It follows, therefore, that double ligation of the trunk of the inferior thyroid artery should be made as far as possible from its division into branches, and that the greatest care should be taken in freeing the goitre from the larynx and trachea in order that the branches of the inferior laryngeal nerve at this point shall not be torn."

Total Extirpation of the Degenerated Thyroid Gland

"According to the cases collected by Bruberger (l. c.) there have been 17 total extirpations of the thyroid gland, with two deaths.

"Adding to these the cases of Rose and Kister, and Billroth's new series of 16 cases, we have a total of 26 total extirpations, with four deaths—a mortality of 15.5 per cent.

"The suggestion to remove the whole thyroid gland instead of extirpating the goitre may be applicable to those localities where goitre is endemic; but where it is only sporadic the simpler procedure of enucleation of the tumor may well suffice. Professor Billroth decides on total extirpation only when the isolation of the goitre presents great technical difficulties, especially in those cases in which the goitre is intimately blended with the thyroid tissue. This much we know, moreover, that the removal of the degenerated thyroid gland in man is well borne, indeed so well, that from its loss we are not warranted in coming to any certain conclusion in regard to the physiology of the normal thyroid gland.

"And now some remarks on the dressings of the wounds in the last eight cases:

"As Professor Billroth advised in the Med. Wochenschrift, 1879 No. 1, we have used since November, 1878, for covering wounds, gauz impregnated with paraffin and kolofonium (not carbolized) from the Schaffhausen Fabrik. Apropos of this it must be emphasized that the wounds in the last eight cases of goitre extirpation—mostly very extensive operations—healed as quickly and with as little reaction as the earlier ones dressed with Lister's carbolic-acid gauze dressing.

"We observed, however, that in some of these cases swelling subsequently appeared about the margin of the wound, or that, the sec-

breaking down at one point, slight suppuraton would occur, and cease only when several silk ligatures came to the surface. The general condition of the patients was not further affected, although their stay in the hospital was lengthened from one to two weeks. Whether the suppuraton was due to the silk ligature or to the tying off in mass of tissues, which having become necrotic could not readily be encapsulated when lying immediately beneath the skin, I do not venture to decide. Foreign bodies, especially needles, produce abscesses when they happen to be just under the skin, whereas they may lie for months or years in the deeper layers without exciting reaction.

"Professor Billroth inclines toward the latter view; against the first hypothesis speaks the circumstance that we observed in a large number of general cases as well as in several cases of goitre-extirpation that the carbolized silk ligatures healed in the wound without reaction."

In a postscript Wölfler states that in the course of the preceding few weeks Billroth operated successfully upon four additional cases of goitre (20 in all); two of these were total extirpations of the gland. It is interesting to note that whereas in the previous cases Billroth had cut his silk ligatures short, he left them long and hanging out of the wound in the last four, because the healing had been delayed a week or two by the late discharge of the short ligatures.

BILLROTH'S CLINIC IN VIENNA. Reported by Anton Wölfler. *Die Kropfextirpationen an Hofr. Billroth's Klinik von 1877 bis 1881*. Wien. med. Wochenschr., 1882, Bd. xxxii, p. 5.

"Five years have now elapsed since Professor Billroth as result of his experience with the antiseptic treatment of wounds took up again the operative treatment of goitre and developed it in typical manner."

We may conclude, therefore, that during his first 10 years in Vienna, from 1867 to 1877, he rarely operated upon the thyroid gland, fearing to repeat his disastrous experiences in Zürich, where eight of his 20 patients operated upon for goitre died. In his preantiseptic period (1860-76) he operated upon 36 cases (Zürich 20, Vienna 16) with 13 deaths (36.1 per cent mortality). In his antiseptic period (1877-81) four of 48 cases (carcinoma excluded) died (8.3 per cent). Excluding five tracheotomized cases of this latter group, of the remaining 43, only one died (2.3 per cent).

As to the kind of operation performed, there were two enucleations (one death), 24 single lobectomies (one death), 22 total extirpations (two deaths). The recurrent laryngeal nerve was uninjured in 31 cases, paralyzed on one side in 11 cases, on both sides in two cases.

Death from tetany occurred in one of the cases of paralysis of the vocal cords. In the same year Riedel²⁰⁰ reported paralysis of the laryngeal nerves from irrigation of the wound with a 2 per cent solution of carbolic acid after total excision of the thyroid.* The patient died of pneumonia following thyroidectomy.

N. WEISS. *Zur Pathologie und pathologischen Anatomie der Tetan*. Wien. med. Wochenschr., 1883, Bd. xxxiii, p. 683.

Weiss reported on 13 cases of tetany which he had collected—Billroth (Vienna), eight cases; Albert (Vienna), two cases; Schönberg (Königsberg), two cases; Nicoladoni (Innsbruck), one case. Tetany had been observed only in young females and only after total extirpation of the gland. In three instances it had appeared within hours of the operation, but usually not until several days thereafter once as late as the tenth day. Having in mind a nervous origin (spinal cord) for the disease he emphasizes the fact that paralysis of the recurrent nerve occurred only in eight. Five patients recovered from the tetany, two died, and in one case the tetany still persisted (three years).

He discusses the question as to whether the operation was responsible for the tetany and decides in the affirmative. From his clinical and anatomico-pathological studies he is confident that tetany is due to persistent condition of irritation in the anterior horns of the gray substance of the spinal cord. He believes that neither the operative incision as such, nor the paralysis of the recurrent nerve, nor the elimination of any special function of the thyroid gland could cause this state of irritability of the spinal cord; he considers it far more possible, but probably, that the ligation of the inferior thyroid arteries, by increasing the flow through the vertebrals may have caused hyperemia of the medulla oblongata and spinal cord and thus have brought about the disease; but he believes it highly probable that the ligation of so many blood vessels in the course of the goitre operation sets up an irritation of the peripheral sympathetic nerves, and thus, an excitation of the vascular centres of the cervical spinal cord and medulla, which in turn

* Recently in the surgical clinic of The Johns Hopkins Hospital a musculo-spiral nerve was paralyzed in a wound freely swabbed out with pure carbolic acid. The wound was thus vigorously sterilized in order to prevent infection of the blood-clot with which an involucral cavity was filled. In about three weeks the function of the nerve was completely restored.

brings about changes observed by him in the gray substance; namely, in the anterior horns of the spinal cord.

In three cases he found such definite changes in the ganglion cells of the anterior horns, particularly in the neighborhood of the fifth and sixth cervical roots, as to confirm his previous postulate that the cause of tetany is to be found in an irritable state of the ganglion cells of the spinal cord. He considered it, therefore, unnecessary longer to speak of tetany as a neurosis, but was inclined to classify it with the diseases of the gray substance of the spinal cord.

I have cited Weiss's views as to the cause of tetany chiefly as an introduction to the following remarks of Billroth, who took part in the discussion:

"There can be no doubt that tetanus and tetany are two perfectly distinct processes which have in common only the muscle cramps and the fact that they appear after operation. Tetanus, by the way, is beginning to become merely a matter of history. In the past 30 years I have seen only five or six cases, except in war-lazarets; and in Vienna only two cases in 16 years, and not one in the past 10 years.

"In most cases of tetanus there is trismus, which is not true of tetany; and tetanus follows wounds of the extremities. Tetany, on the other hand, seems to be due to conditions of irritation which proceed from the trunk and head. Tetanus and trismus are very dangerous; three-quarters of all cases die. From tetany most patients recover; it can, therefore, not be considered a milder form of tetanus. The unquestionable relation of tetany to goitre-extirpation naturally leads one to blame disturbances of circulation; but I doubt if this view is correct, for the following reasons: If we ligate both inferior thyroid arteries, an increase in pressure in the region of the subclavian can only occur when at the same time the routes for the returning blood have undergone a considerable change disadvantageous to the free circulation of the blood. But from the operation for goitre the alteration in conditions is favorable to freedom of the blood stream. The internal jugular vein is not ligated, but, on the contrary, is freed from the pressure of the goitre-mass. Moreover, in the neck collateral routes are so numerous that it is doubtful if an increase in the blood pressure could occur. If this were not so, one should expect something similar to be observed after ligation of the carotid, which, however, is not the case.

"The partial extirpation of the goitre, as hinted at by the speaker (Dr. Weiss), would be more dangerous than the total unless it were indicated by a preformed goitre; the essential progress rests, indeed, upon this, that we take away the entire tumor—that we first the superior and then the inferior thyroid artery in order to be able to work on unembarrassed. Were we compelled to cut through the middle of the goitre we should be confronted with a quite uncontrollable

hemorrhage.* It is possible that the division in great quantity of nerves and the ligation of many arteries play a rôle. But we often perform operations for the extirpation of neoplasms, which are just as formidable as the goitre excisions, and there ensues no tetany; I am inclined, therefore, to lay especial stress upon the division of the numerous nerves of the thyroid gland, and believe that tetany occurs only in those individuals who are predisposed to nervous affections. The number of deaths in consequence of tetany is, altogether, not very great.

"Concerning the anatomical findings, they seem to point to the conduction from the field of operation of a nutritional disturbance; the proximity of the brain and spinal cord may have considerable significance; these lesions (those described by Dr. Weiss) may perhaps occur in every case, but they must be present to a considerable extent in order to produce the picture of tetany. As to the changes in the vicinity of the nerves, I would not attach great importance to them; infiltrations in the nerve-sheaths occur more or less with every injury. The essential thing seems to be a disturbance of nutrition which extends along the axis cylinders; if such nutritional disturbances from wounds are to be regarded as inflammation, then we must call this process inflammatory."

O. KAPPELER. *Geschwülste des Halses. Chir. Beobachtungen aus dem Thurgauischen Kantonssspital Münsterlingen, 1865-70. Frauenfeld, 1874, p. 99.*

In the three years immediately following Billroth's term of service in Zürich, Kappeler enucleated encapsulated tumors in four cases and performed a lobectomy in one. All of the patients recovered.

He refers to the good service which a "Kreuzpinzette" carrying a loop of thread might render, in the troublesome work of dealing with shor vessels. So helpless were surgeons when confronted with blood vessel in the days before the introduction of the modern artery clamps.

A. LÜCKE. *Ueber die operative Behandlung des Kropfes. Samml. klin. Vorträge, Volkmann, Leipzig, 1870, No. 7 (Chirurgie No. 3), p. 37.*

Destined to play an important rôle in the drama of thyroid surgery was Lücke, eminent predecessor of Kocher in Bern; still in his prime, he died at the time when his record for goitre operations was the best in the world. Lücke's successful labors in this field could

* Billroth's view of the matter emphasizes the credit due to Mikulicz for the discovery three years later that, with proper preliminary precautions for the control of hemorrhage, there need be no bleeding on resecting a goitrous lobe.

hardly have failed to stimulate Koehér, who was little more than a boy when he assumed the responsibilities of the directorship of the surgical clinic of the university. We are indebted to his assistant Brière[§] for the publication of Lücke's results, as we are to Stiskind for knowledge of the work of his venerated chief, Victor von Bruns, and to Wölfler for the valuable and scholarly exposition of the contributions of Billroth, the adored master, to the solution of this complex problem.

Lücke advocated parenchymatous injections with tincture of iodine, and warns against excision because of the danger of hemorrhage and infection; he stated that the ligation of the thyroid vessels as recommended by Philipp von Walther[¶] had been condemned.

In 1873 Lücke published a *Bericht über die chirurgische Universitätsklinik in Bern von Ostern 1865 bis Ostern 1872*, D. Zeits. f. Chir., Leipzig, 1873, Bd. ii, p. 337, but concerning goitres there is only the following paragraph:

"Among the solid goitres there was one large calcareous goitre, and one vascular goitre; the remainder were in part treated according to my method with parenchymatous injections of iodine, and in part shelled out. Of 10 extirpations there was only one fatality. On the extirpation of goitre there has appeared a dissertation by my student Dr. Brière von Yverdon."

Brière in his inaugural dissertation on the surgical treatment of goitre records nine cases operated upon by Lücke in Bern—two in 1865, two in 1868, four in 1869, one in 1870. Lücke in his report of his clinic up to Easter, 1872, speaks of 10 extirpations, hence he operated upon one case only from 1870 to Easter, 1872. The nine cases selected by Lücke for operation and reported by Brière were, as I interpret the records, all circumscribed tumors, quite undoubtedly adenomata. Local infection with infiltration of the tissues of the neck so extreme as to completely obstruct the trachea was the cause of death in the single fatal case. Brière reports also three operations by Professor Emmert of Bern, one of which resulted in death, and tabulates 73 operations from the year 1785 to 1871, as follows:

The Operative Story of Goitre

	Nombr d'opérations	Guerisons	Morts
"Cas opérés (1785-1845) *..29	18	2	11
V. Walther †.....	2	2	—
V. Bruns †.....	5	3	2
Emmert §.....	3	2	1
Billroth ||.....	20	12	8
Mildeidorf ¶.....	1	1	—
Schnh **.....	4	4	—
Lücke ††.....	9	8	1
Total	73	50	23

"That Billroth's results were relatively so unfavorable is comprehensible if one bears in mind the fact that many of his patients were operated upon in extremis.

"The success of Lücke, on the other hand, is due not only to the skill of the surgeon and the prudence of the operative procedure, but also to the judgment exercised in discerning the indications favorable to operation."

PAUL STICK. *Ueber die totale Excirpation einer hypertroph entarteten Schilddrüse und über die Rückwirkung dieser Operation auf die Circulationsverhältnisse im Kopfe*. Med. Corresp.-Blatt des Württembergischen Ärztlichen Vereins, Stuttgart, 1867, Bd. xxxvii, p. 199.

The following case of Stick's deserves special emphasis, because the first time symptoms of thyroid deprivation were observed to follow the operation—a total removal, possibly the first, of the thyroid gland. Boy, æt. 10. Tumor, size of apple, tense, elastic, in the midline to the right of it. Extended from the sternal notch to the lower border of the thyroid cartilage and, "remarkable to relate, on deep inspiration disappeared completely behind the breastbone." It caused great difficulty in breathing. The tumor was first noticed in the spring of 1860.

** Schmidt's Jahrbücher.

† Zartmann, De Strumae Excirpatione, Bonnae, 1829.

†† Klein, Ein Beitrag zur chirurgischen Behandlung der Strumeningen, 1860.

§ Brière, l. c.

|| Chirurgische Klinik, Zürich, 1860-67. Berlin, 1869.

¶ Lebert, Die Krankheiten der Schilddrüse, und ihre Behandlung, Breslau, 1862.

** Ausrottung eines Cancer fasciculatus der Schilddrüse und zweier Struma glandulosa mittelst Galvanokaustik. Wien. med. Wochenschr., 1859, Jahr. 9, p. 641.

†† Volkmann's Sammlung klinischer Vorträge, Nr. 7 (Chirurgie 3), 1870."

about one year before Dr. Sick was consulted. Sept. 18, 1866: Exploratory puncture. Only blood, a few drops, came through the cannula. Operation immediately thereafter.

Chloroform. Superficial veins divided between two ligatures, carried under the vessels with an aneurism-needle (procedure attributed by Klein and Sick to von Bruns). All the vessels were secured in this fashion as they were encountered. Division of sterno-hyoid and sterno-thyroid muscles. Tumor completely freed, except for firm adhesions to the trachea. It was then found to be continuous with the left lobe, which, however, was not much enlarged, although on palpation it was hard in spots and partly embraced the trachea. The propriety of dividing the isthmus was debated, but it was finally decided to remove the left lobe. The vessels of the upper pole (unnamed) were divided as on the opposite side, but the central ligature slipped and the wound immediately filled with blood. Many futile attempts to catch the bleeding vessels were made. The spurting artery threw such a powerful jet that the operator's eye became blinded several times with the blood and it was thought that the carotid must have been divided. The operator recalled a precisely similar case in the Tübingen clinic in which the carotid had been ligated to control the bleeding and in which later a secondary hemorrhage had occurred. Pressure on the carotid was finally made and the spurting vessel secured with an artery forceps.* The left lobe was finally freed and the entire gland clung only to the trachea over an area the size of a "bean." The patient suffered so greatly from cramp of the glottis on attempts to ligate the pedicle that the advisability of tracheotomy was considered. Finally, by tightening the ligature very gradually the cramp of the glottis was not reproduced and the gland could be cut away.

This may have been the first case of total excision of the thyroid gland. Bruberger (*l. c.*), however, tabulates it as a partial extirpation and 17 others as total. In my opinion these figures should be reversed, for the only extirpation which without question could have been total was Sick's. This matter I have discussed in connection with Bruberger's paper.

High fever. Pulse at one time 150, but in about 12 days the patient's condition was quite normal. In two months after the operation the patient was discharged with a small granulating wound.

The specimen removed—about five times the size of a normal gland—showed disseminated colloidal changes. Nov. 4: Letter from patient

* Klein²² and others report similar experiences with less happy result. This is a happening which even today occurs, particularly in the practice of surgeons who still employ catgut for ligation. A few years ago, in the course of a week's visit to a clinic where many goitre operations were performed and catgut was exclusively employed, this accident occurred twice under my eyes and once on the patient's transit to the ward.

describes nasal hemorrhages. Dec. 12: Letter. Nasal bleedings have ceased, but there is a running from the nose which is so profuse that the upper lip has become raw. June 1, 1867: Boy has returned for examination. He seems in blooming health, but the father states that the psychological behavior is entirely changed. Formerly joyous and lively he is now silent, quiet and dull.

Sick's is perhaps the most complete total extirpation, up to the time, of the thyroid gland; it supplies also, as I have said, the first report of the condition which we now recognize as status thyreoprivus. Previous cases had, with few exceptions, been excisions of circumscript tumors, cystic or solid, or of more or less readily enucleable portions of colloid goitre. Thus, in the first case of total excision psychological symptoms were produced. Two explanations suggested themselves to the operator: (1) Disturbed circulation in the brain due to removal of the organ (thyroid gland) which was supposed to regulate it; (2) thyroid might be the place where certain "Umsetzungen" of blood constituents take place and with its removal the chemical altered condition of the blood might lead to qualitatively changing nutrition of the brain. The Medical Verein of Stuttgart (June 1867), after due consideration, concluded that the second of these hypotheses had most to commend it.

THEODOR KOCHER. *Zur Pathologie und Therapie des Kropfes*. D. Zeitschr. f. Chir., Leipzig, 1874, Bd. iv, p. 417.

Hardly a year has passed since Kocher was called to the chair of surgery at the University of Bern in which one or more papers on goitre have not appeared from his pen.

Among Kocher's significant contributions to the subject are: Discovery of the fact that total extirpation of the thyroid gland followed by body changes, to which he gave the name cachexia thyreopriva; (2) the studies with his life-long friend Langhans of malignant tumors of the thyroid gland; (3) the perfecting of operation of thyroidectomy; (4) the stimulus which he gave to operative treatment of Graves' disease and to the study of the mild forms of hyperthyroidism; (5) the recognition of engrafted forms of Graves' disease; (6) the demonstration of the value of the ligation of the arteries as a preliminary step to lobectomy, in the highly toxic cases; and (7) the danger of the indiscriminate administration of iodine to patients with goitre.

In 1872, Theodor Kocher, at the youthful age of 31,* succeeded Lücke as director of the surgical clinic in Bern, his native town. Stimulated, presumably, as I have said, by Lücke's success in the operative treatment of goitre and by the great number of patients suffering from this disease who must have applied for relief at the surgical clinic of Bern, Kocher in the first two years of his incumbency, was able to credit himself with 13 extirpation operations upon the thyroid gland. Among these were two total excisions and two évidement † or "Aussehlung" operations; the remainder were, seemingly, enucleations of circumscribed tumors. Two of his patients died—the first and the last, and from infection. In both of the cases of total excision recovery took place. Billroth, at this time, had, apparently, discontinued operating for goitre, being convinced that the danger, chiefly from sepsis, was too great. He had performed only one total excision; this patient died within 48 hours, probably from hemorrhage—plus, perhaps, infection. Kocher writes:

"The chief danger in extirpation is the profuse bleeding ‡ which occurs from the numerous arteries, but much more from the enormously developed venous plexus about the glandula thyroidea. To attempt to lessen the hemorrhage by ligating the four arteriae thyroideae, as has been proposed of late, seems theoretically very rational, but such a procedure is almost identical with extirpation of the goitre itself." §

In six cases the indication for operation was dyspnea. In five of these the tumor was of the "goitre plongeant" variety. The incision employed was either along the edge of the sterno-mastoid muscle (for laterally situated tumors) or in the midline.

"It is absolutely essential for the most successful carrying out of the operation that the operator should not permit himself to be frightened off by any difficulty from dissecting down to the goitre tissue proper; he must not leave the thinnest connective tissue capsule undivided. *It would be better to cut into the goitre itself, to make sure, rather than in the deliverance of the tumor behind, to find oneself floundering in the lateral tissues of the neck.*"**

* Billroth was in his 30th year when he was called to Vienna.

† The exposed tumor having been split in two was shelled out with the finger or sharp spoon from within the capsule which was then sewed to the incised edges of the skin. Lücke terms the method an "intracapsuläre Aussehlung."

‡ Kocher had lost no case from hemorrhage.

§ Italics mine (W. S. H.).

It is interesting, further, to note Kocher's method, at that period, of managing the blood vessels of the pedicle.

"At the posterior periphery of the tumor there occur regularly, even when the operation has been properly conducted, strong, pedicle-like binding strands which often contain huge blood vessels. One reaches most quickly the goal by piercing and surrounding these bands with the artery-hook * and, according to their thickness, by dividing them into two, three or even into six parts and tying forcefully. There occur cases in which the final portion, often over a considerable area, is bound to the trachea by unstretchable adhesions. Under such conditions, *ligation in parts being impossible*, † one must have recourse to the ligature in toto and cut off the tumor with the knife, leaving a stump behind."

A few years later Kocher accomplished this step in the operation, in the manner which in 1874 he had considered impossible.

Particularly worthy of note is the observation of Kocher in the case of Marie Richsel, *et. 11 years*, whose thyroid gland he had completely removed.

"According to the report of the physician she enjoyed unclouded health during the first two weeks after her return home, but latterly a remarkable change in the behavior of the child has taken place. She has become peevish and dull, and will not work except under compulsion, whereas formerly she was a spirited and joyous creature.

"We shall learn from the further progress of the case whether there is any relation between the extirpation *sternuae* and the altered mental condition" ‡.

This observation of Kocher's (Jan., 1874) § was made only a few months after Gull's (Oct., 1873) ¶ description of a peculiar idiopathic condition in adults, to which two years later Ord ** gave the name myxedema, and many years prior to Murray's discovery (1892) *** that operative myxedema can be dissipated by the administration, subcutaneously, of thyroid extract.

* Aneurism-needle is probably meant, although "Arterienhaken" signified tenaculum also.

† Italics mine (W. S. H.).

‡ Italics mine (W. S. H.).

§ Sick, in 1867,*** was, perhaps, the first to note these sequelae of the operation. He was first also to perform successfully what was, except for a possible remnant on the trachea, a total lobectomy. In Patrick Watson's excisions of the entire gland it is probable that at the pedicle of each lobe a considerable stump of gland tissue remained.

Fagge in his paper (1871)¹² on sporadic cretinism occurring in England reported a case which began as late as the eighth year, but it had not occurred to him or to Gull that lack of thyroid gland might be responsible for the condition.

Greater advance was made in the operative treatment of goitre in the decade from 1873 to 1883 than in all the foregoing years—I may say, than in all the years that have followed. Unquestionably this rapid progress was due chiefly to the possibilities and the impetus given by the introduction of antiseptic surgery. Germany, Austria and Switzerland were the countries whose surgeons accepted promptly the doctrines of Lister. It was the German surgeons, notably von Bruns, Bergmann, Schede, Krimmel, Neuber and Schimmelbusch, who did most to eliminate the unessential features of Listerism and to replace antiseptics with asepsis.

In 1883 Kocher¹³ published a famous paper in which he considered the evil consequences of total strumectomy and standardized, may I say, the operation of thyroid lobectomy.

In the 10 eventful years above mentioned he had performed 101 operations upon the thyroid gland, a greater number than any one except Billroth, and in the 17 months preceding the publication of this paper he had operated upon 39 cases of non-malignant goitre with two deaths, the two fatalities occurring in quite hopeless cases operated upon in emergency. In the same period he had excised the thyroid gland four times for cancer, with only one death.

Kocher writes:

"Up to the present time (1883) I have performed 101 goitre-extirpations.* Thirteen of these patients died, a mortality of 12.8 per cent. A year ago there appeared in the *Correspondenz-Blatt für schweizer Aerzte* a publication on the indications and results of goitre-extirpations in which I endeavored to compile and then extended the statistics which, under the guidance of Bruns, Süsskind had collated. Whereas before 1850 about 70 goitre extirpations are known to have been performed, the number in 1877 had risen to 146.†

* Kocher announces that he will hereafter employ the word "*Strumectomie*" instead of the ambiguous and troublesome name "*Thyroid-ectomie*."

† To Süsskind's collection Kocher had added three cases of his own, two of Kappeler, five of Rose, two of Czerny (communicated by Lefter) and the 16 cases of Billroth reported by Wölfler to which I have made reference above.

"Whereas, according to Süsskind and Wölfler, the mortality up to 1850 amounted to 41 per cent, it had decreased to 21.2 per cent for 146 cases operated upon between 1850 and 1877."

In a characteristically thorough and painstaking manner, by correspondence as well as from the literature, Kocher was able to gather reports of 240 cases of non-malignant goitre operated upon since 1873. In this series there were 28 deaths, a mortality of only 11.6 per cent. In the same period (1877 to 1883) he collected 28 cases of operation for malignant struma, with 16 deaths, a mortality of 51.1 per cent. Appended to his paper are abstracts of 236 of the above-mentioned cases.

Kocher in this series *had no deaths from sepsis*, which had been responsible for all the fatal results save one (Billroth's case, No. 1 in the cases theretofore reported of von Bruns, Billroth, Lücke and Kocher, nor had he at any time lost a patient from hemorrhage, though he had stated in his first paper (1873) that "the chief danger in extirpation is the profuse bleeding." Thus, even in the days before artery clamps were generally in vogue, when the art of controlling hemorrhage was relatively crude, there were no deaths from loss of blood at the hands of these competent surgeons. Nevertheless, the operation of strumectomy still made great demands upon the fortitude and skill of the surgeon.

Kocher had made a careful study of the blood vessels of the thyroid gland, particularly of the veins, and as result of this evolved, as he Billroth independently, a method which is essentially the one practised today. He writes:

"In the first place it must be emphasized that one must not permit oneself to be led astray by Virchow's pronouncement that the irregularities of the blood vessels, 'kann bei einem anderen Organ grösser sein können.' In most cases the vessels conform in their arrangement to a perfectly definite plan."

Excellent lithographs illustrate the result of his studies of the circulation of the gland. He credits Watson (l. c.) and Michel (l. c.) with having advised, both of them in 1873, ligation of the thyroid arteries as a step in the operation preliminary to the extirpation, and condemns their method of ligating en masse, on account of the intimate relation of the recurrent nerve to the inferior thyroid artery.

"Furthermore," writes Kocher, "the bloodless exposure of the inferior arteries is made possible only by the previous double ligation of a division of a number of veins. . . . What makes the securing of veins in goitre operations especially necessary is the avoidance of inju-

to the recurrent laryngeal nerve. Wölfler was the first, in thorough manner, to call attention to this danger and to make clear the reasons for it. I must agree with him and Billroth that it is comparatively easy to spare this nerve when ligating the inferior thyroid artery. The artery must be isolated with precision before the ligature is applied, and the trunk of the artery must not be ligated near its point of entrance into the goitre, but laterally, at some distance from it."

Kocher's operation in 1883: To a vertical incision of skin from manubrium to cricoid cartilage was added an oblique incision outwards and upwards from the cricoid cartilage to the anterior border of the sterno-mastoid muscle (Kocher's Winkelschnitt). The chief object of this incision was to give the operator free access to the lower pole "where the largest veins develop," and to the trachea in the region of the gland's attachment. The oblique portion of the incision, which divided the platysma as well as the skin, crossed the subcutaneous veins and thus made possible, at the outset, the double ligation of the anterior and oblique jugular veins and, if necessary, of the external jugular also. The sterno-hyoid, sterno-thyroid and omo-hyoid muscles were then divided in line with the oblique cut of the skin.

"Contrary to Billroth and to our own earlier method, we no longer split the capsule of the goitre at this stage of the operation. Our further procedure is determined by the intention to isolate and ligate each of the larger arteries and veins before dividing it and especially by the desire to have completely freed the tumor before undertaking to separate its pedicle from the trachea.

"At the outset we proceed to ligate the superior artery and vein. By following the vessels on the anterior surface and mesial edge of the tumor to the extreme tip of the upper pole, one easily and surely is guided to the main trunks which form the stem-like continuation upwards and outwards of the upper pole. These vessels are then ligated and divided, having been isolated with the aid of a specially designed 'Kropfsonde,' provided with three grooves. Proceeding from the upper pole downwards along the outer edge one encounters the transverse vena thyroidea superior accessoria, in case it is present, and divides it after double ligation. Then, tracing along the mesial edge of the upper horn, one treats in the same manner the vena thyroidea communicans superior, which courses over the trachea along the upper edge of the isthmus. Thus the upper pole is free, and now one turns to the lower pole. If feasible, the finger is made to encircle the lower pole which is then drawn upwards. In the case of strongly compressing strumas causing considerable dyspnea it is often necessary for the sake of better narcosis to deliver the struma promptly, especially in cases of struma descendens.

The Operative Story of Goitre

"From the inner edge downwards there stretches the vena thyroidea, often a very large vessel, which must be ligated and divided outwards and downwards from the lower pole stretches the ordin smaller, but occasionally equally large, vena thyroidea inferior further to the side and upwards the transverse vena thyroidea in accessoria. Both of these must be doubly ligated. At the lower of the isthmus when there is a double vena thyroidea ima one makes a vein connecting the two; this may be called the vena thyroidea communicans inferior. Except for a few small irregular little veins tumor, at this stage, is held only by its pedicle; namely, by the isthmus, which binds it to the upper rings of the trachea. The goitre is then rolled inwards and taken into the hand, and now the moment arrived when one must keep close to the surface of the gland-capsule (*the external capsule—not the capsula propria, which remain intact*) * being split and the tumor thus further released from the inferior thyroid artery must be isolated and tied far from the tumor, as near as possible to the carotid. The isolation is done with the greatest care, and one must assure oneself that the current nerve is not being caught in the ligature. Keeping close gland, one works without haste along its posterior surface toward trachea, and, relying on pressure to occlude the peripheral branches catches each spurting vessel as finely as possible. The isthmus reached it is gradually divided as, one after the other, each vein secured.

"By following this method the recurrent nerve can often be fully dissected out; but injury to it can with certainty be avoided without this direct exposure. Since we have adhered strictly to procedure the hoarseness, formerly so frequently observed after operation, has now become exceptional."

I have quoted from Kocher's description of his operation a length that the reader, contrasting his method of 1874 with that of 1883, might note the progress made by him in nine years.

Whereas, formerly, he had urged the operator not to be trifled off by any difficulty from dissecting down to the goitre tissue and hence to extirpate it from within its intrinsic capsule, I dissect along the plane external to the external capsule (two removed), and only after he has ligated both thyroid arteries delivered the tumor does he split the external capsule. He now plishes with ease the clean dissection of the "pedicle" (isthmus the trachea, tying each vessel as it spurts, an act which, in 1874, thought insuperably difficult. Paralysis of the recurrent nerve, very often was then observed, is now an accident of rare occurrence.

* Italics mine (W. S. H.).

The larger blood vessels are being isolated before tying, and ligation en masse of the pedicle, in toto or in parts, is in disfavor.

The value of the artery clamps is not likely to be overestimated. They determine methods and effect results impossible without them. They tranquilize the operator. In a wound that is perfectly dry, and in tissues never permitted to become even stained by blood, the operator, unperturbed, may work for hours without fatigue. The confluence gradually acquired from masterfulness in controlling hemorrhage gives to the surgeon the calm which is so essential for clear thinking and orderly procedure at the operating table.

In this classic paper Kocher makes a contribution to physiology even greater than to surgery. Eighteen patients of 34 with total excision returned for examination. Of these only two were free from the symptoms which we now know to be due to loss of the thyroid gland. He describes at length and discusses quite exhaustively the possible causes of the mental and other physical changes characteristic of hypothyroidism, notes the striking resemblance to cretinism, and for the syndrome proposes the name *cachexia strumipriva*:

"We prefer for the present to employ for the designation of this group of symptoms an altogether non-committing name (einen ganz unverfänglichen Namen). To designate the nutritional disturbances which accompany the disappearance of goitres after the administration of iodine the name *goitre cachexia* (Virchow) has been used, but with the addition of the adjective *iodica*; we see no objection to the employment for the time being of the name *cachexia strumipriva*."

And here, in a footnote, he makes the comment:

"It is to be emphasized that the picture of cachexia with rapid emaciation, increase in the pulse rate, etc., which has been observed after the disappearance of a goitre in consequence of and also without (von Roser) the employment of iodine bears no resemblance to the condition described by us."

Thus early is foreshadowed his work 35 years later on *Iod-Basedow*.¹⁹

In each of the two cases of total excision in which strumiprivic symptoms were not manifested it was observed that a nodule, presumably consisting of thyroid tissue, made its appearance after a time.

Many pages are devoted in this paper to the consideration of the possible cause or causes of the progressive anemia which was observed in the thyroidectomized patients:

"The question arises: would a faulty development or atrophy and softening of the trachea explain the high degree of progressive anemia

which occurred in these individuals? We believe so. The affirmative answer to this question would at the same time explain the anemia observed in general in cases of goitre, which most authors are inclined to regard as the cause of the goitre, but which in reality is the consequence."

It is interesting to follow the argumentation of a mind so exegically keen and sane as Kocher's in its futile efforts to explain it sufficiently illuminated phenomena. For example: He had made, six years before, an excision, almost total, of the thyroid gland in a boy aged 17. For five years the boy enjoyed perfect health, then on recurrence of the goitre on one side, cretinoid symptoms appeared.

"*The change in the condition of the patient cannot be explained by the elimination of the function of the thyroid*.* But there was opportunity for especially unfavorable action upon the trachea by the recurrent goitre."

Today we know that the symptoms were due to the further degeneration of the remaining portion of the thyroid. It had not occurred to him that increase in the size of the gland might signify diminution of function. Once this interpretation could be conceded, the true relationship of the cretinoid condition to the colloidal hypertrophy of the thyroid would easily follow. And, conversely, even many years later the vascular and hyperplastic gland of exophthalmic goitre could not be accepted as the cause of the symptoms of Graves' disease.

And again: "As I have said, the thyroid gland is regarded by Liebenmeister and Schiff as a regulator of the circulation of the brain. Gruyot, Rieou, and Maigeneux have further elaborated this conception. According to Maigeneux (*op. cit.* Hermann, *Physiologie*, p. 464) the carotid becomes pulseless after prolonged holding of the breath and after violent muscular exertion. The thyroid gland, accordingly, serves as a safety valve against overfilling of the brain with blood, for the blood, instead of having only the internal jugular vein in which to be blocked, may fill also the thyroid veins; then by means of the thereby greatly swollen gland whose sheath is bound up with the fascia of the vessels of the neck and by the simultaneous contraction of the pretracheal muscles, the carotid becomes compressed. According to numerous, not yet published, measurements of my former assistant, Dr. Menli, the circumference of the head and of the neck is greatly increased in the reverse position of the body; this increase is observed to be most marked and to occur soonest in the neighborhood of the thyroid gland.

"It is quite conceivable that after removal of the thyroid gland more frequent disturbances of the circulation occur in the region of the head, and that it is these disturbances which have in turn the

* Italics mine (W. S. H.).

bloated face as well as altered function of the brain and sluggishness of thought and speech; for, as explained, we cannot, without further evidence, attribute these symptoms to anemia alone.

"We believe, therefore, that the symptoms which condition the picture of idiocy are probably determined by the disturbances of the cerebral circulation, while the cachexia is to be explained by the influence upon the breathing, upon the supply of oxygen, in so far, at least, as it may not be ascribed to the cutting out of that function of the thyroid gland which serves in the formation of the blood.*

"If the explanation of the fact observed by us that cretinoid changes follow excision of struma is correct, namely, that the alteration of the general condition is brought about by secondary changes, then we have advanced a point also in the interpretation of the association of goitre and cretinism in the same individual, one with goitrous parents.

"The occurrence of cretinism in consequence of goitre can, on the basis of the fact of its appearing after removal of the thyroid gland, be interpreted thus: We may suppose that in cretins nothing remains of the normal gland, that everything is pathologically altered and therefore this particular function of the gland is lost. Further investigation must devote especial attention to this matter and also to the relative size of the trachea in cretins."

It is remarkable, as I have said, that symptoms of tetany—and these were transitory—were observed in only one of the 18 cases of total extirpation of the thyroid which returned to Professor Koehler for examination. This is in striking contrast to the relatively frequent occurrence of tetany in the cases operated upon by Billroth in about the same period. The tetany was regarded by Koehler as an indication of particularly intense cerebral disturbance.

THEODOR KOEHLER. *Bericht über mehrere 250 Kropfextirpationen.* Correspondenz-Blatt für schweizer Aerzte, Basel, 1889, Bd. xix, p. 1.

"Discussing in 1882 in this journal the question of the indications for extirpation of goitre on the basis of 58 operations, I found from a review of the statistics of the various operators that their mortality was 13.9 per cent; my own was approximately about as high—14.8 per cent. After careful determination of the cause of death in each case I felt justified in drawing the conclusion that this 13.9 per cent mortality was not the final verdict, that we might anticipate much greater success; indeed, I ventured to formulate the sentence, 'The timely excision of an ordinary goitre is an operation free from danger.' Justification for the expression of this favorable view was derived from the fact that the majority of the fatalities were attributable directly or indirectly to imperfect asepsis of the wound, and from the likelihood that with a perfect antiseptic technique the still existent chief danger would be

* Italics mine (W. S. H.).

eliminated. Then, in April, 1884, at the Twelfth Congress of the Deutsche Gesellschaft für Chirurgie in Berlin where I called attention to the cachexia strumipriva which follows goitre-extirpation, a danger referred to in single instances, but not as yet appreciated, I could add to my 58 excisions 43 others in which the mortality had fallen to 6.9 per cent, or, excluding the malignant strumas, to 5.1 per cent. Since then at the Bernese clinic (and my private clinic) we have performed 250 additional operations, and one might well be allowed to review again the results of this 5½-year period of activity, in order, on the one hand, to formulate for the physician something tangible in regard to the indication for goitre-excision, and, on the other hand, to give to a colleague here and there a hint as to the method of procedure which after a little practice might be useful. . . . We have lost six of the 250 cases operated upon since our last publication. This would give a mortality of 2.4 per cent in contrast to 6.9 per cent for the statistics reported in 1883, and to 14.8 per cent in 1882. But small as this mortality is, it falls considerably if one includes in the computation only the ordinary goitres. By ordinary goitres we do not mean the easy or simple forms, for we were called upon to perform the operation under the most difficult circumstances; frequently the goitre was inflamed at the time of operation; more frequently we had to deal with deeply situated strumas, some of them completely buried within the thorax; and usually there was extreme dyspnea, due to stenosis of the trachea. Further, the operation was undertaken at times upon old individuals and upon badly nourished people. Under the term unusual goitres we include only the malignant ones and the gland of Basedow's disease.

" Excluding the malignant strumas from our calculation there remains a mortality of only 1.3 per cent for the other forms of goitre. . . . If further we subtract the five Basedow cases, the mortality for the remaining 225 becomes reduced to 0.8 per cent. . . . One will therefore not consider it an exaggeration when we affirm that the operation upon an ordinary goitre even under very difficult conditions, however large the growth and however old the patient, has been entirely robbed of its dangers, that one has no longer need to speak of a mortality in consequence of the excision of a goitre."

In April, 1895, at the annual meeting in Berlin of the Deutsche Gesellschaft für Chirurgie, Koehler¹⁰⁰ announced that he had operated upon more than 1000 cases of goitre. Twelve years before, on the occasion of the presentation of his famous paper on *Cachexia thyro-priva*, he gave the results of operation in his first 100 cases. He had then established the fact that not one of his cases of total excision had escaped the cachexia. Since 1883, therefore, in only one instance had he removed the entire gland; in this exceptional case, and only in this one, the cachexia had developed. Tetany, regarded as the acute form of

the cachexia, manifested itself transitorily in a number of instances, but only once (operation for carcinoma) in severe form. In the 900 cases operated upon in the 12 years the mortality was a little over 1 per cent, exclusive of the malignant and Basedow cases.

A new series of 600 operations was reported by Kocher in 1898.¹⁰⁶ In this series for the first time his assistants, Roux, Tavel, Lanz, de Quervain, Schwyzler, Fischer, Albert Kocher and others, were permitted to operate upon some (150) of the patients. For more than two years he had employed cocaine anesthesia and states that the danger in complicated cases was greatly lessened thereby. Now, too, he recommends the collar incision:

"The first distinctive feature of our method consists in this, that we make, as a rule, a so-called collar incision, namely, a transverse bow-shaped cut with its convexity below, which leaves a much more beautiful scar than any other. This we have demonstrated sufficiently often before gatherings of physicians. Occasionally we make an angle cut (Winkelschnitt) which together with the collar incision we have described in detail in our book (*Operationslehre*). . . . Further, we do not, as we have so frequently seen, make a transverse division of the muscles; we go between them and free only above and partly the attachments of the muscles which stretch from the sternum to the larynx, of the sterno-hyoid and sterno-thyroid, in order to insure for them an intact nerve supply. . . . As a third essential act of our method we regard the luxation of the goitre, a procedure already described by us. When the connective-tissue capsule has been split with precision down to the gland and, when necessary, the accessory veins described by us have been ligated, the circumference of the goitre is freed so that it can be rolled over to the tracheal side. This luxation being accomplished, the act of ligating the main vessels is made easier. This again we regard as one of the special features of our operation, that we make it a point to ligate these vessels before shelling out the goitre. . . . This difficulty of determining beforehand the side on which to make the excision brings us to the question of total excision in the cases, for example, in which the surgeon ascertains too late that, having removed the larger lobe, it is the other lobe which is making the pressure on the trachea. It would seem useless to waste further words on this subject, after having in 1883 brought proof that each total excision in man leads to a greater or less danger of cachexia thyreopriva and since subsequent experiments and clinical observations have confirmed my statements. But we note from recent letters and publications that this question still agitates certain minds. Thus Munk in Berlin insists that the consequences of total excision are attributable to accidental traumas in course of the operation. And Bottini in a work on the surgery of the neck declares that he has not seen harm result from total excision of the

gland. It is superfluous for us to state that since the spring of 1883 we have made no total excision without compelling conditions. . . . In this case both thyroid halves were removed because on both sides a high degree of pressure was exercised upon the trachea. In addition to circumstances such as this we find necessity for removing both halves when, in absence of a thin isthmus, the two lobes are welded together in a mass over the trachea. In such cases an attempt to divide the firm colloid masses may be accompanied with hemorrhage so severe that ex indicatione vitali one might better remove the whole tumor. With the exception of these two possibilities only the malignant nature of a struma can justify the total excision."

Kocher had not as yet learned how to deal with a thick isthmus.

I saw Kocher for the last time in the spring of 1914, when we spent four or five days together in Berlin attending the Congress of the Deutsche Gesellschaft für Chirurgie. At that time he was still performing in all except very exceptional cases a one-sided lobectomy. He never approved of the suggestion of Mikulicz to remove, as a regular procedure, the greater part of both lobes.*

Of the 600 new cases reported by Kocher in this paper of 1898, 556 were colloid strumas. Chloroform was the cause of the only fatality in this series. The patient had a greatly enlarged thymus gland. The mortality was only $\frac{1.8}{100}$ of 1 per cent.

At the 30th Congress der Deutschen Gesellschaft für Chirurgie, April, 1901, Kocher¹⁰⁷ reported a second thousand operations for goitre.

"We make, whenever possible, the excision of the half which exercises the greater pressure. It is not always quite easy to determine the side from which the chief pressure comes, and pressure upon the less palpable side often causes less dyspnea than when made upon the other (for reasons which will be developed later). Especially often we find that the larger nodule is on the right side and that on the left is the one more deeply situated and more forcibly pressing.

"Enucleation, a much bloodier and less reliable procedure, we resort to only in the very rare cases of recurrence (4 in 1000) of the goitre, or when there is atrophy of the other lobe, as one observes especially in cretins, or finally when the capsule of the gland is densely adherent.

"We make, as a rule, the transverse, symmetrical bow-incision through skin, platysma and fascia, then the median cut between the muscles, which are divided only in the most difficult cases; we ligate, where possible, the accessory veins which pass over the surface of the

* In the cases of colloid goitres and in the milder forms of Graves' disease it is our practice to remove a part of each lobe, but not precisely in the manner practised by Mikulicz.

goitre and afterwards the two main bundles containing the superior and inferior thyroid vessels; we luxate the goitre out of its adventitia, divide the isthmus and free the lobe, leaving in suitable cases the posterior capsule of the gland. For dividing the isthmus we have advantageously employed a tissue-crushing forceps which works like the modern angiotripter, but not with the idea of crushing particularly the vessels, but rather of crushing through the tissues so that only the vessels remain for the ligature*—briefly, to avoid the ligation en masse which unfavorably influences primary healing.

"The results are as follows: Of 27 malignant strumas six died; of 20 cases operated upon for strumitis two succumbed, and two also of the Basedow cases. Of 929 benign strumas four died—a mortality of 0.4 per cent. The cause of death in one case was chloroform narcosis and status thymicus. We were compelled to anesthetize this child because he was unmanageable. One died of acute cachexia thyreopriva, one of poisoning by corrosive sublimate which, contrary to orders, had been used for disinfecting the skin, and, finally, one of pneumonia four weeks after an exothyreopexy. The operation in this last case was so bloody that it could not have been continued without immediate danger.

"... One may conclude, therefore, that in the excision of an ordinary goitre, however large and however great the difficulties, the danger of hemorrhage and of infection no longer plays a rôle. . . . The danger in the operation for an intrathoracic struma is the hemorrhage. The patients suffer almost without exception from a high degree of constriction. When now one draws through the upper aperture of the thorax a struma immobilis whose diameter is greater than this space, the trachea becomes for the moment compressed, the dyspnea increases to the suffocation point, each little vein that is torn begins to bleed, not to mention the greater venae thyroideae imae, and the situation is critical. It is of first importance that one doubly ligates the accessible vessels from above, the superior thyroid artery and vein and especially the veins named by us *accessory*; also, that one divides the isthmus and completely isolates the cervical part of the tumor before one proceeds to dislocate the deepest nodule. Then is one prepared to deliver the goitre; indeed, it is often a matter of a genuine delivery which can only be accomplished with an obstetrical forceps and spoon. We have had constructed for this purpose a special goitre forceps and a goitre spoon, in order to be able to extract the tumor from the depths safely and quickly.

"... Worst of all are the cases in which the tumor is absolutely too large to pass through the aperture of the thorax. Then nothing helps short of breaking up the tumor as if it were a myoma; but the morcellément must not be done in gynecological fashion; one must practise the évidement described by me, and bore rapidly into the tumor

* Mikulicz was the first to advocate this method and to discover that one might with impunity crush through the colloid masses.

with the finger, breaking up the soft portions within the capsule, opening cysts (occasionally also an abscess) and draw out the tumor to the light of day. This method is truly decidedly more bloody and for its execution requires occasionally a tracheotomy. For such an emergency cannulae are necessary, long enough to reach beyond the stenosis; they should be at hand in every case."

Within five years (from November, 1900, to August, 1905) Kocher added another thousand (his third thousand) to his list of goitre-extirpations. Nine hundred and four operations were for the non-malignant and non-Basedow forms, for the "ordinary" forms of goitre. Three patients of this colloid group died; one death was from secondary hemorrhage in a case of congenital cachexia thyreopriva; a second, from pneumonia, after the wound was healed, in a patient with dilated heart and atrophic kidneys; the third fatality occurred in a patient with a high grade of myocarditis, who from childhood had been afflicted with paralysis of both recurrent laryngeal nerves.

"This result may, in a measure, be taken as a criterion for the prognosis of major operations in general, because a goitre-extirpation in most cases is a serious affair which makes high demands on the surgical art."

"... The glory of this happy outcome of our therapeutic endeavors to relieve an affliction so sore falls to the three luminaries (Dreigestern) Pasteur, Koch and Lister, on whom therefore with full justification we have conferred honorary membership in this society.* In exemplification of this fact one may glean pronouncements particularly of French authors from the years 1875 and 1885; thus Luton †, the discoverer of iodine injections, writes: 'Il y a lieu de s'étonner qu'une opération aussi redoutable soit encore sérieusement conseillé de nos jours.'"

Once or twice or three or more times each year, up to the spring of 1914, Professor Kocher published the results of his studies of the thyroid gland and its diseases. At the time of his death, July 27, 1917, approximately 5000 cases of goitre had been operated upon in his famous clinic. For nearly half a century Professor Kocher had been in surgical harness at Bern, toiling vigorously and triumphantly to the end.

J. L. REVERDIN. *Accidents consécutifs à l'ablation totale du goitre.* Société médicale de Genève, Séance du 13 septembre, 1882. Rev. méd. de la Suisse romande, Genève, 1882, t. ii, p. 539.

* Die Deutsche Gesellschaft für Chirurgie.

† Dugé. *Goitres et médication iodée interstitielle*, Paris, 1886.

"M. J. L. Reverdin thereupon made a communication in regard to the happenings consecutive to the total ablation of goitres. Up to the present time he has performed 14 operations and has had only three deaths: in one case, the cause of death was pneumonia; in another, complex nervous manifestations; and in the third, a cancerous goitre, death occurred from suffocation in the course of the operation. Mons. J. L. Reverdin has observed, in the recovered cases, sequelæ hitherto undescribed, and to these he invites the attention of the society. Two or three months after the operation the patients have, for the most part, presented a state of feebleness, pallor, anemia, accompanied in two of them with edema of the face and hands, without albuminuria; in one, a contraction of the pupil, melancholy, heaviness; in another, the facies closely resembled that of the cretins. In the majority of the patients, this condition was a long time in disappearing, and in three of them it has continued already a year. Not one of the writers giving the subject consideration has called attention to these sequelæ of ablation of the thyroid gland, hypertrophied or otherwise affected.

"Mons. Kocher has, however, related to Mons. Reverdin that in a case observed by him the patient remained depressed and feeble after his recovery. Mons. J. L. Reverdin has observed a case of tetany following operation, and Mons. A. Reverdin a second one, which has recovered.

"What part does the nervous system take in the production of these phenomena? Should the irritation or insult to the great sympathetic be taken into consideration? Or, indeed, the thyroid body, whose functions are still obscure to the physiologists, has it played in hemopoiesis a rôle so important that its ablation could entail so profound a trouble in the economy? In view of these results Mons. J. L. Reverdin has modified his method. Formerly he removed the thyroid body in its entirety, when this was possible. Today he respects the enveloping membrane, or conserves a portion of the gland. From the removal of only one lobe of the thyroid body he has not had a consecutive accident."

Hence Reverdin anticipated Kocher by about one year, and appellation the train of symptoms which followed his total excisions of the thyroid gland *myxédème opératoire*.

Thus the story is brought to 1883, to the time when the art of operating for goitre, particularly by Billroth and Kocher and men of their school, had been almost perfected, relatively minor problems remaining to be solved.

Functional derangements of the thyroid and parathyroid glands have been only cursorily referred to in this paper, which concerns itself primarily with the development of the art of bloodless operating. Bearing incidentally on the vital problems of tetany and Graves'

disease, but particularly on the question of resection versus tion—concerning the advisability of removing parts and of certain parts of both lobes—is a paper by Mikulicz (1886),* although it appeared three years later than the date set for the inauguration of the period of our study, is of such interest and tance as to demand conspicuous recognition in the operative goitre. Surgical art and science owe many a debt to the brilliant, charming Mikulicz of the great school of Billroth.

J. MIKULICZ. *Beitrag zur Operation des Kropfes*. Wie Wochenschr., 1886, Bd. xxxvi, pp. 1, 40, 70, 97.

In the three years from 1883 to 1886, as director of the surgical of Krakau, Mikulicz performed 25 strumectomies without a fatal In seven cases the entire gland was excised; in eight, one lobe; the middle lobe or isthmus; and in 8, resection according to method of his own which he describes for the first time in this.]

Union by first intention was obtained in 20 cases. In one tracheotomy had to be performed; the wound, unclosed, was with iodoform gauze. In every case but one the indication for was an extreme degree of dyspnea from pressure of the goitre, superfluous to state," writes Mikulicz, "that in every case in necessity for operation was not urgent, iodine treatment was tried, usually in the form of parenchymatous injections." The tumor was in 24 cases a "benign parenchymatous or cystic g In one instance it was a carcinoma. The goitre in one path complicated with Morbus Basedowii (case 23). The symptoms dow's disease rapidly and, without doubt, unexpectedly subsided the operation. In performing his operations Mikulicz followed the principles formulated by Billroth which his Wölfler in numerous papers has so admirably described."

His purpose in writing the paper he gives as follows:

"The number of my cases is surely too small to affect part the operative statistics which we already possess of hundreds of goitre; at most, they furnish, in this respect, material from known goitre region, the Galician Carpathians, confirmatory

* Mikulicz, in a footnote says: "The classification of the adenoc given in the splendid paper of Wölfler (*Ueber die Entwicklung Bau des Kropfes*, Berlin, 1883) was, unfortunately, not observed clinical histories, hence in this respect I am unable to specify the character of the growth."

experiences of surgeons in other lands in which goitre abounds. Nevertheless, I shall not hesitate to narrate my experiences, since they may shed light upon a matter which today dominates the whole question of operation for goitre. I refer to the general and local disturbances—tetany, cachexia strumipriva and paralysis of the muscles of the larynx—which follow strumectomy and which, together, demand either an essential curtailing of the indications for operation or a modification of the operative method. There is hardly an operation within the past few years which has given the surgeon so much gratification and, at the same time, so much anxiety and perplexity as the extirpation of goitre. Thanks to the efforts of Billroth and Kocher and to the influence of the antiseptic treatment of wounds, the technique of strumectomy has, in a short time, been so highly perfected that one, soon, will not hesitate to perform, solely for cosmetic reasons, an operation which Dieffenbach shuddered to contemplate.

"In fact, the antiseptic method guarantees to the wound from a goitre extirpation a healing more perfect than is seen in any operation of like magnitude. According to the latest statistics of Rotter there have been only 12 deaths in consequence of wound infection in 405 extirpations of non-malignant goitre in the period from 1877 to 1884. The brilliant results of Billroth and Kocher are well known. Several operators have had the good fortune to operate upon a series of cases without a mishap. Thus Pietrzikowski²⁸ reports 21 strumectomies successfully performed by Gussenbauer; and I have been so fortunate as to have had 25 operations without meeting with a death, although among these was one for Basedow's disease and one for struma maligna in which tracheotomy had to be performed—a complication which affects badly the prognosis.

"Inasmuch as total extirpation complicates the wound conditions no more than partial excision of the gland, and since recurrence may take place, the former operation has more frequently been performed; indeed, Rose has advised that the radical procedure be made the rule. And already most surgeons had manifested a disposition to follow Rose's advice, when Kocher in his well-known address²⁹ on *Cachexia strumipriva* before the Twelfth Congress of Surgeons in Berlin took a decided stand against the total extirpation of the thyroid gland.

"A dissonance in the rejoicing over the goitre operations had already earlier been sounded by the frequently observed disturbances of the innervation of the muscles of the larynx. One referred these, however, at the outset, solely to rough injury of the recurrent nerve, which, it was hoped, would in the future, with the development of a finer technique be possible to avoid.

"Greater uneasiness was aroused by the tetany following thyroid operations, which was announced first from the clinic of Billroth. However, fatalities from this cause had only rarely been recorded. Liebrecht³⁰ in 351 operations met with only three deaths from this

cause—and in the milder cases the attacks had been permanently or temporarily controlled by chloral hydrate and other means.

"Without doubt it was the communications of Reverdin³¹ and Kocher³² concerning the so-called cachexia strumipriva which brought to most surgeons the conviction that the removal of the entire thyroid gland, notwithstanding antiseptis, was no harmless intervention. The sad results of total excision painted in such vivid colors by Kocher were soon confirmed by other observers. Julliard,³³ Baumgärtner,³⁴ Grun-der³⁵ (Bruns clinic), and Pietrzikowski (*l. c.*, from Gussenbauer's clinic) have reported similar observations, so that now the number of cases of cachexia strumipriva has reached 36. To this collection I can add a case of my own which conforms to the picture delineated by Kocher.

"It is comprehensible that in the face of such lamentable experiences a vigorous opposition to the total excision of the thyroid gland should have manifested itself. And when Schiff, Wagner, Zesas, Horsley and others, from experiments on animals, had confirmed the above-cited experiences, one must acknowledge that they are not wrong who affirm that extirpation of the thyroid gland is, physiologically, prohibited.

"But how shall we act in the future when confronted with cases which, notwithstanding, urgently demand excision of both lobes of the thyroid gland? By ignoring the facts, as Maas and Rotter do, progress towards the solution of the problem will surely not be made. I hold that the matter of cachexia strumipriva has certainly not altogether been cleared up; for me, furthermore, the causal relation between strumectomy and cachexia has not as yet been proved in all instances. I believe, at least, that not all of the described cases of cachexia are identical, and that, furthermore, the manifestations in many of them were not in consequence of the operation, but supervened independently. . . . As long as it is not absolutely proved that the cachexia described by Kocher stands in no causal relation to the total excision we must, as much as possible, avoid this operation. Only in the case of malignant neoplasms is it unquestionably justifiable.

"After all, is it not questionable whether the term cachexia strumipriva, selected by Kocher, is pertinent? As is well known, most varied hypotheses have been advanced in explanation of this sequel of total extirpation. This matter has already been so much discussed that it would not be worth while to consider analytically all the explanatory hypotheses which have been advanced, for we are not yet in possession of sufficient data to justify attempts to explain the symptoms of cachexia strumipriva. Only this much seems to me in high degree probable, that the acceptance of a specific function of the thyroid gland, as suggested by Reverdin, Bruns and others—be this the furnishing of a specific secretion or a contribution to the constituents of the blood or an activity (vaso-motor) regulating the circulation of the brain—does not suffice to solve the problem. Against this view are

the facts that the cachexia may occur at any period of life, and that these symptoms are not present in the majority of the patients operated upon. Furthermore, Kocher's theory of deficiency of oxygen due to atrophy and softening of the trachea does not seem to be in accord with the facts. Most plausible to me is the view of Baumgärtner, who ascribes the symptoms to disturbed innervation in consequence of direct injury to or later changes (cicatricial contraction, atrophy, suppuration) in nerves in the neighborhood of the field of operation. This would most satisfactorily explain why in one case there appear the severest manifestations, and in another none whatever.

"This conception would also best account for the altogether inapplicable occurrence of tetany after the operation as well as, aside from the paralysis of the recurrent nerve, the innervation-disturbances of the larynx. As regards the origin of the tetany, Billroth attaches particular importance to the severance of the numerous nerves of the gland, and N. Weiss considers it probable that the irritation of peripheral sympathetic nerves set up by the ligation of so many vessels brings about an active excitation of the vaso-motor centres of the medulla oblongata and cervical cord. The tetany and the consecutive innervation-disturbances of the larynx furnish, moreover, two further reasons which decidedly contraindicate excision."

Mikulicz then calls attention to a theretofore unreported sequel of total extirpation, viz., epileptic * attacks, which he had observed in two cases. In both instances tetany preceded the epileptiform seizures. In three of Mikulicz's seven total excisions of the thyroid tetany developed.

"As to the occurrence of tetany after total extirpation, it is frequently of brief duration and passes off without further consequences. But sometimes it terminates fatally (according to Liebrecht, 3 times in 7, and to N. Weiss, twice in 13 cases) In one of my cases of tetany the manifestations of cachexia strumipriva appeared later. This observation, which also Gussenbauer† had made in two cases, points to the association of the two affections. It is quite conceivable that both of them have origin in the same disturbances of innervation; namely, lesions of nerves in the vicinity of the thyroid gland."

These early experiments on human beings have particular interest for us because they will not be repeated except by accident or through ignorance or in cases of malignant tumor. In animals they can be duplicated exactly. Thus, in dogs, after complete extirpation of the thyroid and parathyroid glands with transplantation of the latter in a film of the former, symptoms of parathyroid deprivation appear

* Epilepsy has repeatedly been observed in cases of parathyroid privation (Westphal, Schultze, Hochhaus, Phleps, Halsted and others).

† *Vid. Pietrkowski, l. c.*

promptly, but the myxedema, coming on slowly, does not usually attain its maximum development for several months (Halsted). In three of my dogs the maximum myxedema, reached in three or four months, was maintained for a month or more and then, gradually subsiding, disappeared. The promptly appearing symptoms of parathyroid deprivation cleared up more or less completely with the revivification of the transplanted glandules, whereas the manifestations of thyroid deficiency vanished only commensurately with the slow compensation from hypertrophy of the thyroid graft.¹⁰ In the three dogs referred to only a thin film of thyroid tissue was transplanted—just enough to make possible, without injury, the transference of the parathyroid gland from the neck to a preperitoneal pocket.

Injury to the recurrent laryngeal nerve is considered by Mikulicz a considerable length:

"As to the paralyses of the larynx muscles, they can occur after one-sided as well as after total extirpation of the goitre. Experience teaches, however, that they are much more likely to follow the complete excisions.

"Jankowski," in a meritorious contribution, has collected the hitherto observed cases of paralysis of the laryngeal muscles after goitre excision. Paralysis occurred 87 times in 620 operations—14.03 per cent.* Of these 87 cases, 65 occurred after total, and only 22 after partial, extirpation of the goitre—a proportion of about 3 to 1. But one must reflect that the partial operation has been practised much more frequently than the total. According to the statistics of Liebrecht there were, in 303 accurately described operations, 125 total and 178 partial extirpations. If we make our calculations from these figures we must conclude that paralyses of the laryngeal muscles occur more than four times as frequently after total as after partial excisions of goitre.

" The question whether in each case of vocal cord paralysis a coarse injury, a division of the nerve, has taken place, I must, as result of my experiences which correspond with those of other surgeons, answer decidedly in the negative. I have, in each case, isolated the nerve with the greatest care, and, until it was clearly in view, have not proceeded to the ligation of the inferior thyroid artery or its branches. In Vienna I saw a great number of goitre operations performed by the master hand of Billroth and learned the topography of this region under the most difficult relations. Nevertheless, it befell me to observe, in my 25 operations for goitre, a paralysis of the vocal cord in one case, and in three cases, increase of a pre-existing hoarseness."

* Undoubtedly the paralysis occurred much oftener than this. Laryngeal examinations were not made as a matter of routine.

In his third paper Mikulicz²⁰ explains how it happened that he hit upon the operation which he is about to describe—an operation which, with slight modifications, is the one which a number of surgeons, myself included, perform today. Most operators, particularly those who ascribed to the thyroid gland some special function (*i. e.*, regulation of the circulation of the brain), advised, following the lead of Kocher, the removal of only one-half of the goitre. Mikulicz, for reasons given in quotations which I have made from his papers, also discarded the total or radical operation.

"But it not infrequently happens," he writes, "that, having undertaken the operation with the intention of removing only one lobe, the surgeon finds it necessary to remove the other. I have several times found myself in this predicament. After a very large, forwardly displaced lobe had been excised there would appear for the first time the second lobe which had been concealed behind the trachea, which it surrounded, or been buried in great part behind the sternum. In such cases one takes a risk if he postpones removing this lobe in the expectation that it may atrophy. It was in a case of this kind that I first practised a method which I hope may best prevent the evil consequences of total extirpation. I extirpated, namely, the second lobe, only in part, resecting in such manner that a portion of the lobe remained in the neighborhood of the inferior thyroid artery.

"I ventured to do this because I had observed that *division and ligation of a quite massive isthmus could be accomplished without evil consequences*,"* the parenchyma of the thyroid gland must, therefore, be tolerant of the insult caused by ligation en masse. Hence I need not fear to sever the principal part of the goitre from the remains by means of mass-ligatures passed through the parenchyma."

Surgeons from the time of Desault had not hesitated—indeed, they were compelled—to cut or crush through the parenchyma, distal to their ligatures or écraseurs. But what Mikulicz evidently had in mind was the behavior of these crushed tissues in a wound treated antiseptically—a wound which should heal by first intention.

He did not fear hemorrhage as he must have done three years earlier when assistant to Billroth who, in 1883, in discussing Weiss's paper (*l. c.*) said: "Were we compelled to cut through the middle of the goitre we should be confronted with a quite uncontrollable hemorrhage." Hence resection of a goitre in a wound to be closed was, per se, a definite contribution.

* Italics mine (W. S. H.).

The Operative Story of Goitre

From Mikulicz's account of the first operation by his new resection it will be interesting to have recorded here the most important paragraphs:

"The very first attempt which I made (case No. 13) proved exceedingly. The patient, a peasant boy, *et. 16*, was suffering from great dyspnea and hoarseness. The trachea, dislocated forward, was compressed to such a degree of flatness that one could feel the skin only a narrow ridge. On the 19th of May I began the operation with the intention of removing the left lobe and isthmus and hope that the right lobe might be left undisturbed. But in the course of the operation it developed that the latter lay chiefly under the sternum and might of itself prove a danger. Accordingly, I removed the lobe, so far as this could be done by blunt dissection, in a very intracapsular manner. The bleeding vessels were, many doubly ligated with catgut. Furthermore, in typical fashion the superior thyroid artery and vein at the upper pole, and superficial vessels running to the lower pole. Next, with the fingerings of the scissors, I freed from the anterior and lateral surfaces the trachea the adherent lobe, taking care to avoid dissect far posteriorly, for fear of injuring the recurrent nerve. The entire goitre was bound only in the angle between the trachea and the esophagus, just where the recurrent nerve and the inferior artery lie buried. This adherent part at the hilus of the treated as if it were a short, thick ovarian pedicle. While an made pressure with the fingers on the vessels entering the split the 'pedicle' longitudinally with the blunt scissors into portions, clamped each portion with a hemostatic forceps and cut in the line of the clamp-made furrows. Only now did I to cut away the goitre-mass which, in this manner, had been The pincers hémostatiques crushed out, in line with their blade the entire parenchyma of the gland, so that in the ligatures little remained but the connective-tissue stroma and the blood vessels. . . .

"The remaining stump of the gland, contracted to a nodule of a chestnut, rested in the angle between trachea and esophagus. Neither the inferior thyroid artery nor the recurrent nerve was Mikulicz calls this procedure a resection, to distinguish the typical extirpation of one or both lobes.

In the manner described he operated upon seven additional cases (Nos. 16, 19, 20, 21, 23, 24 and 25).

* "The application of ligatures en masse to the 'base' of the goitre to its ablation was made by operators as early as the end of the beginning of the present century, as is related in the *Operationen* of Günther and the *Operative surgery* of Dieffenbach."

Upon four of these, just as in the first case, a lobectomy having been done on one side in the typical Billroth manner, it was found necessary to remove the greater part of (*viz.*, to resect) the second lobe. In two cases resection of one lobe was done for the removal of a circumscribed nodule, the other lobe remaining untouched. In only one case (No. 23) were both lobes resected.

"It is noteworthy that in case 23, already several times referred to, the symptoms of Basedow's disease rapidly improved after the resection—a result which Tillaux and Rehn had already observed."

Case 23: Peasant woman, *æt.* 35. Goitre, the size of two fists, involving the entire gland had been developing for eight years. Pronounced symptoms of Graves' disease—dyspnea, cardiac hypertrophy, tachycardia, exophthalmus. Operation June 26, 1885: Kocher's Winkelschnitt. Resection, by the Mikulicz method, of both lobes. Prompt recovery. October, 1885: Patient wrote that her voice was clear, her breathing free and that the palpitation of the heart had ceased. Only the exophthalmus was still noticeable.

Mikulicz recommended his resection method at a time when he did not believe that the thyroid gland was a vital organ and did not attribute cachexia strumipriva to the forfeiture (Ausfall) of a secretion. Indeed, he questioned the propriety of adopting this nomenclature of Kocher believing with Baumgärtner that the symptoms might most plausibly be ascribed to disturbed innervation in consequence of direct injury to or later changes in nerves in the neighborhood of the field of operation.

Kocher had suggested that deficiency of oxygen, due to atrophy and softening of the trachea, might account for the picture, not, however, discrediting the view that the thyroid's function might be to regulate the supply of blood to the brain. He did not believe that cachexia strumipriva was due to the loss of a secretion, for he wrote:

"The change in the condition of the patient cannot be explained by the elimination of the function of the thyroid"; and again: "We believe that the symptoms which condition the picture of idiocy are probably determined by the influence upon the breathing, upon the supply of oxygen, in so far, at least, as it may not be ascribed to the cutting out of that function of the thyroid gland which serves in the formation of the blood."

As to the cause of tetany Mikulicz was inclined to agree with Billroth who, in discussing Weiss's paper, had expressed himself as follows:

"I am inclined, therefore, to lay especial stress upon the division of the numerous nerves of the thyroid gland, and believe that tetany

occurs only in those individuals who are predisposed to affections."

Hence, Mikulicz planned his operation of resection not with of leaving to the patient a portion or portions of a vital or merely knew that removal of the entire gland was likely to be by Kocher's cachexia strumipriva or tetany, or both. He feared recurrence of the goitre and injury to the recurrent nerve operative experience had taught him not only that sometimes imperative to excise the greater part of both lobes in order pressure upon the trachea, but also that neither cachexia strumipriva nor tetany occurred if a portion of even one lobe were left. It is to be gained by leaving a part of one lobe, why not leave both, he undoubtedly asked himself. For cosmetic reasons, to protect the laryngeal and possibly other nerves, the positions of the lobes would naturally have been the parts left to the

It would not be especially interesting to trace further development of the operation of thyroidectomy in England, Italy and America. Progress in operation upon the thyroid country has been made chiefly since 1890 and by those familiar with the advanced work of the Swiss, Austrian and surgeons—of Victor von Bruns, Billroth, Lücke, Kappeler, Reverdin, von Gussenbauer, Wölfler, Baumgärtner, Mikulicz, Eiselsberg, Payr, Schloffer and others.

On my return from Germany in 1881 I was impressed with that our surgeons were greatly handicapped in most of their operations by lack of proper instruments, particularly of artery clamps, were insufficient in number and faulty in design. In most of York hospitals the only artery clamps were of the fenestrated toothed, spring forceps variety (Luslon's and Wakley's), and were about the only ones procurable either in this country or in the elaborate catalogue for 1882 of S. Maw, Son and T London, no other artery forceps, torsion forceps excepted, is in In a catalogue of Collin et Cie, Paris, undated, but evidently about the same period, the little artery clamps of Koeberle and are the only ones figured; "pinces à artères à ressorts" are the latter probably being the mouse-toothed forceps given London catalogue (Maw and Son) and quite universally employed in America until 1880 or a little later.

In Günther's *Surgery* (vol. i, Plate 5, opp. p. 36) is a remarkable lithograph (*vid.* Plate xxiv, Fig. 3) which indicates the part played by the tenaculum in hemostasis in 1859. The divided artery, open-mouthed, is hooked up on the point of the instrument, the handle of which is held in the mouth of the operator who, evidently, was short-handed. Until about 1890 the tenaculum was a favorite instrument in America for checking hemorrhage, especially with some of the senior surgeons, and until about 1880 was quite universally employed here, its only rivals being the inadequate mouse-toothed, spring forceps and the Péan or Koeberle clamps. Then almost simultaneously came the clamps of Spencer Wells* and (1879) of the writer, of which the Péan-Koeberle clamp was the prototype. The point of my clamp was snub-nosed originally, but the length and spread of the handles, the essentially new features, were the same as at present. With the development of the transfixion method with milliner's needles and the use of the fine black silk, the nose of the clamp was made finer (1889). Two or three years later it assumed its present form (Plate xxii, Fig. 5).

Rarely had I seen in our country, prior to my first visit to Europe (1879), more than one artery clamp at a time left hanging in a wound. Clamps were too few for this—four to three or even two being considered ample for an operation. Few hospitals, in New York at least, possessed as many as six artery clamps in 1880. I recall vividly an operation in Vienna performed by Mikulicz in 1879 in Billroth's clinic. Americans, newly arrived in Austria, we were greatly amused at seeing perhaps a dozen clamps (Schieber) left hanging in a wound of the neck while the operator proceeded with his dissection, and were inclined to ridicule the method as being untidy or uncouth. Slowly it dawned upon us that we in America were novices in the art as well as the science of surgery.

The artery forceps, adequate in number and design, undoubtedly played a very important rôle in the strikingly rapid progress in the art of operating made by surgeons, the world over, in the final quarter of the past century.

Retractors of proper size and form are essential, particularly when one is working through a small incision, as in thyroidectomy and in ligation of the inferior thyroid arteries. Valentine Mott used a thin

* I have been unable to ascertain the precise date of introduction of the Spencer Wells clamp.

The Operative Story of Goire

piece of board 3 inches wide and curved spatulas in his remarkable case of ligation of the common iliac artery. Volkmann contributed the many-pronged, grab-rake-like retractors. The blades of retractors used in the general surgical clinic of The Johns Hopk Hospital, specially designed in 1888, are all concave* from side side and, for the most part, convex in the long axis of the instrument. They are solid and provided either with short teeth or with a curved lip (Plate xxiii, Figs. 2, 3 and 4).

The scalpel of our clinic has a handle designed for use as a dissect Every surgeon instinctively makes dissecting strokes with the handle of his knife, but these motions are futile and hence false unless the of the handle has the proper form (Plate xxiv, Figs. 2 and 3). Aneurism-needles we use much less frequently than formerly in thyroid and other operations, for by transfixing the tissues contiguous to the vessels, or the vessels themselves when large, a single thread fine silk gently tied suffices where, otherwise, several strands of considerably heavier silk, forcibly tied, would be required in order to guard against slipping of the ligature.

Aneurism-needles are convenient, and sometimes essential, particularly in the ligation of undivided arteries in a deep pocket. Here we use the form shown in Plate xxii, Fig. 3. A thread, knotted into a knot at one end, is passed through the little hole at the tip of the instrument on a milliner's needle. The black turf, pulled home either before or after the artery has been circumnected by the aneurism-needle, easily recognizable and picked up by the assistant. The little curved needles (Plate xxii, Fig. 4) have an eye in the middle, and are flattened in order that they may be firmly clasped by the pointed artery clamp which delivers, as well as by the one which receives them. We have rarely employed this form of aneurism-needle. A simple contrivance which we frequently make use of is a threaded needle broken short and held in an artery clamp at the desired angle (Plate xxv, Fig. 5). I take pleasure in expressing my appreciation of the case given by the late Wulffing-Luer of Paris to the making of almost all of the surgical instruments originally purchased for The Johns Hopkins Hospital and designed by the author, and my thanks to his son

* I have heard that Sir Victor Horsley, prior to 1888, had employed, operating upon the brain, a retractor, concave from side to side; but the time when our instruments were designed, concave retractors were not to be found in the instrument shops of London, Paris, Hamburg or Berlin.

for many subsequent courtesies. Our instruments, with few exceptions, were fashioned from original designs; the handles, also, had all to be made to order, for at that time (the winter of 1888 and 1889) the handles of instruments in France and England were of wood or bone or ivory—occasionally of hard rubber. In Germany, Dannenberg of Hamburg, at the suggestion of Schede and of Kummel (originator of the *inorganischer Verband*), was making metal handles for many of the instruments, and Schmidt and Windler of Berlin for scalpels.

Many times during the past 20 years I have stood by the side of Professor Kocher at the operating table enjoying the rare experience of feeling in quite complete harmony with the methods of the operator, and it is a pleasure to give expression to the sense of great obligation which I feel to this gifted master of his art and science.

Professor Kocher acquired surpassing skill in the use of the "Kropl-sonde" and aneurism-needle. For some 40 years they were his weapons in his battle with the veins and arteries of the neck. A surgeon employs the instruments which in his hands he finds most effective. My chief weapon against hemorrhage is the artery clamp, a finely pointed instrument which can penetrate and dissect and does not crush the tissues in unnecessary measure. There are times when some form of aneurism-needle is indispensable, as, for example, in the operation for ligation of the inferior thyroid artery through a short incision in the presence of a large goitre.

Tissues included between two ligatures are more or less tense according to the distance between the latter; on being divided these tissues become lax and thus loosen the hold of the ligature. To prevent slipping of the ligature under these circumstances, force sufficient to crush the enclosed tissues would have to be exercised; the greater the force the greater must be the strength of the ligature. Thus Professor Kocher found it necessary to use three or four strands of silk, which we should consider coarse, in tying off the blood vessels of the upper pole of a goitre, and emphasizes the necessity of using crushing force. Is it not a more rational procedure to transfix some part of the tissues to be ligated and use a fine thread for the ligature which, thanks to the transfixion, may be tied with just force enough to stop the flow of blood? The clamp should always be removed as the first turn of the knot is being drawn home; otherwise, as every surgeon knows from experience, the grip of the tie may be loosened, and the ligature, if not a transfixing one, may slip away. The surgeon who has become convinced of the importance of devitalizing tissues as little as possible will not only

employ the finest adequate silk, but will, as he ties, note the force necessary to check the hemorrhage, and use no more. By practice the operator acquires a delicacy in tying, and develops a particular sense which enables him to gauge with accuracy the amount of pull which, for example, a thread No. 00 will permit.

THE AUTHOR'S OPERATION

The window in the top operating sheet is fastened to the skin with fine stitches, two of them, exactly in the midline, serving as a guide in bringing together the lips of the wound. Formerly the midline stitches were placed as shown in Plate xv, Fig. 1, the sheet being clamped to the skin, in clumsier fashion.

A collar incision is usually made in the line of a wrinkle over the centre of the tumor, but sometimes a little nearer to the upper than the lower poles of the thyroid lobes, and occasionally just above the sternal notch, conforming exactly to the curve taken by a trial necklace. It should be carried only very slightly, if at all, upwards at the ends, because the greater the departure from the transverse to the vertical the more unsightly becomes the scar. The platysma muscle, having been divided, is dissected upwards with the skin-flap, the veins being carefully avoided (Plate xv, Fig. 2). The lower flap is not dissected free throughout its entire extent; but in the midline it is reflected low enough to expose the manubrial notch. In splitting between the sterno-hyoid muscles, veins which may cross the midline are ligated, by the transfixion method if necessary, with the finest silk. The sterno-hyoid and omo-hyoid muscles are gently raised away from the sterno-thyroid, the extent and thickness of which is noted. On retracting the muscles of the neck outwards an accessory thyroid vein (or two) is occasionally brought into view, stretching obliquely or transversely across the space to the thyroid gland. These vessels we ligate with the assistance of the broken, threaded needle (Plate xxii, Fig. 5). They should be secured at this stage of the operation, before the sterno-thyroid muscle is stripped from the gland, otherwise they may be torn and prove troublesome. When the sterno-thyroid is thin and narrow, its posterior border may be hooked up with a broad vein-retractor and pulled mesially far enough to expose the superior thyroid vessels sufficiently well; but, ordinarily, we retract this muscle outwards or split it longitudinally in line with these vessels. It is a messy procedure to cut across and then push up and down the divided fibres of the sterno-

thyroid. The dissection is much cleaner if the muscle is split or, better, merely retracted (Plate xvi, Figs. 1 and 2).

The superior pole of the lobe can now be hooked forward with the index finger without fear of tearing a blood vessel. Two clamps are applied near this tip of the gland (Plate xvi, Fig. 2), the upper one about 1 cm. below the entrance of the vessels to the pole. The gland is cut across between these clamps to about the situation of the mesial branch of the artery, when one or two more clamps are applied and the gland is further divided to the trachea (Plate xvii, Fig. 1), which at this juncture is usually bared to the upper edge of the isthmus.*

The lobe is then rolled inwards over the trachea and the loose, extrinsic capsule divided and gently sponged back with the Breslan or "Kittner" roll.† The fine-pointed artery clamps of our clinic are then applied, as shown in Plate xvii, Fig. 2, and its insert, only in greater number. The vessels, arteries and veins are clamped well away from the parathyroids and the recurrent nerve. I have never advocated ligation of the trunk of the inferior thyroid artery.‡ The clamps being placed as depicted, the lobe is rolled outwards (Plate xviii, Fig. 1), three or four vessels of the isthmus being clamped before dividing this structure, which is usually first separated from the trachea with a long, narrow, blunt dissector and then transfixed and gently ligated.

The lobe is now resected from within outwards, just distal to the encircling clamps. In the course of this slicing off of the gland, three or four more vessels have usually to be caught (Plate xviii, Fig. 2). Their positions are fairly constant and hence they can usually be recognized and clamped before being divided.

Fine milliner's needles, armed with silk No. A, whipped along the capsule in such fashion as to be buried in the glandular tissue, occlude the vessels and thus release the clamps. If there should still be the

* The seizure of the upper pole with the artery clamps, in all cases advantageous, is especially helpful when the tip of the lobe is long and slender and extends far up and behind the trachea or esophagus and is difficult to engage with the finger. Under these conditions it may be necessary to apply, in the line of the incision through the pole, a number of clamps in pairs, the gland, as it is drawn forward by the clamps, being divided between them as each pair is placed.

† This useful little roll of tightly wound gauze was devised by the orderly of the Breslan clinic in the days of von Mikulicz.

‡ I emphasize this fact because Professor de Quervain (Surg. Gyn. and Obst., 1916, vol. xxiii, p. 402), to whom I wish to express my compliments for his polite reference to my work, has misunderstood my procedure.

least oozing from the cut surface of the gland, the stump with its capsule is transfixed here and there in mattress fashion or otherwise (Plate xix, Fig. 1). Occasionally, but very rarely, and only when it rides forward, the raw surface of the stump of the lobe is opposed to the raw surface of the isthmus (Plate xix, Fig. 1). The little stump of the superior pole is then drawn down and transfixed with a short needle * carrying a ligature of silk No. C. The transfexion is an almost indispensable procedure. As the ligatures passed in this manner cannot slip, very fine thread may be used, because only just enough force to close the vessel is required.

For subcutaneous vessels silk No. 00 is sufficiently strong. The fat is transfixed in the typical way and the hair-fine thread tied so gently that the tissues are not unnecessarily devitalized. When the tissues are ligated in this delicate manner, made possible by the transfexion, the wound is not studded with the stellar necroses which otherwise abound.

SPECIAL FEATURES OF THE OPERATION WHICH WERE MORE OR LESS NOVEL AT THE TIME OF THEIR INTRODUCTION INTO OUR CLINIC

1. Preservation of the superficial veins of the neck.
2. No muscle except the platysma is divided—not even the sterno-thyroid—except in case of large or adherent goitres.
3. The sterno-thyroid muscle is retracted outwards—occasionally split longitudinally.
4. Delivery and division of the superior pole before the remainder of the gland is dislocated.
5. Resection in place of total lobectomy in order to protect the parathyroid glands and the recurrent laryngeal nerve and to preserve a slice of thyroid in case an operation might have to be performed, possibly by another surgeon, on the opposite lobe.
6. Ultra-ligation (well beyond the origin of the parathyroid arteries) of the blood vessels, all of which are clamped before the lobe is resected.
7. Ligation of the inferior thyroid artery is not practised.
8. Closure of the wound without drainage.† This is made possible by the use of fine silk and the transfexion method for the absolute arrest of hemorrhage.

* This needle is shown in Plate xx, Fig. 1.

† I am interested to note that in 1891¹⁴⁷ I warned against the use of drainage tubes as follows: "It was not until the fall of 1889 that, for clean

ENUCLEATION AND RESECTION-ENUCLEATION OPERATIONS FOR ADENOMATA

The discovery by Emil Goetsch, of our surgical staff, that the parenchymal cells of active thyroid adenomata are richly studded in the cytoplasm with mitochondria approximately proportionate in numbers to the toxic activity of the new growths clarifies a problem which has long perplexed surgeons, and accentuates the necessity of searching for and removing so far as possible all the adenomatous tissue of both lobes and isthmus. We now at last know that the symptoms of hyperthyroidism present in most patients with adenoma when they present themselves for examination, and quite surely present at some period in all, are due to the hyperactivity of the epithelial cells of the adenoma and not to stimulation of the surrounding, histologically normal thyroid tissue. Adenomata may be large or small, single or multiple. They may attain great size, be pendulous and extend to or below the umbilicus, or so small as to be invisible to the naked eye. The entire thyroid gland may be so studded with small adenomata, microscopic or macroscopic, that their removal by enucleation is not feasible and that only resection of the greater part of both lobes avails. In the case of such glands, which might be termed conglomerate, some of the adenomatous tissue must be left in the slice from each lobe which should always be preserved to the patient. Usually the adenomatous nodules, however small, are more or less definitely circumscribed and bounded by some sort of connective-tissue capsule; but we have occasionally found widely disseminated adenomatous-like non-encapsulated areas in the otherwise normal thyroid gland of thyreo-toxic patients.

On Plate xxi, Figs. 1 and 2, are pictured two stages of the operation which we usually perform for the removal of the adenomata. The lower clamp is placed as near as possible to the adenoma in order that the tumor may be made tense by its application. An incision through the glandular tissue between the clamps is made close to the lower one, on the release of which the adenoma partly extrudes itself through and thus defines its enveloping capsule. Before incising between the two wounds, we discarded, absolutely, drainage in all of its forms. Since September, 1890, we have closed, without drainage, all wounds—the suppurating as well as the clean wounds." In those days all infected wounds were thoroughly cleansed by excision and prolonged disinfection just as in our blood-clot cases, and closed loosely, tension being studiously avoided.

clamps figured in the illustration, other clamps are placed on the visible vessels as in the operation for the excision of a lobe, but along higher meridians. By this method both lobes can be freely explored each by a vertical incision, and the adenomata enucleated. Should resection-enucleation be indicated the clamps may be transferred to a deeper meridian.

The operation of enucleation was first defined and recommended by Luigi Porta,²⁸ although probably performed earlier by Heiser and others. It is discussed instructively by Kocher²⁹ who had a method of his own which is depicted in the several editions of his *Chirurgische Operationslehre*. The operation of enucleation as practised by Socin³⁰ who revived it and popularized it, is minutely described by Keeser,³¹ previously his assistant in Basel.

In the story of the development of the operation for goitre the essential history of surgery is comprised. The problem had been a pressing one for hundreds of years, and not only in countries where the majority of the population was affected with the disease. It could not be solved until surgeons had become proficient in the art of dealing with blood vessels. This art could not be acquired except by experience in operating. The experience could not be gained until anesthesia was discovered. With the introduction of anesthesia the number and magnitude of operations promptly increased. The knowledge acquired from the new opportunities soon manifested the need of better methods for controlling hemorrhage, and primitive forms of artery forceps were devised. From these, after a time, the artery clamp was evolved. With the rapidly increasing number of patients and the crowding of hospitals, sepsis reared its head in form so dreadful that hospitals had to be destroyed and operating had to be discontinued, only desperate cases being brought under the knife, for a simple incision was quite surely to be followed by pyemia, septicemia, hospital gangrene. With the introduction of Listerism came the daybreak of modern surgery which had dawned with the advent of anesthesia. And now in the few years since the discovery of anesthetics, in the brief span of one life, surgery, so it seems, has marched from the beginning to near the end of its great era—the great era of operative development. Fortunate, indeed, are those who have labored throughout this stage of its long journey. More privileged still, we trust, may be the progressive surgeons to come who soon must seek fresh pastures and new friends.

TABLE I.—FRANCE

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
P. J. Extirpation d'une partie lérable de la glande (de de chir., Paris, 1792,	F. 27 yrs.	Tumor, 2 inches in diameter, of right side and center of trachea, extending under sternomastoid. Duration, seven years.	Slight dysphagia. De- formity, for the relief of which the opera- tion was performed.	May, 1791. Excision of right lobe mas- terfully performed. The superior and inferior thyroid arteries and other vessels ligated as encountered in course of the dissection.	Recovery.	Full account given in our text. Prob- ably the first instance of isolation and ligation of the superior and in- ferior thyroid arteries in the course of excision of a goitre. <i>The tumor was carefully separated from the trachea. The ligation of a "pedicle" or of tissues en masse was not resorted to.</i>
of Clermont-Ferrand. ean, tion sur le goitre. 1815, p. 16.				Date not given. Excision of thyroid gland.	† Death from hemor- rhage.	Brun writes: "Bonnet, famous sur- geon of Clermont-Ferrand, also prac- tised this operation, but he was not so successful as Dr. Dupuytren; his patient perished, the victim of hem- orrhage."
P. J. sci. méd., Paris, 1817, 556.	F.			Date not given. As soon as dissection of tumor was begun blood flowed with such appalling violence that the operator was "obliged to give up the pursuit of his object." He decided to ligate the portion of the thyroid which had been incised, by means of many threads passed into its depths, but spasms supervened and patient died.	† Died on operating table.	<i>Vid. text for Rullier's comments.</i>
n, G. p. 557.	F. 28 yrs.	Huge tumor extending from chin to sternum and from one maxillary angle to the other. Duration eight years.	Dyspnea; dysphagia; flushing face; daz- zling; vertigo.	Jan., 1808. Excision of entire gland in relatively bloodless manner. All vessels were doubly ligated before division.	† Died 35 hours post operation from shock.	Full history in our text. Apparently a faultless operation. Interesting to note that Dupuytren always applied the first of the two ligatures on the cerebral side of the artery in order that the second ligature might be tied without causing pain.
Unknown. communicated to Rullier Professor Percy." p. 564.	M. Le Mar- quis de A.	Large sarcomatous goitre.	No symptoms. De- formity.	No details given.	† Death from hemor- rhage.	Operation advised by Desault, but dis- approved by the eminent Louis and Professor Percy. Rullier comments: "The imprudent operator saw the patient die instantly of a frightful hemorrhage, and this beneath his eyes, between his hands, and under the knife which should have been the instrument for cure."
n, G. L. F., ier grosse, faserig-zel- eschwulst an der linken der glandula thyreoides part, mit unglücklich- ausgange. aus dem Gebiete der und Heilkunde, Erfurt, xxix, 141.	F. 12 yrs.	Tumor, "size of her head, occupying the whole left side of the neck." Duration since infancy.	No mention made of symptoms.	Nov. 22 (1829?). Tumor was found to have broad base; was not peduncu- lated as had been premised. Pedicle was constricted by three ligatures of thread. These were replaced by a metal ligature after patient was put to bed. Tumor was not re- moved.	† Died about 40 hours post operation.	Froriep acknowledges his indebtedness to Dr. Clémot, assistant at the operation, for the facts. Hemorrhage from many veins was con- trolled temporarily by finger pres- sure. Patient was in syncope at end of operation. Obstinate vomiting set in the day following the operation. Finally, convulsions and death.

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
de la soc. anat. de Paris, s. 3, i, 100.	M. 20 yrs.	"The tumor was as large as a fist."	No account of symp- toms.	No account of operation given.	Not stated.	The specimen was presented to the Soc. anat. "It presented a varied aspect. At certain points it was osseous, in others fibrous, and be- sides it had the aspect of lymphatic ganglia hypertrophied and indurated."
de méd. ou répertoire d. sci. méd., 1836, 2 ^e xiv, 181.					†	Ferrus, after giving an account of Du- puytren's operation, says: "Mr. Blandin had a similar unsuccessful case." There are no further details.
extirpation d'un goitre. gén. d. méd., Paris, s. 2, x, 25.	M. 22 yrs.	Large nodular goitre in cen- ter of neck.		March 26, 1835. Total excision of the gland. The goitre was removed in three parts. About 50 ligatures applied. Estimated loss of blood was 1½ pounds. Duration of operation, 70 minutes.	† Died a few hours post operation.	Notwithstanding the great loss of blood, the pallor and collapse of the patient, six ounces of blood were withdrawn from a vein a few hours after the operation. Death followed three hours thereafter.
P. rgien de la maison cen- de détention de Li- res. ion d'une tumeur située s la région thyroïdienne; rison. méd. de Paris, 1836, s. 2, 372.	F. 36 yrs.	Large tumor of "anterior and inferior part of neck." Duration 21 years.		Oct. 19 (1835?). Excision, probably of left lobe. Six to eight ligatures of veins, three of arteries, all tied with only one knot. Bloody operation. Duration half an hour.	Recovery.	Rather slovenly and rapid operation. Operator states that he was unable to find any trace of a right lobe. Ad- vocates leaving blood in the wound to fill a dead space and to serve in the work of cicatrization. Thus, like John Hunter, he had observed the organization of the bloodclot. Makes interesting comments on the qualities of the blood.
ré médecin en chef- point à l'hôpital civil de asbourg. L., e volumineux; ligature; rison. méd. de Paris, 1841, s. 2, 9.	M. 30 yrs.	Goitre, right side, "10 cm. in all diameters." Duration 20 years.	Very slight interference with respiration and deglutition. Voice a little raucous.	July 25, 1840. Tumor enucleated and pedicle ligated; the ligatures being passed through beads and a silver cannula and fastened to a trans- verse bar in such manner that they could be tightened at pleasure. The bloodless operation was performed in 10 minutes.	Recovery.	The ligature was drawn tighter from time to time, each manœuvre of this kind being followed by increased interference with respiration and swallowing. The tumor sloughed away.
L., e; ligature; guérison.	M. 27 yrs.	Cystic goitre, size of an orange, in midline. Slight enlargement of lateral lobes. Duration three years.	Roughened voice; dif- ficult respiration.	1840 (September?). Draw-knot liga- ture about thick pedicle. Ligature was gradually tightened and tumor ablated fourth day post operation.	Recovery.	
R., de Gaillac. la timent chimurgical 19 yrs.	F.	Goitre. Size not stated.	Dyspnea; vertigo; nightmares.	Aug. 8, 1841. Three separate sub- cutaneous ligatures en masse.	Recovery. Septem- ber 6, 1841, only	"It was decided to apply a ligature en masse, but in three distinct parts, one for the skin, one for the gland, and one for the trachea."

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
le volumineux guéri par la ature sous-cutanée. nal in Bull. soc. de méd. Béançon, 1845 (not in geon General's Library). in Arch. gén. de méd., ris, 1846, s. 4, xi, 222.	F. 19 yrs.	"Voluminous goitre." Duration eight years.	Dyspnea; suffocation.	Aug. 8, 1845. Subcutaneous ligatures passed through beads drawn so as to strongly compress the goitre.	Recovery. Infection and "consider- able reaction."	Original paper not obtainable. Meagre abstract. Sept. 30, 1845. "The cure was com- plete."
Ph. J. e. Opération suivie de rt. soc. anat., Paris, 1848, ii, 205.	F. 28 yrs.	Moderately large colloid nodular goitre. Right lobe considerably larger than left. Duration five years.	No symptoms noted.	Nov. 20, 1847. Excision; probably of entire gland. Veins, very large, were ligated and then cut. Some vessels were cut first and tied afterwards; hence, the hemorrhage was probably considerable.	† Died on second day post operation.	The left recurrent nerve was cut.
Military Hospital, Stras- urg. sur du corps thyroïde. de l'acad. nat. de méd., ris, 1849-50, xv, 1110. p. 1111.	M. "Young sol- dier."	Two cysts, each the size of a pigeon's egg, in midline. The lower tumor plunged behind the sternum.	.....	Date not given. Both tumors were easily removed there being only light adhesions—a fine pedicle con- nected the two. The cysts contained "serous and cretaceous matter."	"Recovery was dif- ficult and tardy."	While making toilet of wound the thyroid gland was observed to swell remarkably. There was no hemor- rhage nor extravasation. The pa- tient, menaced with suffocation and congestion, "was bled copiously."
Ph. J. vation d'une extirpation bronchocèle faite avec soés. de l'acad. nat. de méd., ris, 1849-50, xv, 1106. s case is also given by chel, Obs. II.)	M.	Hard nodular goitre, size of fist, situated probably in the left lobe. Duration 15 years.	.....	July 10, 1850. No anesthetic. Extirpa- tion "without great loss of blood." Vessels cut and then ligated. Some ligated before being divided. Wound stuffed with wads of lint.	Recovery.	August 31, 1850. Paralysis of recurrent nerve. Tumor consisted of numerous cysts with serous, cretaceous and stony contents. Presumably adeno- mata.
t, of Strasbourg. rpation du goître. de l'acad. nat. de méd., ris, 1849-50, xv, 1132.	.....	"Enormous thyroid tumor."	No account of symp- toms.	Date not given. Tumor removed. A ligature was placed on the last in- sertions of the morbid mass.	Recovery.	Tumor "the size of an infant's head." It "hung over the chest." Details of operation not given. Very brief report of this and the two following operations.
de l'acad. nat. de méd., ris, 1849-50, xv, 1132.	.....	"Enormous thyroid tumor."	No account of symp- toms.	Date not given. Tumor removed. A ligature was placed on the last in- sertions of the morbid mass.	Recovery.	
ary hospital. d. l'acad. nat. de méd., ris, 1849-50, xv, 1132.	.....	"Enormous thyroid tumor."	No account of symp- toms.	Date not given. Tumor removed. A ligature was placed on the last in- sertions of the morbid mass.	Recovery.	The operator's procedure was "to place successively on these venous plexuses two ligatures, one on the side of the tumor and the other on the opposite side, in order to divide these vessels without hemorrhage."
t (de St. Malo). rpation d'un goître. méd. de Paris, 1850, s. 3, 710. sented by Dr. Velpeau. ad. de méd., séance de ptembre 24, 1850.)	M. 67 yrs.	Goitre, midline, size of an ostrich's egg. Duration about one year.	Shortness of breath on exertion; slightly im- peded deglutition; abnormal voice.	May 28, 1850. Sitting posture. Exci- sion of both lobes. Most vessels were cut first, then tied or twisted, but only the central ends. Vessels be- lieved to be the superior thyroid arteries were divided between two ligatures. "Scarcely 500 gm. of blood were lost."	Recovery.	

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
Professor. ture des artères thyroï- dines pour remédier à la foculation causée par le tre. les cliniques de Mont- lier, 1854, ii, 222. reported by Dr. Barbin, èse, Montpellier, 1854, p.	F. 25 yrs.	"Enormous goitre, divided into three perfectly distinct lobes." "Careful and re- peated examination failed to reveal the inferior thy- roid arteries."	"Orthopnea; difficulty in speaking; disturb- ance of cerebral cir- culation; troubled sleep; disturbed di- gestion; voice pecu- liar; pulse regular."	Op. I.—April 10, 1854. Ether. Liga- tion of superior thyroid arteries. Op. II.—Date not given. "Three large arteries were found in contact at the same point, viz., behind the clavicular attachment of the sterno- mastoid. Unable to make a choice among these enormous vessels, the operator contented himself with ligating an ascending branch of the inferior thyroid artery."	Recovery.	Thirteen days post first operation, cir- cumscription of tumor 8 cm. less. Cerebral circulation re-established. Respiration easy. Sleeps well. Speech normal. "The patient . . . left, full of gratitude to a surgeon who, had he not been conscientious, might have performed another operation than that of ligating the thyroid arteries, viz., extirpation, to which this woman would readily have con- sented."
s, in Lima. vation de goître enkysté. irpation du kyste. Guéri- Gaz. méd., Paris, 1856, 3, xi, 129.	F. 22 to 24 yrs.	"Goitre, the size of her face." A single cyst. Du- ration "some years."	.....	1831. Cyst incised and thereupon enu- cleated. No blood vessels divided and there was "not the least hem- orrhage."	Recovery.	Patient complained that her tongue was being torn out when traction was made on the tumor whose only adhesions were "at the base of the larynx." Probably a cyst of the thyreo-glossal duct.
gnac. art, A. e kystique latéral; abla- n heureuse par écrasement saire. rance méd. et pharmaceu- ue, Paris, 1860, vii, 234.	F. 29 yrs.	Cystic plunging goitre, size of large pigeon's egg, near the insertion of left sterno- mastoid. Duration one year.	Constant dyspnea, fre- quent cough and oc- casional dysphagia; severe pains radiating to left shoulder and arm; occasional numbness of arm.	Oct. 17, 1859. Dissected free with scissors, sac accidentally pierced, collapsed completely. Écraseur chain applied to pedicle caused convul- sions; reapplication, later, again caused convulsions. Ablation "finally accomplished."	Nov. 22, 1859. Re- covery. Rather stormy conva- lescence.	I saw, last year, a patient with Graves' disease who requested operation on the goitre in order to obtain relief from severe pains in shoulder, arm, forearm, etc. We found a cervical rib. She refused operation on either rib or thyroid when told the cause of her pains.
n, Hôpital Beaujon, Paris. e suffocant cancéreux à me galopante; asphyxie. itative infructueuse de chéotomie. de la soc. chir., Paris le year 1861), 1862, s. 2, 163.	F. 22 yrs.	"The tumor on the right was a continuation of the is- thmus consisting of several unequal masses, some of which extended beneath the right sterno-mastoid. The portion of the tumor on the left was formed of the left lobe of the thyroid, enlarged, but whose struc- ture did not appear to be altered." Duration eight or ten years.	Suffocation; dysphagia.	Exploratory puncture, March 1, 1861. Op. I.—March 2, 1861. Successive sub- cutaneous sections of the two fasciæ of the sterno-mastoid at its insertion at the clavicle. This was done to relieve suffocation, but had no effect. Op. II.—March 4, 1861. Incision in the midline and on the right and left sides to liberate the tumor. A cru- cial incision was made on the middle of the tumor which was cauterized with nitrate and "acide de mer- cure." A quadruple thread was passed trans- versely through the body of the	† Died March 4, 1861. Asphyxia.	Microscopic examination of the tumor and ganglia, made by M. Sée, reveals the existence of cancerous cells.

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
S. A., extirpation du goitre. Strasbourg, 1867, p. 43. I.—Extirpation du lobe che de la thyroïde par se coupante de Middel- on. Mort.	F. 19 yrs.	Large adenoma of left lobe. Duration eight years.	Dyspnea.	Op. I.—Oct. 1, 1867. Gland punctured. Op. II.—Oct. 7, 1867. Enucleation. Ligation of left superior and inferior thyroid arteries.	† Died October 10, 1867. Sepsis.	Autopsy: "The wound and parts pre- sent a gangrenous aspect." Mediastinal infection.
(Professor in Nancy). extirpation complète de glande thyroïde dans les de goitres suffocants, iques ou parenchymateux ération suivie de succès). ebd. de méd. et de chir., is, 1873, s. 2, x, 699, 718.	F. 24 yrs.	"Parenchymatous" goitre, involving both lobes, but greatest development in midline and left side. Duration 15 years.	Dysphagia; dyspnea; muffled voice; head- ache; giddiness.	Nov. 23, 1872. Excision of entire gland. Operation methodically performed. All arteries tied before division. "Patient had not lost 150 gm. of blood." Time, one hour.	Recovery.	Vid. text for abstract of Michel's paper. Goitre operations had been abandoned for 20 years prior to this. He may be said to have revived the operation for France. Michel adopted the novel procedure of permitting vessels doubly ligated to remain undivided until a later stage of the operation.
rrail Couvat, Ch. tribution à la thérapeutique urgicale de goitre cysti- Nouveau procédé atoire. Nancy, 1876, p. 40.	F. 16 yrs.	Cyst of thyroid, size of two fists.	.....	April 28, 1875. A three-act operation: (1) Isolation of greater part of cyst; (2) puncture and evacuation of fluid; (3) cauterization of the sac. Procedure of Michel.	Recovery, but with a slight disten- tion of the neck.	The procedure of Michel is called "Procédé opératoire, procédé mixte (dissection-cautérisation)." There were two slight post-operative hemorrhages. Noteworthy, that hav- ing excised the entire gland three years previously (case No. 27) he should have resorted to puncture and cauterization.
chef de clin. chir., fac. néd., Nancy). p. 41.	M. 21 yrs.	Cyst, size of large orange, to the left of median line. Duration three years.	Slight respiratory dis- turbance.	May 31, 1875. Isolation, puncture, cauterization ("dissection-cautérisa- tion"). Procedure of Michel.	Recovery.	
p. 45.	F.	Cystic tumor, size of fist, pressing on trachea. Duration about two years.	Dyspnea.	Date not given. Isolation, puncture, cauterization. Procedure of Michel.	Recovery.	
, Eugène, of Strasbourg. offre rétropharyngien et on extirpation. et mém. soc. chir., Paris, n. s., v. 303.	F. 25 yrs.	Cystic tumor, size of an apple, on right side of neck. A second cystic tu- mor on the right side was retro-pharyngeal. Duration about three years.	Dysphagia. Respiration free.	Op. I.—Dec. 7, 1878. "Exploratory puncture." Op. II.—Dec. 9, 1878. Tumor on right side of neck punctured and sac ex- cised; the retropharyngeal cyst acci- dentally ruptured and removed.	Recovery.	Walls of cyst examined by Reckling- hausen, who found them composed of thyroid tissue. Boeckel refers to Storck's three cases of "hématomas rétro-pharyngiens." (Wien. med. Woch., 1878, Nr. 46, 1215) believing them to be the same as his.
Hôpital St. Louis. in, cas d'ablation de tumeurs oldiennes. I.—Goitre solide; abla- ; absces des médiastins; cardite hémorragique; t. les hôp., Paris, 1880, lili,	M. 24 yrs.	Solid goitre of right lobe, size of fetus head. Duration 10 years.	Dyspnea; suffocation.	Oct. 19, 1878. Enucleation. Vessels clamped before division—35 clamps employed; 12 of these were removed the following day. Alcohol dressing.	† Died Nov. 2, 1878.	Oct. 25, 1878. Mediastinal abscess; pericardial effusion; double pleurisy. The tumor was evidently an ade- noma. The number of clamps left hanging in the wound is not stated.

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
—Kyste sanguin du thyroïde; ablation de nde thyroïde, guérison. 195.	M. 19 yrs.	Tumor, size of large orange, in midline, composed of numerous cysts filled with blood-stained fluid contain- ing cholesterolin. Duration five years.	Dysphagia; "sense of constriction of lar- ynx."	July 19, 1879. Enucleation—only five clamps employed, all removed— wound closed with metallic sutures; collodion dressing.	Recovery.	July 20. Alcohol and carbolic dress- ing. July 26. Small abscess opened. The walls of the tumor were 1 cm. thick.
cated by Durdos. r. A., ention chirurgicale les tumeurs du corps de. —Kyste colloïde de la e thyroïde, rupture vas- e, collection sanguine. ion. Guérison. Paris, 1880, p. 170.	M. 87 yrs.	Colloid cyst in midline. Cir- cumference of neck 42 cm. Duration 12 years.	Slight dyspnea; slight dysphagia; pain.	Cyst punctured three times—Aug. 17, 1879, Sept. 15, 1879 and Sept. 19, 1879.	Recovery.	After eight months there was only a small tumor, the size of a pigeon's egg, situated on the median line above the sternal notch. The right lobe of the thyroid is larger than normal.
, A., —Goitre kystique ayant lieu à la triade du exophthalmique. Opé- par les caustiques. son de tous les symp- 172.	F. 21 yrs.	"Cystic goitre," size of a turkey's egg. Duration three years.	Dyspnea; palpitation; insomnia; loss of flesh. Pulse 160. Eyes bulging. Menstrua- tion irregular.	June 23, 1877. Incision of tumor, cauterization "pâte Canquoin." July 1. Second cauterization and cyst opened. July 18. Injection with tincture iodine.	Recovery.	Evidently an active adenoma causing severe symptoms of hyperthyroidism. Designated Basedow's disease by Ollier. May, 1879. A little exophthalmus. Pulse 80.
, A., V.—Extirpation d'un colloïde. 177.	F. 20 to 24 yrs.	Large colloid goitre; right lobe larger than the left.	No functional disturb- ance.	April 18, 1877. Excision of right lobe. Division of all vessels between two ligatures. Lister dressing.	"Recovery com- plete and rapid."	"The whole lobe surrounded by the capsule was easily removed."
, A., VI.—Extirpation d'un cancéreux. Mort. 181.	M. 87 yrs.	Large "cancerous goitre," size of "fetal head at term," occupying the whole right side of the neck. Left lobe normal. Tumor size of hazel-nut for nine years, then very rapid growth during the past year.	Headaches; shooting pains; flushing; verti- go; dizziness; cold sweats; noises in the ears; dyspnea; voice raucous, bitonal; dys- phagia; great loss of weight. Pulse 100.	Feb. 8, 1880. Exploratory puncture negative. Feb. 12, 1880. Excision of the tumor readily accomplished and with little loss of blood. Asphyxia necessitated tracheotomy.	† Died 2½ days post operation.	Autopsy: Besides the tracheotomy wound there was another opening in the trachea on the right. A little fluid in left pleural cavity; great congestion of both lungs.
und Terrillon, ms de goitre.	F. 41 yrs.	Moderately large goitre, chiefly of right lobe. Duration 33 years.	Severe attacks of suffo- cation; shooting pains; voice feeble	Tumor punctured in 1863, 1866, 1880; dark or bloody fluid withdrawn. Oct. 29, 1880. Excision of tumor of	Recovery.	

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
and Terrillon, [—Goitre. Hypertrophie obo droit du corps thy. Dyspnée. Raucité de voix. Accès de suffocation. Exstirpation. Guérison. p. 646.	F. 24 yrs.	Goitre, size of two fists, of right lobe. Duration four years.	Dyspnea; suffocation; raucous voice.	Date not given. Carbolic spray. Excision of right lobe. Division of vessels between catgut and silk ligatures. The isthmus was also divided between two ligatures. Duration 2½ hours.	Recovery.	"I did not hesitate to propose operation to the patient because inspired by the confidence given me by the present means of controlling hemorrhage and by the method of Lister." "The tumor was evidently a very vascular parenchymatous goitre." Probably an adenoma.
J. dectomie pour un goître cant. Guérison par pre-intention. soc. de méd., Strasbourg 1880, 1881, xvii, 129.	F. 47 yrs.	Plunging goitre of the left lobe of the thyroid gland, measuring 8 cm. longitudinally by 7½ cm. transversely. Duration 10 years.	Attacks of suffocation; cyanosis of lips; face pale; pronounced exophthalmus.	July 20, 1880. Enucleation of tumor. The two thyroid arteries were ligated and divided. Antiseptic precaution. Vapor spray. Lister dressing.	Recovery.	Collar incision. The first mention of the horizontal incision that I have noted (W.S.H.). Anticipated Kocher by many years.
dectomie pour un goître hthalmique. Guérison. acad. de méd., Paris, s. 2, ix, 401. ed also by Benard, H. —Thèse, 1882, p. 27.	F. 29 yrs.	Exophthalmic goitre; right lobe the larger. Pathological note: Somewhere in the gland a "cystic sac filled with blackish congested blood" was found. Duration four years.	Marked bruit in vessels of neck; heart enlarged; dyspnea; suffocation; dysphagia; palpitation; pallor and flushing; melancholy; nervousness; irritability; frequent cutaneous eruptions. "No marked exophthalmus." Pulse 90-100.	Jan. 28, 1880. Chloroform. Pulse 140. L-shaped incision, finally converted into rectangular U. Excision of entire thyroid. Rather irregular and bloody performance, terminating with the ligation on each side of the "pedicle." Deschamps' or Cooper's needles used for most of the 40-odd ligations.	Recovery.	Carbolic spray and Lister dressing employed. Post operation: "Disappearance of ocular troubles, suffocation, and palpitation." March 27, 1880, pulse 80-88. One of the earliest thyroidectomies for Graves' disease. (Vid. Ollier's case of adenoma with hyperthyroidism.)
L. G. dectomie. t mém. soc. chir., Paris, n. s., vii, 817. Union, Paris, 1885, s. 3, xxxix, 205. was first published in Union méd., Paris, 1881, xxxii, 997. icated by Terrillon.	F. 25 yrs.	Thyroid gland enlarged to one-half size of adult fist. Right lobe larger than left; "middle lobe very hard." Duration 14 years. Induration of isthmus and left lobe due probably to the numerous treatments and infections.	Dyspnea; dysphagia; "disturbance of cerebral circulation"; voice very weak; metrorrhagia.	Iodine and caustic treatments and punctures at intervals; infections. Sept. 11, 1880. Complete excision of thyroid gland by "curved incision from one carotid to the other." Ligation of the four thyroid arteries. "The operation being finished, catgut ligatures were substituted for most of the silk ligatures." Duration two hours.	Recovery.	Second mention of collar incision (vid. J. Boeckel). Immediately post operation complete aphonia. Laryngoscopic examination: Absolute immobility of both vocal cords. After three months some movement of the vocal cords. Four months post operation: Patient speaks without difficulty, voice, though weak, more sonorous than before operation. The operation, well performed, must have been difficult on account of the previous treatments and infections.
, of Saloniki. ation des goitres. —Sarcome kystique du thyroïde; extirpation; son. heb., Paris, 1881, s. 2, 740.	F. 42 yrs.	"Tumor, size of man's fist, on right side of neck." Duration 17 years.	Dyspnea; dysphagia.	Nov. 21, 1880. Incision and evacuation of cyst. Contents purulent. Wall of sac excised. Sterno-mastoid divided.	Recovery.	"Rigorously applied antiseptic treatment." Very brief report.

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
II.—Enchondrome du s thyroïde; extirpation; t au 6 ^{me} jour.	M. 46 yrs.	"Enormous tumor of front of neck." Duration 26 years. Rapid growth in last two years.	Voice raucous; headache; deafness; face pale; suffocation.	Date not given. "Extirpation." No details—apparently a simple operation; only small vessels encountered.	† Died on the sixth day.	Tumor found to be multilocular. Death sudden, "without apparent cause." Brief report. Autopsy not permitted by the Turks.
ation du corps thyroïde. rison. et mém. soc. chir., Paris, n. s., vii, 564.	M. 23 yrs.	"Hard tumor of right lobe and isthmus, size of an orange." Duration 13 years.	"Neither pulsation nor bruit" in tumor. No mention of symptoms.	May 27, 1880. Antiseptic precautions. Excision of tumor (isthmus and right lobe). Time 50 minutes. The left lobe appeared to be normal and was not removed.	Recovery.	"The tumor weighed 180 gm., and had the size and form of a breast and also its consistency, except for some disseminated calcified nuclei." Probably an adenoma. Brief report.
hypertrophique simple. roïdectomie; médiastinite & infectieuse; mort ra- et mém. soc. chir., Paris, n. s., viii, 298.	F. 23 yrs.	Ovoid tumor covering the trachea from the larynx to sternum, size of an orange. Duration about five years.	Painful prickling in tumor; dyspnea; attacks of suffocation. "Neither bruit, pulsation nor exophthalmus."	Oct. 22, 1881. U-incision. Extirpation of tumor weighing 145 gm. "Finally, the lateral pedicles were cut between two strong catgut ligatures."	† Died Oct. 25, 1881. Acute infection of mediastinum.	Histologically the tumor "is constituted by simple hypertrophy and proliferation of the vesicles of the gland without predominance of any normal or pathological element."
Chirurgien de l'Hôpital ion. H., ribution à l'étude du re exophthalmique. Paris, 1882. II.—Sarcome du corps oïde ayant donné lieu à les symptômes du goître hthalmique. Ablation la tumeur. Guérison de les accidents.	M. 33 yrs.	"Rounded tumor" of left lobe, which at operation was found to extend below the sternum. Thyroid cartilage displaced to right. Duration one year.	Suffocation; palpitation; dysphagia; raucous cough; sclera visible around cornea; sense of tension in eyes; diplopia for distant objects. Patient very irritable and easily agitated. No bruit in tumor. Pulse 80, but easily accelerated.	May 18, 1881. Chloroform anesthesia begun, but patient became so cyanosed that operation was not undertaken. May 21, 1881. Operation under large doses of chloral and subcutaneous injections of morphia. Lister technique. Rectangular U-shaped incision, cutaneous flap dissected with the fingers. Tumor ruptured in course of operation and friable, granular masses escaped, leaving little but the capsule for removal. Right lobe and isthmus "unaltered." At bottom of cul-de-sac in mediastinum the left innominate vein "of enormous size was plainly visible."	Recovery. July ?, 1881. Exophthalmus and all the other symptoms of hyperthyroidism had vanished. Died about two months post operation. No post-mortem note.	Diagnosis before operation: "Exophthalmic goitre as plain as possible." Post-operation note: "Lungs probably seat of generalized cancer, from which patient will soon succumb." "Tumor found on careful histologic examination to be sarcoma." As the toxic symptoms could not have been caused by a sarcoma or relieved by its removal, we may assume either that the tumor was an adenoma or possibly carcinoma, or that the gland was hyperplastic and in part, at least, removed.
kystique volumineux; tion; guérison. acad. de méd., Paris, s. 2, xi, 1445.	M. 25 yrs.	"Cystic goitre, size of small ostrich egg, occupying the whole extent of the neck and plunging into the mediastinum." The tumor was "very hard, almost osseous at some points. . . . fibro-cartilaginous at others." Thyroid cartilage dislocated 3 cm. to left. Greatest circumference is	Voice slightly roughened.	1874. Received, in Holland, interstitial iodine injections. Oct. 25, 1882. Lister technique. Excision. Rectangular U-shaped incision. Omo-hyoid, sterno-hyoid and sterno-thyroid muscles divided. "As soon as the tumor was extracted a multitude of forceps were applied to the arteries showing on all sides." Pedicle over trachea ligated en masse with catgut.	Recovery.	Quite bloody operation. Vessels clamped as encountered. No attempt to secure the thyroid arteries as preliminary step. The entire gland was probably excised.

TABLE I.—FRANCE.—CONTINUED

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
J. dectomies. ents de chirurgie anti- que, Paris, 1882, 468.), 471. dectomie partielle pour otre du volume de deux gs. Lister. Guérison par ière intention au bout euf jours.	F. 20 yrs.	Cystic colloidal goitre of right lobe. Circumference of neck 47 cm. Duration six years.	Suffocation for two months.	Sept. 16, 1880. Cyst punctured; extirpation of right lobe after ligation and division of the two thyroid arteries.	Recovery.	
), 472.	F. 21 yrs.	"Cystic goitre, right side. Circumference of neck 40 cm.; tumor is median." Duration six months.	.....	Date not given. Injections of iodine and evacuation of liquid. Aug. 26, 1880. Evacuation of cyst and extirpation of sac. Lister dressing.	Recovery.	
rd, of Havre. ation de thyroïdectomie. t mém. soc. chir., Paris, n. s., ix, 21.	M. 28 yrs.	"Three-lobed tumor about the size of an orange; central lobe the largest." Duration 14 years; rapid growth of late.	Suffocation; raucous voice, at times complete aphonia.	Sept. 5, 1882. After "isolation" of both lobes "the pedicle was so large and short that it prevented dissection and ligation of the thyroid arteries." Hence the tumor was transfixed by crossed steel rods and ligated under these by a rubber tube. Sept. 9. Severe hemorrhage; thereupon the rubber tube was replaced by a chain écraseur and the tumor removed.	Recovery.	"The tumor weighed 285 gm. The walls of the sac were thick, but pliable. The remains of the thyroid body were studded with numerous calcareous concretions." Authors, at this time, did not recognize adenomata as something to be distinguished from colloid goitre.
), service of Professor euil, Hôpital la Pitié, 17 yrs. plongeant parenchyma- et kystique. Extirpa- après trachéotomie pré- aire. Forcippresure pro- ie de l'artère thyroïdien- périeure. Hémorrhagies daires. Mort. éd. de Paris, 1883, s. 6, 0.	M. 17 yrs.	"Trilobed tumor occupying whole right side and center of neck, extending to left." Duration five years.	Modified voice; dyspnea; wheezing; suffocation attacks.	July 1 and 8, 1883. Tumor punctured by Verneuil. Aug. 1. Drainage tube "in the sac." (Verneuil). Oct. 5, 1883. Operation by Pozzi. Chloroform. Tracheotomy to relieve asphyxia. Excision of both lobes. Operation difficult on account of the previous surgical treatment. Duration three hours. Evidently considerable hemorrhage. Two forceps on large vessel, accidentally wounded, were left in wound because ligation was found impossible.	† Died Oct. 8 about 10 a. m., 3 days post operation. Hemorrhage.	Oct. 7. Severe hemorrhage on removal of forceps was controlled by re-application of several forceps. Oct. 8, 4 a. m. "Enormous loss of blood; hemorrhage controlled with difficulty, with about 10 forceps. Patient almost exsanguinated." Autopsy: The right superior thyroid artery found cut 7 mm. from its origin. "There was no clot in the artery. The right external carotid had apparently been caught in one of the last forceps."
éon. suppuré du corps thy- —Accès de suffocation. soïdectomie. Guérison. i. maladies de l'oreille, rynx et des organes con- s, Paris, 1883, ix, 146.	F. 28 yrs.	Firm, elastic, ovoid tumor, the size of a large egg, ending just above suprasternal hollow and had an up the edge of the right sterno-mastoid. Duration nine months.	Dyspnea; dysphagia.	June 6, 1882. U-shaped incision, the branches measuring 7 cm. and 6 cm. across. The right incision followed the sternomastoid, and the left was a little beyond the midline. The tumor was isolated and enucleated. The cyst wall was ruptured, "nevertheless the extirpation of the sac could be entirely carried out." "The loss of blood was insignificant; there were few ligatures." Carbolic spray during whole operation. "Lister dressing."	Recovery.	Post operation: "The wound preserved good aspect, with only a few drops of sero-purulent liquid from the drain."

TABLE II.—ITALY

Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
di, G. B. enorme; infiammazione, razione, cancrena. Set- Ligatura della tiroidea iore. elle sci. med., Bologna, s. 3, ix, 365. lly published in Mem. med. contemporanea, 337.	F. Past middle age.	Enormous goitre "reaching to the hyoid bone, and laterally to the trapezius." The tumor covered the right breast and had an abscess at its extremity. Duration "since childhood."	Dyspnea; vertigo.	Oct. 6, 1844. Ligation of the superior thyroid artery. "Hemorrhage arising from certain arteries was soon controlled by ligation."	Recovery. Oct. 21, 1844. "Tumor" reduced one-half.	"The patient was seen not long before the publication of the paper, and she was in better health than before the ligation of the artery." Infection may, in part, have been responsible for the ultimate result. There was a large suppurating cavity within the tumor. For other low hanging goitres <i>vid.</i> Holmes (Great Britain, No. 23) and Perassi (Italy, No. 19).
igi, professore di clin- hirurgica in Pavia. nalattie e delle opera- della ghiandola tiroi- Milano, 1849, p. 135.	F. 26 yrs.	"Large hypertrophied tumor of the right lobe."	.....	April, 1835. Ligation of the right superior thyroid artery.	Recovery. Tumor not affected by the operation.	"The operation, . . . in spite of some difficulty in discovering the artery hidden behind the summit of the swollen lobe, succeeded without accident per se."
	M. 28 yrs.	"Large hypertrophied tumor of the right lobe."	.....	Nov. 30, 1846. Ligation of the right superior thyroid artery.	Recovery. Tumor not affected by the operation.	Patient died from erysipelas of the head three months after the healing of the wound. The lumen of the ligated artery was found to be normal below the ligation.
[, p. 136.	M. 20 yrs.	Large goitre consisting of three lobes, the median as large as a turkey's egg, those on the sides each larger than a fist. Duration "from childhood."	Dyspnea.	May 9, 1848. Ligation of both superior thyroid arteries: the right, palpable, was tied in a "few minutes; the left, deep seated, in 15 minutes." Short vertical incisions.	Recovery. The tumor was diminished by one-third of original volume and remained so for four months when it "seemed disposed to grow again."	
	M. 38 yrs.	"Very voluminous goitre."	Suffocation.	Dec. 1848. Venesection, without relief. Ligation of what was thought to be the enlarged inferior thyroid artery.	† Died on the day of operation.	"At autopsy it was noted with surprise that the ligature had been placed on the internal carotid artery." Cause of death not stated.
II, p. 149.	M. 20 yrs.	"The tumor of the right thyroid lobe not larger than an orange." Duration "from childhood." "The left lobe appeared small and atrophied."	Altered voice; dysphagia; dyspnea; fatigue; cough; oppression in the chest.	Iodide pomade tried without effect. 1840. Tumor incised, "a coriaceous cyst as large as a turkey's egg was discovered, isolated and drawn out. Then were disinterred and extracted, two sarcomata of smaller size." Duration of operation one-quarter of an hour with loss of four or five	Recovery.	"After one month of suppuration the wound healed with total disappearance of the tumor and of the symptoms." Operator saw patient in 1848, eight years post operation. He was relieved of all symptoms and there remained no trace of the goitre.