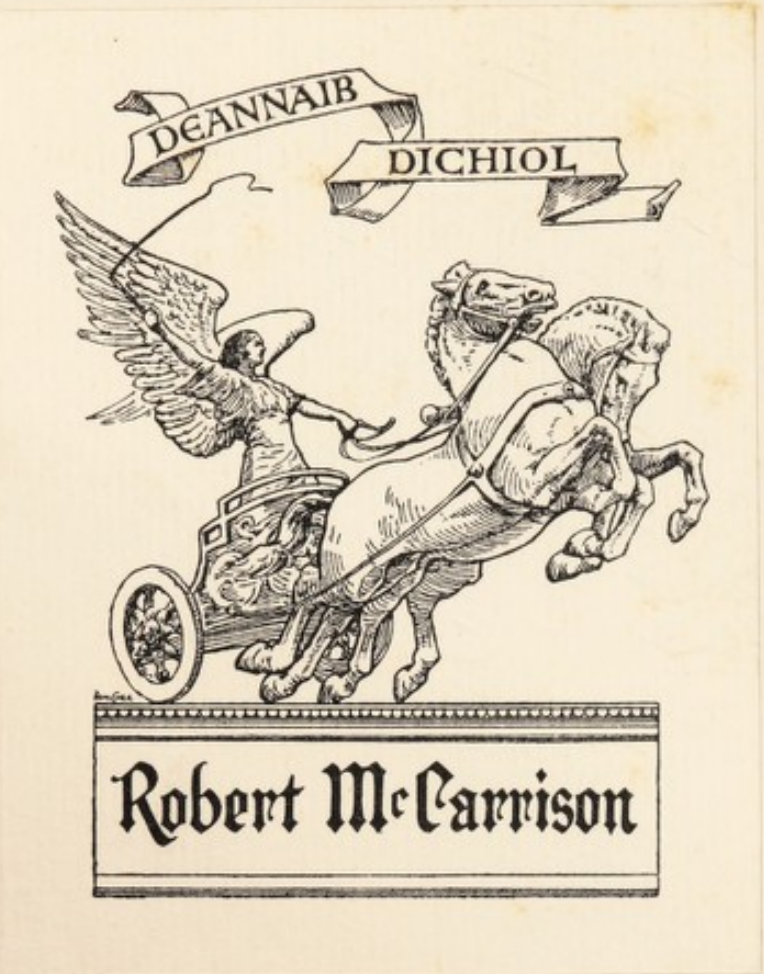
The operative story of goitre : the author's operation / by William S. Halsted.



To Dr. McCarrison

with the high regard

of

W. S. Halsted

THE OPERATIVE STORY OF GOITRE

THE AUTHOR'S OPERATION

By WILLIAM S. HALSTED, Baltimore, Md.

The extirpation of the thyroid gland for goitre typifies, perhaps better than any operation, the supreme triumph of the surgeon's art. A feat which today can be accomplished by any really competent operator without danger of mishap and which was conceived more than one thousand years ago might appear an unlikely competitor for a place in surgery so exalted.

There are operations today more delicate and, perhaps, more difficult, but they have followed naturally and easily in the paths made clear for them. But is there any operative problem propounded so long ago and attacked by so many which has cost so much thought and endeavor and so many lives before its ultimate solution was achieved? And further, is there any problem in surgery having required for its solution such intrepid throbbing and prolonged striving of the world's greatest surgeons which has yielded results so bountiful and so adequate?

For thousands of years, probably, goitre has been a familiar malady. An unsightly and frequently fatal disease, it was accepted as an inoperable affliction or dispensation of Providence in communities where it prevailed, and paraded the streets exciting the curiosity of the populace in towns where it was unusual. The sufferers sought relief from suffocation, difficulty in swallowing, failure of the heart and from a distressing disfigurement. Thus this conspicuous tumor of the neck was a perpetual challenge to the physician, and to the surgeon a stigma as well.

My interest in the thyroid gland may be traced to the time, 40 years ago, when Wölfler was writing his classic monograph on *Die Entwickelung und Bau des Kropfes.*[270] Anton Wölfler, first assistant of Billroth and later professor of surgery in Prague, occasionally came to the laboratory in which I was working in Vienna in 1879 and 1880 to study my sections of the salmon, with reference to the development

and structure of the thyroid gland in the fish. I do not recall, however, having seen an operation for goitre in the clinic of Billroth, which I attended quite regularly.

From 1880 to 1886, the period of my surgical activities in New York, I neither saw nor heard of an operation for goitre, except that in one instance I assisted Dr. Henry B. Sands to extirpate a small tumor from the right lobe of the thyroid gland. The patient, a male, was operated upon in the sitting posture, with a rubber bag to catch the blood tied about his neck. We had only two artery forceps, all, probably, that the hospital afforded, and these were of the mouse-tooth or bull-dog variety (Liston's).

In the autumn of 1887, at the suggestion of Dr. Welch, I began experiments on extirpation and transplantation of the thyroid gland in dogs, which resulted in the discovery, among other things, of the striking histologic changes which signify hyperplasia and hyperactivity of this gland and which apparently are identical with those usually found in Graves' disease. The knowledge thus acquired enabled us early to interpret the microscopic picture of the gland of exophthalmic goitre. The remarkable discoveries by Gley (1891-2)[131] and Vassale and Generali (1896)[244] of the vital importance of the parathyroid glandules stimulated afresh my interest in the surgery of the thyroid gland and suggested experiments in transplantation of the tiny epithelial bodies (Epithelkörperchen). From these experiments there resulted the general law that homografts of these glandules will not live, and that for the successful transplantation of autografts a considerable deficiency must be created. We made the startling and hardly believable observation that the life of a dog may be maintained by a particle of parathyroid tissue only one-quarter of a millimeter in diameter and extinguished by tetany on its removal.

In 1907 Mr. Herbert M. Evans kindly made at my request arterial injections of the parathyroid glandules, and from his and Dr. W. G. MacCallum's careful anatomical studies and my own surgical and experimental observations there resulted an operative procedure in our clinic which I have described on several occasions (1907,[145, 149] 1911,[150] 1912[151]), but perhaps too fragmentarily to attract attention. Inasmuch as we have been unable during the past 12 years to make any essential improvements in our operation, it occurred to me that it might now be well to describe it in greater detail and to give in outline the history of the development of the operation for goitre.

So far as possible I have let the story narrate itself in the words of the principal actors, those chiefly responsible for the operative progress. Surgical performances which seem not to have influenced the development of the operation have been in greater part merely recorded.

I wish to express my thanks and deep indebtedness to Colonel McCulloch and Dr. Fielding Garrison for their great courtesy and assistance. They have granted me very unusual privileges in the use of the Surgeon General's Library, without which and the *Index Medicus* it would not have been possible to conduct the investigation.

To my accomplished secretaries, Miss Stokes and Miss Hough, I can hardly emphasize sufficiently the extent of my obligations for their assiduous and intelligent support. And in the beautifully executed illustrations from the pencil of Max Broedel I have found constant pleasure and a stimulus.

Statistics on the subject of operations, performed the world over, for goitre have from time to time been compiled. The latest collection is Süskind's, who in 1877,[230] reporting 28 operations by Victor von Bruns of Tübingen, was able most favorably to compare his master's work with that of all others and justly to boast of the contributions which German-speaking nations had made to the list of operations for goitre as contrasted with those from the rest of the globe. He makes no mention of a very similar, but less fervidly patriotic paper by Bruberger [58] which antedated his own by about one year. The fundamental historical papers are a tract by Hedenus (Leipzig, 1822),[156] an admirable treatise by Mandt (1832) [232] of Greifswald, and a voluminous chapter by Günther (1864),[144] professor of surgery in Leipzig, in the fifth volume of his *Lehre von den blutigen Operationen am menschlichen Körper.*

HISTORICAL PAPERS

Mandt. *Der Kropf; Geschichte u. Exstirpation desselben,* Rust's Magazin f. d. gesammte Heilkunde, Berlin, 1832, vol. 37, pp. 390, 412, 413.

" The early story of goitre is voluminous, but very tangled. Traces of attempts to distinguish varieties are found with the ancients; later, however, and especially in the Middle Ages, scrofula and other diseases of the glands were confounded with it and synonymously treated. This error was continued until late in the eighteenth century.

" Only in recent, indeed very recent, times have the doctrines on the subject of goitre been put in order by the works of Kortum,[200] Wichman.[361] Webers (Monograph on Scrofula), Maas,[226] von Walther,[340]

Hausleutner,[155] Mühlibach,[255] Hedenus,[156] especially Johannes Müller and others.

"I think it probable that Abul Casem Khalaf Ebn Abbas, usually named Albucasis, undertook about the year 330 * a genuine extirpation of goitre. He lived in Bagdad, was a bold and, one may say, venturesome operator, and could the better hazard the operation because of the following experience: A 'homo ignarus' had attempted a similar operation, and the patient having nearly bled to death from an injured artery Albucasis knew very well how to control the hemorrhage by ligature and the hot iron."

G. B. Günther. In the fifth volume of that scholarly, voluminous, altogether remarkable and today almost unknown work, Günther's *Lehre von den blutigen Operationen am menschlichen Körper,* Leipzig, 1864, 5. Abtheilung, p. 369, the author records in chronological order abstracts of the first 41 cutting operations performed for the removal in whole or in part of "Struma lymphatica," the common form of goitre, covering the period from Celsus to 1861.

"We have used chiefly the treatise by Mandt in Greifswald, Rust's Magazin, vol. 37, p. 411, and that by Hedenus,† *Tractatus de gland. thyreoid.,* Lipsiae, 1822, and, at the same time, corrected some errors which appear in these articles.

"According to Schreger, Celsus had already undertaken the extirpation of goitre. But it is clear from the text that in the chapter which Celsus entitles 'De Struma,' lib. vii, cap. 13, the author, in the use of this term, has not in mind a disease of the thyroid gland, but rather a swelling of the lymph glands. Of goitre proper he speaks in lib. vii, cap. 13, under the title 'De Cervicis Vitio.' Here he describes, unmistakably, cystic goitre, and says, after discussing the use of caustics, 'sed scalpelli curatio brevior est.'

"It is doubtful if the operation mentioned by Galenus, 'De Locis Affectis', (lib. i, cap. 6) comes under this head. See Hedenus, *Tractatus de gland. thyreoid.,* Lipsiae, 1822, p. 288.

*** Gurlt (Geschichte d. Chirurgie, vol. i, p. 620) states: "The year of his (Albucasis') birth is unknown. Nevertheless, it is safe to say that he lived in the second half of the tenth century, since it is stated that he was the body physician of Caliph el-Hakim III (961-976). According to the latest investigations of Leclerc (Gaz. hebd. de méd. et de chir., 1874, pp. 537, 569) the statements of the Arab chroniclers that he died in the 404th year of the Hejira, or 1013 of the Christian era, can be accepted as correct (in spite of the assertion of Mich. Casiri, 1766, who says that Albucasis died almost 100 years later, *i. e.*, in the 500th year of the Hejira or 1106-7 A. D.). And if it is true, according to the account of Leo Africanus, that he lived to the age of 101 years, then he must have been born in the year 912 A. D." (W. S. H.)**

† Hedenus, Augustus Gulielm, not to be confounded with J. A. W. Hedenus whose operation for goitre is described later in this paper.

"According to Mandt in Rust's Magazin, vol. 37, p. 413; and Langenbeck, Chirurgie, v, p. 306 (note), Albucasis is listed among those who performed this operation about the year 330. In the local library I have not been able to find any passages bearing on this.

"Paulus Ægineta, who lived 400 years later, evidently refers, like Celsus, to tumors of the lymphatic glands when he speaks of amputating strumas. Guy de Chauliac (1363) advocated the extirpation of goitre instead of treatment by 'sympathetical' means.

"Extirpation is next mentioned by Johannes de Vigo (1501 to 1512).

"Mandt, in Rust's Magazin, vol. 34, p. 414, states that Amatus Lusitanus about the year 1550 relates that an 'audax homo' excised small goitres, and thereby exposed the trachea. I therefore consulted the 1557 edition of the works of this author and found only two passages which could be construed as bearing on the extirpation of goitres. One is found in Centur. III, Curatio 56, p. 416, and is entitled 'De Strumis'; the other, in Centur. IV, Curatio 58, p. 597, and is entitled 'De Strumis Dictis Scrofulosis.' But one soon becomes convinced that by the former he means scrofulous abscesses, and by the latter swollen lymph glands.

"It is doubtful whether the accounts of Fabricius ab Aquapendente (1613) and of Marchetti (1664) relate to an extirpated goitre or to swollen glands.

"Joh. Jessen speaks also of an operation on a bronchocele, but he certainly alludes to a swollen gland. Dionis, in his *Cours d'opérations de chirurgie,* 4th edition, 1740, p. 639, after describing struma lymphatica, gives explicit directions for operation. After reading his description of the operation, one doubts whether the author really performed it or only witnessed it.

"According to the account of Mandt, there is an observation by Muralt which makes it seem very probable that an extirpation was accomplished. The communications of Wepfer (1727) and Wiesemann probably relate only to the excision of lymphatic glands. I cannot find anything in Muralt and Wepfer bearing on this operation.

"On the contrary, Forestor, Fulvius Gherli (1710), Petit, Roonhuysen, Hoin, and Conrad Ludwig Walther seem to have excised true goitres. Mandt credits also Joseph Warner. In the translation of the fourth edition, 1787, pp. 83 and 84, I have found only two cases which could possibly be considered under this heading. After reading the full description of these cases I am convinced that they were not goitres.

"Laurentius Heister, 1752, seems to have performed the operation several times, for he says in the second edition of his large *Chirurgie,* vol. ii, p. 659, that he has never found it necessary to use the red-hot iron on account of bleeding. He also describes, in detail, the operative procedure.

"Theden, *Neue Bemerkungen und Erfahrungen, etc.*, new edition, 1776, vol. ii, p. 108, tells of an operation performed by an unnamed physician, with happy result. Mandt speaks of this as a successful case; but it appears that he did not read it in the original, or he could not have alluded to it as an extirpation of an ordinary goitre, for it was clearly a cystic goitre out of which a piece was cut. Desault erroneously credits Theden with an extirpation on account of this operation. It also appears that the case of Kaltschmied in Jena should not be counted among the extirpations. Theden says of this case that Kaltschmied had operated on a similar tumor of the gland, but that the carotid artery ran through it, that this artery was cut in two and that the patient died on the operating table.

"In the *Dissertation* of Zartmann, p. 5, it is stated that Schmucker removed a portion of a goitre. This statement is incorrect. In the second volume of his miscellaneous writings, from which Zartmann quotes, the 23d Observation is entitled: 'Complete Cure of an Enormous Goitre by Dr. Sellin, Military Surgeon' (the case, therefore, does not belong to Schmucker). The operative procedure was in no respect an extirpation; it consisted in the opening and stretching wide of abscesses, caused by severe inflammation of the goitre, whereby, to be sure, the entire enlarged thyroid gland, which contained many bony fragments, by degrees came away.

"Richter in Göttingen did not venture to undertake the operation.

"Boyer declared himself against it, and Fodéré claims to have carried it out only in cases of scirrhous degeneration.

"According to Froriep in Notizen, vol. vi, p. 336, the operation was practised in India.

"In the Dictionnaire des sciences médicales, vol. xviii, p. 555, several instances of extirpation of goitre are mentioned, but they certainly are not all vouched for, and indeed in part are improbable. We quote the following from this treatise:

"'Fodéré asserts that this operation has been performed even by ignoramuses. It is known that intoxicated patients have cut out very large goitres without disaster; in other cases, they have accidentally been cut away without harm by the stroke of a sabre or a knife. Further, Paradin relates, "It is narrated in a chronicle of Savoyen that a barber successfully removed a disfiguring goitre from his wife." Fodéré tells of a courageous surgeon in Marseilles, Giraudy, who successfully removed two goitres.'"

Chronological List of All the Operations which Actually or in All Likelihood have been Performed

"1. In the year 1596 an empiric attempted to remove a goitre in the case of a 10-year-old girl. She died under the operation, and the surgeon was imprisoned. Fabric. Hildanus, vol. ii, p. 399; Fabric. Hildanus, Opera, p. 216, Obs. 35; Langenbeck, Chirurgie, Bd. v, p. 306, footnote.

"2. Johann Heinrich Freitag in Zürich, about 1694; *Epistola de glandulae thyreoideae, partim osseae, partim meliceridis formam referentis exstirpatione,* Lipsiae, 1778; Weiz, *Neue Auszüge aus Dissertationen für Wundärzte,* Bd. iv, p. 66; Langenbeck, Chirurgie, Bd. v, p. 304.

"In a girl of 18 years Freitag extirpated, with success, probably half the thyroid gland. The tumor was almost the size of a goose's egg and could easily be dislodged up to the sternocleido-muscle. A deeply situated vessel, thought to be the right thyroid artery, was ligated. Langenbeck doubts that it was the thyroid gland. The fact that it was so easily movable is suspicious.

"3 and 4. (About 1770.) Benjamin Gooch. S. Cooper, Dictionary, vol. i, p. 301; Bell, System of Surgery, vol. v, p. 525; Richter, Chir. Bibliothek., Bd. ii, Stück IV, p. 128; Langenbeck, Chirurgie, Bd. v, p. 305, footnote; Dictionnaire des sciences médicales, t. xviii, p. 555.

"In one case (3) such a severe hemorrhage occurred that the surgeon was obliged to stop in the middle of the operation. He was unable to control the hemorrhage by any means. The patient died eight days later. Gooch assisted at this operation.

"In the other case (4), after several fruitless attempts at ligation of the arteries, the severe hemorrhage was controlled by compression day and night during eight days by persons alternating with each other at the task. Gooch should have performed this operation, but he declined. It was performed by another skilled surgeon.

"5. Adolph Friedrich Vogel, in his inaugural dissertation (*Observationes quaedam chirurgicae*), Kiel, 1771, reports this operation, but he does not say who performed it. If he had performed it himself he would certainly have said so. Peculiarities in the procedure were the circular incision employed in removing the tumor, and the ligation of the arteries leading into the thyroid gland by a common ligature. I have compared the *Observat. quaedam chirurg.,* Killiae, 1771, quoted by Mandt, but have not been able to find this case.

"6. Desault excised successfully the greater part (so it is said in the text) of an enlarged thyroid gland in the year 1791.* Desault, Chir. Wahrnehmungen, 1794, Bd. v. p. 3. This is probably the case attributed to a Girault by Bernstein (Handbuch der Chirurgie, Leipzig, 1800, Bd. iv, p. 604). There are many errors in Bernstein.

"7. Another operation which Desault performed on a woman is described in the Dictionnaire des sciences médicales, t. xviii, p. 356. After beginning the operation the hemorrhage was so severe that he abandoned the attempt and contented himself with tying up the piece of gland which had been cut. The patient died subsequently of convulsions.

"8. In the time of Desault. Related by Parey in Strasburg. Rullier, Dict. des sci. méd., t. xviii, p. 504; Rust's Chirurgie, Bd. xv, p. 504.

*** A complete report of this case is given under the chapter on France.**

"In the case of Marquis A., Desault advised operation; Parey and Louis advised against it. The surgeon who had proposed the operation performed it with the assistance of two people whom he came across accidentally. The patient died from hemorrhage on the operating table.

"9. About 1800. Kergel, military surgeon of Saxony. Successful operation. He had to ligate 11 arteries. Bernstein Handbuch d. Chir., Leipzig, 1800, Bd. iv, p. 405; *ibid.*, 5. Aufl., 1818, Bd. i, p. 752; Langenbeck, Chirurgie, Bd. v, p. 305.

"10-15. J. A. W. Hedenus in Dresden (about 1800). Six times with good results.* Journ. von Walther und Graefe, Bd. ii, p. 236.

"16. Bonnet, surgeon in Clermont-Ferrand. Year unknown. Brun, *Dissertation inaugurale sur le goître,* 1815, p. 16; Dict. des sci. méd., t. xviii, p. 564; Rust's Handb. d. Chir., Bd. xv, p. 504. The patient died from hemorrhage.

"17. Ohle, Prof. der Chir. Academie in Dresden. Successful. Hedenus, *Tractatus de gland. thyreoid.,* 1822, p. 291.

"18. Weiss in Dresden, successful. Hedenus, *l. c.*

"19. Dupuytren,† Jan. 1, 1808. Pelletan, Clin. Chirurg., vol. i, p. 215. Death after 35 hours. Seventh Obs., Paris, 1810; Dict. des sci. méd., t. xviii, p. 557; Rust's Handb. der Chir., Bd. xv, p. 504. Related in greater detail; Dupuytren, Clinique chirurgicale, t. i, p. 215, Obs. 7, Paris, 1810. Adelaïde Michon, *æt.* 28. Jäger, Walther und Radius, Bd. vi, p. 548, give this case and case No. 33 of this article as one and the same, while the reference here given by Pelletan and the reference in case 33 taken from Froriep's Notizen is regarded as one and the same story. The two cases, to be sure, have many points in common, but the two operations were certainly performed in two entirely different periods.

"20. Langenbeck in Göttingen (year unknown). Langenbeck, Chirurgie, Bd. v, p. 303.

"Since Langenbeck in the very full chapter on 'Struma,' declares himself, on the whole, more against than in favor of the operation, and also gives only very general rules for the same, one would doubt that he had himself operated if he had not said explicitly in Anm. 3: 'At the extirpation which I accomplished I found not the least difficulty in ligating the arteries.' I have not been able to find out anything about the result.

"21. 1820, Graefe in Berlin, Jan. 19. Hedenus, *Tractatus de gland. thyreoidea,* Lipsiae, 1822, p. 276; Journ. von Walther und Graefe, Bd. ii, p. 388. He had some time previously ligated the thyroid artery and removed only the greater part of the gland. Fifty-three arteries were ligated. The result was good.

*** Paper of Hedenus is abstracted in chapter on Germany.**

† For abstract see chapter on France.

"22, 23. Graefe. Hedenus states (*l. c.*, p. 292) that besides the above-mentioned case, Graefe has twice performed the operation successfully.

"24. Eichenberg, a Swiss, extirpated the gland without excessive bleeding. It is, however, doubtful whether this was the thyroid gland, although he asserts that after the operation the larynx and the trachea were exposed. Epheremid. med. physic. germ. acad. Natur. curios., Dec. ii, Anm. v, p. 453; Langenbeck, Chirurgie, Bd. v, p. 304.

"25. Klein * in Stuttgart, Journ. von Graefe und Walther, Bd. i, p. 120, undertook the operation in a boy of 15 years (1815). The patient died directly after the operation.

"26. Klein. On p. 130 he tells of a second operation, but it is doubtful if he extirpated the thyroid gland. He had only three arteries to ligate. The patient lost his voice during the operation, and developed great difficulty in swallowing. These symptoms disappeared very slowly after the ligatures came away.

"27. Klein. The third operation was performed on a man aged 22 years (p. 133). A very severe hemorrhage occurred, but the patient recovered, nevertheless.

"28. Hermann Schmidt in Paderborn. Zartmann, *Dissertation,* p. 26.

"29. Roux. Took out half the gland. Death. *Ibid.*

"30. About 1829, Green, at St. Thomas's Hospital. Extirpation of the right lobe in Maria Gale, *æt.* 24, on May 22. Death June 6. The Lancet, No. 302; Froriep's Notizen, Bd. xxv, p. 95.

"31. May 21, 1829. Walther. Removed half the gland. Patient Catherine Nath, *æt.* 28. Recovery. Chir. Handwörterbuch von Walther, Jäg. u. Rad., Bd. ii, p. 542; Zartmann, *Dissertation,* p. 26.

"32. Aug. 11, 1829. Walther. Removed half the gland. Patient, Elsie Hartung, *æt.* 34. Recovery. Chir. Handwörterbuch von Walther, Jäg. u. Rad., Bd. ii, p. 542; Zartmann, *Dissertation,* p. 22.

"33. About 1831. Nov. 22. Dupuytren. Froriep's Notizen, Bd. xxix, p. 141. Girl of 12 years. Death the next day at 3 a. m.

"34. About 1832. Mandt in Greifswald. Patient Charlotte Schneider, *æt.* 34. Recovery. Rust's Magazin, Bd. xxxvii, p. 387.

"35. About 1834. Professor Franke in Leipzig, with the assistance of Professor Bock. Verbal report.

"36.† March 26, 1835. Roux. Operated on Girard Gourvain, *æt.* 22. Forty-seven ligatures were applied. The operation lasted 1½ hours. Arch. géner., 1836; Schmidt's Jahrb., Bd. xi, p. 58. Detailed with full autopsy account; Oppenheim, Zeitschrift ii, p. 519. Short account. Death after two days.

*** For full account see chapter on Germany.**

† Abstracted in chapter on France. Interesting because the patient was venesected while dying from result of hemorrhage at the operation. Venesection was not infrequently practised on exsanguinated patients.

"37. 1844-1846. Reported by Madelung in Gotha. Probable Recovery. Aerztlicher Verein in Gotha, 1844-46; Schmidt's Jahrb., Bd. lvi, p. 279.

"38. Bruns in Tübingen. Deutsche Klinik, 1859, p. 145, Fall 3. Gurlt, Jahresbericht von 1859, p. 186. Successful.

"39, 40. About 1861. Züricher Krankenhaus. Struma lymphatica twice successfully extirpated. Deutsche Klinik, 1861, p. 167.

"41. N. Pirogoff. Rapport médical d'un voyage en Caucase et St. Petersbourgh, 1849; Schmidt's Jahrbücher, Bd. lxvii, p. 117. In a girl of 17, with the administration of ether. The middle lobe was the size of a goose's egg and pressed on the trachea. Thirty arteries were ligated. Operation lasted half an hour. Result not stated.

"42. R. V. A. Schmidt tells of the extirpation of a goitre in a horse with the écraseur. Cure. Reported by Falke in Jena. Schmidt's Jahrb., Bd. cix, p. 346."

Thus the story is carried by Günther to 1861. He collected 41 cases, but overlooked 65 (France, 17; Italy, 13; Great Britain, 12; United States, 8; Germany, 15) operated upon prior to this date, which are abstracted in our tables. Many of these cases were, however, published in journals to which Günther hardly could have had access; and some were merely ligations of thyroid arteries which Günther did not attempt to collate. Most important, perhaps, of the omitted cases are Nathan R. Smith's (1835) [223] and E. S. Cooper's (1860).[55] The operations prior to 1861 were chiefly resections of portions of the gland or enucleations of more or less circumscribed nodules or ligations of one or two thyroid arteries. There were, however, several remarkable lobectomies which will be considered later under the geographic headings.

Operations Prior to 1861 Not Tabulated by Günther

FRANCE

Nélaton: Bull. soc. anat. de Paris, s. 3, i, 100.

Blandin: Ferrus, Dict. de méd. ou répertoire gén. des sci. méd., Paris, 1836, 2e éd., xiv, 181.

Voisin: Gaz. méd. de Paris, 1836, s. 2, iv, 372.

Bach: Hirtz, Gaz. méd. de Paris, 1841, s. 2, ix, 9.

Rigal, R.: Bull. gén. de thérap., méd. et chir., Paris, 1841, xxi, 224.

Ballard: Arch. gén. de méd., Paris, 1846, s. 4, xi, 222.

Roux: Petit, Bull. soc. anat. de Paris, 1848, xxiii, 205.

Bégin: Bull. de l'acad. nat. de méd., Paris, 1849-50, xv, 1110.

Roux: *Ibid.*, p. 1106.

Sédillot: 3 cases, *ibid.*, p. 1132.

Cabaret: Gaz. méd. de Paris, 1850, s. 3, v, 710 (communiqué par Dr. Velpeau).

Alquié: Annales cliniques de Montpellier, 1854, ii, 222. Also reported by Barbin, Thèse de Montp., 1854, p. 26.

Dunglas: Gaz. méd. de Paris, 1856, s. 3, xi, 129.

Chassaignac: Foucart, La France méd. et pharm., Paris, 1860, vii, 284.

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Porta, L.: Delle malattie e delle operazioni delle ghiandola tiroidea, Milano, 1849. Articola II, Cura chirurgica, p. 135.

Ibid., p. 135.

Ibid., p. 136.

Ibid., p. 139.

Ibid., p. 149.

Ibid., p. 150.

Ibid., p. 151.

Ibid., p. 152.

Ibid., p. 153.

Ibid., p. 154.

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Brodie: Lancet, Lond., 1832, ii, 314 and 479.

Liston, R.: Wilson, W. J. E., Brit. Ann. Med., Pharm., etc., 1837, i, 11.

Lancet, Lond., (1839-40), 1840, ii, 31.

Lancet, Lond., 1841, i, 691.

Lectures on the operations of surgery, with numerous additions by Thos. D. Mütter, Phila., 1846, 320.

Ibid., p. 321.

Cusack, S. A.: Dublin Hosp. Gaz., 1857, iv, 276.

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Harris, C. (1807): Gross, S. D., A system of surgery, Phila., 1882, 6th ed., ii, 354.

Mott, V.: "Early in his professional life." *Ibid.*

Jameson, H. G.: Amer. Med. Recorder, Phila., 1822, v, 116.

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At this juncture we may, opportunely, quote the views, current at the time (the middle of the nineteenth century), of a few of the world's leading surgeons on the subject of operating for goitre.

ROBERT LISTON.* *Lectures on the operations of surgery, and on diseases and accidents requiring operations.* With numerous additions by Thomas D. Mütter, Philadelphia, 1846, p. 318.

"It has been proposed, again, to cut these tumors out, and some surgeons have ventured upon that, but the result has not been at all satisfactory. You could not cut the thyroid gland out of the living body in its sound condition without risking the death of the patient from hemorrhage; and when that body has become hypertrophied to an immense extent, and all the veins and arteries are enormously enlarged, you can easily understand what dangers may arise from any attempt of the kind. Look at the foregoing sketch, and think of the dangers that must encompass you on all sides, and you will pause before undertaking such a task as the extirpation of the thyroid body. It is a proceeding by no means to be thought of."

JOHANN FRIEDRICH DIEFFENBACH.† *Die Operation des Kropfes. Die Operative Chirurgie.* Leipzig, 1848, vol. ii, pp. 331 and 340.

"The operation for goitre is one of the most thankless, most perilous undertakings, which, if not altogether prohibited, should at least be restricted to certain varieties of the malady.

* Robert Liston (1794-1847) was a pupil of Sir William Blizard (in 1816), who was the first to ligate the superior thyroid artery (publication in 1811); he taught anatomy with Syme, his younger rival; was a member of the Council of the Royal College of Surgeons, F. R. C. S., 1841.

Obituary notice, London *Times*, Dec. 20, 1847 (Dictionary of National Biography): "Liston's claim to remembrance is based upon the marvellous dexterity with which he used the surgeon's knife, and upon the profound knowledge of anatomy which enabled him to operate successfully in cases from which other surgeons shrank. Living at a time immediately antecedent to the introduction of anesthetics, he appears to have attained to a dexterity in the use of cutting instruments which had probably never been equalled, and which is unlikely to be surpassed. When chloroform was unknown it was of the utmost importance that surgical operations should be performed as rapidly as possible. Of Liston it is told that, when he amputated, the gleam of his knife was followed so instantaneously by the sound of sawing as to make the two actions appear almost simultaneous, and yet he perfected the method of amputating by flaps."

† "Die Operation des Kropfes ist eine der undanksbarsten, lebensgefährlichsten, und wenn auch nicht ganz aus der operativen Chirurgie zu verbannen, doch nur auf gewisse Kropfarten zu beschränken.

"Wenn wir nun alles, was wir aus den Werken der Schriftsteller über die Operation grosser, gleichmässig harter, oder selbst scirrhöser Kröpfe wissen, nochmals überblicken, so müssen wir mit Schaudern an diese tollkühnen Unternehmungen denken."

"If, now, we again review all that we know from the writings of authors concerning operations upon large, uniformly hard or indeed scirrhous goitres, we can only regard with tremulous aversion these foolhardy performances."

Samuel D. Gross. *A system of surgery.* Philadelphia, 1866, 4th ed., vol. ii, p. 394.

"When the tumor resists our curative efforts, and endangers suffocation, it has been proposed to afford relief by extirpation; but the question arises, is such a procedure proper or justifiable? In a word, can the thyroid gland, when in a state of enlargement, be removed with a reasonable hope of saving the patient? Experience emphatically answers, no. This conclusion is not invalidated by the fact that the operation has, in a few instances, been successfully performed. By no means. It only proves that an undertaking may occasionally be accomplished under circumstances apparently the most desperate. What has once been effected may be effected again. But no sensible man will, on slight considerations, attempt to extirpate a goitrous thyroid gland. If a surgeon should be so adventurous or foolhardy as to undertake the enterprise, I shall not envy him his feelings while engaged in the performance of it, or after he has completed it, should he be so fortunate as to do this. Every step he takes will be environed with difficulty, every stroke of his knife will be followed by a torrent of blood, and lucky will it be for him if his victim live long enough to enable him to finish his horrid butchery. Should the patient survive the immediate effects of the operation, if thus it may be called, death will be almost certain to overtake him from secondary hemorrhage, or from inflammation of the cervical vessels, esophagus and respiratory organs. When the tumor is large, the wound is of frightful extent, involving all the most important and delicate structures of the neck, and rendering it altogether improbable, from the constant motion of the windpipe and esophagus, that much of it will unite by first intention. Thus, whether we view this operation in relation to the difficulties which must necessarily attend its execution, or with reference to the severity of the subsequent inflammation, it is equally deserving of rebuke and condemnation. No honest and sensible surgeon, it seems to me, would ever engage in it."

John E. Erichsen. *The science and art of surgery.* American edition. Philadelphia, 1873, vol. ii, p. 367.

"I have more than once been tempted to remove large, pendulous, pedunculated bronchoceles, but close examination has satisfied me in all cases that the pedicle of the tumor was so vascular, containing large arterial and venous branches, and so intimately connected with the sheath of the carotid, stretching under the sternomastoid, which was expanded over it, that no operation could be safely undertaken.

In the event of its being thought desirable to operate, the better plan would be, after exposing the tumor by a straight incision, to enucleate it as much as possible with the handle of the scalpel, ligaturing carefully all the vessels divided as they were cut."

TH. BILLROTH. *Geschwülste der Schilddrüse.* Chirurgische Klinik, Zürich, 1860-67. Berlin, 1869, p. 179.

Billroth, in 1869, having performed 20 extirpation operations for goitre with eight deaths, writes:

"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, only one patient dying of "collapse" (hemorrhage?).

The views of other surgeons will appear later in the pages devoted to their contributions.

BRUBERGER. *Ueber die Exstirpation des Kropfes, nebst einem geheilten Fall von Totalexstirpation einer grossen, mit breiter Basis aufsitzenden Struma hyperplastica und statistischen Bemerkungen.* D. militärärztl. Zeitschr., Berlin, 1876, Jahrg. 5, p. 447.

In 17 pages Bruberger condenses the story of the surgical treatment of goitre from 1785 to 1876. The important work of Günther he undoubtedly overlooked, as no mention is made of it. For the extirpations from 1785 to 1845 he accepts Brière's collation from Schmidt's Jahrbücher (*l. c.*). From 1845 to 1876 the study is original and possibly furnished to Süskind material for his monograph of the following year.

A very creditable and successful case of Küster's, which Bruberger publishes in detail, gave the incentive for his work. A "total extirpation" in a difficult case was performed by Küster in the Augusta Hospital, Berlin, on May 4, 1875. In January and May of the following year the patient was examined by Bruberger, who found him in perfect health and with voice unaffected. In the strict sense of the term this operation of Küster's was probably not a total extirpation, for I note that the broad base or pedicle of each lobe was perforated in several places and tied off in masses. Had no thyroid tissue been left to the patient it is more than likely that such a procedure would have

caught the recurrent nerve and probably have cut off the circulation of the parathyroid glands. As there was neither tetany nor cachexia strumipriva nor laryngeal paralysis, it is probable that the patient (male, *æt.* 18) was not entirely deprived of his thyroid gland.

Bruberger tabulated 124 cases. In 82 it could not be determined that anything more than the "goitre" had been excised; of these patients, 28 died and 54 recovered.

"In 17 cases," he writes, "the entire degenerated gland was certainly removed; of these only two died. In 25 cases it is expressly stated by the authors that only degenerated portions were removed; of these, five died.

"The mortality from goitre-extirpations, according to the published reports, amounts to 29 per cent."

In Bruberger's table the 17 total extirpations are assigned as follows: Lücke, 2; Greene, 3; Watson, 6; Kocher, 2; Hopmann, 1; Michel, 1; Dupuytren, 1; Roux, 1.

By reference to the notes which we have made of these cases from the original sources I am convinced there is no evidence that the entire thyroid gland was removed in any one of them except Kocher's. Sick's [320] case is regarded by Bruberger as a partial extirpation. This is probably an error, for from Sick's description of the operation it seems quite certain that the entire gland was removed; furthermore, the patient developed symptoms of thyroid privation—*the first recorded case of status thyreoprivus.*

It would indeed be strange if 17 complete extirpations had been accomplished by the comparatively rough methods of the earlier, relatively inexperienced, surgeons without resultant tetany or cachexia strumipriva or injury to the recurrent nerve, when later operators with vastly greater experience and better technical equipment had such disastrous sequelæ from their total excisions. Thus Kocher, in 1883,[323] states that of 18 patients, out of 34 with total excision who returned for examination, only two were free from the symptoms of cachexia strumipriva. In three of Mikulicz's total excisions (1886) [269] of the thyroid gland, tetany occurred; and in one of the cases of tetany, cachexia strumipriva developed later.

In 1883 Weiss [359] reported eight cases of tetany from Billroth's clinic; he does not, however, give the number of Billroth's total lobectomies at that time. But the previous year Wölfler [269] reported these as 22, with two post-operative deaths.

Notwithstanding much speculation on the subject by various authors, it has not been made clear why Kocher's cases of cachexia strumipriva should have been so free from tetany, nor why Billroth's total extirpations should have been so frequently followed by tetany and should have so seldom manifested symptoms of thyroid deprivation. I have pondered this question for many years and conclude that the explanation probably lies in the operative methods of the two illustrious surgeons. Kocher, neat and precise, operating in a relatively bloodless manner, scrupulously removed the entire thyroid gland, doing little damage outside of its capsule. Billroth, operating more rapidly and, as I recall his manner (1879 and 1880), with less regard for the tissues and less concern for hemorrhage, might easily have removed the parathyroids or at least have interfered with their blood supply, and have left fragments of the thyroid. Surprising, however, is the fact that the function of the parathyroids was so seldom interfered with by Kocher, notwithstanding his careful procedure; for these little bodies were entirely disregarded by surgeons until years after the discoveries of Gley (1891) [121] and Vassale and Generali (1896)."[44]

Bruberger writes: "Besides Lücke, who, quite beyond question, ranks first as authority in the province of the surgical treatment of goitre, and who as early as 1870 declared himself in favor of excision, there are several surgeons who, very recently, have rendered conspicuous service in matters pertaining to the technique of goitre-extirpation. These are the American Greene, the Englishman Watson, our German fellow-countryman Kocher and the Frenchman Michel. In the preceding pages, I have furnished proof that the surgical authorities of all countries have almost up to the present time contributed to the placing of a ban upon the excision of goitre; it is therefore permissible to point out, in connection with the above names, that the voices which now are asking that this adverse verdict be set aside are from Germany, England, France and America, and, accordingly, that the reintroduction of goitre-extirpation as an operation which is justifiable and deserving of a place of honor has international support.

"Watson practises the following original method, which he has had opportunity to test in six cases: He divides the soft parts by a long incision in the midline, passes the index finger round the upper and lateral edge of the struma and carries a threaded aneurism-needle beneath the gland from the middle of the upper to the middle of the lateral edge. When this thread is tied, about one-fourth of the vessels leading into the gland are shut off. In the same way the needle is passed three times beneath the remaining quarters of the gland, and after all the threads are tied, the tumor is severed from its connections by means of curved scissors.

"Greene divides his procedure, which he has practised in three cases, into four operative acts: (1) Exposure of the struma by a long, straight incision, avoiding any wounding of the tumor or of its fascia; (2) division of the fascia of the tumor on the director; (3) retraction of the fascia and enucleation of the tumor with the fingers and the handle of the scalpel—disregarding the bleeding, the operator advances quickly to the base in order to compress the thyroid arteries; (4) transfixion and double ligation of the pedicle.

"Kocher, who has already reported 13 cases of goitre-extirpation—among them two cases of cure by total extirpation—practised in four cases the enucleation described by him."

Thus, with generous courtesy, Bruberger divides the honors of the early triumphs in the surgery of the thyroid gland almost equally between Germany, England, France and America, mentioning after Lücke, the name of one surgeon for each country—Kocher for Switzerland, Watson (Edinburgh) for England, Michel for France and Greene for America; and this, too, at a time when for Germany he might have mentioned, among many, the names of Hedenus, von Walther, von Bruns and Billroth, and probably could not from his knowledge have credited America with any one besides Greene, nor Great Britain with any one except Watson. The names of Desault, Dupuytren and Sédillot for France he should not have overlooked. Süskind, truer to the facts, waves ardently, a year later, the colors of his country.

Adolf Süskind. *Ueber die Exstirpation von Strumen.* Inaugural-Abhandlung, Tübingen, 1877.

Süskind continues the operative story introduced so comprehensively by the scholarly Günther and carried by him from the beginning of the Christian era to the middle of the nineteenth century. He makes no mention of Bruberger's paper of the preceding year.

The contrast between the adverse sentence visited by surgical authors with few exceptions upon extirpatio strumæ and the favorable results obtained by Victor von Bruns in the surgical clinic at Tübingen gave Süskind the incentive to submit to critical review the cases theretofore published. For the history of the earlier period he makes due acknowledgment to the work of Günther (*l. c.*), and to Michel (1873)[246] for his collection of cases operated upon in France. Quite justly he makes the claim that from the end of the eighteenth century to the date of his thesis (1877) the operative work upon the thyroid gland was performed chiefly by German surgeons. Notwithstanding this,

BRUBERGER'S STATISTICAL SUMMARY OF GOITRE-EXTIRPATIONS TO 1876

Operator	No. of cases	Cured	Died	Total extirpations of whole thyroid gland	Partial extirpations (whole gland not affected)	References
Operations, 1785-1845.....	29	18	11	....	....	Schmidt's Jahrbücher, collected by Brière.
Walther	2	2	..	....	....	Zartmann: De Strumae exstirpat. Dissertation, Bonn.
Bruns.....	5	3	2	....	....	Werner: Chir. Behandl. d. Strumen. Dissert., Tübingen, 1853.
						Klein: Behandl. der Strumen. Dissert., Tübingen, 1860.
Emmert.....	3	2	1	....	3	Brière: Du traitement chirurgical des goitres parenchymateux. Lausanne, 1871. (Cases 10, 11, 12.)
Billroth.....	20	12	8	....	....	Billroth: Chir. Erfahr., Zürich, 1860-67.
Middeldorpf.....	1	1	..	....	....	Lebert: Krankh. d. Schilddrüse.
Schuh.....	4	4	..	....	....	Wien. med. Wochenschr., 1859, 60.
Lücke.....	9	8	1	2 (cured)	7 (1 death)	Lücke: Chir. Klinik in Bern, Brière, *l. c.*, Cases 1-9.
Greene.....	3	3	..	3	....	Amer. Journ. Med. Sci., Jan., 1871.
Watson	6	5	1	6 (1 death)	....	Edinb. Med. Journ., 1873, p. 252; Brit. Med. Journ., 1875, Sept. 25.
Kocher	13	11	2	2 (cured)	....	Methode d. Exstirpatio Strumae nebst Bericht über 13 Fälle. D. Zeitschr. f. Chir., Bd. iv.
Kappeler	5	5	..	....	....	Bericht aus dem Spital Münsterlingen, 1874.
Sick	1	1	..	....	1 (cured)	Württemb. med. Correspondbl., 1867, No. 25.
Hofmockl.....	2	1	1	....	2 (1 death)	Wiener med. Presse, 1869, No. 2, 3, u. 4.
Blackman	1	1	..	....	1	Amer. Journ. Med. Sci., 1870, Jan.
Hopmann.....	1	1	..	1	....	D. Zeitschr. f. Chir., 1872, Bd. ii.
Holmes	1	..	1	....	1	Amer. Journ. Med. Sci., Jan., 1873.
Billroth	3	2	1	....	3 (1 death)	Chir. Klinik in Wien, 1869 u. 70, p. 130.
Michel.....	1	1	..	1	....	This and the following cases are taken from a paper by Michel in which the cases in French literature are assembled. Gaz. hebd., 1874, No. 44 et 45.
Desault.....	2	1	1	....	2 (1 death)	
Dupuytren.....	2	0	2	1 (died)	1 (died)	
Roux.....	2	1	1	1 (cured)	1 (died)	
Sédillot.....	3	3	..	....	3	
Bégin.....	1	..	1	....	....	
Cabaret.....	1	1	..	....	....	
Blandin.....	1	1	..	....	....	
Brun.....	1	..	1	....	....	
Percy.....	1	..	1	....	....	
	124	88	36	17 (2 deaths)	25 (6 deaths)	

the general verdict among them at the time of Süskind's publication was decidedly against these performances which in great measure had resulted disastrously.

Süskind writes:

"At the end of the eighteenth century when the operation was celebrating in Germany its first triumphs it was emphatically condemned in France * by all the members of the influential Academy of Surgeons of Paris except Desault,† who, according to Günther and Michel (*l. c.*), is the first French surgeon to whom is accredited the excision of a struma."

Süskind, evaluating operations upon the thyroid in terms of failure and success, writes:

"Günther in the above-cited work gives 37 cases of extirpation of solid strumas which, up to the middle of this century, he found recorded. Of these 37 cases 17, nearly one-half, ran a fatal course. Gurlt in his monograph *Ueber die Cystengeschwülste des Halses* (Berlin, 1855) enumerates 10 cases of extirpation of cystic goitres, of which, as Klein has remarked in his dissertation, three should not be regarded as extirpations. There remain, accordingly, seven extirpations of cystic goitres, one with fatal result. The total number of extirpations up the year 1850 is 44; of these 18 ended fatally—mortality 40.9 per cent. Of the operations since this time (1850) there were performed

By Germans .....97 extirpations with 20 deaths,
By Americans‡ ..... 7 extirpations with 3 deaths,
By Englishmen .....12 extirpations with 0 deaths,
By Frenchmen ..... 2 extirpations with 0 deaths,

accordingly a mortality of 19.4 per cent.

"Of the various operators Bruns has extirpated the greatest number of strumas:

Bruns .....28, with 6 deaths,
Billroth .....20, with 8 deaths,
Kocher .....13, with 2 deaths,
Kapeller ..... 5, with 0 deaths,
Chelius ..... 5, with 1 death,
Mech ..... 4, with 0 death.

* It was also condemned in Germany, by most surgeons, even three-quarters of a century later.

† Desault (*l. c.*) operated upon two cases—in one of them successfully (*vid.* Table I, France).

‡ Süskind's figures for England, France and America are far from complete. By reference to my tables it will be seen that up to 1877 there had been in America 30 operations with five deaths; in England 39, with nine deaths; and in France 30, with 10 deaths.

"Comparing the mortality figures of the extirpations made before and after the middle of this century, we find:

"1. That the mortality from the operation in the past 25 years has decreased by one-half.

"2. That the extirpation of strumas is not only not more dangerous than other major surgical procedures, but indeed offers greater chances of success than many dangerous, but nevertheless approved operations, such as high amputation of the thigh, resection of the hipjoint, exarticulation of entire limbs, ovariotomy.

"As far as I have been able to discover, the following are the cases * of extirpation of goitre which have been published since the middle of this century:

"To begin with Werner recorded in 1853, in his dissertation written under the presidency of Professor von Bruns (*Ueber die chirurgischen Behandlung von Strumen*), a successful case operated on by Prof. Bruns, describing at the same time the customary procedure followed in the Tübingen surgical clinic, in which were employed all possible precautions against hemorrhage in this operation.

"To this case are added the following, according to date of publication:

"1859 3 cases by Schuh in Vienna (Wien. med. Wochenschrift, 1859, pp. 641 and 657).

"1860 1 case by Schuh (Wien. med. Wochenschrift, 1860, p. 145).
3 cases by Bruns in Tübingen (dissertation by Klein: *Beitrag zur chir. Behandlung der Strumen,* 1860).
1 case of extirpation, begun but not completed, is not counted.

"1861 4 cases by Meeh in Brackenheim (Med. Corr.-Bl. für württemb. ärztl. Ver., 1861, Nr. 29).

"1862 1 case by Middeldorpf in Breslau (*cf.* Lebert, *Krankheiten der Schilddrüse,* p. 221).

"1867 1 case by Sick in Stuttgart (Med. Corr.-Bl. für württemb. ärztl. Ver., 1867, Nr. 25).
1 case by Gärtner in Stuttgart (Med. Corr.-Bl. für württemb. ärztl. Ver., 1867, Nr. 40).

"1868 20 cases by Billroth, at that time in Zürich (Billroth, Chir. Klinik in Zürich, 1860-67).

"1871 9 cases by Lücke, at that time in Bern (*cf.* dissertation by Brière: *Du traitement des goîtres parenchymateux et en particulier de leur extirpation,* Lausanne, 1871).
3 cases by Emmert in Bern (*ibid.*).
5 cases by Kappeler in Münsterlingen (*Chir. Beobachtungen aus dem Thurgau'schen Cantonsspital Münsterlingen,* 1865-70).

* **In Germany, Switzerland and Austria.**

"1874 1 case by Hopmann in Cologne (Deutsche Zeitschrift für Chirurgie, Bd. ii).
5 cases by Chelius in Dresden (*cf.* Jahresbericht der Gesellschaft für Natur- und Heilkunde in Dresden, Oct., 1873, Mai, 1874).
"1875 13 cases by Kocher, at that time in Bern (*cf.* Deutsche Zeitschrift für Chirurgie, Bd. iv).
2 cases by Gärtner in Stuttgart (Med. Corr.-Bl. für württemb. ärztl. Ver., 1875, Nr. 29).
"1876 1 case by Gärtner in Stuttgart (Med. Corr.-Bl. für württemb. ärztl. Ver., 1876, Nr. 3).

"In addition to the 70 cases in the German literature published since the middle of this century, 23 other cases of goitre extirpations should be added. These patients were operated on by Professor von Bruns between 1861 and 1876 in the Tübingen surgical clinic. I propose to assemble these cases, together with the remaining cases of goitre extirpation made since the middle of this century (as far as I have been able to find accurate description in the literature available to me) in a tabulated review, and then to run over them for the results of the operation (mortality, dangers and indications), and describe in more detail the operative technique, especially that customarily employed at the Bruns clinic.

"In closing I shall add some especially instructive clinical histories from the Tübingen clinic.

"Upon the whole it appears that the good results obtained in late years by good operative methods only now entitle this operation to assume the place of honor in surgery which was earlier altogether forfeited on account of mishaps caused by imperfect technique.* "

I shall leave unconsidered the attempts, continued in some countries until after 1890, to reduce the size of goitres by the use of the setaceum, wick, hair seton, cannula, incision, through drainage; by the injection of iodine, tincture of chloride of iron, turpentine, etc.; by caustics and by the actual cautery; by subcutaneous and, indeed, extra-cutaneous ligature en masse of thyroid tumors or prominent goitrous nodules; by débridement, subcutane Zerreissung (Billroth), morcellement, évidement (Kocher), etc.; and shall confine myself to the story of operations performed with the scalpel.

In our tables of operations performed in France, Italy, Great Britain and the United States up to 1883, the year when the operation may be considered to have become essentially perfected in Switzerland, Germany and Austria, there are included a number of the earlier and more

* Süskind had in mind merely the technique of operating, the art of controlling hemorrhage—not the antiseptic technique.

important ligations of arteries. Counting these, the score of each of the four great nations is about 50 (France, 53; Italy, 53; Great Britain, 49; United States, 45). Most of these operations were relatively minor ones—resections of conspicuous portions of the gland, enucleations of more or less circumscribed nodules or cysts or new growths, transfixion ligations and écrasement of pedicles, division of isthmus, etc. There were few lobectomies, either single or double, and few surgeons who had the experience of more than one case. By 1883 the operation performed by Desault in 1791 had not been improved upon in France and in America. Nathan R. Smith, in 1835,[223] Marshall in 1852 [225] and Maury in 1871 [228] had set fine examples which deserve to be brought to the attention of the medical profession of our country.

England made no operative contributions of importance, but Scotland could congratulate herself upon the work of Patrick Heron Watson (1874),[235] who was the only surgeon, except Bottini, of the four great nations, France, Italy, Great Britain and America, to perform more than three lobectomies and to devise a method regarded at the time as worthy of adoption. But Watson's method was crude as compared with the procedure of some surgeons of half a century earlier (Desault, Hedenus) or with the method of Victor von Bruns, practised by him in 1859 and thereafter.

Warren Greene erroneously thought himself and is quite universally believed to be the pioneer in this field in America. He was a courageous and probably dexterous operator, but his method, to be described later, was not commendable.

Given this outline, we may proceed to consider in greater detail the operative work set forth in our tables of the four countries, France, Italy, Great Britain and America.

FRANCE (TABLE I)

Michel. *De l'extirpation complète de la glande thyroïde dans les cas de goîtres suffocants, cystiques ou parenchymateux. (Opération suivie de succès.)* Gaz. hebd. de méd. et de chir., Paris, 1873, s. 2, t. x, pp. 699 and 718.

Michel gives an inventory of the cases operated upon in France to the time of his publication (1873). His comments upon these cases and his references to the animated discussions participated in by Vel-

peau, Sédillot and others make interesting reading for the surgeon who cares to trace the story. He collected 14 operations and writes:

"We count in France up to this moment 14 operations—mine makes the 15th *—including in this list extirpations partial as well as complete. Desault, 2; Dupuytren, 2; Roux, 2; Sédillot, 3; Bégin, 1; Cabaret, 1; Michel, 1. Adding the case operated by Blandin, that seen by Brun and that seen by Percy, one obtains a total of 15. Of these 15 cases there were seven recoveries (Desault, 1; Roux, 1; Cabaret, 1; Sédillot, 3; Michel, 1) and eight deaths (Desault, 1; Roux, 1; Dupuytren, 2; Blandin, 1; Bégin, 1; Brun, 1; Rullier, 1). Among the fatalities two succumbed to hemorrhage at the hand of the surgeon (cited by Rullier and Brun); in three the loss of blood was so great that the surgeon was compelled to interrupt the operation (Desault, Dupuytren, Bégin); the sixth (Dupuytren) died 36 hours after the operation; the seventh (Roux) after 56 hours. I have been unable to find the cause of death in Blandin's case."

Michel's conclusions: "1. The total extirpation of the thyroid gland should retake its rank as an operative procedure; it enjoys in France an unmerited discredit.

"2. It is expressly indicated when the life of the patient is menaced, notwithstanding the employment of all the means at the disposal of science.

"3. Partial excision of the thyroid gland appears to be at least as grave as the complete extirpation."

Michel (Table I, No. 27), after having successfully performed an excision of both lobes and isthmus in a methodical but sanguinary manner, abandoned the cutting operation and substituted for it a timid procedure which thereafter bore his name. It consisted of isolation, puncture and cauterization—"dissection-cauterization"—(Table I, Nos. 28, 29, 30).

Pierre-Joseph Desault. (No. 1.) *Observation sur l'extirpation d'une partie considérable de la glande thyroïde.* Reported by Giraud. Jour. de chirurgie, Paris, 1792, t. iii, p. 3.

Desault isolated and ligated the superior and inferior thyroid arteries before cutting them, and was, I am quite sure, the first † to dissect the firmly adherent gland from the trachea. Von Bruns, Lücke, Billroth, Kocher and surgeons of all countries up to about 1874 found it necessary to ligate the tumor en masse when it was firmly bound to the trachea; Kocher[189] states that when the tumor is bound

*** We have added 12 cases to Michel's list; hence in our table Michel's first operation appears as the 27th instead of the 15th.**

† Dupuytren was the second.

to the trachea over a considerable area by unstretchable adhesions "*ligation in parts being impossible,** one must have recourse to the ligature *in toto* and cut off the tumor with a knife, leaving a stump behind."

The tumor which Desault removed was probably an adenoma. When, in the course of its growth, it had become cystic, he incised it and treated it with caustics. As a consequence of the treatment and resultant infection the tumor, and, possibly, remains of the thyroid lobe also, had become indurated.

It is quite probable that the thyroid lobe had been absorbed more or less completely by the pressure of the adenoma. When this is the case the operation of hemistrumectomy is simplified and the danger of injury to the recurrent nerve is, I believe, lessened. With the atrophy of the thyroid tissue, due to the pressure exercised by the growing adenoma, a new capsule develops. This capsule may contain all that remains of the original thyroid lobe, although usually normal glandular tissue is found at the upper pole. Adenomata may be deeply buried in the thyroid, surrounded everywhere by normal or even occasionally, as in Graves' disease, by hyperplastic glandular tissue. The capsule of an adenoma may, therefore, consist solely of connective tissue or almost altogether of thyroid gland.

Many a surgeon, on enucleation of an adenoma, has believed, undoubtedly, that he had performed a lobectomy, inasmuch as no vestige of the thyroid gland remained at the conclusion of the operation. He may, however, merely have enucleated an adenoma from its transformed, transfigured capsule, and nevertheless have thought or found it necessary to ligate both thyroid arteries.

It is impossible to decide from Giraud's description of Desault's operation whether or not there were remnants of normal thyroid tissue in the part removed. In any event, the operation was a remarkable one for his time.

There are cases, but these are not common, in which no trace of the the thyroid lobe remains to suggest that the adenoma had originally been embedded in glandular tissue. The tumor in these cases is delivered more easily at operation than a thyroid lobe would be, and is enclosed in an extrinsic capsule thicker than that which ordinarily envelopes the gland. But the blood supply is quite different and less abundant.

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

" In 1784, Jacqueline Hyons, then 20 years of age, experienced a very sharp pain in the anterior and middle part of her neck, following a violent movement of the head. Although this pain was but momentary, there remained afterwards slight restriction of movement; but three months later there appeared to the right of the trachea a small, hard, indolent tumor, without fever and without change in the color of the skin. Over it were felt lifting pulsations which showed that it was situated over a large artery; in fact, its base rested on the ordinary course of the common carotid.

" The patient, who was not at all incommoded by the tumor, paid no attention to it until June, 1788. At that time the tumor measured 1 inch in diameter, and thenceforth its progress became as rapid as it had previously been slow. Internal and external remedies had no effect upon the progress of the tumor; there was always manifest a fluctuation in the centre. On making an incision at this point there issued a yellowish serosity. Three months after this operation, which was absolutely fruitless, caustic was applied several times, also without result. At last the patient, having suffered in vain for a long time, presented herself at the Hôtel Dieu in Paris, on May 20, 1791.

" At this period the tumor was 2 inches in diameter; it was round, very hard, adherent to the right side and centre of the trachea, and pressed outwards the sterno-mastoid muscle. Besides being lifted up distinctly by each pulsation of the arteries, as has already been noted, it followed the movements of deglutition, and interfered a little with the passage of solid food.

" The patient, strongly desirous of being freed from this uncomfortable deformity, determined on the spot to undergo extirpation of the tumor, which was suggested to her as the sole expedient; but we did not conceal from her either the dangers, the length of the operation or the pain which were inseparable from the procedure. M. Desault performed this operation in the amphitheatre, after having for several days prepared this woman by general remedies.

" The patient was put on her back, inclined a little to the left side, the head and neck elevated more than the rest of the body. The surgeon made a longitudinal incision over the centre of the tumor extending it a finger's breadth above and a finger's breadth below it, in order to facilitate the carrying out of the operation. With this first incision he penetrated to the gland, dividing the skin, the cutaneous muscle and some fibres of the sterno-hyoid and thyroid muscles. Then, while an assistant drew to the left the internal border of the incision, in order to immobilize the tumor, he separated it from the sterno-mastoid muscle. In cutting the cellular tissue surrounding these parts he divided two small arteries, which he immediately ligated while they were lifted up by means of a dissecting forceps. Then, after having disengaged the external side of the tumor, the internal side was likewise freed by drawing the tumor outwards with a hook in order to facilitate its separation from the anterior part and from the side of the

trachea. In the course of this dissection the branches of the thyroid arteries were successively ligated as they were cut. Then the assistant who held the hook drew the gland inward and forward, and at the same time the operator completed its dissection exteriorly, above and below. This phase of the dissection was most minute and difficult. It was necessary to sponge continually the small quantity of blood which still oozed and prevented one from recognizing clearly the tissues. This it was which made it necessary to cut only a little at a time and to identify with the finger, before each cut of the bistouri, the part which was about to be incised. Dissecting with these precautions, the superior and inferior thyroid arteries were exposed without wounding them, and were ligated with the aid of a blunt-curved needle. These arteries were divided transversely and it was found possible to detach the tumor from the trachea, to which it was firmly adherent.

"The wound resulting from this operation was almost 3 inches deep; it was bounded exteriorly by the sterno-mastoid muscle, within by the trachea and the esophagus, and behind by the common carotid artery and the eighth pair of nerves, which appeared at the bottom of the wound.

"After having washed this wound with tepid water and having absorbed all the blood which it contained, it was filled with coarse lint powdered with colophony. Square compresses held in place by loosely applied bandages formed the rest of the dressing.

"The tumor after its excision was about 5 inches in circumference. However, it did not differ at all from other scirrhous glands, unless one notes the fact that it contained a cartilaginous nucleus.

"The patient had borne the long, difficult and painful operation with uncommon fortitude. She passed the rest of the day quietly, suffering only the pains usually present in large wounds. The following night she complained of slight feeling of heat in the neck and of slight difficulty in swallowing. She was a little relieved the next day by soaking the dressing with a decoction of mallow. For a drink weak eau de chiendent seasoned with oximel was prescribed.

"The difficulty in swallowing greatly increased on the third day, although the fever was very moderate. At this period the compresses and the external lint were renewed for the first time, and the dressing was soaked as on the previous day.

"The fever ceased after the fourth day and the swallowing became less difficult. Suppuration had already begun: the following day it had detached all the lint so that the dressing could be entirely renewed. The wound was in good condition and it was dressed only with soft lint and compresses soaked in the emollient decoction. This was continued every day.

"Nothing of note happened in the course of the treatment. The wound followed the ordinary course of wounds. It had cicatrized at the end of a month, and the patient left the hospital perfectly recovered on the 34th day after the operation."

Desault's second case (No. 3), evidently much more difficult (no details given) than the first, ended disastrously. The dissection had hardly begun when blood flowed with such appalling violence that the operator was "obliged to give up the pursuit of his object." He transfixed the incised portion of the goitre with many threads, but the patient died in spasms.

Guillaume Dupuytren. (No. 4.) *L'excision de la thyroïde.* Related by Rullier in Dict. d. sci. méd., Paris, 1817, t. xviii, p. 557.

There are many dramatic, tragic and a few even brutal performances linked in the story of operations for goitre. One of the most pathetic cases is Dupuytren's first—reluctantly, conscientiously and courageously undertaken; cautiously, deliberately and admirably performed. Rullier draws the picture in stirring lines:

"Patient, female, *æt.* 28, was of a choleric and vivacious temperament; a worker in the fields, who had always enjoyed flourishing health.

"Eight years ago, following an attack of the itch which had been driven in by cold, the patient noticed a small tumor the size of a hazelnut on the anterior and middle part of her neck. From that time the tumor constantly increased in size, but its growth, slow and gradual at first, became very rapid in the course of the seventh year. Then it made enormous progress, and covered the whole front of the neck. Like the thyroid gland, of which it was only an expansion, the tumor presented three distinct lobes, one middle and two lateral; but the first alone became offensive. It fell in front of the sternum, presenting a tumor about 4 inches in diameter.

"At this period a surgeon of Paris, at the solicitation of this young woman, determined to excise the middle lobe. He succeeded in this after making a transverse incision of the teguments. No hemorrhage or other accident occurred, and the wound which resulted from this operation was healed at the end of a month.

"Meanwhile, about six months after this operation, the two lateral portions of this goitre acquired an enormous volume, the centre itself increased rapidly, and the whole formed a tumor so extensive that respiration became difficult. This difficulty in breathing increased towards evening and when the patient lay on her back. There was also difficulty in swallowing if the food was not very well masticated. Added to this marked derangement of function was such great deformity that this woman, still young and endowed by nature with a pleasant face and good figure, was distressed to be only an object of aversion and disgust to those around her.

"It was under these circumstances that the patient presented herself at the public service of the Hôtel Dieu. She wanted to be freed from the tumor, and she declared that whatever the dangers and pain

to which she might be exposed, she was determined to submit to them. Nevertheless, in spite of her resolution, she received a negative answer, and was sent away by Drs. Pelletan and Dupuytren, who told her very positively that in their judgment she should not be operated upon. In spite of this she returned a few days later in the same state of mind but received the same answer; and all the dangers to which she would be exposed by operation were depicted to her in the most vivid colors. Besides, she was advised of appropriate measures to bring about the relief of the numerous symptoms of which she complained.

"However, nothing could convince this poor girl. She returned dissatisfied and desperate. Neither fear of the pain nor of the dangers to which she was incessantly warned she would expose herself, nor the express refusals which she had already received had any influence upon her spirit, and she did not hesitate to present herself for the third time at the Hôtel Dieu. Such perseverance at last vanquished our reluctance to admit her, and she entered the hospital January 1, 1808.

"Without, then, any fixed plan as to what might be determined to do for her, the surgeons of the hospital submitted to serious and thorough consideration the question as to what might appear best to attempt in behalf of this young woman.

"The picture which she presented at that time was as follows: Over the whole extent of the anterior and lateral regions of the neck there was a tumor extending vertically from the base of the inferior maxilla to the sternum and to the clavicles, and laterally, from one maxillary angle to the other. This tumor measured 7 inches longitudinally, and a little more transversely; one saw, as is usual in the thyroid, two distinct lateral lobes, connected with each other by a middle lobe, which was less protuberant and shorter in the vertical measurement than either of the other two. In addition, all three were irregularly nodular and soft to the touch. Their mobility differed: the middle lobe was very adherent to the larynx and moved only with it, while the two lateral lobes, loosely attached to the neighboring parts, could easily be moved in all directions. The teguments played freely over the portions of the tumor covered by them.

"The jugular veins and their ramifications were greatly dilated; the superior thyroid arteries, beating forcibly, could be palpated a little above the mid-portion of the tumor. The pulsations of the common carotids were likewise readily felt, but it was necessary to seek for them behind and outside of the tumor, into which position they had been forced. The tumor itself had never become painful, but it hindered respiration to a very appreciable degree, interfered with deglutition, and under many circumstances, notably during strong emotion, it became a cause of obstruction to the circulation of the brain; at such time the patient's face for some instants would be deep red and she would be sensible of dazzling and vertigo. Otherwise all her functions were normal.

"Such was this affection, to which one could not give too serious attention; the progress which it had made for some time past, and was making each day, the imminent danger of suffocation to which it subjected the patient, did not admit of doubt that there would soon be a fatal issue. But when, on the other hand, one considered the location, the size and the relations of this tumor, one could not contemplate without well-founded fears the hazardous operation by which one might radically deliver the patient from this tumor. Nevertheless, the dangers overbalanced too much the advantages which one might expect from the operation, and it was determined to do nothing; but at that time a sombre despair took possession of the unhappy patient, her profound melancholy increased, and she resolved to let herself die of inanition. Indeed, she refused food of any kind. The menstrual flow which took place at that time, was suppressed, and soon thereafter a condition of violent spasm, extreme suffocation and convulsive movements came to augment the torment and the horror of the situation.

"This paramount circumstance put an end to our indecision; the patient would certainly perish, and there was some hope that she might be saved by operation. Operation was promised her, and calm returned to her spirit.

"The good health, the vigor, the youth of this girl, her extreme desire to be operated upon, and, moreover, the great mobility of the tumor, the laxity of its connection with the teguments, and, in short, the knowledge of what had been accomplished with impunity for a part of the tumor gave M. Dupuytren ground for the hope which determined him at last to risk the hazards of this operation.

"Observe how the operation, at which we assisted, was performed in the presence of M. Pelletan, of many surgeons of Paris, and of an immense gathering of students.

"The teguments of the anterior and middle part of the neck were elevated in such a manner as to form of them a transverse fold of great size. This fold was incised perpendicularly from over its centre to its base; the incision was then enlarged by carrying it upwards to the symphysis of the chin, and below to the superior border of the sternum. The left edge of the incision was detached by breaking up the cellular adhesions which connected it with the corresponding portion of the tumor, then the dissection was continued on the same side by lifting up the teguments and separating them from the tumor. Thus was reached the left part of the tumor. One encountered along this course two sets of veins, one of which was adherent to the tumor, and the other of which was subcutaneous. The greater part of these veins was avoided, and as to those which one was obliged to divide, not one was cut until two ligatures had been thrown round it: one on the side towards the heart, and the other on the side towards the tumor. Meanwhile, having reached the left side and behind this part, four thyroid arteries were encountered, all of which appeared considerably dilated. They were easily recognized, and in ligating them the

same precautions were observed as in the case of the veins; that is to say, that after having previously exposed them, two ligatures were passed around each, and they were cut in the space between these two ligatures.

" Here, as throughout the operation, *one was careful to place the first ligature on the side corresponding to the brain, in order to avoid prolongation of the pain which, without this precaution, would follow the application of the second ligature.** The same care was taken in the dissection, so that almost never were the arteries opened before being ligated, and always in a manner equally secure, whatever their size.

" One thus succeeded in detaching the left lobe of the tumor, without other accident to the patient than the pain inevitable in a dissection too careful not to become at the same time a little long. Soon afterwards the right part of the tumor was encountered, and it was separated from its surroundings with the same precautions and with equal success. During this stage of the operation we encountered no intimate adhesions which had to be destroyed; the fingers and the back of the bistouri sufficed almost always. It was easy also to avoid the internal jugular veins, the common carotid arteries and the pneumogastric nerves. Twenty times one perceived these parts, but they were always pushed away, and in this manner put, without trouble, out of danger.

" It was after this stage of the operation that M. Dupuytren saw the possibility of realizing the hope which he had conceived of removing the whole of the disease. In order to achieve this end the two lateral lobes of the tumor, which had just been successively isolated, were brought out again and through the skin incision; they were held in place by elevating them and carrying them a little forward, in order to stretch, in this way, the middle part of the tumor which adhered intimately to the larynx and to the windpipe; one succeeded in this manner in the dissection of this part, but it was done only by carrying the instrument down to the very substance of the gland, extremely close, it is true, to the larynx and the trachea, so dense was the cellular tissue which established the connection of these parts. The larynx and the trachea then appeared bare. The latter presented anteriorly a very marked flattening, evidence of the prolonged compression to which it had been subjected by the tumor.

" The patient bore with astonishing courage this operation, which was long, and which called for, during a dissection made in the midst of parts which it was important to avoid, sustained and delicate attention as much on the part of the surgeon as of his aids. Never for an instant, however, did one feel fear of a hemorrhage, and the patient did not lose more than a few spoonfuls of blood; but she was several times threatened with syncope, and she was also nauseated at times.

" The wound was dressed very gently; a little lint was put at the bottom and the edges were brought together fairly well; the sheaf

* Italics mine (W. S. H.). It is interesting to find this early reference to the sensitiveness of arteries.

formed by the threads of the ligature was brought to the inferior angle of the wound.

"After the operation the face of the patient was very pale and profoundly altered; all of her vital forces were depressed; the pulse was frequent, small and concentrated; respiration was laborious and frequent, the skin quite uniformly cold; there was cardialgia and continued nausea. This unhappy woman, in a word, appeared to us to be dangerously stricken, and as if shocked by the blow itself of the operation.

"The most pressing indication to be met then appeared to be to raise again and to sustain the little strength left to the patient. Cordials were administered, but with great difficulty, because deglutition was much hampered, and one only lessened the dangers of suffocation, which appeared when the patient took a spoonful of liquid, by making her assume an almost vertical position.

"Nevertheless, from the same evening her unfavorable condition appeared to improve: to the prostration there succeeded a rather marked reaction, the pulse became frequent and high (élevé), the respiration deviated less from the normal state, color returned to the face, the skin was dry and warm, and some spoonfuls of liquid were administered without exciting nausea and vomiting. But the hopes raised by this improvement lasted a very short time, and from the fall of night the respiration became laborious, even stertorous, the pulse wretched, the skin without heat; in a word, the phenomena of the death-struggles commenced, and the patient expired the next day, 35 hours after the operation.

"Specially charged with the anatomic examination, this is what we observed in the tumor, the wound of the neck and in the remainder of the cadaver.

"The tumor which had formed the goitre was oblong, nodular, with a volume as great as that of the lungs of a young child. It presented two conoid lobes, excessively swollen. These lobes were joined together by a transverse mass, situated at their inferior and middle portion. A cellular mesh covered the whole surface of this tumor and was intimately adherent to it.

"This tumor was of a density which did not appear to be greater than that ordinarily seen in the thyroid; its weight, at the moment of extirpation, was 1202 gm., or about 2 pounds 8 ounces; its color was reddish, and its tissue was not different internally from that of the thyroid in its usual state: only the organization of this portion had become more evident by means of the considerable increase in nutrition which it had experienced. Here one perceived a multitude of small vesicular cysts, filled with a yellowish and viscous fluid; but besides, one saw here and there some points, whitish and callous, which appeared as if scirrhous. The superior and inferior thyroid arteries, as well as the thyroid veins, showed a diameter double their usual size. One may see the model in wax of this specimen in the anatomic museum of the Faculté de Médecine, where M. Dupuytren deposited it. . . . ."

Dupuytren practised the method of ligating twice and cutting between ligatures. This method has been attributed by Sick and others to Victor von Bruns. Dupuytren, in ligating arteries, placed the first ligature on the cerebral side so that patients would not twice suffer pain. I have often practised this method in local anesthesia operations, believing it to be original; but Dupuytren had the idea 100 years ago.

Dupuytren removed the entire gland in bloodless manner—"only a few spoonfuls lost." Dupuytren like Desault accomplished the feat of dissecting the isthmus from the trachea, which more than one-half a century later even the greatest German and Swiss surgeons did not believe possible.

Dupuytren waited 11 years before venturing upon a second operation (Table I, No. 6). The goitre in this case, to his disappointment, had a broad, non-pedunculated base. Hemorrhage from many veins was controlled temporarily by finger pressure, but the patient was in syncope at the end of the operation. Thus, Dupuytren who had so calmly operated upon a relatively simple case was unable to contend with a complicated one.

Roux. (No. 9.) Reported by Rufz. *De l'extirpation d'un goître.* Arch. gén. de méd., Paris, 1836, s. 2, t. x, p. 25.

A brief abstract of Roux's case (No. 9) is here given to tell of a venesection performed just after an operation from which the patient had nearly bled to death on the table. Exsanguinated patients were venesected, sometimes repeatedly, to reduce the fever of sepsis.

The patient was a young peasant, *æt.* 22, with a large goitre in the centre of the neck, presenting two definite lobes. It was irregularly round, with nodules. The symptoms from the goitre were moderately severe.

Operation, March 26, 1835: First incision in the mid-line from the hyoid bone to the sternum; second incision through the middle of the tumor from right to left. The tumor was freed partly by incision, partly by enucleation in three parts. The arteries were situated laterally, and could be for the most part ligated before being cut. Several veins were ligated. In all 40 to 47 ligatures were applied. The patient lost about "1½ pounds" of blood. The operation lasted 1 hour and 10 minutes. At 3 o'clock the lips were colorless. *The patient was bled, 6 ounces of blood being removed.** Death at 6 o'clock.

Ollier. (No. 35.) *Goître kystique ayant donné lieu à la triade du goître exophthalmique. Opération par les caustiques. Guérison de*

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

tous les symptômes. Reported by A. Boursier. *L'intervention chirurgicale dans les tumeurs du corps thyroïde.* Thèse de Paris, 1880, Obs. ii, p. 172.

In 1877 Ollier cured by repeated incisions and cauterization a "cystic goitre," the size of a turkey's egg, which had caused pronounced symptoms of Graves' disease—pulse 160, exophthalmus, loss of flesh, etc. Two years later the patient's pulse was 80 and only a little exophthalmus remained. This case is not included in Buschan's collection (1894)[**] of 80 operations in Basedow cases.

Paul-Jules Tillaux. (Nos. 41, 47, 48.) *Sarcome du corps thyroïde ayant donné lieu à tous les symptômes du goître exophthalmique. Ablation de la tumeur par M. Tillaux. Guérison de tous les accidents.* Reported by Benard. *Contribution à l'étude du goître exophthalmique. Pathogénie. Traitement.* Thèse de Paris, 1882, Obs. ii, p. 36.

Tillaux operated upon two cases of hyperthyroidism (1880 and 1881). In both the toxic symptoms vanished.

In the second of these cases the tumor, believed on microscopic examination to be sarcoma, was circumscribed and confined to the left lobe; the right lobe and isthmus being "unaltered" were not removed. The clinical history, the operation and the thorough microscopical examination are admirably reported by Benard. This second case of Tillaux's is, I think, altogether the most interesting of the contributions of France to the surgery of the thyroid gland.

No. 47. Cazabonne, male, *æt.* 33, entered l'Hôpital Beaujean May 9, 1881. Four years previously he had noticed transitory disturbances of vision, with sometimes phenomena of cephalic congestion with headache and amblyopia. The patient also suffered with palpitation, especially after fast walking or mounting the stairs. He said that he had always had this symptom since childhood. One year previous to examination the patient noticed that his neck was enlarging. Iodine treatment had no effect. Two months after noticing the enlargement of his neck, the patient's eyes, which were naturally a little sunken, became prominent. As the exopthalmus increased the palpitation became exaggerated. Respiration also became more difficult. Attacks of suffocation occurred in the day as well as at night, and were accompanied by profuse perspiration of the head and upper part of the body. At the Beaujean, digitalis was administered. The palpitations diminished a little, but the voice became rough.

Examination, May 9, 1881: The largest part of the tumor is situated on the anterior lateral surface of the left side. There is a continuation on the right side, but much less voluminous, and appearing

to be clearly separated from the tumor by the right sternomastoid. The anterior and left portions are, on the contrary, blended, and represent in their entirety a regularly rounded tumor. The lower border completely covers the sterno-clavicular articulations and, a little, the sternal notch. The upper border runs obliquely upward and from right to left, passing 1 cm. below the Adam's apple; its left extremity reaching the angle of the jaw, about 4 cm. higher than in front on the midline. The left border reaches to the trapezius and forms a rounded and rather thick swelling. On the right the tumor stops beneath the sterno-mastoid. This portion on the right is a little soft, in contrast to the firmness of the rest of the tumor. Measurements: Vertically, 12 cm. in front, 14 cm. near the left border; 28 cm. transversely. For some years the neck measured 39 cm.: on examination it measures 47 cm. in circumference.

The skin moves easily on the tumor. On the right side the pulsations of the carotid seem weak, as if the artery were at a distance; on the left they are strong; and on palpation of the tumor there is the sensation of a veritable thrill, while it is at the same time evidently elevated by the immediately underlying vessel. Pressure on the right sterno-mastoid provokes a raucous cough with a prickling sensation in the larynx. The thyroid cartilage is thrown nearly 3 cm. to the right of the midline. The tumor does not appear to be very adherent to the larynx, but does seem to be rather solidly fixed to the surrounding muscles.

The surface of the tumor is rather regularly rounded without any prominent indentations. The consistency is firm; below and in front there is a zone where it is a little more soft, but there is no real fluctuation. One can see no movement of lifting up; palpation reveals no movement of expansion; one finds only near the left upper angle the pulsations of a superficial artery of rather large size. If the patient walks one perceives throbbing over the whole tumor, due to the exaggerated pulsations of the left carotid, which, lying immediately behind the tumor, lifts it up en masse. Auscultation reveals no true vascular bruit in the tumor, but the throbbing of the carotids is perceived over its whole extent.

Symptoms: Attacks of suffocation, due partly to compression of the trachea and partly to compression of the recurrents; rough voice, difficulty in swallowing. The two globes of the eyes are on the same plane and they reach the level of the orbital arcades. The patient estimates their projection in front at 1.5 cm. The eyelids close only with an effort; the sclera are visible around the cornea. There is continually a sense of tension in the eyes. There is diplopia when looking at objects at a distance. Movements of the eyes are easy and regular. Pupils normal.

On palpation the cardiac pulsations are rather strong, but there is no exaggerated thrill with the patient in repose; after walking, the pulsations become more frequent and the precordial impulse much

stronger. Pulse 80; much quicker if the patient takes a few steps. Auscultation of the vessels of the neck shows continuous bruit with paroxysm. Appetite is good; no diarrhea.

The patient has become irritable, flies into temper over nothing, is almost always in a state of very pronounced nervous agitation. There are frequently choreiform movements in the limbs.

Diagnosis: Exophthalmic goitre, as plain as possible.

On the left temple, the dorsal region (left side), and on the upper external part of the left arm are three small swellings about the size of a hazelnut. The patient noticed them about eight months before examination.

It was decided to operate May 18, 1881, and the patient was prepared and administration of the chloroform had begun, when he was seized with very severe attacks of dyspnea, with harsh breathing and beginning cyanosis. On this account the operation was postponed and Dr. Tillaux decided to consult the Society of Surgery.

Benard writes: "The question of anesthesia, decided in advance, so to speak, held small part in the discussion. It was decided not to use chloroform, but to have recourse simply to the administration of strong doses of chloral at the same time with subcutaneous injections of morphine.

"As to the expediency of surgical intervention, there was diversity of opinion.

"MM. Verneuil, Trélat, Duplay advised against operation, as much because of the immediate danger of the operation as of the probable hypothesis, according to M. Duplay, that the goitre might be the effect instead of a cause.

"MM. Labbé, Maurice, Perrin, Desprès, on the contrary, considering the condition of the patient who appeared doomed to certain and early death if left to himself, and being of the opinion that the surgeon should have the courage to undertake, at the risk of disagreeable eventualities, dangerous operations when they are the only chance offered to the patient, urged strongly M. Tillaux to persist in his first intention."

Operation, May 21, 1881: The operation was begun at 9.30 a. m., about one hour after administration of morphine and chloral. U-shaped incision, with the opening above. The two lateral incisions were parallel with the anterior border of the sterno-mastoids. The horizontal incision, over the inferior third of the tumor, joined the others in rounding very slightly and giving to the flap an almost rectangular form. The right branch corresponded exactly to the right border of the tumor; the transverse incision was made next (both with the bistouri); for the left incision scissors were used and the teguments were divided from below upward. Here the hemorrhage was almost insignificant and was easily controlled with forceps.

After dissecting the cutaneous flap with the fingers for 8 or 10 cm., he cut the sterno-hyoids and omo-hyoids at the transverse incision.

Now was seen the greater part of the tumor surrounded by the capsule. The operator proposed to disengage first the inferior border of the tumor by using on it from below upward a 'mouvement de bascule' and to end on each side by ligature of the thyroid vessels. With the fingers bent he commenced the enucleation. But hardly had he freed the inferior border when the capsule tore and the pressure brought forth numerous fragments of a friable, granular mass, of grayish-white color, without any cohesion. This suddenly diminished the size of the tumor; then as much with the fingers as with the spatula he set himself to dissecting the remains of the capsule, having care to cut, at the same time, between two ligatures all the frena of vascular appearance which he encountered.

New difficulties presented themselves when it was necessary to attack the left extremity of the capsule, which reached deeply beneath and behind the sterno-mastoid. It was necessary above all to avoid the common carotid and the jugular vein which adhered firmly to the capsule. An assistant retroverted the cul-de-sac of this capsule, which was then completely detached with the spatula from the vessels. The rather firm adhesions to the upper part of the trachea were seized with a T-forceps and divided. Now the capsule adhered only to tissue of glandular appearance, representing the isthmus of the thyroid, the right lobe of which did not seem to be altered.

This species of pedicle was cut after being ligated. Then the extirpation of the tumor was complete, but below, behind the sternum, there was a deep cul-de-sac filled with débris.

"Having removed this, one was able to estimate the depth of the cul-de-sac which ran towards the mediastinum; with each expiration was seen the trunk of the left innominate vein, which was of enormous size and filled up the whole space. Above, one saw the trachea thrown to the left and considerably flattened transversely. Its right lateral face was hidden by the corresponding lobe of the thyroid body and had not been uncovered; the left face, on the contrary, running almost directly from in front backward, was completely denuded and separated from the vasculo-nervous bundle by a rather large space into which reached a prolongation of the tumor.

"At the bottom of this space the whole anterior surface of the esophagus was seen, which was immediately in connection with the tumor; but the recurrent nerve had not been exposed."

All this part of the operation was effected in half an hour; but the wound was the site of hemorrhage which was controlled by means of a large number of ligatures, taking one hour.

When hemostasis was complete the wound was sutured and a drain placed in the lower part of the wound. Lister dressing; the patient was carried to a specially prepared carbolized room.

"From the first cut of the knife to the end of the dressing a 'pulvérisateur' enveloped the patient in carbolized vapors. The ligatures were of catgut. The Lister method was, in a word, scrupulously observed."

Post operation, May 22, 1881: Since yesterday the patient has not suffered. He breathes easily. Dressing changed. May 25, 1881: Cough tires patient. Deglutition and respiration easy. Tension of the eyes diminishes more and more, and the patient says that the skin of his lids seems too long. Exophthalmus still rather pronounced. Palpitations have ceased. Temperature between 39° and 40°. May 28, 1881: Diminution of exophthalmus is apparent to any one. The wound continues to be satisfactory. Sutures removed. Healing *p. p.* At this point the recovery was complicated by an attack of erysipelas. June 20: From this date recovery from erysipelas.

July 8, 1881: Patient discharged. Exophthalmus has completely disappeared, but the patient is extremely thin and weak. There is trouble in the lungs. "It is probable that this organ (lungs) is the seat of generalized cancer, from which the patient will soon succumb." The patient died July 27, 1881.

Histological examination of the tumor: "It is easily determined that it belongs to the genus sarcoma but it presents diverse varieties of this kind of tumor.

"At certain points the tissue consists solely of fusiform cells, without appreciable intercellular substance, arranged in bundles which, grouped, present themselves as cut sometimes transversely, sometimes longitudinally (sarcome fascicule).

"At other points true connective tissue fibres and trabeculæ are seen between the cellular fasciculi (fibro-sarcome). Finally, one sees at these fibro-sarcomatous points a homogeneous, faintly tinted and, in places, slightly granular intercellular substance imbedding the cells of certain bundles.

"The fusiform cells remain in relation with each other by prolongations more or less numerous. In a word, veritable mucous tissue is formed, not at all an extraordinary fact in a fibro-sarcoma, this tumor belonging to the same class as the myxoma; *i. e.*, to the tumors derived from connective tissue.

"The vessels are not very numerous; for the most part they present a simple wall which, in the sarcomatous points, is not clearly distinct from the surrounding tissue.

". . . . fibro-sarcoma, having become 'sarcome fasciculé' at certain points, and presenting myxomatous transformation in other regions much less extensive."

How is this case to be interpreted? That the patient was suffering from hyperthyroidism and that after removal of the tumor all the toxic symptoms, including the exophthalmus disappeared, there seems to be no doubt. The tumor was a circumscribed one of the left lobe. The right lobe and isthmus were, according to Tillaux, macroscopically normal. Could the new growth have been a sarcoma, as Tillaux supposed, and as the careful histologic examination by an accomplished

pathologist seemed to indicate? Is it conceivable that a mesodermic tumor could, per se, be responsible for the syndrome of Graves' disease? Had the removal of the tumor not been followed by disappearance of the symptoms we might have surmised that the remaining right lobe and isthmus were hyperplastic and not, as Tillaux believed, normal. We are forced to the conclusion that the tumor must have been epithelial, either an adenoma or carcinoma, and not sarcomatous. An adenoma may, we know, cause severe thyroid intoxication, and Tillaux's description of the macroscopic appearance of the material evental, in the course of the operation, from within the capsule would not exclude this variety of tumor—nor, indeed, would the metastases to the temple, arm and lung necessarily exclude it. But a carcinoma of the thyroid might bear a closer resemblance, histologically, to sarcoma than would an adenoma.

Professor Kocher called my attention to the fact that Professor Langhans, his life-long friend in Bern, who, probably, studied malignant tumors of the thyroid more zealously than any one, had finally concluded that certain malignant tumors of this gland, which for many years he had considered sarcomata (indeed spindle-celled sarcomata), were undoubtedly carcinomata. If Langhans was for a time so deceived, surely others may well have been. But it would not altogether clarify the situation to assume that Tillaux's tumor was a carcinoma, for carcinomata of the thyroid have rarely been accompanied by the symptoms of hyperthyroidism, and then only in a very mild form. Adenomata, on the other hand, may produce the complete picture of Graves' disease, even in serious form. We may assume, therefore, that the degree of anaplasia in carcinoma is not only greater than in adenoma, but that in adenoma the cells function, at least for a time, overactively. This has been convincingly shown by Goetsch [133, 138] in his illuminating studies of the mitochondria in the cells of adenomata of the thyroid.

Is it not conceivable that the tumor, if an adenoma, may in parts have become carcinomatous and thus have given rise to the metastases, while sufficient hyperactive adenomatous tissue remained to cause the toxic symptoms; or that the whole tumor was of an unusual adenocarcinomatous variety capable of producing in pronounced form the picture of Graves' disease?

Tillaux operated upon a third case (No. 48). All of his patients recovered from the operation; although in each instance considerable

blood was lost and in none were the thyroid arteries tied as a preliminary step. In all he practised a rectangular U-shaped incision. The transverse or collar incision, for the popularization of which Kocher deserves credit, had already been employed by Boeckel (1880).[28] Oblique or vertical incisions, often with supplementary cuts, were employed by all the French surgeons up to 1880.

Of the 53 cases tabulated for France, in 15 the patients died (28.5 per cent); but, excluding the relatively minor operations, the fatalities for the 12 total excisions plus the four operations which had to be abandoned and two operations for cancer were 12—a mortality of 66.6 per cent. The cause of death was hemorrhage in seven cases, sepsis in three, hemorrhage and sepsis in one, asphyxia in one, shock in one, unknown in two. No operative procedure was devised in France up to 1883 which definitely advanced the art of operating for goitre. Her surgeons were still far from being able properly to deal with the blood vessels.

ITALY (TABLE II)

In reviewing the contributions of a nation to the solution of an important operative problem one naturally looks for the names of the eminent surgeons, and usually to find that they are well represented, particularly so before the days of high specialization in surgery. Inasmuch as for the excision of a goitre the first and great difficulty was the control of hemorrhage we might hope for greatest assistance from those who had particularly interested themselves in the ligation of arteries, in the surgery of the blood vessels. In the case of Italy we are not disappointed.

Those of us who are familiar with Luigi Porta's great classic on *Delle alterazioni patologiche delle arterie per la legatura e la torsione,* Milano, 1845, may have premised that in considering the various procedures which might be employed to bring about a reduction in the size of a goitre he would first test, as he did, the effect of ligation of the thyroid arteries. After ligating one superior thyroid artery in two cases without effect, he ligated, simultaneously, both of the superior arteries in his third case (Table II, Nos. 2, 3, 4) and noted appreciable, but only temporary, reduction in the size of the goitre. Now he concluded that in the future the inferior thyroid artery should be tied, marvelling that it had occurred to no one to do this. He writes:

"Ligature of the arteries with the object of producing atrophy of tumors of the thyroid gland is a procedure really rational and destined

to succeed; but with this object in view one must ligate both the arteries of the same side, the superior and inferior of the side corresponding to the tumor. . . . . which operation (the ligation of the inferior thyroid artery) is, without doubt, more hazardous and serious than the ligature of the superior thyroid artery, but the dangers are not such as to deter a skillful surgeon; although I have had the operation in mind, I have not attempted it because no patient suitable for the undertaking has been presented to me."

Porta soon had the opportunity to test the feasibility of his proposition.

In July, 1850, a girl, aged 17, entered the clinic. There was a goitre on the left side of the neck, the size of a mandarin, which she had had from childhood, and which had grown rapidly during the two previous years.

The superior thyroid artery could be distinctly seen pulsating at the summit of the circumscribed tumor, but there was no trace of the inferior artery. The right lobe was not altered. It was decided to ligate the superior and inferior thyroid arteries on the affected side.

Operation, July 28, 1850: Longitudinal incision 4 finger-breadths in length between the sterno-mastoid and the sterno-thyroid muscles. As the ligation of the inferior thyroid artery was the most difficult part of the operation, it was decided to ligate this artery first. This was done through the inferior angle of the incision, dissecting with the index finger the cellular tissue towards the back and a little below the base of the tumor. The pulsations of the artery were clearly felt between the trunk of the common carotid and the trachea. Guided by the index finger placed on the thyroid artery, the operator succeeded in passing beneath it a curved Lawrence needle. The eye of the needle being brought out through the incision, an assistant threaded it with a little thread of red silk * which was thrown twice around the artery. Having accomplished this first ligature, the superior thyroid artery was carefully ligated without great difficulty; it ran obliquely from the external carotid to the summit of the tumor.

The operation lasted about three-quarters of an hour, most of the time being spent in ligating the inferior artery. Inasmuch as this, he says, is difficult in any case, and since it was a new operation for which the author had got the idea from studies on the cadaver, he "stayed his hand" and proceeded with great circumspection in cutting the parts and in the search for the vessel. In a footnote the author states that he lost a quarter of an hour in looking for the inferior thyroid artery behind the posterior-inferior part of the tumor, where

*** Porta had a fondness for red silk, using it for ligating arteries in his experiments on animals.**

it would naturally be located. He finally lifted out the lower extremity of the lobe, and found the inferior thyroid beneath it to the left of the trachea, between this and the carotid. He thinks that in another attempt he would achieve his object with greater ease and promptness.

This is probably the first case of ligature of both the superior and inferior thyroid arteries. The operation, in Porta's opinion, proved two things: that the obliteration of the two arteries of the tumor may produce radical effect, and that the two arteries of the other side are not capable of maintaining the proper amount of blood.

Porta performed 11 operations for goitre; the first in 1835; the last in 1850. Five were merely ligations of one or two thyroid arteries; the remainder were small operations—incisions or enucleations of very small tumors. In one instance he ligated the internal carotid artery (No. 5), mistaking it for the inferior thyroid; the error was discovered at autopsy. He was the first to ligate the inferior thyroid artery (No. 13). The most important and the greatest number of operations for Italy were performed by Bottini, who like Porta occupied the chair of surgery in Pavia. Bottini operated upon 18 goitres; Porta, as I have said, upon 11. Thus in Pavia 29 of Italy's 53 operations for goitre were performed; indeed, the surgery of goitre in Italy up to 1883 may be said to have begun and ended and centred in Pavia. Most of Bottini's operations were of considerable magnitude, six of them being more or less complete excisions of the thyroid gland. His first operation, in 1868, was regarded, probably erroneously, as a total removal; his second operation, also believed to be a total one, was not performed until 10 years later; then, in five years, he operated 16 times.

The period from 1878 to 1883 was one of great activity in this field in Germany, Austria and Switzerland—for Billroth, for Kocher and indeed for most surgeons in all surgical fields and in all countries. For Listerism was being introduced—eagerly adopted in German-speaking lands, very tardily in England and the United States. It was not until about 1890, 23 years after Lister's first papers on the use of carbolic acid, and 14 years after his visit to America, that the value of antiseptic surgery was generally recognized in the United States. From 1876 to 1889 the contributions to antiseptic and aseptic technique were made chiefly by the German-speaking nations; since 1889 they have come quite exclusively from America. Bottini observed "strict antiseptic precautions" in 1879 or perhaps 1878 (*vid.* No. 20); for

France the first mention in my tables of a Lister dressing is made by Monod, 1880 (No. 38); for Great Britain, by McLeod, in 1880 (No. 40) and by Purcell, in 1880 (No. 41). In the accounts of the operations in America there is nothing to indicate that antiseptic precautions were taken in a single instance. It is remarkable that Bottini, notwithstanding his great experience in operating upon goitres—an experience greater than that of any surgeon of the four countries—should not have hit upon the idea of ligating the thyroid arteries as a measure preliminary to the extirpation of the gland. The preliminary ligation was made only once in our series for Italy—by Berruti (No. 39), who removed the whole gland "by the method of Billroth."

The incisions, except in one instance, were longitudinal, or obliquely so. Ruggi (No. 44) employed a semilunar flap—approximately a collar incision.

Bottini's mortality was 16.6 per cent (3 in 18); for Italy it was 13.2 per cent (7 in 53). The fatalities were distributed as follows: Porta, 1 (No. 5); Bottini, 3 (Nos. 28, 50, 51); Colomiatti, 1 (No. 32); Fiorani, 1 (No. 34); Novarro, 1 (No. 37). There were no deaths from primary hemorrhage—one from secondary. Sepsis was the cause of death in three cases, and in a fourth was undoubtedly responsible for the fatal secondary hemorrhage. One patient died of pneumonia and one from suffocation caused by an unremoved and undiscovered post-tracheal lobule of the thyroid.

GREAT BRITAIN AND IRELAND (TABLE III)

Benjamin Gooch. (Nos. 1 and 2.) *Of bronchoceles. Medical and chirurgical observations,* London, 1776, p. 134 (being an appendix to *A practical treatise on wounds and other chirurgical subjects,* 1767).

These first cases for England are essentially the first for the world, if we may exclude cases 1 and 2 of Günther's abstracts. Gooch protested against operation in both cases. Bell [19] and Langenbeck [205] erroneously state that he either operated or intended to operate. Günther believes that he assisted at one of the operations. Gooch's quaint account of these earliest operations (1776) is entertaining and well worth repeating:

"I have had my opinion asked in a great number of tumors of this kind, and cannot recollect an instance of their endangering life, even when enlarged to a very great size.

"It is said, that in some parts of this kingdom, there are persons who undertake to cure this disease; and some years ago I had a letter upon this subject from a surgeon of character at Coventry, written in a very modest and sensible manner, wherein he acquainted me he had sometimes succeeded. But, for my own part, I must ingenuously confess, the various methods I have tried to disperse these swellings, even in a recent state and moderate size, have been defeated; * and I never durst venture to attempt the cure by excision, on account of the vicinity of the large blood vessels.

"I was once indeed prevailed upon to be present at such an operation, where the tumor was of a very large size, and the patient's blood in a thin, depauperated state.

"Before I went the operation was resolved upon, in a numerous consultation, and all I could do was to shew my fears and apprehensions of what would probably attend it, declaring, that were it a patient of mine I would not attempt it.

"The surgeon was a good and intrepid operator; but before he had half finished the operation, there was such an effusion of blood, as obliged him to desist and turn his whole attention to restraining the hemorrhage, or, in the opinion of all present, the patient would have sunk and died under his hands. She died in less than a week and, I was informed, the blood was never totally stopt. The unhappy event naturally brought the reputation of all the surgeons concerned in question.

"I remember another case of this kind, in which my opinion was asked jointly with that of an excellent surgeon in the country, my particular friend,† and the operation was performed against our judgment by one of the ablest surgeons and most dexterous operators in London, which was very near ending in a fatal hemorrhage. The young lady's life was preserved only by having a succession of persons to keep constant pressure upon the bleeding vessels day and night for nearly a week with their fingers upon proper compresses, after the operator had been repeatedly disappointed in the use of the needle and ligature, etc., as his pupil assured me who attended this case.

"I may here add a third similar case, wherein I was consulted, in which the surgeon concerned discovered an earnest desire to attempt extirpation; but I as earnestly urged the arguments I have assigned, which dissuaded him from so dangerous an operation.

*** "I have talked with many eminent hospital surgeons upon this subject, and they express themselves in the same manner, who have the best opportunities of improving our art, and making useful discoveries."**

† "Mr. Cooper, late of Bungay in Suffolk."

"This disease is very frequent in Swisserland, and in the neighborhood of the Alps, which made Juvenal say, 'Quis tumidum guttur miratur in Alpibus.'" *

Sir William Blizard. (No. 3, reported by Burns.) was the first to ligate a thyroid artery (1811) for the cure of goitre. Death from hemorrhage due to sepsis.

Key and H. Earle. (Nos. 5 and 6.) The ligations of Key and Earle are noteworthy because both patients had symptoms of the disease described 12 years later by Graves. Key's patient died on the second day, probably from hyperthyroidism.

Green (No. 7) is usually credited with the first excision of a goitre in Great Britain. He believed that he had removed the right lobe, but from his vague description of the operation one questions if he knew what he had done. The patient died about two weeks after operation, probably from infection.

Robert Liston. (Nos. 8, 10, 11, 12, 13, 14.) The dexterous Liston was evidently helpless when confronted with a goitre.

Edward Hamilton (1865) (No. 17) was surprised to find how easily both lobes could be freed. He transfixed the "pedicle" (the part adherent to the trachea—the isthmus). There was great loss of blood, but the patient recovered.

Alfred Poland (No. 20) creditably enucleated (1870) an adenoma.

Timothy Holmes. (No. 23.) *A case in which a large bronchocele was removed, with fatal result.* Amer. Jour. Med. Sci., Phila., 1873, n. s. vol. lxv, p. 17.

Timothy Holmes extirpated (1872) with care and skill a great cyst which hung below the patient's waist. His case is erroneously attributed by Süskind to America. Dr. Holmes writes:

"I have read with extreme interest the article on the removal of bronchocele published in the American Journal of the Medical Sciences for January, 1871, by Dr. Greene of Portland, Maine. It happens that I had been led to a conclusion similar to that of Dr. Greene as to the occasional justifiableness of such operations and had had occasion to perform the operation before meeting with his excellent paper. My case, although its issue was fatal, was one which to my

* "I have been told by gentlemen who have been in Swisserland, that this tumor in the throat, called 'goutière,' is far from being there looked upon as a personal deformity."

mind showed that such operations are not impracticable and that recovery may be reasonably anticipated in a certain proportion of them."

Woman, *æt.* 65. Enlarged thyroid for more than 40 years. The tumor gradually increasing in size, finally burst and discharged, her friends said, half a pailful. Suppuration of the enormous cyst followed. Greatly reduced in strength and when death seemed inevitable the patient consulted Dr. Holmes, who finally agreed to operate.

The tumor hung below the patient's waist. "On the right side the innominate artery could be felt extending as high as the lower edge of the tumor, and giving off its two branches; the subclavian lying over the pedicle for some distance" (*sic*).

Operation, June 19, 1872: "I did not adopt the plan of operation proposed by Dr. Greene, of endeavoring to enucleate the tumor without regard to the hemorrhage so produced. In fact, the enormous size of the mass rendered such a plan too dangerous, especially in her enfeebled state. The tumor was surrounded by appropriate incisions around its lower part; flaps were carefully dissected off it, sufficient to cover the vast surface which would be exposed; all large vessels that could be seen were divided between ligatures, and any that spirted were tied at once, and in this way we got down to the base of the tumor. Having dissected the soft parts away from the base of the large cyst to a sufficient extent, I encircled the pedicle with the chain of an écraseur so as to check the hemorrhage, while with an amputating knife I cut away the mass. This left behind a portion of the cyst. After the divided vessels had been secured, the écraseur was removed, and the remains of the cyst partly dissected off, and partly surrounded with ligatures. The operation lasted about an hour; the patient remained quiet under the influence of chloroform the whole time, and did not suffer at all from dyspnea, except when an attempt was made to pass the chain of the écraseur fairly below the tumor, instead of around its lower end. This attempt completely closed the trachea and stopped the breathing entirely. It was this intimate connection between the deep part of the cyst and the windpipe which obliged us to leave a part of the cyst wall behind; but I carried double ligatures round every accessible part of it—partly to command the hemorrhage, and partly to insure the separation of all the secreting surface. The patient lost very little blood, and her pulse was as good after the operation as before. She passed a comfortable night after the operation, and was able without difficulty to swallow milk and other liquids. Early next morning hemorrhage set in from the upper part of the wound, and before it could be stopped a considerable quantity of blood was lost; in the afternoon erysipelatous redness began to appear over the throat, the pulse became rapidly weaker, unconsciousness supervened, and she died on the following morning, having survived the operation about 39 hours. No post-mortem examination was made.

"The tumor, when removed, weighed a little over 7 pounds. It consisted almost entirely of the single large cyst, the walls of which were

of considerable thickness, containing here and there nodules of calcareous matter, and a few small secondary cysts."

James Syme (No. 25, reported by Watson). James Syme, Scotland's famous surgeon, seems to have been almost as greatly embarrassed (1874) as Liston in the presence of the blood vessels of a goitre.

Patrick Heron Watson. (Nos. 27, 28, 29, 30, 31, 32, 33, 34.) *Excision of the thyroid gland.* Edinburgh Med. Jour., 1874, vol. xix, p. 252.

Watson's triumphs undoubtedly entitle him to the dominant position in the field of goitre surgery, not only for Great Britain, but also for France, Italy and America. Warren Greene excepted, he is the only surgeon of these countries who devised a special method of operating and practised it systematically and with success. His method served him well in the first seven cases, but in the eighth, having wounded "a large vein lying posteriorly in the groove between the trachea and esophagus," and being unable to control the hemorrhage, he accidentally opened the trachea in his haste to detach the tumor from it. The patient died from aspiration of blood. Watson's method almost guaranteed difficulties for the surgeon—difficulties which even those who approved of it would hardly have been able to cope with. He was not master of the art of dealing with blood vessels, and few could have been in those days when surgeons, handicapped by example and training and without suitable equipment, had not developed a deliberate manner of operating. His first operation was in 1871. In 1874 he reported five cases, all successfully operated upon by him. He writes:

"The operation of excision of the thyroid gland has no claim of novelty to render it attractive. It has been practised previously by different surgeons, notably by the late Mr. Liston, and the ill success which attended upon the attempts to extirpate this organ, when most requiring operative interference, has served to deter most writers of the present day from recommending its adoption. Before practising this operation, I had twice assisted at operations where a partial extirpation of the hypertrophied organ was adopted. In one case under the care of the late Mr. Syme, where in a cystic goitre, after tapping and injecting the cyst, aneurismal signs manifested themselves, he laid open the pulsating sac, and failing to arrest the hemorrhage, which poured out in a rapid stream, he seized first one side of the sponge-like sac and then the other, cutting away as much of the walls as could be exposed. In this case the hemorrhage proved unrestrainable, in spite

of stuffing the cavity with sponges and stitching the margins of the incision together over them, and the patient died in our hands. In the second case, Professor Spence extirpated a tumor of the isthmus of the thyroid with complete success, but with great bleeding attending upon the division of the vascular connexion. The hemorrhage which complicated both of these cases was certainly such as to make any one timid in adopting such a proceeding."

Watson describes the second operation in greater detail than the others.

Case 2: "In her case, I operated by a long linear incision, which sufficed to expose the upper and lower margins of the tumor. After dividing the skin and cellular tissue, and opening the fascia over the interval between the sterno-hyoid and thyroid muscles, carefully avoiding the fascial sheath of the thyroid gland, I carried my forefinger and thumb over the margin of the tumor at its upper and right-hand corner, and feeling that I had the vascular connexions of the tumor, with the right superior thyroid artery in my grasp, I introduced an aneurism-needle through the fascial sheath in the middle line, bringing it out again at the right side of the level of the equator of the tumor. A ligature was passed through the eye of the needle, and when the needle was withdrawn, the ligature was left in its track. This ligature was confided to an assistant, and held aside. The needle was again passed in the situation of its former emergence, guided by the finger, and then passed beneath the right inferior margin of the gland, so as to include all the right inferior thyroidal connexions. The ligature was similarly withdrawn along the track of the needle. The same process was repeated upon the left side, a ligature being carried beneath the left superior and inferior thyroidal connexions, together with their delicate investing fascia. These four ligatures were then separately tied, so as to secure the vessels included within their cellular sheath as near their origins as was possible; the further separation of the tumor was effected by curved scissors.* As the right superior thyroidal attachments were divided, the ligature came away in the hands of the assistant to whose care it had been confided. A gush of blood took place, but was at once stanched with a sponge thrust into the wound."

In three of Watson's patients (Nos. 28, 29 and 31) exophthalmus was noticed. No mention is made of other eye signs or of tachycardia, or other symptoms of Graves' disease. All of these were "cystic goitres," possibly adenomatous in origin and hence probably toxic. It is noted in one of them (No. 29) that "the anemia and exophthalmia which were present on admission markedly diminished after the operation." I recall no earlier mention of exophthalmus having been

* E. S. Cooper of San Francisco practised a similar method in 1861.

improved by thyroidectomy. It was, indeed, accidentally discovered by several (*i. e.*, Tillaux,[338] Rehn,[288] Mikulicz [349]) that Graves' disease could be cured by operation upon the thyroid.

In August, 1875, Watson [355] read a paper on *Excision of the thyroid gland* before the surgical section of the British Medical Association in Edinburgh. This paper is almost a verbatim reproduction of his earlier communication in the Edinburgh Medical Journal, 1874. I mention this because Süskind's "two successful operations performed at Chalmer's Hospital," given in his English list of 13, were undoubtedly Watson's, and counted twice; also because Watson in his second paper recounts a fatal case, as follows:

"In this fatal case, the tumor, of a very large size, was adherent to the trachea. After preliminary application of ligatures and the division of the vascular attachments upon the right and left sides had been effected, on turning the tumor to one side, a large vein, lying posteriorly in the groove between the trachea and the esophagus, was unfortunately wounded. The pressure of the sponge applied to arrest its bleeding, together with the drag upon the trachea when the tumor was turned to one side, interrupting the respiration, led me to attempt to separate the attachments of the tumor from the trachea rapidly by means of the knife in a deep wound, from which bleeding was still going on. The thin and soft posterior wall of the trachea thus turned outwards was unfortunately wounded; and, before relief could be afforded by opening the trachea and introducing a tracheotomy tube below the level of the tumor, so much blood had been sucked into the air-passages as to determine a fatal result in the course of the evening."

Spence, McLeod Whitehead. (Nos. 39, 40, 43.) Three cases operated upon by Watson's method. Spence modified the method by dividing the isthmus and removing the lobes separately. This is probably the first instance in Great Britain in which this procedure was practised. The patient, who quite possibly had Graves' disease, died within 24 hours.

The remainder of the operations tabulated for Great Britain are relatively minor ones, although for the day they were major undertakings in that they represented the best efforts of the best operators.

UNITED STATES AND CANADA (TABLE IV)

We have found reports of 45 operations for goitre in America up to 1883. There were five deaths, one of these (Maury, No. 21) occurring from pneumonia three weeks after operation and when the wound was almost healed and the patient convalescent. Including this case the

mortality, therefore, was only 11 per cent; excluding it, 9 per cent. There was only one death from hemorrhage (Cooper, No. 8) unless possibly another in the case of Valentine Mott (No. 2), which Gross reports in a single line. But the hemorrhage in two of Greene's cases was "fearful." In Nathan R. Smith's case sepsis was the cause of death; the huge pendulous tumor was ulcerated and sloughing at its dependent portion. Of the remaining two fatalities, one (Maury, No. 21) was, as just stated, due to pneumonia incurred three weeks after operation; the other (Hamilton, No. 26) followed a tracheotomy and was also probably due to pneumonia. One would naturally expect to find the greatest mortality in the cases of excision of both lobes; but in the 10 more or less complete thyroidectomies there was not a death. The cases of Nathan R. Smith (No. 4), E. S. Cooper (No. 8), Warren W. Greene (Nos. 13, 18, 19), E. L. Marshall (No. 14), F. F. Maury (Nos. 20 and 21) and C. E. Fenwick (No. 23) deserve especial consideration.

Nathan R. Smith. (No. 4.) *Extirpation of the thyroid gland.* North American Arch. of Med. and Sur. Science, Baltimore, 1835, vol. ii, p. 309.

The patient, *æt.* about 40, was a Mrs. Wells of Prince George's County, Maryland. The thyroid enlargement was noticed about 1815; this is the only date given in the paper. The tumor "occupied the whole space between the os hyoides above, and the sternum below, and by its weight it had assumed something of a pendulous form, falling over the margin of the sternum. The general configuration of the tumor, in short, was that of a common goitre, and when the integuments were entire it presented the varicose veins usually conspicuous in that disease.

"Some months before the case fell under my observation, the skin covering its most prominent and dependent point had ulcerated, and all the means which had been employed to effect the cicatrization of the sore had failed. There had now issued from this breach of the integuments, a dark, fungous excrescence, represented in the drawing, and presenting a strong resemblance to the fungus hematoides. From this excrescence there issued a sanious and offensive discharge, and occasionally slight hemorrhage had occurred.

"On carefully examining the relations of the tumor (together with Professor Geddings, whose advice I requested) we became satisfied that it was one of the thyroid gland, the right lobe of the organ being chiefly concerned. We could distinctly feel and see the sterno-hyoid and sterno-thyroid muscles passing like tense ribbands vertically over the tumor. The margins of the sterno-mastoid muscles,

on each side, were raised and spread upon the sides of the tumor. More obscurely, the situations of the omo-hyoid muscles were also discerned.

"The superior thyroid artery of the right side was distinctly felt and seen, descending superficially, in a tortuous course, obliquely upon the lateral and anterior portion of the tumor. The left thyroid artery could be obscurely felt. On handling the tumor for the purpose of determining its deep attachments, we could readily cause it to glide beneath the muscles of the neck and upon the trachea and larynx; but, owing to its magnitude, it was impossible to determine the nature of all its relations with the deeply seated parts on which it rested. We satisfactorily ascertained, however, that the great vessels of the neck were not involved in, or adherent to, the tumor.

"On carefully weighing all the circumstances of the case, it was manifest that there was no rational ground for hope that any course of palliative treatment would arrest the progress of the disease or effect the cicatrization of the ulcer. The propriety of attempting the complete extirpation of the tumor was now considered. We arrived at the conclusion that the operation would be attended with extreme difficulty and great peril to the patient, but, as a dernier resort, we regarded it as justifiable in case the individual and her friend, on being made acquainted with the circumstances of the case, should desire the attempt to be made. In a few hours I was informed that our patient had firmly resolved to place herself wholly in our hands, and cheerfully to incur the hazard of any course we might see fit to pursue.

"On the ——— of ——— I performed the operation, with the assistance of Professor Geddings, Dr. Whitridge, Dr. Thomas, of Elk Ridge, and several medical pupils. I commenced the operation by making, in the integuments, an elliptical incision, the length of which corresponded with that of the neck. Its central and broadest portion included the ulcerated and fungous portion of the tumor. I then commenced my dissection around the body of the tumor on the right side, it being my desire to expose and secure as quickly as possible the thyroid artery. This I soon effected, though in consequence of its exceedingly tortuous course, I wounded it and secured it at more than one point.

"I now proceeded to raise the border of the sterno-mastoid muscle, and lay it back from the tumor. In doing this I encountered (that which does not usually exist) the anterior jugular vein, the vessel being somewhat withdrawn from its close proximity to the border of the sterno-mastoid muscle by the fascia involving it, which was tensely drawn over the anterior part of the tumor. As the muscle was retracted with some force, such tension of the parts was necessarily produced, as compressed the vein and emptied it of its blood. The wounding of the vessel, under these circumstances, was therefore scarcely to be avoided. Blood soon flowed freely from the wounded

vessel, its flow being hurried by the struggling, and deep, strong breathing of the patient. I was perfectly aware of the great danger of the inhalation of air into the vein, and the fatal consequences which might be expected to result from its reaching the heart in any considerable quantity. I, therefore, while making efforts to secure the vessel with the ligature, was careful to grasp the border of the sterno-mastoid muscle, including the lower portion of the vein, with the finger and thumb. The vessel was secured with the armed needle; but notwithstanding my utmost care, I twice distinctly heard the gurgitation of a small bubble of air, as it entered the vein, at the moment of a strong and deep inspiration of the patient. For a moment I desisted from the use of the knife, and looked in the face of my patient to observe the effects of the ingress of air into the veins. Happily the quantity was not sufficient to produce any obvious effect, and I proceeded with the operation.

"Having now passed through the strata of blood vessels which pertain to the muscles and to the border of the thyroid gland, I proceeded in my dissection with much greater facility. On the left side I effected it with much more ease than on the right; but here also, on the division of the thyroid veins, I distinctly heard the gurgitation of air. To guard against its repetition during the remainder of the operation, I was careful, whenever I divided any fascicules which might be supposed to contain veins, to grasp it firmly with the finger and thumb below the incision, and if blood flowed from the upper portion, to secure the lower with the ligature. I should have remarked that I found it necessary to divide the tendon of the omohyoid muscle on each side.

"As I progressed with the dissection of the tumor from the deep-seated parts, I found it necessary to proceed with extreme caution. The sheath of the great vessels on each side lay in immediate contact with the tumor and, indeed, was to some extent incorporated with it. I also found that the fascia covering the thyroid and cricoid cartilages was thickened and adherent to the tumor. Its separation from these connections was the most tedious and difficult part of the operation. The separation of the tumor from the parts immediately above the border of the sternum, where I was prepared to expect great difficulty and danger, was effected with infinitely more ease than I had anticipated. The vessels in this region appeared, by the traction of the tumor, to have been elongated, and to some extent obliterated. The thyroid artery, particularly on the right side, presented the appearance of a long, loose, hard cord, pulsated but feebly, and was secured without any difficulty, being drawn out with the tumor. On the left side I secured nothing but branches. The veins of this region were neither numerous nor large, they having no doubt been diminished by the pressure of the parts upon the sternum.

"At length I succeeded in effecting the complete removal of the tumor. There was now left a frightful chasm in the throat, the

larynx being dissected quite bare, especially on the right side, and the trachea exposed as low as the border of the sternum. The great vessels on each side were also seen throbbing in their sheaths. The recurrent laryngeal nerve was distinctly seen on the right. The last point from which I detached the tumor was a portion of the thickened tissue covering the thyroid cartilage, and its attachment here was very firm. When I had severed it, two or three minute arteries sprung, one of which I immediately secured; but as the hemorrhage then appeared to cease, I did not take up the others.

"The operation was necessarily painful and protracted; its execution occupying an hour; the patient, however, endured her sufferings with wonderful fortitude, and at no time did there take place any alarming sinking of the powers of life. Twice or thrice, at her desire, I had delayed a few minutes to allow her a moment of comparative repose, but neither then, nor after the operation, did there appear to have been inflicted any serious shock.

"In the morning, on visiting Mrs. Wells, I was alarmed at finding the dressings bathed in blood which was still flowing from the wound, and evidently of the arterial hue. I immediately cut the stitches, opened the wound, and turned out a mass of coagulated blood, and found the bleeding to have occurred from a minute artery seated where the last attachment of the tumor had been cut away. I secured the vessel with the ligature, and as there was a disposition to hemorrage from minute vessels, I applied to the part a small compress of lint dusted with alum powder.

"On the fifth day, however, there occurred a severe rigor, followed by fever, sonorous and embarrassed breathing, cough and irritability of the stomach. It passed off with a sweating stage, precisely as a paroxysm of intermittent fever. The wound, which had suppurated kindly, now began to exhibit a flabby appearance, and to discharge an unhealthy secretion.

"It is not necessary that I should relate the subsequent progress of the case; suffice it to say, that the rigors recurred every day, notwithstanding our endeavors to parry them, and that the patient expired on the 13th day. The chills were evidently of malarious origin, and my patient undoubtedly came to me predisposed to intermittent fever. To this, in part, I think I may with propriety ascribe the fatal result."

When we consider that the patients were unanesthetized and that the surgeon until many years after Nathan R. Smith's day was without artery forceps, and had to rely chiefly on aneurism-needles, hooks and the pressure of fingers or sponges for the control of hemorrhage we must concede that the most difficult task of the present-day surgeon is hardly more creditable than this operation by Smith upon the thyroid gland in 1835. The control of hemorrhage has always been, as it is today, the chief concern of the operator. Now the

surgeon is provided with literally hundreds of artery clamps and the patient being anesthetized there is no need for haste; the operator, unperturbed by the cries or struggles of the patient or the fear of hemorrhage, proceeds calmly and surely from one step of a well-perfected method to the next.

Nathan R. Smith had quite surely never seen an operation performed upon the thyroid gland, and it is not unlikely that he had never heard of such an operation, although he concludes his paper with the sentence, "Instances in which the operation has been successfully accomplished are no doubt fresh in the minds of the readers."

My admiration for Dr. Smith, Baltimore's "Emperor," has been greatly increased since reading his modest and lucid report of a case, the importance of which he could hardly have comprehended. I have seen no reference to this case in the literature except in the Index Catalogue of the Surgeon General's Library. It is surprising that Samuel D. Gross ~~did not know~~ makes no mention of this chef d'œuvre of Nathan R. Smith.*

E. S. Cooper. (No. 8.) *Operation for the removal of bronchocele. Death of the patient.* Cinc. Lancet and Obs., 1860, vol. iii, p. 15.

"Important surgical operations proving successful, should generally be reported to the medical world, but those terminating fatally should always have the widest range of publicity among the profession.

"In consequence of the great fatality attendant upon operations for the removal of bronchocele, the practice is now generally abandoned. The extent and importance of the tissues involved, when the tumor is large, rendering the operation dangerous in the highest degree, is sufficient reason why it should not generally be resorted to, except in extreme cases.

"There are those, however, where the disease is rapidly growing, and from the hardness of the enlargement and its pressure upon the windpipe suffocation must inevitably result at no distant day, in which an attempt at removal may be made. Such is the one I am about to relate.

"Case: Mrs. M., *æt.* 24 years, consulted me on the 3d of October, 1859, in consequence of an enlargement on the left side of the neck, extending from the clavicle to near the chin. It was twice the size of a man's fist, and had been over four years attaining that size, and during the preceding year increased very rapidly. It pressed heavily upon the trachea, which was considerably flattened. Pulsa-

* Both were professors at Jefferson Medical College—Smith, professor of anatomy from 1825 to 1827; Gross, professor of surgery 29 years later.

tion of the left carotid artery could be distinctly heard on applying the ear over it, while the sounds of expiration and inspiration could be as clearly heard over it as by applying the ear to the chest. There was distinct pulsation nearly all over the tumor. In the act of swallowing, it arose and fell with the motion of the trachea, and was much more firmly fixed over the region of the trachea than over the outer part of the neck.

"I was convinced that I had made a true diagnosis before operating, and that it was not aneurism, but bronchocele, though some of my medical friends thought it might be the former.

"I have been consulted in regard to many cases of bronchocele, but I never saw any one presenting so fearful a prospect for the use of the knife, and from the lights before me, conferred by the experience of others, I never would have decided upon removing this disease by the knife; and notwithstanding the certain prospect of a fatal termination of the case at an early day, I would have either sent the patient away hopeless, or pursued a temporizing course, as had been my custom in other cases, but for having decided to try the écraseur, by which I concluded I might succeed in removing it without the dangers of fatal hemorrhage, so often attendant upon the use of the knife.

"For the purpose of applying the instrument, I made the crucial incision over the tumor, and reflected the flaps of integument down its sides until I thought one-half of it was exposed, after which I passed needles armed with ligatures deeply into its substance in six different places, to be strongly drawn upon by my assistants, thinking thereby to force the chain round the tumor to its under side. It was soon ascertained, however, that the chain would slip forwards in spite of the ligatures. I therefore made a further dissection, so as to expose the entire anterior half for the purpose of inserting the ligatures as before.

"About this time the procedure was arrested by a collapse of the patient, apparently from the effects of the chloroform.

"The patient became pulseless, and for some seconds respiration appeared entirely suspended, but by the use of brandy and other stimulants, with electricity, she had reaction, when the écraseur was again applied; but the use of the instrument was still found to be impracticable, in consequence of the firm attachments of the tumor to the trachea, in consequence of which the chain would have broken down and carried part of it away, instead of separating it from the tumor. I therefore laid aside the écraseur, and took up the scalpel to dissect the tumor away from the trachea; but in effecting this I found it necessary to ligate the primitive carotid artery a little above where that vessel crosses the lower part of the trachea.

"This I think was the most difficult dissection I ever did. The extreme low point on the neck at which I was compelled to ligate this vessel in order to place it out of the reach of being subsequently wounded, together with the density of the abnormal adhesions among

the different structures, rendering their separation with the scalpel exceedingly difficult, while the use of that instrument was hazardous in the extreme, were the causes of this dissection being so difficult.

"The carotid artery being tied, I concluded to extirpate the tumor by the knife, which was accomplished in 1 hour and 20 minutes from the time the operation was commenced, with the loss of a comparatively small amount of blood.

"The internal jugular vein was not wounded, but the anterior and external jugulars were both ligated above and below, as also the superior and inferior thyroid and some other enlarged veins. There were but four arteries besides the carotid and inferior thyroid ligated.

"The tumor being removed, the flaps of integument were brought together by sutures, and were formed sufficiently large to cover the exposed surface. Adhesive straps were put upon the wound, and a piece of lint wetted with an evaporating lotion placed over it, when the dressing was completed.

"The patient revived considerably, and appeared to be doing tolerably well for two hours, but perfect reaction did not take place, and she died in five hours from the time the operation was concluded.

"The great length of time occupied in this operation was owing to the care with which part of the dissections had to be made, the delay occasioned by the sinking of the patient at one time from the chloroform, and the time occupied in the efforts to use the écraseur."

E. S. Cooper. (No. 9.) *Cutting away of a bronchocele without hemorrhage, with a case. Remarks.* Med. and Sur. Reporter, Philadelphia, 1862, vol. viii, p. 38.

"Operation, March 27, 1861: Mrs. P., *æt.* 27, applied to me with a small tumor situated at the isthmus of the thyroid body, of 10 months' standing. It was the size of a hen's egg, and moved up and down in the act of swallowing. It was unattended with pain and had increased in size but slowly. Its growth was, however, constantly perceptible to the patient, and caused her great mental anxiety.

"Being convinced that all methods in use among surgeons will fail to give that freedom from hemorrhage, at the same time certainty of success, with avoidance of suffering to patients, and of deformity after cicatrization, which the nature of the disease and surrounding tissues reasonably warrant, I have for some time been gradually departing from the usual practice.

"My first method was dissecting away the tissues covering the tumor, then passing ligatures through its lower as well as its upper parts so as to include the thyroid arteries.* After this, transfixing the enlargement at different points and in different directions by

* Thus he anticipated Patrick Watson, who, 13 years later, described the very similar method which he and his followers practised with marked success.

needles armed with ligatures of great strength, in case of large tumors using a sort of nevus needle made, on purpose, with a long, piercing extremity, sufficiently long to transfix readily a tumor 4 inches in diameter.

"Many double ligatures being thus passed through the tumor and their ends tied tightly together, it is at once reduced to one-fourth or one-sixth of its natural size. Sloughing occurs in these cases without secondary hemorrhage. But as cases operated upon in this way have been often published with their results, I shall not dwell upon it now, but proceed to my *second* method.

"This consists in exposing the tumor as before and transfixing it above and below, throwing ligatures around the substance as described before and cutting it away close to the ligatures. This was done in the case mentioned without more hemorrhage than results from the simplest operations. Should the wound bleed too much in any case, I would whip-stitch the entire cut surface.

"In this case every symptom was favorable from the commencement, and on the 21st day after the operation the patient left for her home in the country, almost recovered, and with very little deformity from cicatrization, which was almost complete.

"Remarks: Although the method of treatment adopted in the above case is applicable to those of bronchocele generally, still the surgeon will now and then meet with the vascular or *aneurismatic* bronchocele in which the excessive hemorrhage resulting from every stroke of the scalpel will be such that he is finally compelled to abandon the operation; but these cases are extremely rare, and the surgeon should not in any case be too much alarmed at a sudden gush of blood, as that will often occur in cases where the hemorrhage is perfectly controllable by occasionally whip-stitching the bleeding surface.

"I repeat here, substantially, remarks made in the publication of other similar cases elsewhere, which is done so that any who read this report, but may not have read the others, will understand it.

"Surgical writers often state that the method of ligating the thyroid arteries frequently results in secondary hemorrhage. This I have never seen in any case. Is it because of ligating the arteries in the midst of a mass of other tissue and at the same time strangulating every part of the tumor, as mentioned in the first method, or removing the unnatural growth close to the ligature, as in the second, thus causing a consolidation of the tissues around the arteries, that prevents the secondary hemorrhage as chronicled in the books?

"And at this point I am reminded of a question which has often arisen in my mind, as to whether the ordinary method of ligating blood vessels by isolating them completely first, is not based upon erroneous principles. Whether the necessity of drawing the ligature sufficiently tight to cut the inner coats of the artery, is not favorable to the production of secondary hemorrhage, by inducing the too early sloughing of the ligature; and whether it would not be better in

all cases to include such surrounding tissue as would admit of it, is also a question.

" Of course a nerve could not be included in the ligature; but muscle, fascia, cellular tissue, and even the veins might be included. The veins which have heretofore been supposed to be particularly disposed to phlebitis when wounded are found to be not more so than the arteries, unless the wound of the vein causes the arrest of the undecarbonized blood in its way back to the heart. But when that occurs, it becomes dangerous, because the accumulation of venous blood acts as a foreign substance and source of great irritation.

" I am now constantly in the habit of sewing up the ends of arteries, even of considerable size, in a mass of other tissue, when the vessel is either hard to isolate and tie, or in that exposed situation which would leave the ligature liable to be disturbed by the sponge or other cause during the subsequent steps of the operation.

" I do not believe that it is at all necessary to draw a ligature sufficiently tight, when applied to any artery, to cut the inner coat, as is supposed. Pressure, by which the hemorrhage will be arrested, would produce a change of action in the parts sufficient for the effusion of fibrin, by which the vessel would become filled.

" We have innumerable examples of pressure causing the effusion of coagulable lymph. Why should a ligature be drawn more tightly upon an artery than simply to arrest the hemorrhage? It appears to me that if there is any reason why this should be done, it is to keep the ligature from slipping, which may be readily effected by including some of the surrounding tissues. In natural amputations of the extremities, the arteries are hermetically sealed by the process of nature, and a firm clot is formed in the vessels without the aid of ligature. Who knows whether the inner coats of the arteries are cut by the ligatures even when drawn tightly? If not, it is very obvious that a very tight ligature would favor the too early division of the vessels without there being any just cause for the risk."

William Warren Greene. (No. 13.) *Successful removal of a large bronchocele.* Med. Record, New York, 1866-67, vol. i, p. 441.

" It is well understood by the members of the profession that extirpation of an enlarged thyroid gland is one of the most fearful operations ever undertaken by the surgeon. While there is always great danger from shock, secondary hemorrhage, inflammation of the cervical vessels and of the esophagus and respiratory organs, *the* danger which overshadows all others, hanging like a thunderbolt over patient and operator, is terrible and uncontrollable hemorrhage.

" . . . . such surgeons as the Coopers, the Bells, Ferguson, Velpeau and others have been obliged to abandon operation.

" I have quite carefully examined the literature of this subject, and so far as I can learn, *all* bronchoceles that were ever successfully re-

moved (and there are very few) were small. I am very confident that none were as large as that which I shall describe." *

Woman, *æt.* 45. The tumor had been growing for 26 years. Pressure symptoms were so great that attempts to swallow or talk caused "terrible spasms of dyspnea." She was unable to lie down. Suffered from headaches and giddiness and could not stoop without losing consciousness.

Operation, dates not given (Aug. (?), 1866 (?)): Vertical incision. "Fearful hemorrhage" from veins on exposing the tumor. "I now rapidly separated the areolar attachments, and in a few seconds was at the pedicle, which I found containing three large arteries whose pulsations were very distinct, and which were my guides for dividing the pedicle into three parts, which I also accomplished with the fingers. I immediately tied each third with a ligature composed of 18 strands of saddler's silk, *saturated* with wax and *loosely twisted.* As I drew the last cord all hemorrhage instantly ceased. The pedicle was carefully divided close to the goitre, and it removed. During the dissection I found at one point the tumor quite firmly adherent to the sheath of the vessels; and while separating it, a gush of venous blood indicated the rupture of a large vessel. The finger of an assistant controlled it until the ablation of the bronchocele, when examination proved the internal jugular to be wounded. This was tied with a ligature of three strands of silk loosely twisted; no other vessels needed interference. The entire operation occupied 22 minutes."

The patient was restored to perfect health. The weight of the tumor was one pound and nine ounces. The paper is illustrated with interesting woodcuts showing the patient before and after the operation.

William Warren Greene. (Nos. 18 and 19.) *Three cases of bronchocele successfully removed.* Amer. Jour. Med. Sci., Philadelphia, 1871, n. s., vol. lxi, p. 80.

No. 18: Woman, *æt.* 40. Tumor, the size of a small orange, in the right lobe caused great difficulty in swallowing.

Operation, Oct. 25, 1869: The tumor was removed by enucleation. Simple operation except for adhesions to esophagus. Recovery.

No. 19: Woman, *æt.* 35. The tumor had been growing slowly for 20 years. Headache, vertigo, dysphagia and an alarming degree of dyspnea were complained of when she consulted Dr. Greene in August, 1869. "To the fingers, as to the eye, the tumor pulsated everywhere." At one point there was a distinct thrill and bruit. "So marked and peculiar was it that an eminent hospital surgeon of Buffalo had pronounced it an aneurism of the common carotid.† But it was certain

*** Greene evidently knew nothing of the European literature.**

† Thanks to the courtesy of Dr. Frederic Henry Gerrish of Portland, Me., who assisted at the operations in this and the previous case, I have photographs of this patient. There is nothing in the facial expression definitely to indicate Graves' disease.

that this case was more formidable than either of the others—involving both lobes, being of immense size, and more vascular than any goitre I had ever seen; and I did not believe that removal by the ordinary mode of enucleation of morbid growths, attempting to control hemorrhage step by step, was possible. I considered the chance to be a hundred to one that she would die upon the table or of secondary hemorrhage soon after."

Operation, Jan. 20, 1870: Ether. Vertical incision. "At very many points the thin coats of superficial vessels gave way, and uncontrollable oozing resulted. Still the hemorrhage was not immediately alarming until the dissection, which was carried on by the fingers, reached the calcareous portion of the tumor on the right side. Here adhesions were encountered of considerable firmness, and as they yielded to the most careful efforts I could make, the large branches, which had given the aneurismal thrill, and whose coats were extremely attenuated, burst, and immediately we had the most fearful hemorrhage, such as one who has not seen it can hardly realize. This took no one by surprise, as I had already forewarned my assistants of its probable occurrence, and in such event of the entire futility of any expedient, except the rapid completion of enucleation and seizure of the vessels at the base of either lobe. This I accomplished in a very few seconds and was enabled so to seize the pedicle with the fingers as to suppress the bleeding measurably until I could transfix it with the blunt needle, armed with double ligature made of eight strands of saddler's silk. This was carried in the median line from below upward, close upon the trachea, and either ligature tightened sufficiently by a single knot to control the hemorrhage and give time for examination. I had hoped to separate either half of the pedicle into as many parts as there were arteries, as I did in my first case. This I found impossible from the firmness of the tissue, unless I used a cutting instrument, which I did not dare to do. I, therefore, tied either half as tightly as possible, and carefully severed the tumor from its attachments. This being done, seven small arterial twigs, not connected with the growth, were tied, when all hemorrhage ceased. The wound was now kept open, only ether enough being administered to keep her quiet, and time given for glazing of the surface and reaction of the circulation. Within 10 minutes the vessels in every part of the exposed surface were throbbing violently, and in 15 minutes from the ablation of the tumor the inferior thyroid artery of the left side escaped from the ligature and spirted with great violence. In my own opinion, as in that of the attending surgeons, this vessel was equal in size to the common carotid in its normal condition. In a moment this was seized and secured; then, the entire left half of the pedicle being transfixed with a tenaculum, a new ligature of 12 strands was carried underneath both the original one surrounding the pedicle and the separate one around the inferior thyroid artery, and drawn as tightly as possible. From this time, all bleeding was arrested, and in a few minutes the wound was closed with

silver sutures, a light dry compress applied, and the patient placed in bed with a fair pulse of 100 per minute, and presenting no marked signs of collapse."

Secondary hemorrhage occurred on the tenth day. "One week before the operation she lost her voice entirely. Since the removal of the tumor she has fully recovered it."

It is interesting to note that the laryngeal nerves have rarely been paralyzed in the many cases operated upon more or less in this fashion, and that neither cachexia strumipriva nor tetany developed. Presumably a considerable amount of thyroid tissue was left behind in the écraseur ligatures en masse.

The thyroidectomies of Warren Greene deserve conspicuous mention in the history of American surgery; for this reason I have quoted at such length from the picturesque and spirited describings of this dauntless practitioner.

E. L. Marshall. (No. 14.) *Extirpation of the entire thyroid gland. Recovery.* Chicago Med. Jour., 1867, vol. xxiv, p. 97.

"In your journal for December last, I find the report of a case of removal of one-half of the thyroid gland, by Prof. Wm. Warren Greene, being the third instance (so far as my own information extends) of this operation having been successfully performed in America. Dr. Geo. McClellan, Sr., of Philadelphia, is said to have succeeded in a single instance (his being a single lobe only) and my own, performed Jan. 18, 1852, comprising the entire gland, with Dr. Greene's more recent case, of August 19, 1866; all of which patients have had good recoveries. I am unaware, at this time, of there being a single case of a fatal or unsuccessful operation in this country.

"My patient, Mr. John Mank, now residing at Bridger's Corners, Mercer Co., Ill., had consulted a number of eminent surgeons, among whom were Professors Mussey and Joseph N. McDowell, also Professor Brainard, and S. S. Cooper, of Peoria, all of whom, after an examination of the case, gave it as their opinion that an operation for removal of the gland might, eventually, become justifiable. To my own knowledge, Mr. Mank has been, from time to time, through a period of many years, subjected to vigorous treatment, with reference to absorption of the tumor, all of which had not even checked the progress of the morbid growth.

"Referring to my notes, I find that on the 12th of January, 1852, the patient had for three months been unable to lie down, and required constant watching to save him from suffocation; was subject to spasms of great dyspnea; constant headache; had twice had convulsions from attempts to lie down; was mentally despondent, declaring that he preferred death to such an existence. After making a full statement

of the hazards incidental to extirpation, it being the only resource left upon which to fall back or recommend, I left it with himself for decision. He promptly requested me to undertake the removal of the tumor. In this decision I had the happiness of having the concurrence of Drs. Adam Clandaning and A. B. Campbell, whose valuable counsel and assistance I here take the occasion to acknowledge.

"The patient, Mr. Mank, aged 40, a gentleman of high order of intelligence, and, previous to his health having been impaired by his present affliction, a man of great muscular power, possessing a high order of moral courage—such courage, indeed, as I have seldom, if ever, witnessed in any other person.

"The patient, declining the use of an anesthetic, took his position (agreeable to his own request, in an arm-chair) and I proceeded to operate by making an incision through the median line, commencing a few lines above, and completing as much below, the lower border of the tumor. This wound I transformed into a crucial incision; detached the flaps and dissected them down to their base; fleshy fibres that were not easily pushed aside were divided transversely, until the entire superficial surface of the body was exposed. I now separated the tumor from its bed, by dividing the several fasciæ on the director and tearing up the areolar tissue with the finger and handle of the scalpel, until the base of the gland was freely exposed. There was but little hemorrhage from the superficial vessels of the tumor, and none that required especial care, save a couple of small arteries that were found lying alongside the thyro-hyoid muscle, imbedded in the cellular lamella. These were ligated—they were, perhaps, branches of the lingual or maxillary arteries. The pedicle of the tumor being reached, I found each lobe to be supplied with two arteries (the superior and inferior thyroid). Each portion containing a vessel was surrounded by a heavy ligature of loosely twisted saddler's silk. The inferior arteries were now sealed without any disturbance of organic function; but on attempting to tighten the ligatures of the superior vessels, we were met by a difficulty that was well-nigh fatal to our operation. This occurred incidental, as I believe, to pressure upon a branch of the great sympathetic, the pneumo-gastric, the glosso-pharyngeal, or fibres from two, or possibly all three, of those important nerves. Be that as it may, on any attempt to ligate these vessels, the patient suffered from severe paroxysmal cough, labored breathing, and a lessening of the force of the heart's action that was truly alarming. As we could not hope to be able, under the circumstances, to find and exclude the small, thread-like fibre from the ligature, we did that which I believed to be the next best thing in the premises—to destroy the functional integrity of the nerve; this was done by tightening the cord and holding it firmly so long as the patient was able to endure and live, when it was loosened and interrupted organic functions were allowed to resume something of their normal condition. This required but a few minutes, and here was witnessed a heroism

upon the part of Mr. Mank that was truly sublime. Nothing daunted by the peril, so well understood by himself, he was always ready, after his brief rests, to request that the work of nerve-crushing might be resumed.

"After several efforts of this kind, I had the happiness of knowing that the difficulty was so far overcome as to admit of ligation, which was accordingly done, and the tumor was removed without farther trouble.

"The tumor, when examined, was found to be hard, firm, with cartilaginous deposits, and weighed 1 pound 11 ounces, avoirdupois.

"I would especially invite attention to the fact that, in the case of Mr. Mank, the only serious difficulty encountered during the operation was in the dissection of the nervous communication between the gland and nervous centres, while in Dr. Greene's case no such trouble was had, neither have I any knowledge of any such barriers to the successful execution of the operation being encountered by any other party attempting the extirpation of this gland; while all refer to the fearful hemorrhage incidental to the rupture of delicate superficial veins, spread like a network over the body. In my own case, the walls of those vessels were sufficiently firm to admit of careful dissection, without risk to their continuity."

F. F. Maury. (Nos. 20 and 21.) *Extirpation of the thyroid gland for cystic enlargement.* Photographic Review of Med. and Sur., Philadelphia, 1871-72, vol. ii, p. 17.

"During January of the present year, my colleague, Dr. Parry, of the obstetrical staff of the Philadelphia Hospital, asked my advice in reference to a tumor of the neck, in a patient then an inmate of his wards. After repeated and careful examinations, it was clearly defined to be an enlarged thyroid gland.

"The history was as follows: The woman was 23 years of age, born in Cheshire, England, and when nine years old first discovered a small swelling on the anterior part of the neck, its situation being somewhat to the right of the median line. This slowly but gradually increased up to the date of my seeing her. She then complained of but little pain, some difficulty in deglutition, and scarcely any obstruction to her respiration, save in certain positions. She manifested great desire to be rid of the tumor, though the strongest representations of the gravity of the operation were fully made and understood. It was decided to attempt the reduction of the tumor by the process of electrolysis. This was fully tested and afterwards abandoned, the result being entirely negative. In February, before extirpation was resorted to, a final effort was made to produce an impression on the morbid mass by electrical cauterization, which was effected by means of a large Bunsen's battery of 15 cells. This procedure was more effective than the former. The phenomena here evolved were of a

very interesting character. A perceptible crackling noise was audible in the tumor during the application of the needles, which were heated almost to a white heat. Great induration was developed around the negative pole, and the tumor at once began to increase in size, measuring before the operation 16 inches, and in two hours 17. Great dysphagia also followed, and excessive pain when the parts were touched or the head moved. During the day following, all the symptoms of acute inflammation were present; these, however, began to subside in a few days, leaving the patient in her former condition, save the induration around the site of the entrance of the negative pole. In April it was finally decided to resort to the knife. The patient being fully influenced by chloroform, an incision 5 inches in length was made over the most prominent part of the growth, parallel with its perpendicular diameter, and this joined by a horizontal one of sufficient extent to allow free manipulation during the operation. The firm, dense capsule of the gland was soon reached by a division of the bands of fascia overlying. It was soon seen that the thyroid arteries were greatly enlarged, more especially the right and left inferior. All these were well secured in turn, as likewise all smaller vessels. In this way *absolutely* all hemorrhage was avoided.

"The cyst was then peeled away from the trachea for the extent of 3½ inches. The sheath of the right carotid was undisturbed, but fully exposed, as also that of the left. The wound was closed, no hemorrhage followed, and the patient did well, excepting a slight attack of erysipelas, which came on three days after, and, queerly enough, involved the face and portions of the neck to the entire exclusion of the wound.

"This case is pregnant with interest, but space will not admit of its free elaboration. It must suffice to say that here the repeated use of electricity would not have availed much, as the consistency of the tumor would have resisted it entirely, or the time occupied by this mode of treatment would have compassed many months. When the capsule was opened, the structure was found to be dense, and very tenacious in character, and not apparently very vascular. The belief that this operation in many cases can be effected is confirmed by the fact that I removed, some weeks after, another very large growth of the same kind in the same manner, and with the best result, as respect hemorrhage and shock. This patient did well for 21 days, and was then seized with pneumonia and perished, after all the ligatures had become detached and the wound almost healed. The subject of this photograph was seen some days since in the enjoyment of perfect health. She has never experienced any difficulty, save slight aphonia, which has now disappeared."

H. G. Jameson (No. 3), was the first and only American on our list and the tenth in the world to tie a thyroid artery for the cure of goitre. The ligation was made in 1821, only 10 years after the opera-

tion of Sir William Blizard, who was, as I have said, the first to perform this operation. Four of Great Britain's surgeons besides Blizard attempted to cure goitre by ligation of one superior thyroid artery (Coates, 1819; Key, 1824; Earle, 1826; and Sir Benjamin Brodie, 1832). In Earle's case the opposite superior thyroid artery was tied at a second operation, a month after the first. Alquié (1854) was the only French surgeon to ligate the thyroid arteries *per se*. In Italy the first five operations for goitre were merely arterial ligations—Marzuttini, 1844, and Luigi Porta, 1835, 1846 and 1848 (2). At the autopsy of Luigi Porta's second case it was ascertained that his ligature had been placed on the internal carotid which he had mistaken for an enlarged inferior thyroid artery. In 1850 Porta ligated the inferior and superior thyroid arteries of the left side. The circumscribed goitre of the left lobe vanished, leaving no trace. No further attempts were made by Italian surgeons to cure goitre by ligation of the thyroid arteries. W. H. Welch in 1874 * (unpublished thesis) collected 32 cases of ligation of one or more thyroid arteries for the cure of goitre.

Ch. G. Lange [207] is accredited with having been the first (1707) to suggest tying the thyroid arteries in case of goitre. This is what he has written:

"Magis vero efficax esset sectio Arteriae, quae ad strumosos tumores sanguinem defert, modo vas illud prompte inveniri, & haemorrhagia statim iterum sisti posset. Veterinarii quidem hoc modo procedere dicuntur, & arteriam, quae ad strumosos tumores equorum defertur, abscindendo, efficere, ut strumae evanescant; in homine tamen haec operatio non sine periculo instituitur." †

To base a claim of priority for Lange on the evidence furnished by the above quotation would seem to require a highly developed patriotism or a carefully nurtured naïveté. Lange, apparently, did not distinguish scrofulous tumors from goitre, or if he did he had in mind the former, not the latter, when he proposed ligating or dividing

* St. John's paper [313] was founded upon this thesis of Dr. Welch.

† "But more efficacious would be the division or ligation of the artery which conveys blood to the strumous tumors, provided this vessel may be easily found and the hemorrhage forthwith checked. Veterinarians, indeed, are said to proceed in this manner and by dividing the artery which supplies the strumous tumors of horses to bring about the disappearance of the struma; in man, however, this operation will not be undertaken without peril."

"*the* artery." Furthermore, he had the impression that one artery supplied "*the strumous tumors,*" and unquestionably had not the remotest notion of the whereabouts of this hypothetical vessel. And, finally, he warns against undertaking on man this operation, the credit ~~the~~ devising ~~of~~ which he accords to the veterinarians.

Apropos of patriotism, I yield to the temptation to offer my readers extracts from an amusing controversy between von Walther and Chelius on the subject of national as well as individual priority. Philipp von Walther was the first to tie successfully the superior thyroid artery, the case of Blizard having terminated disastrously (*vid.* Table III, case No. 1).

Chelius[11] writes: "Because I credit the Englishman Blizard with the first performance of this operation (and I know of no other German author who has done so) Herr von Walther has been stirred to direct against me the following rather strong attack. It will surely be a satisfaction to my highly esteemed Herr von Walther to have the matter cleared up, inasmuch as the correct history of the operation in question is at stake.

"Herr von Walther says: 'Moreover will our dear countrymen ever cease abasing German achievements in surgery to the indisputable minimum, and creating prejudice with scholarly industry against the German discoverer whenever they can exhume from a foreign land the slightest trace of priority? Certain it is that among the English and French we have no competitors for the glory of such uprightness, probably also none to envy us. Even were it true that the ligation of the superior thyroid arteries for the cure of aneurismatic goitre is a discovery of English surgery, as a German writer relates, it still remains a fact that independent of this and simultaneously (? !) or with a trifling difference in time, the idea originated in Germany and was there successfully carried out. Untrue it is (!) that the operation was proposed by Jones. Jones speaks of the ligation of the thyroid arteries only interrogatively, as of a means to make possible the extirpation of the thyroid gland, not to cure the goitre without extirpation (? !). In regard to the time when Blizard performed his operation, there is nothing to indicate it either in the brief account by Burns nor in the equally brief notice in S. Cooper's *Surgical Dictionary,* 4th Edition. Nowhere is the date of the operation mentioned. From what source then does one know what so positively is asseverated, that Blizard undertook this operation before me? The meagre descriptions of Burns and Cooper seem indeed to prove that they and Blizard had no knowledge of my paper on goitre. But I know with certainty that this little paper was carried to England soon after its appearance. In that country, too, the *Salzburger medicinisch-chirurgische Zeitung* is read, in which some years earlier I had pub-

lished a brief report. Since, however, I do not know the date of this operation I will not quarrel about it. It would be just so much the more interesting and gratifying if indeed the idea of this undertaking had originated with him or Burns. Such a coincidence would be the more likely to kindle a favorable fore-judgment and entitle to the hope of its future establishment in the field of operative surgery.'

"The entire passage, so far as it concerns the history of the ligation of the thyroid arteries, contains nothing but untruth.

"In the second volume of my *Handbuch der Chirurgie,* p. 1160, where I ascribe the priority of the ligation of the thyroid artery to the Englishman Blizard, I have quoted from S. Cooper's *Surgical Dictionary,* London, 1813, 2d Edition, and added the German translation from Burns' *Surgical anatomy of the head and neck.* Had Herr v. Walther seen this second edition of S. Cooper in which on the dedication leaf the 4th of February, 1813 is noted, he would have been able to acquire the absolute conviction that Blizard several years earlier than he must have performed this operation. But if this interval of time should not be great enough for the pronouncement of an opinion in regard to the priority of this operation, then the original paper of Burns (Edin., 1811, p. 202) suffices to dispel any doubt of the most sceptical. These are the sources upon which I base my assertion. Inasmuch as I give reference to the second edition (1813) of Cooper, Herr von Walther should not have taken refuge in the fourth edition which appeared a long time thereafter. Concerning the date of the Blizard operation one need not harass himself so very much, since it is not a question of days or months, but of several years. . . . .

"How does v. Walther happen to make such a statement as this: 'It is untrue that the operation was proposed by Jones. Jones spoke of the ligation of the thyroid arteries only interrogatively, as of a means to make possible the extirpation of the thyroid gland.' Jones says: 'I inquire then further, cannot this procedure, stemming the circulation of the blood through the arteries, be employed with advantage in cases of bronchocele?' Neither in this nor in the appended comment of Spangenburg is to be found the remotest justification for the view that this ligation was proposed as a means for making possible the extirpation of the thyroid gland; an inference quite to the contrary is to be drawn. The entire asseveration of v. Walther I can explain to myself only in this wise, that with Jones he confounded Charles Bell, who in his *System of operative surgery* says: 'Before making the attempt to excise the thyroid gland one might propose ligating the four arteries which supply it.' This passage has no bearing upon the question of ligation of the superior thyroid arteries of which we are speaking; wherefore I did not refer to C. Bell in narrating the history of this operation. On whose side now is the untruth? After all, as a result of thorough investigation it develops that the honor for the suggestion to ligate the thyroid arteries in cases of goitre belongs to a German, to Ch. G. Lange, who already in the year 1707

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.* Journal 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 operation, which on account of the arteries, veins and nerves is so difficult and dangerous, I will relate the story of only the most important one, namely the second, notwithstanding the fact that the third, fifth and sixth were not less significant.

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

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

Abstract of Hedenus's case 2: Male, *æt.* 21. Large goitre which caused rattling in the throat.

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

Stormy convalescence. Difficulty in swallowing, hoarseness, paresis of right arm, chills and high fever, delirium, extensive infection of wound, abscesses under scapula and hemorrhage from the stump on

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

† Italics mine (W. S. H.). This method of treating the so-called pedicle was followed in all countries for about 80 years. For notable exceptions see cases of Desault 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).[354] 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 doltish savagery.

Dr. Klein (Stuttgart). *Ueber die Ausrottung verschiedener Geschwülste, besonders jener der Ohrspeicheldrüse und der Schilddrüse. Ausschälung 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 on the lap of an attendant, since his breathing would have caused motions interfering with operative precision. One assistant held the head, two assistants, one on each side, held the arms, and two, the hands 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 the 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 more readily, inasmuch as the incisions crossed above and below. An assistant now pressed a cork firmly upon the carotid above the collarbone. I pulled the tumor with the fingers forcibly upwards and, 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 from 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 the 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 sign of life. I ordered quickly a sponge dipped in cold water to be placed 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 no 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 and all the reviving means employed; during this time the heart, and 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 possible 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; 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, otherwise there would at least have been violent coughing and a streaming out 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 vertebræ 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 vertebræ 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 Richter 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., *æt.* 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 omo-hyoid, 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 disengorged 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 septicemia. 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 septicemia and pyemia, 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 Ehrlich 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) [189] direct attention to the regularity in the arrangement of the arteries and veins and

* In Süskind's paper [239] these cases are tabulated, and 10 of the most important ones are recorded in detail.

† Desault 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 polyspeculum; 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 Süskind'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 Muzeux'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[368, 370] 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 Garrè, Rehn and Klose, and of Garrè'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	Geheilt	Gebessert	Ungeheilt	Gestorben
1. Cystenkröpfe:					
Punction	2	..	..	2	..
Punction, Drainage	1	1	..	..	..
Incision, Vernähung von Cystenwand und Haut	10	8	..	..	2
Punction, Iodinjection	20	18	..	2	..
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"

Eagerly 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, Theodorus 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 condemned is the method of Mackenzie[111] (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 usé it.

Wölfler asks if it might not be justifiable to extirpate cystic goitres 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 surgeons of England, France and America were not so advanced in the

* Paleæ hæmostaticæ. Root hairs of the East Indian bullock tree (Baumfarren).

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 Süskind, 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~~ flowed 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 anteflexion 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 Sick (*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 Verona 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 Wölfler (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 thymol 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 peripherally to the goitre;

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

"11. Application of an antiseptic dressing covering the chest, 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. As 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, in 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 the vocal cord closure of the glottis was exact before operation.

"It should be emphasized that in each of the three cases of total 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 fluids; this indicates that the epiglottis is no longer able to close the glottis accurately.

"Fortunately these one-sided paralyses of the epiglottis improve markedly after the first or second day. If such patients are later examined laryngoscopically, it is seen on phonation that only that 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 most of the patients that in the course of four to six weeks the voice became less hoarse, or that the hoarseness almost entirely disappeared. This improvement in the speech, which is noticed in paralysis of the recurrent nerve produced by other causes, is not due to the restoration in so 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, then,

* *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 Gräfe-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 Küster, 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, gauze impregnated with paraffin and kolofonium (not carbolized) from the Schaffhausener 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 scar

breaking down at one point, slight suppuration 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 suppuration 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 Kropfexstirpationen 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 both vocal cords. In the same year Riedel [296] reported paralysis of both 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 Tetanie.* 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; Schönborn (Königsberg), two cases; Nicoladoni (Innsbruck), one case. The tetany had been observed only in young females and only after total extirpation of the gland. In three instances it had appeared within 24 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 a persistent condition of irritation in the anterior horns of the gray substance of the spinal cord. He believes that neither the operative insult, 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 not probable, 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 the 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 to be 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 tie 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 Kantonsspital 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 "Kreuzpincette" carrying a loop of thread might render, in the troublesome work of dealing with short vessels. So helpless were surgeons when confronted with blood vessels in the days before the introduction of the modern artery clamps.

A. Lücke. *Ueber die operative Behandlung des Kropfes.* Sammlung 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 Kocher, 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 [55] for the publication of Lücke's results, as we are to Süskind 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 [349] 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:

	Nombre d'opérations	Guérisons	Morts
"Cas opérés (1785-1845)*..	29	18	11
v. Walther †.....	2	2	—
v. Bruns ‡.....	5	3	2
Emmert §	3	2	1
Billroth ‖	20	12	8
Middeldorpf ¶	1	1	—
Schuh **	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 Sick. *Ueber die totale Exstirpation einer kropfig 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 Sick's deserves special emphasis, because for 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 and 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 1866,

"* Schmidt's Jahrbücher.

"† Zartmann, De Strumae Extirpatione, Bonnae, 1829.

"‡ Klein, Ein Beitrag zur chirurgischen Behandlung der Strumen, Tübingen, 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 zweimal einer Struma glandulosa mittelst Galvanokaustik. Wien. med. Wochenschr., 1859, Jahr. 9, p. 641.

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

*** Klein[185] 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 his psychical 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 that 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 circumscribed tumors, cystic or solid, or of more or less readily enucleable portions of colloid goitre. Thus, in the first case of total excision psychic 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) the thyroid might be the place where certain "Umsetzungen" of the blood constituents take place and with its removal the chemically altered condition of the blood might lead to qualitatively changed nutrition of the brain. The Medical Verein of Stuttgart (June 6, 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: (1) Discovery of the fact that total extirpation of the thyroid gland is followed by body changes, to which he gave the name cachexia thyreo- or strumipriva; (2) the studies with his life-long friend Langhans of malignant tumors of the thyroid gland; (3) the perfecting of the operation of thyroidectomy; (4) the stimulus which he gave to the operative treatment of Graves' disease and to the study of the milder forms of hyperthyroidism; (5) the recognition of engrafted forms of Graves' disease; (6) the demonstration of the value of the ligature 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 "Ausschälung" 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 "goître 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.*"*

9/

* 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 Ausschälung."

‡ 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, *æt.* 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 in any relation between the extirpatio strumæ and the altered mental condition*"‡.

This observation of Kocher's (Jan., 1874) § was made only a few months after Gull's (Oct., 1873) [148] description of a peculiar idiopathic condition in adults, to which two years later Ord [205] gave the name myxedema, and many years prior to Murray's discovery (1892) [229] 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,[229] was, perhaps, the first to note these sequelæ 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)[111] 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 foregone 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, Kümmel, Neuber and Schimmelbusch, who did most to eliminate the unessential features of Listerism and to replace antisepsis with asepsis.

In 1883 Kocher[112] 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 complete and then extended the statistics which, under the guidance of Bruns, Süskind 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 "Thyroidectomie."

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

"Whereas, according to Süskind and Wölfler, the mortality up to 1850 amounted to 41 per cent, it had decreased to 21.2 per cent for the 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 1877. 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. 17) in the cases theretofore reported of von Bruns, Billroth, Lücke and Kocher, nor had he at any time lost a patient from hemorrhage, although 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 had Billroth independently, a method which is essentially the one he practises 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, 'kaum 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, but 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 and division of a number of veins. . . . . What makes the securing of the veins in goitre operations especially necessary is the avoidance of injury

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.

" From the inner edge downwards there stretches the vena thyroidea ima, often a very large vessel, which must be ligated and divided. Outwards and downwards from the lower pole stretches the ordinarily smaller, but occasionally equally large, vena thyroidea inferior, and further to the side and upwards the transverse vena thyroidea inferior accessoria. Both of these must be doubly ligated. At the lower edge of the isthmus when there is a double vena thyroidea ima one may find a vein connecting the two; this may be called the vena thyroidea communicans inferior. Except for a few small irregular little veins, the 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 has arrived when one must keep close to the surface of the gland. The capsule (*the external capsule—not the capsula propria, which must remain intact*) * being split and the tumor thus further released, the trunk of the inferior thyroid artery must be isolated and tied far away from the tumor, as near as possible to the carotid. The isolation must be done with the greatest care, and one must assure oneself that the recurrent nerve is not being caught in the ligature. Keeping close to the gland, one works without haste along its posterior surface towards the trachea, and, relying on pressure to occlude the peripheral lumina, catches each spurting vessel as finely as possible. The isthmus being reached it is gradually divided as, one after the other, each vessel is secured.

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

I have quoted from Kocher's description of his operation at such 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 frightened off by any difficulty from dissecting down to the goitre tissue proper, and hence to extirpate it from within its intrinsic capsule, he now dissects along the plane external to the external capsule (two planes removed), and only after he has ligated both thyroid arteries and delivered the tumor does he split the external capsule. He now accomplishes with ease the clean dissection of the " pedicle " (isthmus) from the trachea, tying each vessel as it spurts, an act which, in 1874, he thought insuperably difficult. Paralysis of the recurrent nerve, which 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 confidence 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*.[199]

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 exceptionally keen and sane as Kocher's in its futile efforts to explain insufficiently 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 diminished 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 Liebermeister and Schiff as a regulator of the circulation of the brain. Guyon, Ricou, and Maiqueux have further elaborated this conception. According to Maiqueux (*vid.* 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. Meuli, the circumference of the head and of the neck is greatly increased in the reversed 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 train 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 Kocher 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 Kocher as an indication of particularly intense cerebral disturbance.

Theodor Kocher. *Bericht über weitere 250 Kropfexstirpationen.* 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, Kocher [184] 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 thyreopriva,* 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.[194] In this series for the first time his assistants, Roux, Tavel, Lanz, de Quervain, Schwyzer, 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*).[195] . . . . 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 traumatisms 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, Kocher [197] 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 culpable 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 angiotriptor, 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 morcellement 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 cannulæ 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[186] 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 goître.* 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.

† Duget. Goîtres 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 appellated 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 extirpation—concerning the advisability of removing parts and of leaving certain parts of both lobes—is a paper by Mikulicz (1886),[360] which, although it appeared three years later than the date set for the termination of the period of our study, is of such interest and importance as to demand conspicuous recognition in the operative story of goitre. Surgical art and science owe many a debt to the brilliant and charming Mikulicz of the great school of Billroth.

J. Mikulicz. *Beitrag zur Operation des Kropfes.* Wien. med. Wochenschr., 1886, Bd. xxxvi, pp. 1, 40, 70, 97.

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

Union by first intention was obtained in 20 cases. In one instance tracheotomy had to be performed; the wound, unclosed, was packed with iodoform gauze. In every case but one the indication for operation was an extreme degree of dyspnea from pressure of the goitre. "It is superfluous to state," writes Mikulicz, "that in every case in which the necessity for operation was not urgent, iodine treatment was first tried, usually in the form of parenchymatous injections." The excised tumor was in 24 cases a "benign parenchymatous or cystic goitre." * In one instance it was a carcinoma. The goitre in one patient was complicated with Morbus basedowii (case 23). The symptoms of Basedow's disease rapidly and, without doubt, unexpectedly subsided after the operation. In performing his operations Mikulicz followed implicitly the principles formulated by Billroth which his "friend 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 particularly the operative statistics which we already possess of hundreds of cases of goitre; at most, they furnish, in this respect, material from a little-known goitre region, the Galician Carpathians, confirmatory of the

* Mikulicz, in a footnote says: "The classification of the adenomata as given in the splendid paper of Wölfler (*Ueber die Entwicklung und den Bau des Kropfes*, Berlin, 1883) was, unfortunately, not observed in the clinical histories, hence in this respect I am unable to specify the precise 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 Pietrzikowski[275] 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 address[193] 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. Liebrecht[214] 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 Reverdin [202] and Kocher [192] concerning the so-called cachexia strumipriva which brought to most surgeons the conviction that the removal of the entire thyroid gland, notwithstanding antisepsis, was no harmless intervention. The sad results of total excision painted in such vivid colors by Kocher were soon confirmed by other observers. Julliard,[178] Baumgärtner,[15] Grundler [142] (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 inexplicable 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.* Pietrzikowski, *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.[181] In the three dogs referred to only a tiny 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 at 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,[182] 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 masterhand 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 Mikulicz[249] 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 ligature 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.).

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

"The very first attempt which I made (case No. 13) pleased me exceedingly. The patient, a peasant boy, *æt.* 16, was suffering from great dyspnea and hoarseness. The trachea, dislocated forwards, was compressed to such a degree of flatness that one could feel through 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 with the 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 isolated the lobe, so far as this could be done by blunt dissection, in the customary intracapsular manner. The bleeding vessels were, as usual, doubly ligated with catgut. Furthermore, in typical fashion, I tied the superior thyroid artery and vein at the upper pole, and also the superficial vessels running to the lower pole. Next, with little snippings of the scissors, I freed from the anterior and lateral surfaces of the trachea the adherent lobe, taking care to avoid dissecting too far posteriorly, for fear of injuring the recurrent nerve. Finally, the entire goitre was bound only in the angle between the trachea and esophagus, just where the recurrent nerve and the inferior thyroid artery lie buried. This adherent part at the hilus of the gland I treated as if it were a short, thick ovarian pedicle. While an assistant made pressure with the fingers on the vessels entering the hilus, I split the 'pedicle' longitudinally with the blunt scissors into several portions, clamped each portion with a hemostatic forceps and tied with catgut in the line of the clamp-made furrows. Only now did I proceed to cut away the goitre-mass which, in this manner, had been isolated. The pinces hémostatiques crushed out, in line with their blades, almost the entire parenchyma of the gland, so that in the ligature-furrow little remained but the connective-tissue stroma and the blood vessels. . . . .

"The remaining stump of the gland, contracted to a nodule the size of a chestnut, rested in the angle between trachea and esophagus. Neither the inferior thyroid artery nor the recurrent nerve was seen."*

Mikulicz calls this procedure a resection, to distinguish it from 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 prior to its ablation was made by operators as early as the end of the last and beginning of the present century, as is related in the *Operationslehre* 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 nervous affections."

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

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

On my return from Germany in 1881 I was impressed with the fact that our surgeons were greatly handicapped in most of their operations by lack of proper instruments, particularly of artery clamps. These were insufficient in number and faulty in design. In most of the New York hospitals the only artery clamps were of the fenestrated, mouse-toothed, spring forceps variety (Liston's and Wakley's), indeed, these were about the only ones procurable either in this country or England. In the elaborate catalogue for 1882 of S. Maw, Son and Thompson, London, no other artery forceps, torsion forceps excepted, is mentioned.

In a catalogue of Collin et Cie, Paris, undated, but evidently of about the same period, the little artery clamps of Koeberle and of Péan are the only ones figured; " pinces à artères à ressorts " are catalogued, the latter probably being the mouse-toothed forceps given in the 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.

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 the retractors used in the general surgical clinic of The Johns Hopkins Hospital, specially designed in 1888, are all concave * from side to 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 curled lip (Plate xxiii, Figs. 2, 3 and 4).

The scalpel of our clinic has a handle designed for use as a dissector. Every surgeon instinctively makes dissecting strokes with the handle of his knife, but these motions are futile and hence false unless the tip of the handle has the proper form (Plate xxiv, Figs. 2 and 3). Aneurism-needles we use much less frequently than formerly in our thyroid and other operations, for by transfixing the tissues contiguous to the vessels, or the vessels themselves when large, a single thread of 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 tuft at one end, is passed through the little hole at the tip of the instrument on a milliner's needle. The black tuft, pulled home either before or after the artery has been circumvected by the aneurism-needle, is 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 xxii, Fig. 5). I take pleasure in expressing my appreciation of the care given by the late Wulfing-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 sons

*** I have heard that Sir Victor Horsley, prior to 1888, had employed, in operating upon the brain, a retractor, concave from side to side; but at 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 Kümmel (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 "Kropfsonde" 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 mussy 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 Breslau or "Küttner" 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 Breslau 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 transfixion 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 transfixion, 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 transfixion method for the absolute arrest of hemorrhage.

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

† I am interested to note that in 1891 [147] 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

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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 a 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,[183] although probably performed earlier by Heiser and others. It is discussed instructively by Kocher[183] 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 Socin, who revived it and popularized it, is minutely described by Keser,[184] 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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
1	Desault, P. J. Giraud, Sur l'extirpation d'une partie considérable de la glande thyroïde. Jour. de chir., Paris, 1792, iii, 3.	F. 27 yrs.	Tumor, 2 inches in diameter, of right side and center of trachea, extending under sternomastoid. Duration, seven years.	Slight dysphagia. Deformity, for the relief of which the operation was performed.	May, 1791. Excision of right lobe masterfully 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. Probably the first instance of isolation and ligation of the superior and inferior thyroid arteries in the course of excision of a goitre. *The tumor was carefully separated from the trachea.* The ligation of a "pedicle" or of tissues *en masse* was not resorted to.
2	Bonnet, of Clermont-Ferrand. Brun, Jean, Dissertation sur le goître. Paris, 1815, p. 16.	.....	.....	.....	Date not given. Excision of thyroid gland.	† Death from hemorrhage.	Brun writes: "Bonnet, famous surgeon of Clermont-Ferrand, also practised this operation, but he was not so successful as Dr. Dupuytren; his patient perished, the victim of hemorrhage."
3	Desault, P. J. Rullier, Dict. d. sci. méd., Paris, 1817, xviii, 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.	*Vid.* text for Rullier's comments.
4	Dupuytren, G. *Ibid.*, 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; dazzling; 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.
5	Operator Unknown. Case communicated to Rullier by "Professor Percy." *Ibid.*, p. 564.	M. Le Marquis de A.	Large sarcomatous goitre.	No symptoms. Deformity.	No details given.	† Death from hemorrhage.	Operation advised by Desault, but disapproved 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."
6	Dupuytren, G. v. Froriep, L. F., Ungeheuer grosse, faserig-zellige Geschwulst an der linken Seite der glandula thyreoidea exstirpirt, mit unglücklichem Ausgange. Notizen aus dem Gebiete der Natur- und Heilkunde, Erfurt, 1831, 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 pedunculated 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 removed.	† 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 controlled temporarily by finger pressure. 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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
7	Nélaton. Goitre, Bull. de la soc. anat. de Paris, 1835, s. 3, i, 100.	M. 20 yrs.	"The tumor was as large as a fist."	No account of symptoms.	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 besides it had the aspect of lymphatic ganglia hypertrophied and indurated."
8	Blandin. Ferrus, Dict. de méd. ou répertoire gén. d. sci. méd., 1836, 2e éd., xiv, 181.	.....	.....	.....	.....	†	Ferrus, after giving an account of Dupuytren's operation, says: "Mr. Blandin had a similar unsuccessful case." There are no further details.
9	Roux. Rufz, De l'extirpation d'un goître. Arch. gén. d. méd., Paris, 1836, s. 2, x, 25.	M. 22 yrs.	Large nodular goitre in center 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.
10	Voisin, P. Chirurgien de la maison centrale de détention de Limoges. Ablation d'une tumeur située dans la région thyroïdienne; guérison. Gaz. méd. de Paris, 1836, s. 2, iv, 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. Advocates 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.
11	Bach. Agrégé médecin en chef-adjoint à l'hôpital civil de Strasbourg. Hirtz, L., Goître volumineux; ligature; guérison. Gaz. méd. de Paris, 1841, s. 2, ix, 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 transverse 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.
12	*Idem.* Hirtz, L., Goître; ligature; guérison. *Ibid.*	M. 27 yrs.	Cystic goitre, size of an orange, in midline. Slight enlargement of lateral lobes. Duration three years.	Roughened voice; difficult respiration.	1840 (September ?). Draw-knot ligature about thick pedicle. Ligature was gradually tightened and tumor ablated fourth day post operation.	Recovery.	
13	Rigal, R., de Gaillac. Sur le traitement chirurgical du goître par la ligature sous-cutanée. Bull. gén. de thérap., méd. et chir., Paris, 1841, xxi, 224. Case, p. 225.	F. 19 yrs.	Goitre. Size not stated.	Dyspnea; vertigo; nightmares.	Aug. 8, 1841. Three separate subcutaneous ligatures en masse.	Recovery. September 6, 1841, only a trace of the goitre.	"It was decided to apply a ligature en masse, but in three distinct parts, and not wishing to sacrifice the skin, we took care to make the ligature subcutaneous."

TABLE I.—FRANCE.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
14	Ballard. Goître volumineux guéri par la ligature sous-cutanée. Original in Bull. soc. de méd. de Bésançon, 1845 (not in Surgeon General's Library). Abst. in Arch. gén. de méd., Paris, 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 "considerable reaction."	Original paper not obtainable. Meagre abstract. Sept. 30, 1845. "The cure was complete."
15	Roux, Ph. J. Petit, Goître. Opération suivie de mort. Bull. soc. anat., Paris, 1848, xxiii, 205.	F. 23 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.
16	Bégin, Military Hospital, Strasbourg. Tumeur du corps thyroïde. Bull. de l'acad. nat. de méd., Paris, 1849-50, xv, 1110. Case, p. 1111.	M. "Young soldier."	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 connected the two. The cysts contained "serous and cretaceous matter."	"Recovery was difficult and tardy."	While making toilet of wound the thyroid gland was observed to swell remarkably. There was no hemorrhage nor extravasation. The patient, menaced with suffocation and congestion, "was bled copiously."
17	Roux, Ph. J. Observation d'une extirpation de bronchocèle faite avec succès. Bull. de l'acad. nat. de méd., Paris, 1849-50, xv, 1106. (This case is also given by Michel, Obs. II.)	M.	Hard nodular goitre, size of fist, situated probably in the left lobe. Duration 15 years.	.....	July 10, 1850. No anesthetic. Extirpation "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 adenomata.
18	Sédillot, of Strasbourg. Extirpation du goître. Bull. de l'acad. nat. de méd., Paris, 1849-50, xv, 1132.		"Enormous thyroid tumor."	No account of symptoms.	Date not given. Tumor removed. A ligature was placed on the last insertions 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.
19	*Idem.* Bull. de l'acad. nat. de méd., Paris, 1849-50, xv, 1132.		"Enormous thyroid tumor."	No account of symptoms.	Date not given. Tumor removed. A ligature was placed on the last insertions of the morbid mass.	Recovery.	
20	*Idem.* Military hospital. Bull. d. l'acad. nat. de méd., Paris, 1849-50, xv, 1132.		"Enormous thyroid tumor."	No account of symptoms.	Date not given. Tumor removed. A ligature was placed on the last insertions 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."
21	Cabaret (de St. Malo). Extirpation d'un goître. Gaz. méd. de Paris, 1850, s. 3, v, 710. (Presented by Dr. Velpeau. Acad. de méd., séance de Septembre 24, 1850.)	M. 67 yrs.	Goitre, midline, size of an ostrich's egg. Duration about one year.	Shortness of breath on exertion; slightly impeded deglutition; abnormal voice.	May 28, 1850. Sitting posture. Excision of both lobes. Most vessels were cut first, then tied or twisted, but only the central ends. Vessels believed to be the superior thyroid arteries were divided between two ligatures. "Scarcely 500 gm. of blood were lost."	Recovery.	

TABLE I.—FRANCE.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
22	Alquié, Professor. Ligature des artères thyroïdiennes pour remédier à la suffocation causée par le goître. Annales cliniques de Montpellier, 1854, ii, 222. Also reported by Dr. Barbin, Thèse, Montpellier, 1854, p. 26.	F. 25 yrs.	"Enormous goitre, divided into three perfectly distinct lobes." "Careful and repeated examination failed to reveal the inferior thyroid arteries."	"Orthopnea; difficulty in speaking; disturbance of cerebral circulation; troubled sleep; disturbed digestion; voice peculiar; pulse regular."	Op. I.—April 10, 1854. Ether. Ligation 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, circumference 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 consented."
23	Dunglas, in Lima. Observation de goître enkysté. Extirpation du kyste. Guérison. Gaz. méd., Paris, 1856, s. 3, xi, 129.	F. 22 to 24 yrs.	"Goitre, the size of her face." A single cyst. Duration "some years."	.....	1831. Cyst incised and thereupon enucleated. No blood vessels divided and there was "not the least hemorrhage."	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.
24	Chassaignac. Foucart, A., Goître kystique latéral; ablation heureuse par écrasement linéaire. La France méd. et pharmaceutique, Paris, 1860, vii, 284.	F. 29 yrs.	Cystic plunging goitre, size of large pigeon's egg, near the insertion of left sterno-mastoid. Duration one year.	Constant dyspnea, frequent cough and occasional 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 convulsions; reapplication, later, again caused convulsions. Ablation "finally accomplished."	Nov. 22, 1859. Recovery. Rather stormy convalescence.	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.
25	Gosselin, Hôpital Beaujon, Paris. Goître suffocant cancéreux à forme galopante; asphyxie. Tentative infructueuse de trachéotomie. Bull. de la soc. chir., Paris (for the year 1861), 1862, s. 2, ii, 163.	F. 22 yrs.	"The tumor on the right was a continuation of the isthmus 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 structure did not appear to be altered." Duration eight or ten years.	Suffocation; dysphagia.	Exploratory puncture, March 1, 1861. Op. I.—March 2, 1861. Successive subcutaneous 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 crucial incision was made on the middle of the tumor which was cauterized with nitrate and "acide de mercure." A quadruple thread was passed transversely through the body of the tumor, as much to produce suppuration as to draw it outside. Op. III.—March 4, 1861. Tracheotomy attempted, but not accomplished.	† 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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
26	Boeckel. Pesme, A., De l'extirpation du goître. Thèse, Strasbourg, 1867, p. 43. Obs. I.—Extirpation du lobe gauche de la thyroïde par l'anse coupante de Middeldorph. 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 present a gangrenous aspect." Mediastinal infection.
27	Michel (Professor in Nancy). De l'extirpation complète de la glande thyroïde dans les cas de goîtres suffocants, cystiques ou parenchymateux (opération suivie de succès). Gaz. hebd. de méd. et de chir., Paris, 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; headache; 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. Goître 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.
28	*Idem.* du Terrail Couvat, Ch. Contribution à la thérapeutique chirurgicale de goître cystique. Nouveau procédé opératoire. Thèse, 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 distention of the neck.	The procedure of Michel is called "Procédé opératoire, procédé mixte (dissection-cautérization)." There were two slight post-operative hemorrhages. Noteworthy, that having excised the entire gland three years previously (case No. 27) he should have resorted to puncture and cauterization.
29	Gross (chef de clin. chir., fac. de méd., Nancy). *Ibid.*, p. 41.	M. 21 yrs.	Cyst, size of large orange, to the left of median line. Duration three years.	Slight respiratory disturbance.	May 31, 1875. Isolation, puncture, cauterization ("dissection-cautérization"). Procedure of Michel.	Recovery.	
30	Michel. *Ibid.*, 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.	
31	Boeckel, Eugène, of Strasbourg. Du goître rétropharyngien et de son extirpation. Bull. et mém. soc. chir., Paris, 1879, n. s., v, 303.	F. 25 yrs.	Cystic tumor, size of an apple, on right side of neck. A second cystic tumor 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 excised; the retropharyngeal cyst accidentally ruptured and removed.	Recovery.	Walls of cyst examined by Recklinghausen, who found them composed of thyroid tissue. Boeckel refers to Storck's three cases of "hématomes rêtro-pharyngiens" (Wien. med. Woch., 1878, Nr. 46, 1215) believing them to be the same as his.
32	Péan, Hôpital St. Louis. Brochin, Deux cas d'ablation de tumeurs thyroïdiennes. Case 1.—Goître solide; ablation; abscès des médiastins; péricardite hémorrhagique; mort. Gaz. des hôp., Paris, 1880, liii, 193.	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 adenoma. The number of clamps left hanging in the wound is not stated.

TABLE I.—FRANCE.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
33	*Idem.* Brochin, Case 2.—Kyste sanguin du corps thyroïde; ablation de la glande thyroïde, guérison. *Ibid.*, p. 195.	M. 19 yrs.	Tumor, size of large orange, in midline, composed of numerous cysts filled with blood-stained fluid containing cholesterin. Duration five years.	Dysphagia; "sense of constriction of larynx."	July 19, 1879. Enucleation—only five clamps employed, all removed—wound closed with metallic sutures; collodion dressing.	Recovery.	July 20. Alcohol and carbolic dressing. July 26. Small abscess opened. The walls of the tumor were 1 cm. thick.
34	Communicated by Durdos. Boursier, A., L'intervention chirurgicale dans les tumeurs du corps thyroïde. Obs. I.—Kyste colloïde de la glande thyroïde, rupture vasculaire, collection sanguine. Ponction. Guérison. Thèse, Paris, 1880, p. 170.	M. 37 yrs.	Colloid cyst in midline. Circumference 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.
35	Ollier. Boursier, A., Obs. II.—Goître kystique ayant donné lieu à la triade du goître exophthalmique. Opération par les caustiques. Guérison de tous les symptômes. *Ibid.*, p. 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. Menstruation 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.
36	Le Fort. Boursier, A., Obs. IV.—Extirpation d'un goître colloïde. *Ibid.*, p. 177.	F. 20 to 24 yrs.	Large colloid goitre; right lobe larger than the left.	No functional disturbance.	April 18, 1877. Excision of right lobe. Division of all vessels between two ligatures. Lister dressing.	"Recovery complete and rapid."	"The whole lobe surrounded by the capsule was easily removed."
37	Trélat. Boursier, A., Obs. VI.—Extirpation d'un goître cancéreux. Mort. *Ibid.*, p. 181.	M. 37 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; vertigo; dazzling; cold sweats; noises in the ears; dyspnea; voice raucous, bitonal; dysphagia; 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.
38	Monod. Monod and Terrillon, Opérations de goître. Obs. I. Bull. et mém. soc. chir., Paris., 1880, n. s., vi, 643.	F. 41 yrs.	Moderately large goitre, chiefly of right lobe. Duration 33 years.	Severe attacks of suffocation; shooting pains; voice feeble and shrill.	Tumor punctured in 1863, 1866, 1880; dark or bloody fluid withdrawn. Oct. 29, 1880. Excision of tumor of right lobe, a small nodule from isthmus, and still another. Considerable bleeding. Lister dressing.	Recovery.	

TABLE I.—FRANCE.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
39	Terrillon. Monod and Terrillon, Obs. II.—Goître. Hypertrophie du lobe droit du corps thyroïde. Dyspnée. Raucité de la voix. Accès de suffocation. Extirpation. Guérison. *Ibid.*, 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.
40	Boeckel, J. Thyroïdectomie pour un goître suffocant. Guérison par première intention. Mém. soc. de méd., Strasbourg (1879-80), 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.
41	Tillaux. Thyroïdectomie pour un goître exophthalmique. Guérison. Bull. acad. de méd., Paris, 1880, s. 2, ix, 401. Reported also by Benard, H. Obs. I.—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.)
42	Richelot, L. G. Thyroïdectomie. Bull. et mém. soc. chir., Paris, 1881, n. s., vii, 817. Union méd., Paris, 1885, s. 3, xxxix, 193, 205. Case was first published in L'union méd., Paris, 1881, s. 3, xxxii, 997. Communicated 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 menton 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.
43	Lebovicz, of Saloniki. Extirpation des goîtres. Case I.—Sarcome kystique du corps thyroïde; extirpation; guérison. Gaz. hebd., Paris, 1881, s. 2, xviii, 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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
44	*Idem.* Case II.—Enchondrome du corps thyroïde; extirpation; mort au 6me 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.
45	Périer. Extirpation du corps thyroïde. Guérison. Bull. et mém. soc. chir., Paris, 1881, 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 130 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.
46	Bouilly. Goître hypertrophique simple. Thyroïdectomie; médiastinite aiguë infectieuse; mort rapide. Bull. et mém. soc. chir., Paris, 1882, n. s., viii, 293.	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 mediastnum.	Histologically the tumor "is constituted by simple hypertrophy and proliferation of the vesicules of the gland without predominance of any normal or pathological element."
47	Tillaux, Chirurgien de l'Hôpital Beaujon. Benard, H., Contribution à l'étude du goître exophthalmique. Thèse, Paris, 1882. Obs. II.—Sarcome du corps thyroïde ayant donné lieu à tous les symptômes du goître exophthalmique. Ablation de la tumeur. Guérison de tous les accidents. p. 36.	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.
48	Tillaux. Goître kystique volumineux; ablation; guérison. Bull. acad. de méd., Paris, 1882, 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 46 cm. Duration eight years.	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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
49	Boeckel, J. Thyroïdectomies. Fragments de chirurgie antiseptique, Paris, 1882, 468. Obs., p. 471. Thyroïdectomie partielle pour un goître du volume de deux poings. Lister. Guérison par première intention au bout de neuf 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 ligature and division of the two thyroid arteries.	Recovery.	
50	*Idem.* Obs., p. 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.	
51	Beauregard, of Havre. Delens, Observation de thyroïdectomie. Bull. et mém. soc. chir., Paris, 1883, 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 ligature 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.
52	Pozzi, S., service of Professor Verneuil, Hôpital la Pitié, Paris. Goître plongeant parenchymateux et kystique. Extirpation après trachéotomie préliminaire. Forcipressure prolongée de l'artère thyroïdienne supérieure. Hémorrhagies secondaires. Mort. Gaz. méd. de Paris, 1883, s. 6, v, 510.	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 reapplication 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."
53	Labbé, Léon. Kyste suppuré du corps thyroïde.—Accès de suffocation. Thyréoïdectomie. Guérison. Ann. d. maladies de l'oreille, du larynx et des organes connexes, Paris, 1883, ix, 146.	F. 28 yrs.	Firm, elastic, ovoid tumor, the size of a large egg, ending just above suprasternal hollow and lifting 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

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
1	Marzuttini, G. B. Gozzo enorme; infiammazione, suppurazione, cancrena. Settone. Ligatura della tiroidea superiore. Bull. delle sci. med., Bologna, 1846, s. 3, ix, 365. Originally published in Mem. delle med. contemporanea, xiv, 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 ligature."	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 *vid.* Holmes (Great Britain, No. 23) and Perassi (Italy, No. 19).
2	Porta, Luigi, professore di clinica chirurgica in Pavia. Delle malattie e delle operazioni della ghiandola tiroidea, 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."
3	*Idem.* P. 135.	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 ligature.
4	*Idem.* Obs. XI, 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."	
5	*Idem.* P. 139.	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.
6	*Idem.* Obs. XII, 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 ounces of blood and without the denudation of any adjacent organ except an anterior branch of the superior thyroid which was cut and twisted.	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.

TABLE II.—ITALY.—Continued

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
7	*Idem.* Obs. XIII, p. 150.	F. 25 yrs.	"Tumor, as large as a hen's egg, on the left side of the neck."	.....	Iodine tried without effect. Aug. 3, 1842. Ligation of the extremity of the trunk of the superior thyroid artery. Incision of tumor and excision of all the central "carne" in pieces.	Recovery.	Open wound. Phlegmon of neck and pulmonary disturbances. Venesection, purgatives, etc. All symptoms disappeared in two weeks. Wound healed in a month.
8	*Idem.* Obs. XIV, p. 151.	M. 9 yrs.	Tumor, the size of a hen's egg, "protruding at the summit of the right lobe of the thyroid gland beside the larynx."	.....	1843. The tumor, easily enucleated, was found to be a "sarcoma" the size of a "nut."	Recovery.	The "cortex" was divided to a depth of a millimeter. Thereupon the tumor was exposed.
9	*Idem.* Obs. XV, p. 152.	F. 16 yrs.	Goitre on the right side of the neck, size of a fist, "which pressed close to the lower jaw."	.....	Pomade of iodide and burnt sponge had been tried without effect. 1844. After torsion of an anterior branch of the superior thyroid artery, the tumor was split, exposing to view a circumscribed sarcoma the size of a hen's egg. This being enucleated, "the empty cortex collapsed." Loss of blood amounted to a few ounces.	Recovery.	Post-operation symptoms: Phlegmon of the neck; dysphagia and pain in the chest; headache; restlessness; fever. Treatment: "Six generous bleedings of the arm, 40 leeches at the temple, repeated purgatives, and most severe diet. After these measures the symptoms in the head, neck and chest disappeared and the wound, after copious suppuration, healed at the end of five weeks."
10	*Idem.* Obs. XVI, p. 153.	M. 24 yrs.	Tumor, the size of a lemon, in the left lobe.	Dyspnea; attacks of suffocation.	Iodine and burnt sponge had been tried without effect. 1845. Incision of tumor exposed a large coriaceous cyst which was excised except at the base, where the capsule was adherent to parts in the mediastinal region. Torsion was applied to a wounded artery.	Recovery.	"Inflammation in the wound was dissipated by two bleedings and 20 leeches. After copious suppuration the cavity was reduced to a fistula which closed in about two months."
11	*Idem.* Obs. XVII, p. 154.	M. 27 yrs.	Goitre, the size of a fist, in the right lobe, extending to the manubrium.	Mental anxiety; dyspnea; dry cough.	1846. "Extraction of two sarcomata the size of a "nut"; a cartilaginous cyst full of limpid serum was excised." Duration of operation "15 minutes without wounding vessels and without hemorrhage."	Recovery.	Post-operation symptoms: Fever, with swelling of the neck; difficulty in breathing; congestion of the head; somnolence. Treatment: "Five generous bleedings of the arm and in a week all the symptoms disappeared and the wound, after abundant suppuration, was reduced to a small fistula, which was still open when the patient left the hospital."

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
12	Rizzoli, Prof. F., chir. primario nello Spedale Maggiore di Bologna. Gozzo sottosternale de tessuto erettile operato colla legatura del tumore. Collezione delle memorie chirurgiche ed ostetriche, Bologna, 1869, i, 112. Originally published by Rasi in Bull. delle scienze med. di Bologna, 1845, s. 3ª, vii, 237.	F. 27 yrs.	Rapidly growing, partly subclavicular, tumor. Diagnosed "Walther's aneurismatic goitre" because of "thrill and peculiar pulsation."	Attacks of suffocation; dyspnea; dysphagia.	1833. Ligation of the pedicle of the tumor. The ligature on subsequent occasions was drawn tighter.	Recovery.	"The tumor came away in the hands of the operator on the eighth day. A sudden spurt of blood was controlled by filling up the wound with lint and by light compression with the hand."
13	Porta, Luigi prof. di clinica chirurgica in Pavia. Della legatura delle arterie tiroidee per la cura del bronchocele. Annali universali di medicina, Milano, 1850, cxxxvi, 5.	F. 17 yrs.	Goitre on the left side of the neck the size of a mandarin. Duration from childhood.	Dyspnea; dysphagia.	July 28, 1850. Ligation of left inferior thyroid artery. Ligation of left superior thyroid artery. Duration of operation three-quarters of an hour.	Recovery. "Good health, no trace of the tumor."	First case of ligation of the inferior thyroid artery.
14	Bella, F. Storia di una cisti tiroidea felicemente guarita. Il morgagni, Napoli, 1876, xviii, 258.	F.	Cystic tumor of isthmus larger than a mandarin. Duration seven years.	.....	1875. Puncture of cyst. Iodine injections. Vertical incision about one month later. "The walls of the cyst were attached to the skin on each side by two sutures. Between the sutures the sac was incised. From the cyst came turbid liquid and granular matter." "Drainage tube for the first few days, and frequent injections of tincture of iodine and carbolic solution."	Recovery. "Some months after the discharge of patient there was no return of the tumor."	Post operation: "The cavity grew smaller day by day, and at the same time a small tumor appeared around the aperture. After two months there was only a fistulous opening terminating in the little tumor. Treatment with nitrate of silver soon closed this fistula."
15	Menzel, A., medico chirurgo primario, Ospitale Civico, Trieste. Struma cistica; estirpazione, guarigione. Resoconto sanitario dell'Ospitale Civico di Trieste per l'anno 1873, Trieste, 1876, ii, parte speciale, p. 93.	F. 18 yrs.	Cystic goitre, the size of a hen's egg. Duration two years.	.....	Aug. 11, 1873. Extirpation. Hemorrhage during operation was slight, but some hours post operation a more severe hemorrhage supervened, probably on account of the slipping of a ligature.	Recovery.	The patient was a cretin. Very brief account of case.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
16	Bottini, E., of Pavia. Estirpazione totale di gozzo parenchimatoso. Guarigione. Gior. della R. accad. di med. di Torino, 1878, s. 3, xxiii, 353. Obs. I, p. 365. (Read before the Accademia March 15, 1878.)	F. 28 yrs.	Parenchymatous goitre, the size of an infant's head, in the center of the neck. Duration from childhood.	Attacks of suffocation; voice low and thick; speech difficult; "respiration gasping with whistling."	Sept., 1868. Spedale Maggiore of Milan. Professor Albertini attempted extirpation, but had to desist on account of severe hemorrhage (according to the story of the patient). Severe suppuration lasted for months. His second attempt to operate was futile on account of hemorrhage. Jan. 22, 1877. Dr. Bottini. "The central part of the morbid mass was ligated and the mass removed." Duration of operation 30 minutes. Fifty-two ligatures were applied, without wounding a single vein or artery. Lister methods scrupulously adhered to.	Recovery.	"Twenty-five ligature threads, gathered together at the lower angle of the wound, came away little by little." Zambianchi, in 1873, refers to this case of Bottini's as the first total extirpation of goitre in Italian surgery. Perassi, at the meeting of the Accademia of April 5, 1878, refers to this communication of Bottini's, and gives a case of his own of removal of a very large "bronco-lipo-cele," which he accomplished in 1864. It does not seem quite clear that this was a total extirpation. First goitre case in which Listerism was employed in Italy. All vessels divided between two ligatures.
17	*Idem.* Obs. II, p. 371. Case given in greater detail in Gior. della R. accad. di med., Torino, 1878, s. 3, xxiv, 179. Altro caso di estirpazione completa di gozzo parenchimatoso. Guarigione.	M. 40 yrs.	Large parenchymatous goitre on the right side of the neck. Duration about two years.	.....	March 19, 1878. "Procedure the same as in the preceding case. Fifty-four ligatures were applied. While, on account of ligating the vessels before dividing, there was no spurt of arterial blood, there was enough blood lost to give the operator uneasiness at times.	Recovery.	Probably an excision of isthmus and right lobe.
18	*Idem.* Gior. della R. accad. di med., Torino, 1878, s. 3, xxiv, 170. Obs., p. 185. More fully described by Baiardi, Tansini and Brichetti. Gozzo cistico. Asportazione totale. Guarigione. L'osservatore gazz. delle cliniche di Torino, 1880, xvi, 131.	F. 18 yrs.	Cystic goitre, the size of a large mandarin, extending from one sternomastoid to the other, divided into two lobes, the right a little larger than the left. Duration four years.	Dyspnea.	1878. Total extirpation. "The operation was difficult, for in spite of proceeding with the greatest caution and always dividing the tissues between two ligatures, hemorrhage was severe." Forty-eight ligatures were applied.	Recovery.	Vertical incision. Tracheal "pedicle" of goitre surrounded by catgut ligature; ablation beyond ligature. This is probably the first total extirpation for Italy.
19	Perassi. Gozzo voluminoso esportato con successo mediante il taglio e la legatura. Gior. della R. accad. di med., Torino, 1878, s. 3, xxiii, 389. (Read at the meeting of April 5, 1878.)	M. 46 yrs.	An enormous goitre, "bronco-lipo-cele," which hung over the breast down to the abdomen. Duration 15 years.	.....	Aug. 18, 1864. Operation without anesthesia. The tumor was first punctured. The attempt to excise it had to be abandoned. Seven ligatures were passed through the pedicle; the tumor was then ablated.	Recovery.	The goitre in Marzuttini's case (No. 1) also hung down over the breast. In Timothy Holmes's case (Great Britain, No. 23) the cyst hung below the patient's waist.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
20	Bottini, E. Tansini, Iginio, Estirpazione totale di gozzo retrosternale, eseguita con successo nella clinica operativa della R. universita di Pavia. Gazz. med. italiana, Lombardia, 1879, xxxix, 481.	M. 31 yrs.	Substernal goitre, the size of a small mandarin. Duration 22 years.	Dyspnea.	Nov. 10 (year?). Total enucleation of a tumor of the isthmus—partly substernal.	Recovery.	Bottini uses catgut for the peripheral ligatures; silk for the central. Strict antiseptic precautions.
21	Dionisio, F. Estirpazione di gozzo. Guarigione. L'osservatore. Gazz. delle cliniche, Torino, 1879, xv, 433.	F. 25 yrs.	Spherical tumor of isthmus, size of a fist. Duration about four years.	Dyspnea on exertion; suffocation from the slightest pressure on the tumor; dysphagia.	April 21, 1879. Tumor incised and emptied of its contents. Severe hemorrhage from the cavity was controlled by ligature of some small arteries and by compression sponges. The anterior portion of the sac was removed with scissors and the edges of the remaining portion were sutured to the margin of the skin-wound.	Recovery.	Operation similar to the eventration which Kocher performed upon intrathoracic goitres too large for delivery, but without justification in this case.
22	Berruti, L., Spedale Mauriziano di Torino. Grosso gozzo vascolare guarito colla legatura elastica. Gior. della R. accad. di med. di Torino, 1879, s. 3, xxvi, 140.	M. 49 yrs.	Large pendulous, cylindrical tumor of the neck, which covered part of the sternum. Duration 30 years. "After two years of growth a second tumor appeared on the first. The first tumor was hard, but the second was soft."	Hemorrhage from the tumor, necessitating surgical interference.	May 13, 1879. The pendulous tumor, skin included, was firmly ligated with an elastic cord. The skin was thrown into radiating folds by the ligature. May 18. The sloughing tumor was ablated 3 cm. from the ligature. Immediately a considerable hemorrhage occurred; a second encircling ligature was applied.	Recovery.	This performance resembles the proceeding of Matthias Mayor (1826).
23	Albertini, Professor, Ospitale Maggiore, Milan. Esportazione di gozzo. Gazz. degli ospitali, Milano, 1880, i, 476.	F. 57 yrs.	Large goitre. Duration eight years.	.....	Date not given. Extirpation. Twenty-two ligatures were applied. Very slight hemorrhage. Scrupulous antisepsis. Duration 32 minutes.	Recovery.	Very brief notes. Unable to state the nature of the operation.
24	Bottini, E. Baiardi, Tansini and Brichetti, Ipertrofia del lobo medio. Estirpazione. Guarigione. L'osservatore. Gazz. delle cliniche di Torino, 1880, xvi, 117.	F. 12 yrs.	Tumor, the size of a nut, immediately over the larynx. Duration one year.	.....	1877. Enucleation of tumor; ligation of pedicle.	Recovery.	
25	Bruno, L., and Novaro, in Turin. Canalis, Gozzo ipertrofico del lobo destro del corpo tiroide, con cisti a contenuto colloide. Estirpazione. Guarigione. *Ibid.*, p. 625.	M. 10 yrs.	Tumor, the size of a hen's egg, on the confines of right lobe and isthmus.	.....	Aug. 17, 1880. Exploratory puncture. Aug. 31, 1880. Enucleation; pedicle doubly ligated with catgut and the tumor ablated. Lister dressing.	Recovery.	Devecchi (*l. c.*) asserts that this operation was performed by Novaro, and that Bruno made only the exploratory puncture.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
26	Ruggi, G., Ospedale Maggiore di Bologna. Folier, C. A., Gozzo follicolare con parziale degenerazione cistica curato coll' estirpazione della glandola tiroidea. Guarigione. Bull. delle scienze mediche, Bologna, 1880, s. 6, vi, 388.	F. 19 yrs.	"Tumor on the anterior and center of neck, the size of a fetus head at five months." Duration 13 years.	.....	June 29, 1880. Precise nature of operation not clear. Partial enucleation and trasfixion; ligation of pedicle over trachea in parts; ablation. Rupture of a cyst in course of the operation.	Recovery.	Vertical incision. Péan and Billroth forceps left hanging in wound for three or four days.
27	Medini, L. Storia di una voluminosa cisti multiloculare della tiroide guarita colla spaccatura. *Ibid.*, p. 263.	F. 67 yrs.	Tumor, the size of an adult's head, reaching from the lower jaw to the sternum and on the right and left to the anterior border of the trapezius. Duration about 41 years. Skin over tumor shiny, tense and livid.	Cyanosis; breathing stertorous; suffocation; alteration in the voice; cerebral symptoms.	The patient had been bled at the temple for cerebral symptoms with only temporary relief. 1880. Tumor incised, evacuation of about 900 gm. of colloid substance.	Recovery.	Explored with the finger, the tumor proved to be a cyst lined with calcareous plaques.
28	Bottini, E. Tansini, I. Sulla metodica estirpazione del gozzo. Gior. della R. accad. di medicina di Torino, 1880, s. 3, xxviii, 81. Obs. I, p. 84. Estirpazione di enorme gozzo parenchimatoso. Insuccesso.	M. 43 yrs.	Tumor in front and sides, size of the head of the patient. The surface of the tumor is nodular and overrun by large and numerous veins. Duration 24 years.	Dyspnea.	Feb. 14, 1880. Curved incision from the right mastoid process to the left sternomastoid. It was proposed to attack the tumor on the left. Although blunt dissection was used there was severe hemorrhage. Controlling the hemorrhage with difficulty, operator attempted to detach the tumor between double ligatures, but this did not succeed. Then the operator attacked it from above, proceeding now to the right and now to the left, and "thanks to about 200 ligatures," succeeded in removing the tumor.	✝ Died March 5, 1880, from sepsis.	Oblique collar incision. At autopsy two aberrant lobes were found behind the sternum and a lobe, probably aberrant, in the neck. These cases are often excessively vascular—some have been almost inoperable. I presume that this case was a very difficult one for the period, and that the operation was creditably performed by this masterful surgeon.
29	*Idem.* Obs. II, p. 88. Estirpazione completa di gozzo parenchimatoso retrosternale. Guarigione.	M. 19 yrs.	"Tumor in the lower part of the right carotid region, the size of a hen's egg." Duration one month.	.....	May 3, 1880. Enucleation.	Recovery.	The tumor contained a large cystic cavity filled with brownish blood. Microscopic examination showed fetal type of thyroid gland. This is the first mention that I have found of this type of tumor—Wölfler's classic monograph on tumors of the thyroid gland appeared the same year.
30	*Idem.* Obs. III, p. 90. Estirpazione completa di gozzo prevalentemente vascolare. Guarigione.	F. 60 yrs.	"In the lower two-thirds of the neck are two tumors, each the size of a mandarin, divided in the midline by a furrow." Duration a few months.	Dyspnea.	May 3, 1880. Local anesthesia. Enucleation of the tumors which were very vascular.	Recovery.	First mention of local anesthesia. Bottini used a blunt instrument in placing the ligatures—after the manner of v. Bruns and others of his day. He was evidently well supplied with artery clamps.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
31	*Idem.* Sulla metodica estirpazione del gozzo. Gior. internazionale delle scienze mediche, Napoli, 1881, iii, 139. Obs., p. 143.	F. 70 yrs.	Trachea compressed by an enormous goitre.	.....	Date not given. Extirpation. The operation required 150 ligatures.	Recovery.	Bottini devotes only three lines to the report of this case, of which we find no mention elsewhere.
32	Colomiatti, Prof. V., Hospital of San Luigi, Turin. Devecchi, P., Contributions to the radical cure of goitre. The San Francisco Western Lancet, 1881, x, 241. Obs., p. 245.	M. 60 yrs.	Circumscribed tumor of the right lobe, extending back of the sternum. Duration from childhood.	Pain; dyspnea. Ulcer; erysipelas.	May, 1879. "Total extirpation" of the right lobe. Posterior suface of sternum denuded in course of operation.	† Died from pleuritis in a few days. Mediastinal infection.	Colomiatti was assisted by Devecchi, and on the death of the patient remarked to him that if he should meet with an identical case he would trephine the sternum and introduce a drainage tube for the free flow of the secretions.
33	Fiorani, G., chir.-prim. operatore all' Ospedale Maggiore di Lodi. L'esportazione del gozzo per mezzo del laccio elastico. Gazz. degli ospitali, Milano, 1881, ii, 241. Obs. I, p. 243. Gozzo di mediocre volume. Esportazione. Guarigione.	F. 19 yrs.	"Tumor, the size of an orange, situated to the right of the larynx." Duration nine years.	.....	May 16, 1880. Tumor partly enucleated and pedicle ligated. Antiseptic precautions were observed. Large vessels encountered were divided between two ligatures. Duration of operation "a few minutes."	Recovery.	May 21, 1880. "The greater part of the completely mortified tumor excised." May 31, 1880. "The ligature fell away and with it the pedicle."
34	*Idem.* Obs. II, p. 244. Gozzo molto voluminoso. Esportazione. Morte.	F. 25 yrs.	Tumor occupying the anterior part and both sides of the neck. Duration about two years.	Dyspnea. Goitre interferes with the movement of the neck.	Oct. 17, 1880. Tumor partly enucleated and pedicle ligated. "Antiseptic precautions scrupulously observed." Duration of operation 13 minutes.	† Died Nov. 7, 1880. "Typhoid fever." Death probably due to sepsis.	"The tumor was removed with scissors on the fourth day; erysipelas on the fifth day; the ligature came away on the 12th day. Aphonia was present after operation." Probably a left-sided lobectomy.
35	*Idem.* Obs. III, p. 247. Gozzo retrotracheale. Esportazione.	M. 13 yrs.	Hard goitre, the size of a large nut, firmly fixed to the right side of the trachea. Another tumor was palpated behind the trachea, a little to the left, the size of a large nut.	Labored breathing; feeling of suffocation at night.	Jan. 14, 1881. Tumor behind the trachea was partly enucleated and pedicle ligated.	Recovery.	"Three days after the operation the goitre was smaller. The ligature fell away on the 14th day."
36	Giommi, M. Estirpazione totale di gozzo follicolare-colloide, prima curato colle iniezioni parenchimatose di iodio. Raccoglitore medico, Forlì, 1881, s. 4, xv, 13. Case, p. 14.	F. 40 yrs.	Very large globular goitre occupies the whole front of the neck and extends behind the manubrium. Duration many years.	The patient "has pellagra." Dizziness; noises in the ears; dyspnea.	May 22, 1879. No anesthetic. Longitudinal incision. Ligation of the short, thick pedicle. Hemorrhage from two openings in the hardened capsule of the goitre. Tightening the ligature did not control the hemorrhage. The margins of the openings were sutured and encompassed with a figure of eight ligature. The hemorrhage controlled, a metal thread was placed below the silk ligature, and the tightening begun. Bleeding occurred again, but a few twists of the vise controlled it.	Recovery.	May 23. Tumor ablated in front of the metal ligature which came away on the third day.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
37	Novaro, G. F. Esportazione del lobo destro della tiroide; resezione della faringe; autoplastia delle faringe; morte per emorragia secondaria all'undicesimo giorno. Gior. della R. accad. di med. di Torino, 1881, s. 3, xxix, 34.	M.	Epithelioma of right thyroid lobe, secondary to cancer of larynx. Duration a few weeks.	.....	Jan. 10, 1881. Vertical incision. Removal of the tumor with the resection of the right wall of the pharynx. The opening in the pharynx was closed with a layer of skin. The ligature of the superior thyroid artery was displaced and violent hemorrhage occurred. Catgut ligatures were used.	† Died Jan. 25, 1881, suddenly from hemorrhage. Infection.	Aug. 19, 1880. Novaro extirpated the whole larynx for epithelioma. The enlargement of the right thyroid lobe was evidently a recurrence of the neoplasm.
38	Piccinelli, E. Contributo all'esportazione del gozzo coll'allacciatura elastica. Guglielmo da Saliceto. Gior. di med., farmacia e sci. affini, Piancenza, 1881-82, anno iii, 229.	F. About 19 yrs.	Spherical, midline goitre, the size of two mandarins, furrowed transversely by three lines and having the appearance of three lobes. Diagnosis: "Vascular and aneurysmatic bronchocele." Duration seven years.	For a year or more the voice has been harsh and hoarse. Attacks of dyspnea and dysphagia.	Jan. 26 (year?). In isolating the tumor embarrassing hemorrhage occurred. As the tumor had no real pedicle, a double elastic ligature was thrown around it to control the hemorrhage. Hemorrhage continued, and was controlled by "piazza hemostasis" and cotton and ice. About two hours post operation there was another hemorrhage. Lister precautions. Infection.	Recovery.	Patient became so exsanguinated in the course of the operation that an Esmarch bandage was applied above the pelvis.
39	Berruti, L., Ospedale Mauriziano, Turin. Tre casi di gozzo guariti colla esportazione. Gior. della R. accad. di med. di Torino, 1882, 3 s., xxx, 808. Obs. I, 808.	M. 11 yrs.	Rounded tumor on the right side, size of an orange. Duration about one year.	Severe dyspnea.	Puncture and iodine treatment without effect. April 16, 1882. Two cysts were removed on the right side. Finding the left lobe "hypertrophied" the whole gland was removed, according to the method of Billroth. The superior and inferior thyroid arteries were "previously ligated."	Recovery.	Longitudinal incision still employed. First instance in Italy of preliminary ligation of the thyroid arteries.
40	*Idem.* Obs. II, p. 809.	F. 42 yrs.	Colloid goitre, the size of a hen's egg, on the right side. Left lobe "especially hypertrophied." Duration from childhood.	Dyspnea; dysphagia.	Op. I.—June 5 (1882?). Removal of tumor on right side. Op. II.—June 22 (year?). "The entire thyroid gland was removed." This operation "was rather long and difficult."	Recovery.	The second operation was performed because no relief followed the first.
41	*Idem.* Obs., II, p. 811.	F. 18 yrs.	Large cystic tumor in an "hypertrophied" left lobe. Duration 18 months.	Dyspnea; dysphagia.	June 13, 1882. Left lobe of the thyroid gland entirely removed. "Each little vessel was ligated."	Recovery.	Presumably the "hypertrophy" of the left lobe which contained the cyst was due to presence of other adenomata.
42	Minich, Ospedale Civile di Venezia. Marta, G. B., Esportazione e guarigione di un gozzo mediante il laccio elastico. Gazz. med. ital., lombardia, Milano, 1882, xlii, 103.	F. 50 yrs.	Ovoid tumor at the level of the thyroid cartilage, on the right side of the neck, the size of a large orange. Near this is another small mobile tumor, the size of a pigeon's egg. Duration 34 years.	No symptoms.	Sept. 24, 1881. Enucleation of tumor. Elastic ligature applied to the base. Strict antiseptic precautions.	Recovery.	Sept. 27, 1881. With the scissors the gangrenous tumor was detached about one-half cm. from the ligature. Sept. 28. Patient is almost voiceless and unable to swallow. Oct. 19, 1881. The ligature fell away. Oct. 29. The difficulty in swallowing and loss of voice were of short duration.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
43	Ruggi, G., Ospedale Maggiore di Bologna. Brugia, R. Due casi di gozzo follicolare curati con l'estirpazione della glandiola tiroidea. Guarigione. Raccoglitore medico, Forli, 1883, s. 4, xx, 373. Case I, p. 376.	M. 22 yrs.	Large tumor in front of the neck, divided in two by a longitudinal sulcus, the right side larger than the left. Duration 10 years.	Slight dysphagia; severe dyspnea; slight cyanosis; pupils are dilated and react very slowly.	Nov. 15, 1882. Excision of entire gland. Enucleation of a little nodule projecting from the right half of the gland which compressed the trachea. Fifty-four catgut ligatures were applied, the four thyroid arteries included. Rigorous antiseptic precautions were used. After the operation, as before, the pulse was 70.	Recovery.	Dec. 22, 1882. Pleurisy. Vertical incision supplemented by transverse ones; vessels ligated as encountered; isthmus ("pedicle") carefully dissected from trachea (for first time in Italy).
44	*Idem.* Case II, p. 387.	F. 12 yrs.	Hypertrophied thyroid, divided in two by a longitudinal sulcus, the right half flatter and extended, the left more prominent. Small hard, resistant nodules palpated between the right sterno-mastoid and the end of the right half of the tumor.	Severe dyspnea, accompanied by a sense of distress.	April 22 (year not given). Total excision of thyroid. The same method was followed as in the preceding case. Thirty-five catgut ligatures were applied. Antiseptic dressing.	Recovery.	Semilunar flap (for first time in Italy).
45	Bottini, E., University of Pavia. Zambianchi, F., Sulla metodica estirpazione del gozzo. Annali universali di med. e chir., Milano, 1883, cclxv, 350. Obs. I, p. 356.	M. 11 yrs.	"Parenchymatous goitre, the size of a small melon, in the middle of the neck, a little more developed toward the right." Duration about two years.	Dyspnea.	Dec. 6, 1881. Enucleation.	Recovery.	"The parenchymatous tumor was interspersed with small cysts."
46	*Idem.* Obs. II, p. 357.	F. 22 yrs.	"Parenchymatous goitre, the size of the head of an infant, occupying the front and sides of the neck. It is formed of three lobes, the left as large as the other two together." Duration 11 years.	Dyspnea; attacks of suffocation.	March 4, 1882. "Total extirpation." A severe hemorrhage occurred in isolating the tumor behind the insertion of the sternomastoid, which was controlled with difficulty.	Recovery.	Not clear that this was a total extirpation. Wound suppurated. "The tumor consisted of small cysts enclosed in colloid substance." "When 15 years old, patient was attended by Professor Porta at Pavia, who treated her with a seton."
47	*Idem.* Obs. III, p. 363.	F. 39 yrs.	Parenchymatous goitre, the size of the head of an infant, on the left side of the neck. Duration 19 years.	Dyspnea; voice weak; difficulty of speech.	April 25, 1882. This operation was just like the preceding one, the only difference being that some skin, which had been stretched over the tumor, was removed.	Recovery. Some disturbance of respiration on account of S-shaped deformity of the trachea.	"The tumor consisted of numerous cysts with colloid contents."
48	*Idem.* Obs. IV and V, pp. 365 and 366.	F. 17 yrs.	First admission: Jan. 21, 1882. Cystic adenoma, the size of a hen's egg, in the lower part of the right carotid region. Duration 10 years. Second admission: Jan. 24, 1883. Cystic adenoma, the size of a hen's egg, behind the left sternomastoid. Duration about two months.	Dyspnea. Dyspnea.	Four years previously the tumor had been punctured in the Pavia clinic. Op. I.—Jan. 31, 1882. "Operation was a little difficult on account of firm adhesions, but the tumor was isolated in a short time. Drainage; twisted sutures." Op. II.—Jan. 24, 1883. "Total extirpation."	Recovery. Discharged cured Feb. 26, 1882. Recovery. Post second operation, tetany.	The typical attacks of tetany, called convulsions, were first observed Feb. 6, 13 days after the second operation. The patient, greatly agitated, noisy and destructive, became unmanageable and was discharged Feb. 19. March 16, 1883, the patient returned to have a fistulous tract cured, but became so excited that she was again dismissed.

TABLE II.—ITALY.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
49	*Idem.* Obs. VI, p. 368.	M. 48 yrs.	"Cystic goitre with calcareus concretions on the right side of the neck, the size of a large melon." Duration 28 years.	Abscess, the result of treatment by leeches and poultices.	Dec. 14, 1882. Enucleation.	Recovery.	
50	*Idem.* Obs. VII, p. 370.	F. 21 yrs.	A tumor in the center of the neck, another to the left. To the right is a nodule the size of a mandarin with many nodules of varying sizes in groups. Diagnosis: "Goitre and sarcoma of left cervical glands." Duration of tumor in the center of neck, 10 years. Of the one to the left, 13 months.	Dyspnea; dysphagia; bass and raucous voice.	March 11, 1883. The two tumors and "the other glands" were removed. The wound was closed with two drainage tubes and twisted sutures.	† Died March 18, 1883. Pneumonia.	Autopsy: "The tumor was a sarcoma of the thyroid gland infiltrating all the cervical glands."
51	*Idem.* Obs. VIII, p. 374.	M. 16 yrs.	Cystic goitre, the size of an orange, in the lower part of the neck, a little to the left. Duration about five years.	Dyspnea; attacks of suffocation.	May 26, 1883. Enucleation. "Very little loss of blood." The tumor was found to extend below the clavicle. "The trachea did not assume its normal position, and the breathing was not improved."	† Died June, 5, 1883.	Autopsy: "A piece of the thyroid lobe was found reaching behind the trachea, compressing it laterally and pushing it to the right. This was undoubtedly the cause of the attacks of suffocation and of death."
52	*Idem.* Obs. IX, p. 376.	M. 63 yrs.	"Sarcoma of the thyroid filling completely the jugular fossa and reaching deeply behind the sternum. Duration about four months.	Voice bass and raucous; dyspnea; dysphagia; attacks of suffocation.	May 26, 1883. The operator did not succeed in freeing the tumor from the sides of the cartilage of the larynx or from the first rings of the trachea. Using the "Tauschbatterie" to control hemorrhage, the greater part of the tumor was cut out, and the remainder was scraped out with a Volkmann spoon.	Uneventful recovery.	Oblique longitudinal incision. Microscopic examination: "Sarcoma." "The wound healed by granulation." One would not have expected this.
53	*Idem.* Obs. X, p. 378.	F. 25 yrs.	Cystic tumor, as large as an orange, filling the jugular fossa and extending behind the sternum.	Low, raucous voice and difficulty in speaking; severe respiratory disturbance.	June 2, 1883. Slightly oblique incision from right to left. Not succeeding in isolating the tumor from above, the portion behind the sternum was lifted out, thus relieving the respiration. This portion was larger than appeared at examination, and its isolation was laborious on account of the firm adhesions and the large vessels encountered. Trachea small and flattened laterally.	Recovery.	Specimen: There were cysts, varying in size, in the tumor.

TABLE III.—GREAT BRITAIN AND IRELAND

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
1	Gooch, Benjamin. A brief account of broncho-celes. Med. and chir. observations, 1773, iii, 134.	F.	(?)	(?)	Ineffectual attempt at removal. Operation performed by another surgeon notwithstanding protest from Gooch.	† Died "in less than a week." Bleeding never controlled.	Operation discontinued on account of hemorrhage.
2	*Idem.*	F.	(?)	(?)	Nearly fatal hemorrhage. Gooch protested against the operation.	Recovery.	"The young lady's life was preserved only by having a succession of persons to keep constant pressure upon the bleeding vessels day and night for near a week, with their fingers upon proper compresses," *vid.* text.
3	Blizard, Sir Wm. Burns, Allan, Observations on the surgical anatomy of the head and neck, Edinburgh, 1811, p. 202. "From manuscript notes taken by Dr. Brown."	.....	.....	.....	Date not given. Ligation of "the arteries going to an enlarged thyroid gland." (Superior thyroid arteries.)	† Died of hospital gangrene.	Post operation: "In a week the tumor was reduced one-third in its size. The ligatures then sloughed off; repeated bleeding took place from the arteries, and by the extension of the hospital gangrene, the carotid itself was laid open."
4	Coats, Henry, R. C. S., surgeon of the Salisbury Infirmary. Cooper, Sir Astley, Case of bronchocele in which the superior thyroideal artery was successfully tied. Med. chir. trans., Lond., 1819, x, 312.	F. 17 yrs.	"The thyroid glands were large and pressed on the trachea."	Dyspnea; dysphagia.	Dec. 29 (1818?). Ligation of left superior thyroid artery.	Improved.	"Her breathing much improved and the size of the tumor reduced nearly half." "Discharged Feb. 14, quite well." Possibly infection of the wound contributed to the exceptional result.
5	Key, Guy's Hospital. Case of bronchocele. Lancet, Lond., 1824, ii, 358.	F. 28 yrs.	General enlargement of thyroid, particularly of right lobe. Duration two years.	Marked exophthalmus; nervousness; livid countenance; irritability; vertigo; headache; dysphagia.	June 11 (year not given). Ligation of right superior thyroid artery—undoubtedly only its median branch. Duration of operation one hour.	† Died two days post operation.	Unmistakably a case of Graves' disease. Graves' paper appeared in 1835. Operator greatly embarrassed by a superficial vein. First day post operation the patient was bled and cupped.
6	Earle, H., F. R. S., St. Bartholomew's Hospital. Case of bronchocele, in which the superior thyroid arteries were tied. Lond. Med. and Phys. Jour., 1826, lvi, 201.	F. 17 yrs.	Bronchocele of considerable magnitude, in front of neck. Duration four years.	Interrupted menstruation; dyspnea; dysphagia; headache. "State of health in every respect bad." Pulse 120. Greatly enlarged superior thyroid arteries.	Op. I.—Aug. 2, 1823. Ligation of right superior thyroid artery which was "as large as a carotid artery." Op. II.—Sept. 11, 1823. Ligation of left superior thyroid artery.	Recovery.	Tumor diminished in size. Dyspnea and dysphagia disappeared. Perhaps earliest case in which pulse rate is mentioned. Undoubtedly a case of hyperthyroidism. Perhaps the first operation for Graves' disease. Jan., 1824. "Health greatly restored." The infection which followed operation in these days was probably responsible for the good result of trivial operative measures.

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
7	Green. Removal of the right lobe of of the thyroid gland. Lancet, Lond., 1829, ii, 351.	F. 24 yrs.	"Enlarged thyroid gland." No further details.	None mentioned.	May 22, ——. Operator believes that he removed the right lobe. "It was impossible to remove the whole of the gland on account of the large vessels in the neighborhood."	† Died about 15 days post operation, probably from infection.	Report of operation and of the case very meagre and indefinite; am unable to state what part or what kind of gland was removed.
8	Liston, R., Edinburgh Royal Infirmary. Enlargement of the isthmus of the thyroid gland—removed. Lond. Med. Gaz., 1830, vi, 477.	M. 47 yrs.	Tumor of isthmus "larger than a goose's egg." Duration about three years.	Dyspnea; voice "considerably impaired."	Feb. 10, ——. Tumor "detached from its more loose connexions." The "remaining attachment" transfixed and ligated. Tumor left to slough away. "Surrounded the lower part of the tumor by two semicircular incisions."	Recovery.	Profuse bleeding—". . . . if the operation had been finished by means of the knife, the patient might have sunk before the hemorrhage could have been arrested, it being impossible to apply any great degree of pressure in that situation."—Liston.
9	Brodie, St. George's Hosptial. Ligature of the thyroid artery, for enlargement of the thyroid gland. Lancet, Lond., 1832, ii, 314 and 479.	M.	Tumor of right thyroid gland.	.....	June 21 (1832?). "Ligature of the right superior thyroid artery." Evidently its median branch.	Recovery.	No subsequent note.
10	Liston, Robert, North London Hospital. Wilson, W. J. E., Cases of removal of part of the thyroid gland. Brit. Annals of Med., Pharm., etc., Lond., 1837, i, 11.	F. 23 yrs.	Large goitre, greater on right side. Duration eight years.	Dyspnea.	Dec. 14, ——. Transfixion of tumor of right lobe and ligation. Removal by strangulation.	Recovery.	Probably cretinoid child.
11	Liston, Robert, F. R. S., University College Hospital. Bronchocele. Division of the sternomastoid muscle. Lancet, Lond., 1840, ii, 31.	M. 43 yrs.	Large bronchocele on left side of neck. Duration six years.	Dyspnea.	Jan. 28 (year not given). Sternomastoid muscle divided to relieve pressure.	Recovery. Dyspnea somewhat relieved.	No attempt made to remove the tumor. England's most dexterous operator evidently helpless when confronted with a goitre.
12	*Idem.* Bronchocele treated by ligature. Lancet, Lond., 1841, i, 691.	F. 13 yrs.	Bronchocele, size of small orange, on right side. "Always had slight swelling." Rapid increase in size in last two years.	Respiration impeded only "when child laughs."	Oct. 26, ——. Transfixion and ligation of pedicle.	Recovery.	Eighth day patient fainted from profuse secondary hemorrhage. Seventeenth day, hemorrhage.
13	*Idem.* Case I.—Encysted tumor on the thyroid body. Lectures on the operations of surgery, Phila., Liston & Mütter, 1846, 320.	..... 2½ yrs.	Encysted tumor, size of an apple, "upon the box of the larynx." Present from birth.	Caused no symptoms.	No date. Enucleation of "sac containing a thin pellucid fluid."	Recovery.	Relation to thyroid gland not determined.
14	*Idem.* Case II.—Cystic tumor on the thyroid body. Lectures on the operations of surgery, Phila., Liston & Mütter, 1846, 321.	M. 10 yrs.	Cystic tumor, size of small hen's egg, "front of throat." Existed since birth.	"Inconvenience."	Nov. 11, ——. Enucleation of cyst. Precise situation not stated. No vessels ligated.	Recovery.	Considered by Liston to be a tumor of the thyroid gland.

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
15	Cusack, S. A., F. R. C. S., Steevens's Hospital. Case of dyspnea from bronchocele relieved by the division of the cervical fascia. Dublin Hosp. Gaz., 1857, iv, 276.	M. 17 yrs.	Bronchocele. Duration about four years.	On admission, March 12, 1857, laborious breathing. March 13, comatose; respiration 5; "pulse slow and feeble."	March 13, 1857. Laryngotomy and tracheal catheter.	Recovery.	Larynx and wound closed in seven days. ". . . . peas were placed in the external wound to keep up the discharge." Operator helpless.
16	Parsons, D. W., Dublin. Removal of an osseous tumor from the thyroid gland. Med. Times & Gaz., Lond., 1862, ii, 685.	F. 21 yrs.	Osseous tumor, size of bantam's egg, in right lobe. Duration about 10 years.	Dysphagia and aphonia.	Date not given. Enucleation.	Recovery.	Tumor, sawed in two, was found to be "composed of perfectly formed ossific matter."
17	Hamilton, E., F. R. C. S. I., Steevens's Hospital. Extirpation of the thyroid body. Dub. Quart. Jour. Med. Sci., 1865, xl, 315. Illustrations.	F. 16 yrs.	Large colloid goitre.	.....	June 10, ——. Both lobes were dislocated so as to protrude out of the wound. "Pedicle" tied by encircling ligature caused alarming asphyxia; therefore, transfixed and ligated.	Recovery.	Patient fainted from great loss of blood. The "pedicle" in this case was the part adherent to the trachea (the isthmus). Operator surprised to find that the goitre could be so easily dislocated.
18	King, K., Hull General Infirmary. Cases of bronchocele of the isthmus of the thyroid body; with remarks on the practicability of excision under certain circumstances. Case II. Brit. Med. Jour., Lond., 1865, ii, 5.	M. 21 yrs.	Bronchocele, size of a hen's egg, in front of trachea. Duration "long time."	Dyspnea.	Nov. 13, 1864. Incision, eventration and ligation of neck of sac. Tracheotomy two hours post operation, presumably necessitated by asphyxia due to the encircling ligature.	† Died two days post operation.	Autopsy: Both lobes studded with small tumors, evidently adenomata.
19	*Idem.* Case III, p. 6.	M. 21 yrs.	Bronchocele, size of a hen's egg, in front of trachea. Both lobes slightly enlarged. Duration three or four years.	Dysphagia; dyspnea.	May 9, 1865. Blunt enucleation of central tumor.	Recovery.	In course of operation, other tumors were observed on each side of the central one—operator "resisted temptation" to remove them.
20	Poland, Alfred. Tumor of the neck in connection with the thyroid gland; removal; structure thyroidal; recovery. Guy's Hosp. Reports, Lond., 1871, s. 3, xvi, 484. One woodcut showing a few follicles.	F. 40 yrs.	Tumor, "size of shaddock," front and right side of neck. Undoubtedly adenoma. Duration 26 years.	Dysphea; dysphagia.	May, 1870. Enucleation. The tumor had only "an adhesive connection with the side of the thyroid gland." Operator realized that he had not removed the right lobe of the gland.	Recovery.	Carefully performed operation by an unusually competent surgeon.

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
21	Durham, A. E., Guy's Hospital. Removal of cystic bronchocele. Lond. Med. Record, 1873, i, 209. Case first briefly reported in the Brit. Med. Jour., Lond., 1873, i, 286.	F. 36 yrs.	Cystic bronchocele of isthmus, size of large orange. Duration about five years.	Dyspnea; dysphagia.	Date not given. Enucleation.	Recovery.	The two lobes were seen and appeared to be normal. The tumor was, evidently, an adenoma with degenerated center.
22	*Idem.* Removal of bronchocele. Guy's Hosp. Gaz., 1873, ii, 38.	F. 47 yrs.	Bronchocele 19½ inches in circumference. Duration 20 years.	.....	Date not given. Either an excision of both lobes or enucleation of a large adenoma from each side. Description of operation not sufficiently definite.	Not stated.	Mr. Durham thought that thyrotomy would be an appropriate name for this operation. Torsion was applied to all the arteries; the veins were ligated with catgut.
23	Holmes, Timothy, surgeon to St. George's Hospital and professor of surgery and pathology, Royal College Surgeons. A case in which a large bronchocele was removed with fatal result. Amer. Jour. Med. Sci., Phila., 1873, n. s., lxv, 17. Illustration.	F. 65 yrs.	Enormous cyst of thyroid which hung below patient's waist. Weighed about seven pounds. Duration about 40 years.	So greatly reduced in strength that death seemed inevitable.	June 19, 1872. Skilfully and carefully performed extirpation. Vessels tied as encountered.	† Died 39 hours post operation. Hemorrhage and erysipelas.	*Vid.* abstract and illustration given in text. The innominate artery could be felt; the subclavian passed in front of the pedicle.
24	Jessops, Leeds General Infirmary. Cystic enlargement of thyroid body; extirpation; recovery. Lancet, Lond., 1873, ii, 841.	M. 7 yrs.	Cyst of right lobe and isthmus, size of small hen's egg. Duration about four years.	No symptoms.	Oct. 2, 1873. Extruded by pressure through incision of 2 inches. Pedicle at isthmus transfixed and ligated.	Recovery.	
25	Syme, James. Watson, P. H., Excision of the thyroid gland. Edinb. Med. Jour., 1874, xix, 252.	(?)	Cystic goitre.	.....	Cyst tapped and then opened, because "aneurismal signs" developed. Hemorrhage uncontrollable. The "patient died in our hands" writes Watson.	† Death from hemorrhage.	Note that in these recent days a great surgeon was powerless when confronted with blood vessels. Patrick Heron Watson assisted at the operation.
26	Spence, Prof. *Ibid.*	(?)	Tumor of isthmus of the thyroid gland.	.....	Extirpation of tumor of isthmus. "Great bleeding attending upon the division of the vascular connexion."	Recovery.	Watson assisted.
27	Watson, Patrick Heron, F. R. S., F. R. C. S. E., Edinburgh. Excision of the thyroid gland. Case I. Edinb. Med. Jour., 1874, xix, 252.	F.	"Central tumor, size of a China orange." Duration "many years."	.....	May, 1871. Excision of both lobes—the second lobe by his special method.	Recovery.	*Vid.* abstract and comments on Watson's method in text. Profuse hemorrhage on freeing the first lobe.
28	*Idem.* Case II, p. 253.	F.	Multilocular cystic goitre, size of two fists.	Anemia; slight degree of exophthalmus. Pulse not mentioned.	May, 1871. Excision of both lobes by Watson's method.	Recovery.	The goitre was probably made up of adenomata with cystic degeneration. In course of operation the long silk ligature, which included the vessels of the left superior pole, slipped. The gush of blood was controlled by pressure of sponge, no attempt being made to catch the vessels.

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
29	*Idem.* Case III, p. 254.	F.	Multiple cystic goitre.	Anemia; exophthalmus. No mention of other symptoms of hyperthyroidism.	Autumn 1871. Excision of both lobes by Watson's method.	Recovery. "The anemia and exophthalmia which were present on admission, markedly diminished after the operation."	Catgut ligatures used and cut short. Presumably an adenomatous goitre, inasmuch as patient had exophthalmus.
30	*Idem.* Case IV, p. 254.	F.	Multiple cystic goitre.	.....	1872. Excision of both lobes—Watson's method.	Recovery.	
31	*Idem.* Case V, p. 254.	F.	Multiple cystic goitre, size of large fist; it "had grown steadily for 23 years."	Anemia; exophthalmus. The goitre pulsated.	March 1, 1872. Excision of both lobes.	Recovery. No note as to effect of operation upon the exophthalmus.	"A pulsating swelling" with bruit developed in the situation of the right superior pole six weeks or more after operation. "It then presented all the characters of an aneurysm with a venous communication." In about three weeks it disappeared.
32	*Idem.* Excision of the thyroid gland. Brit. Med. Jour., Lond., 1875, ii, 386. Case VI, p. 387.	(?)	.....	.....	Watson's method.	Recovery.	
33	*Idem.* Case VII, p. 387.	(?)	.....	.....	Watson's method.	Recovery.	
34	*Idem.* Case VIII, p. 387.	(?)	Large tumor adherent to the trachea.	.....	Watson's method.	† Died a few hours after operation.	Profuse hemorrhage. Death caused by aspiration of blood into wounded trachea.
35	Dowson, C. H. Hypertrophy of thyroid gland, and successful removal of right lobe. Trans. Bristol Med.-Chir. Soc., 1874-78, i, 71.	F. 13 yrs.	"Enlarged thyroid gland," right lobe larger than left.	"On July 28, 1874, she appeared premoribund, with stridulous breathing and livid countenance."	July 28, 1874. Excision right lobe. Superior and inferior thyroid vessels ligated as adhesions, but not recognized.	Recovery and relief.	The nature of the goitre is not stated. Creditable operation.
36	Holthouse, Westminster Hospital. Gibb, Sir G. Duncan, Division of the isthmus to relieve dyspnea in certain cases of bronchocele. Lancet, Lond., 1875, i, 120. Case I, p. 121.	F. 29 yrs.	Enlargement of thyroid gland, right lobe the larger. Isthmus decidedly enlarged. Duration two years.	Facial turgescence; dyspnea; discomfort and tension about neck; nausea and vomiting for about 10 days.	July 11, 1874. Excision of isthmus.	Recovery and relief.	Sir Duncan writes, "I believe that this is the first occasion in which the isthmus has been either wholly removed or divided, at my suggestion." He would prefer, as a rule, to have "a good large portion of the isthmus" removed.

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
37	*Idem.* Case II, p. 121.	F. 17 yrs.	Tumor "of the entire front of the neck." Duration since birth.	Dyspnea; dysphagia; laryngeal cough; facial turgescence.	Dec. 15 (1874?). Aneurism-needle armed with double thread passed under the isthmus. The ligatures were tied at two points with the idea that sloughing would take place between them.	Recovery.	
38	Ticehurst, H. R. Tumor of the thyroid gland. Brit. Med. Jour., Lond., 1875, i, 59.	....	Pendulous tumor, size of "small melon."	.....	Nov. 4, 1874. Blunt dissection. Encapsulated growth removed by galvano-cautery.	Recovery.	Meagre description.
39	Spence, Professor, Royal Infirmary, Edinburgh. From notes of Mr. T. F. Chavasse. Excision of a large bronchocele. Lancet, London, 1877, ii, 843.	F. 13 yrs.	Large bronchocele involving the entire gland. Right side of neck larger than left. Duration three years.	Dyspnea; "thrill over præcordia; first cardiac sound at apex somewhat thumping; second sound accentuated. No exophthalmus."	Sept. 28, 1877. Total excision after method of Patrick Watson, except that the isthmus was divided and each lobe removed separately.	† Died within 24 hours; possibly of hyperthyroidism.	Clever operation. Trachea flattened from side to side. Sterno-hyoid, omo-hyoid and thyro-hyoid muscles divided. "Considering the vascularity of the organ, comparatively little hemorrhage occurred." First instance in Great Britain of division of isthmus and removal separately of each lobe.
40	McLeod, Surgeon-Major K. Successful removal of bronchocele. Indian Med. Gaz., Calcutta, 1880, xv, 250.	M. 29 yrs.	Goitre, "size of child's head, more prominent on the right than on the left side." Duration eight years.	Respiration and deglutition not impeded.	July 22, 1880. Excision of entire gland, according to the method of Watson, the author states. Antiseptic precautions.	Recovery.	From the author's description of the operation one would conclude that the method employed was not precisely Watson's. Professor McConnel, who examined the specimen, compared its size to a man's fist.
41	Purcell, F. A. Cancer Hospital, Brompton. Removal of the right lobe of the thyroid. Lancet, Lond., 1880, ii, 339.	F. 23 yrs.	Tumor, size of duck's egg, right side of neck, extending from about third ring of trachea to upper border of thyroid cartilage, overlapped by edge of sterno-mastoid muscle. Thickening of isthmus. Duration three years.	.....	July 20, ——. Blunt dissection and excision, right lobe and isthmus. Antiseptic precautions, including carbolic spray.	Recovery.	The tumor was probably an adenoma and presumably enucleable.
42	Rose, W. Tumor of thyroid; removal. Brit. Med. Jour., Lond., 1881, i, 232.	F. 27 yrs.	Bronchocele, size of a turkey's egg, right lobe. Duration eight years.	Dyspnea; suffocation; pain.	Dec. 16, 1880. Blunt and bloodless enucleation and ligation of pedicle with "loop of carbolized catgut."	Recovery.	"The tumor was found to be composed of hypertrophied gland tissue." It was, presumably, an adenoma.
43	Whitehead, W., F. R. C. S., F. R. S., Edin., Manchester Royal Infirmary. Excision of the thyroid gland. Brit. Med. Jour., Lond., 1881, ii, 779.	F. 51 yrs.	Pendulous goitre extending from thyroid cartilage to sternum. Both lobes enlarged. Duration 30 years.	Dyspnea; suffocation; hoarseness.	May 21, ——. Excision of entire thyroid gland by Watson's method. Antisepsis.	Recovery.	June 29, ——. "The voice has been daily improving, and in every other respect the patient had regained perfect health."

TABLE III.—GREAT BRITAIN AND IRELAND.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
44	Pitts, B., Resident Surgeon, St. Thomas's Hospital. Case of bronchocele in which the thyroid was removed during an attack of dyspnea. Case I. Tr. Path. Soc., Lond., 1882, xxxiii, 364.	M. 15 yrs.	"Bronchocele." Duration eight years.	Dyspnea.	Oct. 26 (1881?). Preliminary venesection from jugular vein; only 1½ ounces dark blood flowed. Tracheotomy. Gland was removed "without the loss of any material additional blood."	† Died the day after operation.	Meagre report.
45	*Idem.* Case II, p. 365.	F. 33 yrs.	Large bronchocele mainly on left side. Duration "ever since she could remember."	Great dyspnea; stridulous breathing; voice hoarse; left vocal cord paralyzed.	Dates not given. Op. I.—Gland incised. Op. II.—Gland incised. Op. III.—Tracheotomy.	† Died about six weeks after first operation.	Operations undertaken in attacks of extreme dyspnea.
46	Barker, A. E. Excision of small goitre: recovery. Brit. Med. Jour., Lond., 1883, i, 1066.	F. 21 yrs.	Tumor of right lobe, 3 inches in transverse diameter, 2 inches in vertical. Evidently an adenoma. Duration seven years.	Dyspnea, paroxysmal at times; anemia and "vascular excitement."	Aug. 24, 1881. Excision of right lobe. Vessels tied as encountered.	Recovery.	Prior to operation had been treated with leeches, injection of iodine, seton, electricity.
47	May, Bennett, Queen's Hospital, Birmingham. Case of excision of large bronchocele, with preliminary tracheotomy. Brit. Med. Jour., Lond., 1883, i, 1227.	F. 42 yrs.	Large tumor "covering the trachea from the hyoid bone down to the sternum." Duration 20 years.	Dyspnea; cough; voice faint and husky; slight exophthalmus.	(1881?). Preliminary tracheotomy. Excision.	† Died four days post operation.	Treated with injections and with hydrofluoric acid, iodine, ergotin, etc., by mouth. Tapped and only blood obtained. Death "apparently from suppurative bronchitis." Operator states that it was "probably an adenoid tumor undergoing sarcomatous change."
48	Stoker, W. T., F. R. C. S., professor anatomy, Royal College Surgeons, Ireland. On removal of the thyroid gland. Tr. Acad. Med., Ireland, Dublin, 1883, i, 231, 295.	M. 17 yrs.	"Enormous goitre involving the entire gland." "Hanging down as low as the abdomen." Duration since birth.	"Cretinish"; constant cough; laryngeal irritation; stridulous breathing; "impending death."	March 10, 1882. Op. I.—Excision of right lobe and isthmus. Two and one-half hours. March 8, 1883. Op. II.—Excision of left lobe. Two hours. Antiseptic precautions.	† Died fifth day after second operation, sepsis and pulmonary thrombosis.	Difficult operations, cautiously and admirably performed. Autopsy: Thrombosis of pulmonary artery and of internal jugular, innominate and superior cava veins, due undoubtedly to the infection of the wound which had filled with blood.
49	Jones, Sydney, St. Thomas's Hospital. Enlargement of the thyroid gland in a male, producing pressure on the trachea and serious attacks of dyspnea; removal of isthmus; atrophy of lateral lobes; cure. Lancet, Lond., 1883, ii, 900.	M. 18 yrs.	"Greatly enlarged thyroid gland." Duration seven or eight years.	Dyspnea.	March 17, 1883. Excision of isthmus between silk ligatures, which were left hanging out of wound "for drainage." Drainage tube.	Recovery. Complete relief.	The trachea was found at operation to be flattened from side to side. May 4, 1883. "The thyroid cannot be felt."

TABLE IV.—UNITED STATES AND CANADA

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
1	Harris, Charles, New York, 1807. Gross, S. D., Diseases of the thyroid gland. System of Surgery, Phila., 1882, 6th Ed., ii, 354.	F.	Goitre extending from chin to sternum and from ear to ear. Duration 22 years.	.....	1807. Freed with knife and fingers up to tracheal attachment; base tied off with stout ligature.	Recovery.	Only two small arteries tied.
2	Mott, Valentine, professor of surgery, N. Y. *Ibid.*	.....	.....	.....	Removed goitre weighing three pounds.	† Died.	
3	Jameson, H. G., Baltimore, Md. Case of bronchocele relieved by taking up one of the superior thyroid arteries. American Medical Recorder, Phila., 1822, v, 116.	F.	General enlargement of thyroid gland. More or less circumscribed tumor of left lobe. Duration about 20 years.	Dysphagia; difficulty of speech; strong pulsation of left carotid and superior thyroid arteries.	May 10, 1821. "Superior thyroid artery" ligated with "animal ligature."	Recovery.	Mistaken for aneurism of carotid by many physicians.
4	Smith, N. R., professor of surgery, University of Maryland, Balto., Md. Extirpation of the thyroid gland. North American Archives M. & S. Sci., Balto., 1835, ii, 309.	F. 40 yrs.	Large, somewhat pendulous, tumor of right lobe. Duration presumably 20 years.	Ulceration of skin over lower part of tumor.	Date not given. Probably an enucleation of large adenoma of right lobe.	† Death on the 13th day post operation. Sepsis.	Case fully described in text. Operation skillfully performed. Superior thyroid artery wounded and secured early in operation.
5	Hoyt, O. Tumor of the thyroid gland successfully extirpated. Boston Med. & Surg. Jour., 1847, xxxv, 297.	F. 30 yrs.	Large tumor of left lobe. Duration five years.	Dysphagia; dyspnea.	Aug. 13, 1835. Extirpation of tumor, probably an adenoma. Dissection from below upwards along inner border.	Recovery.	Inferior thyroid artery closed by torsion; furious bleeding from accidentally divided superior thyroid artery controlled by actual cautery applied blindly in pocket. Patient was bled 18 ounces on day following operation.
6	Otis, G. A., Richmond, Va. A report of a case in which an enlargement of the isthmus of the thyroid body was successfully extirpated. Virginia Med. & Surg. Jour., Richmond, 1854, ii, 115.	F. 26 yrs.	Tumor of isthmus, size of hen's egg. Thick fibrous capsule, very vascular interior. Duration 12 years.	Dysphagia; dyspnea.	Sept. 7, 1853. Removed by strangulation; transfixion with two needles armed with double ligatures of silk, the eight ends of which were tied each to the ones adjacent.	Recovery.	"The internal portion of the tumor closely resembled the parenchyma of the placenta, a similitude I borrow from Sacchi, who has noticed this species of goitre." It was "a spongy tissue composed almost exclusively of a congeries of enlarged vessels."
7	Toland, H. H., San Francisco, Cal. Enlargement of the isthmus and right lobe of the thyroid gland with bony deposit; operation; cure. Pacific Med. & Surg. Jour., San Francisco, 1858, i, 53.	M. 26 yrs.	Enlargement of isthmus and right lobe. "Irregular and large portions of bone rested on the trachea." Duration nine years.	Vertigo; dyspnea; aphonia.	Dec. 1, 1857. Short incision into tumor and eventration. Profuse hemorrhage controlled by ligating wall of sac under transfixing tenaculum.	Recovery.	On eventration "blood gushed from the wound in fearful quantity."

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
8	Cooper, E. S., professor of anattomy and surgery, University of the Pacific, San Francisco. Operation for the removal of bronchocele. Death of the patient. Cinn. Lancet & Observer, 1860, iii, 15.	F. 24 yrs.	Circumscribed bronchocele, left side, extending from clavicle to chin. Duration four years.	Tumor apparently so vascular that consultants diagnosed aneurism.	No date. Futile attempts to use écraseur. Excision after preliminary ligation of the carotid.	† Died five hours post operation. Hemorrhage.	Inferior thyroid and four other arteries tied in course of operation. Abstract in text.
9	*Idem.* Cutting away of bronchocele without hemorrhage, with a case. Remarks. Med. & Surg. Reporter, Phila., 1862, viii, 38.	F. 27 yrs.	Bronchocele of isthmus, size of hen's egg. Duration 10 months.	"Mental anxiety."	March 27, 1861. Transfixed above and below, tied, and excised above ligatures.	Recovery.	States, in general way, that he has previously transfixed thyroid tumors so as to include the thyroid arteries and then transfixed the gland in many places and ligated.
10	Voss. Successful removal of thyroid gland. Amer. Med. Times, N. Y., 1862, iv, 10.	F. 54 yrs.	Tumor, size of fist, chiefly in left lobe and slightly substernal. Duration 42 years.	Dysphagia; dyspnea; deflected trachea.	Date not given. Removed by écraseur.	Recovery.	Profuse venous bleeding, unmanageable until écraseur was applied.
11	Smith, T. S., Lexington, Mo. Operation for the removal of a single goitrous tumor of the neck. Amer. Med. Times, N. Y., 1863, vii, 168.	Negro. M. 34 yrs.	Cystic tumor, left side.	.....	July 1, 1863. Ligation of artery supposed to be inferior thyroid; operation abandoned for fear of fatal hemorrhage.	.....	Another large vessel, size of goose quill, arising from subclavian, "dipped into the tumor on the under side, passed through it, and again showed itself running along the superior border of tumor . . . . then dipped into it again." Smith believed this to be the transversalis colli. *Vid.* text for Valentine Mott's observations.
12	Cheever, D. W., surgeon, Boston City Hospital, Boston, Mass. Bronchocele originating in America; operation; recovery. Boston Med. & Surg. Jour., 1866, lxxiii, 332.	F. 24 yrs.	"Solid" tumor, a little to the right and just below the larynx. Size 1½ inches by 2 inches.	.....	July 19, 1865. Excision of entire gland. "No very great hemorrhage." The left lobe at operation was found to be much larger than the right.	Recovery.	Only one of the two cases was operated upon. "The ready removal of it without profuse hemorrhage would seem to indicate early surgical interference with these growths." The descriptions of the growth before and at operation conflict. Am in doubt as to the nature of the enlargement.
13	Greene, W. W., Portland, Me. Successful removal of a large bronchocele. Med. Record, N. Y., 1866-67, i, 441.	F. 45 yrs.	Bronchocele weighing 1 pound 9 ounces. Duration 26 years.	Dysphagia; dyspnea; headache; giddiness.	Aug., 1866? Operation badly described; apparently a one-sided lobectomy.	Recovery.	"Fearful hemorrhage" from veins on exposing the tumor. Pedicle "containing three large arteries," which were his "guides for dividing pedicle into three parts with the fingers."

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
14	Marshall, E. L., Keithsburg, Ill. Extirpation of the entire thyroid gland. Recovery. Chicago Med. Jour., 1867, xxiv, 97.	M. 40 yrs.	Tumor weighing 1 pound 11 ounces. Duration many years.	Dyspnea; attacks of suffocation; headache; despondency.	Jan. 18, 1852. Excision of entire gland. Anesthesia declined by patient. Careful ligation of the four thyroid arteries as preliminary to excision.	Recovery.	Operation admirably performed. Marshall reports a lobectomy by Geo. McClellan, Sr., of Philadelphia. (Date not given.)
15	Warren, J. Mason, Boston, Mass. Large encysted thyroid tumor of the neck. Incision. Recovery. Surgical observations with cases and operations, Boston, 1867, 506.	F. 56 yrs.	Large cystic tumor occupying whole front of neck, from chin to sternum. Duration 54 years.	"Fullness in head."	Op. I.—June 20, 1860. Cyst incised and tent introduced. Op. II.—June 30, 1860. "Sac freely incised and covered with large poultice."	Recovery.	
16	*Idem.* Thyroid tumor. Twice removed. *Ibid.*, p. 507.	F. 35 yrs.	Cyst of right lobe. Subsequent cyst in same situation, size of an apple. Duration about seven years.	First tumor painful. Second tumor caused dyspnea.	Op. I.—Nov., 1851. Extirpation of cyst. Op. II.—May, 1858. Incision of sac and ligation of mouth of sac.	Recovery.	Cyst probably only partially removed at first operation. Repeated hemorrhages for five days after second operation. Sac obliterated by suppuration.
17	Blackman, G. C., professor of surgery, Medical College, Ohio. Pendulous pedunculated bronchocele successfully removed. Amer. Jour. Med. Sci., Phila., 1870, n. s., lix, 93.	F. 36 yrs.	Oblong tumor of isthmus 3½ inches long, circumference 4 inches, "looking much like a banana." Duration 15 years.	Tumor had caused no symptoms. Operation to relieve "unsightly deformity."	Feb., 1869. Extirpation. Blunt dissection; tumor wrenched from its connections.	Recovery.	Tumor being completely isolated was "suddenly wrenched from its connections," thereupon appalling hemorrhage from superior and inferior thyroid arteries. Bleeding controlled by sponges retained by transfixing needle and twisted suture.
18	Greene, W. W., Portland, Me. Three cases of bronchocele successfully removed. Amer. Jour. Med. Sci., Phila., 1871, n. s., lxi, 80. Case II, p. 81.	F. 40 yrs.	Tumor, size of small orange, in right lobe.	Dysphagia.	Oct. 25, 1869. Enucleation.	"Recovery."	Simple operation except for "adhesions to esophagus."
19	*Idem.* Case III, p. 82.	F. 35 yrs.	Tumor "involving both lobes, being of immense size."	Headache; vertigo; dysphagia; dyspnea; aphonia; thrill; bruit. "Pulsated everywhere." Diagnosed aneurism by "a prominent surgeon."	Jan. 20, 1870. Probably a double lobectomy. Vertical transfixion along midline and ligation of "pedicle" on both sides. "Most fearful hemorrhage."	.....	Before operation "considered the chances 100 to 1 that she would die on the table. . . . ." *Vid.* text for author's description.

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
20	Maury, F. F., Philadelphia Hosp. Extirpation of the thyroid gland for cystic enlargement. Case I. Photographic Review of Med. & Surg., Phila., 1871-72, ii, 17.	F. 23 yrs.	Very large cystic goitre, probably of isthmus and right lobe. Duration 14 years.	Dysphagia; pain; slight dyspnea.	April, 1871. Excision carefully performed after ligation of four thyroid arteries.	Recovery.	Operations well performed in bloodless manner.
21	*Idem.* Case II, p. 17.	Sex and age not given.	"Another very large growth" similar to that in case given above.	.....	1871. Precise date not given. Similar operation as in case given above.	† Died three weeks post operation. Pneumonia.	The operation was practically bloodless. The patient recovered normally and at the time of death the wound was almost healed.
22	Hodder, E. M., F. R. C. S., Eng., professor obstetrics, Trinity Hospital, Toronto, Canada. Fibro-cystic disease of the right half of the thyroid gland and its removal. Canada Lancet, Toronto, 1873, v, 159.	F. 18 yrs.	Tumor, size of pullet's egg, at right side of the larynx. (Fibro-cystic.) Duration 2½ years.	Dysphagia; "voice seriously affected."	Op. I.—April 10, 1872. Unnamed surgeon removed "upper portion only of the tumor." Op. II.—Oct. 31, 1872. By Hodder. Enucleation-excision of right lobe, which was hypertrophied and contained an adenoma.	Recovery.	Voice somewhat restored. Dysphagia disappeared. Superior and inferior thyroid arteries were the only ones which required ligation.
23	Fenwick, G. E., Professor of clinical surgery, McGill University, Montreal, Canada. A case of fibro-cystic bronchocele. Removal of the right half of the thyroid body. Canada Med. & Surg. Jour., Montreal, 1873, i, 208. Case, p. 211.	F. 21 yrs.	Fibro-cystic tumor. "Huge central mass and two lateral" portions. Duration 18 years.	Dyspnea.	About June 8, 1872. Excision of both lobes. Ligation of superior and inferior thyroid arteries "which appeared small." Tumor twice tapped previously.	Recovery.	Presumably an excision of both lobes. The tumor consisted of three distinct lobes. A ligature was applied to the pedicle over trachea. Creditable operation.
24	Milligan and Tupper, Wabasha, Minn. Removal of right lobe of the thyroid gland, for cystic degeneration. Med. & Surg. Reporter, Phila., 1875, xxxii, 361.	F. 40 yrs.	Large cystic tumor, right lobe. Duration a number of years.	Anxiety; nervousness; slight dyspnea; slight dysphagia.	No date. Enucleation and removal by écraseur, right lobe.	Recovery.	Relatively trivial operation.
25	Nelson, W., Physician accoucheur to the Female Home, etc., Montreal. Fibro-cystic bronchocele. Operation and recovery. Canada Med. Record, Montreal, 1875-76, iv, 79.	F. 32 yrs.	"Fibro-cystic bronchocele, size of small teacup," in left lobe. Duration 16 years.	Difficulty in breathing at times.	Oct. 24, 1874. Probably an enucleation of an adenoma.	Recovery.	Left superior thyroid artery ligated in course of operation.

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
26	Hamilton, Frank H., New York. Division of isthmus of the thyroid gland to relieve dyspnea in bronchocele. Med. Record, N. Y., 1876, xi, 4.	M. 50 yrs.	Large bronchocele which encircled the trachea.	Dyspnea so excessive as to necessitate support of tumor by an attendant for three days prior to the operation.	Jan. 8, 1849. Division of isthmus and removal, perhaps, of part of goitre without relief of dyspnea. Hence tracheotomy.	† Died three days and four hours post operation.	Cause of death not stated.
27	Gay, G. W., Massachusetts General Hospital, Boston, Mass. Goitre. Bost. Med. & Surg. Jour., 1876, xciv, 727.	F. 20 yrs.	Solid tumor 6 inches x 8 inches. Duration two years.	Slight tracheal obstruction.	March 25, 1876. Enucleation of tumor—probably adenoma. Pedicle in midline transfixed and tied.	Recovery.	Simple operation. Carbolic acid dressing. First case in America in which mention is made of an antiseptic. Year of Lister's visit to America.
28	Homans, J., Carney Hospital, Boston, Mass. Cystic adenoma of the thyroid; excision; cure. Bost. Med. & Surg. Jour., 1876, xciv, 44.	F. 32 yrs.	Cystic adenomata of isthmus of left lobe. Duration eight years.	Dyspnea.	Op. I.—Nov. 21, 1875. Excision-enucleation of tumor over trachea. Cretaceous contents. Op. II.—Dec. 15, 1875. Excision-enucleation of tumor of left lobe.	Recovery.	After first operation: Left vocal cord immovable. Operation carefully performed by blunt dissection and in fairly bloodless manner.
29	Willoughby, W. A., Colborne, Ontario. Sinclair, J. A., Removal of right thyroid gland. Canada Lancet, Toronto, 1876-77, ix, 73.	M. 19 yrs.	Right thyroid gland enlarged. (Somewhat larger than human heart.) Duration four years.	Pressure on larynx. "Death from dyspnea was likely soon to result."	Date not given. "Removal of the right thyroid gland." Probably an enucleation of an adenoma.	Recovery.	
30	Miner, J. F., Sisters of Charity Hospital, Buffalo, N. Y. Feasibility of extirpating the thyroid gland in some cases of disease, with report of a case. Buffalo Med. & Surg. Jour., 1876-77, xvi, 323.	M. 15 yrs.	Cystic tumors of right gland. Duration eight years.	Dyspnea.	Enucleation. No large vessels encountered.	Recovery.	Profuse bleeding from small vessels at base of tumor seared by actual cautery.
31	*Idem*: Wall, C. A., Removal of the thyroid gland. buffalo Med. & Surg. Jour., 1877-78, xvii, 207.	M. 42 yrs.	Large calcified and cystic adenoma of isthmus. Duration 23 years.	Slight suffocation at night.	Oct. 25, ——. Enucleation. The inferior thyroid arteries were ligated and divided.	Recovery.	Extirpation of tumor composed of cysts and calcified masses, measured 9 inches in circumference, 3¾ inches in breadth, 4 inches in length, 2½ inches in thickness. The ligatures of silk were left long.
32	Fuller, Wm. Successful removal of right lobe of thyroid gland by the knife. Detroit Lancet, 1878, i, 883.	F. 40 yrs.	Tumor, size of an orange, right lobe.	Neuralgia in back of neck, shoulder and head; tingling sensation in the arms and hand.	April, 1878. Excision-enucleation of right lobe—partly substernal. Superior thyroid artery accidentally torn and secured with difficulty.	Recovery.	"The wound was closed when suppuration was fully established, and the ligatures came away slowly during three or four weeks." Pedicle ligated with waxed cobbler's thread.

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
33	McLean, R. A., lecturer on anatomy University of California. Two successful cases of extirpation of the thyroid gland for fibro-cystic tumors. Case I. Western Lancet, San Francisco, 1878-79, vii, 263.	F. 56 yrs.	Large "fibro-cystic tumor." Duration about 15 years.	Pain; suffocation; dysphagia.	Op. I.—Sept., 1877. Free incision into the sac; drainage until healed from bottom. Op. II.—Oct. 15, 1877. Excision of left lobe and isthmus; possibly of right lobe also.	Recovery.	A portion of the anterior wall of the pharynx and the greater cornua of the hyoid bone were cut away in course of the operation. "Branches of the inferior and superior thyroid arteries were cut and tied, but the hemorrhage was insignificant."
34	McLean, R. A., San Francisco Female Hospital. *Ibid.* Case II, p. 265.	F. 30 yrs.	Large fibro-cystic tumor. Duration 14 years.	Pain.	Jan. 16, 1878. "Enucleation of tumor. A few vessels were cut and ligated."	Recovery.	
35	Maclean, Donald, professor of surgery, University of Michigan. Cystic goitre, complicated by epilepsy. Excision of the cyst. Recovery with complete and permanent cure of the epilepsy. Physician & Surgeon, Mich., 1879, i, 9.	M. 29 yrs.	Cystic goitre, size of an orange.	Sleeplessness; epilepsy.	Cyst tapped twice. March 18, 1876. Enucleation of cyst. Profuse hemorrhage controlled by transfixion ligatures.	Recovery.	The epilepsy followed an injury of the head. Three years post operation: No return of epilepsy.
36	Devecchi, P. Contributions to the study of the radical cure of goitre. San Francisco Western Lancet, 1881, x, 241.	M. 24 yrs.	Large cystic goitre of right lobe and isthmus. Duration eight years.	Dyspnea.	June 16, 1881. Enucleation of cyst.	Recovery.	No large blood vessels were encountered. Operation carefully performed.
37	McGraw, T. A. Operation of the thyroid gland. Detroit Clinic, 1882, i, 1.	.....	.....	.....	.....	.....	Unable to obtain the original communication.
38	Wyeth, J. A., surgeon to Mt. Sinai Hospital, New York. Some cases of goitre recently treated by excision. Med. Record, N. Y., 1882, xxi, 94.	F. 22 yrs.	Tumor of left lobe and isthmus.	.....	July, 1881. Cystic portion of tumor aspirated and injected with tincture of iodine, by Dr. Gerster. Sept. 7, 1881. Excision-enucleation. Superior and inferior thyroid arteries ligated, and finally the pedicle *en masse*.	Recovery.	Cure with aphonia, which is believed to have disappeared. The tumor was probably an adenoma with cystic center, and enucleable.
39	Byrd, W. A., St. Mary's Hospital, Quincy, Ill. Connell, G. W., Extirpation of thyroid gland by enucleation. Med. & Surg. Reporter, Phila., 1882, xlvi, 111.	F. 3 yrs.	Tumor weighing 8 ounces. Duration one year.	Dyspnea.	Dec. 6, 1881. Enucleation.	Recovery.	

TABLE IV.—UNITED STATES AND CANADA.—CONTINUED

No.	Operator and Publication	Sex and Age	Location and Duration	Symptoms	Operation	Result	Remarks
40	Cheever, D. W., surgeon Boston City Hospital, Boston, Mass. Excision of the goitre. Case I. Med. & Surg. Reports, City Hosp., Boston, 1882, 3 s., p. 130.	F. 36 yrs.	Solid tumor, size of small orange, in front and to right of trachea. Duration four years.	"Great pain."	Date not given. Extirpation by blunt dissection. Pedicle transfixed, ligated; tumor was cut away and the base burned with the galvano-cautery.	Recovery.	Dr. Cheever's operative work may be regarded as typical of the best methods in America of the period. He enucleated small tumors of the thyroid, but considered removal of a large double bronchocele as "out of the question," although in 1865 he apparently removed the entire gland. *Vid.* case No. 12.
41	*Idem.* Case II, p. 131.	F. 23 yrs.	Solid tumor, size of lemon, to right of midline, and small one, correspondingly situated, on left side. Duration two years.	.....	Dec. 14, ——. Extirpation by blunt dissection. Transfixion ligatures of pedicle, tumor cut away, and base burned with the galvano-cautery.	Recovery.	Wound dressed with carbolized oil and syringed daily.
42	*Idem.* Case III, p. 133.	"Young girl."	Small circumscribed tumor of "one lobe."	.....	Date not given. The tumor "was removed without hemorrhage." No particulars.	Recovery.	Described in only three lines.
43	*Idem.* Case IV, p. 133.	"Young lady."	Bronchocele. Small circumscribed tumor.	.....	Date not given. Tumor "removed without trouble."	Recovery.	A four-line description.
44	McIntyre, J. H. Reported by Watkins, W. W., St. Louis, Mo. A partial extirpation of a remarkably large bronchocele. St. Louis Med. & Surg. Jour., 1883, xlv, 409.	M. 29 yrs.	General enlargement of thyroid gland. Duration nearly eight years.	"Impeded cerebral circulation"; eyes somewhat prominent; mental anxiety.	May 10, 1883. Left lobe removed by "the tear-process or enucleation." Left superior thyroid artery torn through near its origin. Operator unable to determine whether inferior thyroid artery had been divided or not.	Recovery.	Probably a mild case of Graves' disease. Three months post operation: The remaining portion of the gland (the pyramid and right lobe) had decreased one-third and the cerebral symptoms had nearly disappeared. Crude operation.
45	Wyeth, J. A., surgeon to Mt. Sinai Hospital, New York. Goitre. Excision. Cure. Med. Record, New York, 1883, xxiv, 566.	F. 16 yrs.	Circumscribed tumor of right thyroid lobe. Duration four years.	.....	Oct. 10, 1883. Excision-enucleation. Superior and inferior thyroid arteries ligated, and finally the pedicle en masse.	Recovery.	The remains of the right lobe probably removed, as well as the tumor.

TABLE V.—GERMANY, AUSTRIA AND SWITZERLAND

Author and Publication	Number of Cases
Hildanus, Fabric. (1596)	1
Hildanus, Fabric., ii, 399; Hildanus, F., Opera, p. 216, Obs. xxxv; Langenbeck, Chirurgie, Bd. v, 306. (Ref., Günther.)	
Vogel, A. F.	1
Observationes quaedam chirurgicae defendit, Kiliae, 1771. (Ref., Günther.)	
Freitag, J. H. (about 1694)	1
Epistola de glandulae thyroideae, partim osseae, partim meliceridis fromam referentis Extirpatione, Lipsiae, 1778; Weiz, Neue Auszüge aus Dissert. f. Wundärzte, Bd. iv, 66; Langenbeck, Chir., Bd. v, 304. (Ref., Günther.)	
Eichenberg	1
Epheremid. med. physic. germ. acad. Natur. curios. Dec. ii. Ann. v, 453; Langenbeck, Chirurgie, Bd. v, 304. Anm. (Ref., Günther.)	
Kergel, Saxony (about 1800)	1
Bernstein, J. G., Praktisches Handbuch f. Wundärzte, Leipzig, 1800, N. Aufl., Th. iii, 604.	
v. Walther, Ph.	1
Neue Heilart des Kropfes durch die Unterbindung der oberen Schilddrüsenschlagadern, u. s. w., Sulzbach, 1817. (Ref., Chelius, M. J.)	
v. Klein, Stuttgart	3
Jour. d. Chir. u. Augen-Heilk., Berlin, 1820, i, 106.	
Zang	1
Höring, Rust's Magazin f. d. gesammte Heilk., Berlin, 1820, vii, 314.	
Hedenus, J. A. W., Dresden (about 1800)	6
Jour. d. Chir. u. Augen-Heilk., Berlin, 1821, ii, 237.	
v. Walther, Ph.	1
Jour. d. Chir. u. Augen-Heilk., Berlin, 1821, ii, 584.	
Fritze, Cl.	1
Hedenus, A. G., Tractatus de glandula thyreoidea, Lipsiae, 1822, 256, footnote 612.	
Gräfe, Berlin (1820)	3
Hedenus, A. G., Tractatus de glandula thyreoidea, Lipsiae, 1822, 255, 276, 292.	
Ohle, Dresden	1
Hedenus, A. G., Tractatus de glandula thyreoidea, Lipsiae, 1822, 291.	

Author and Publication	Number of Cases
Weiss, Dresden	1
Hedenus, A. G., Tractatus de glandula thyreoidea, Lipsiae, 1822, 291.	
Wedemeyer	1
Neue Bibliothek f. d. Chir. u. Ophthalmologie (Langenbeck), Göttingen, 1822, iii, 185.	
Schmidt, H., Paderborn	1
Zartmann, De strumae extirpatione, Dissert., Bonn., 1829, 26. (Ref., Günther.)	
v. Walther, Ph.	2
Zartmann, De strumae extirpatione, Dissert., Bonn., 1829, 22 and 26 (Ref., Günther.)	
Mandt, Greifswald (about 1832)	1
Rust's Magazin f. d. gesammte Heilk., Berlin, 1832, xxxvii, 387.	
Langenbeck, Göttingen	1
Langenbeck's Chirurgie, 1834, v, 303.	
Madelung, Gotha (1844-46)	1
Schmidt's Jahrb., Leipzig, 1847, lvi, 279.	
Dieffenbach, J. F., Leipzig	1
Dieffenbach, Die Operative Chirurgie, Leipzig, 1848, ii, 331.	
Pirogoff, N.	1
Rapport médical d'un voyage en Caucase, St. Pétersbourgh, 1849; Schmidt's Jahrb., 1850, lxvii, 116. (Ref., Günther.)	
Schuh, Wien	3
Wien. med. Wochenschr., 1859, ix, 641 and 657.	
Klein, A.	1
Dissert., Tübingen, 1860, 30.	
Schuh, Wien	1
Wien. med. Wochenschr., 1860, x, 145.	
Meeh, Brackenheim	4
Med. Corresp.-Bl. d. württemb. ärztl. Vereins, Stuttgart, 1861, xxxi, 227.	
Name of operator not given	2
Deutsche Clin., 1861, 167. (Ref., Günther.)	
Middeldorpf, P., Breslau	1
Lebert, Krankheiten der Schilddrüse, Breslau, 1862, 220.	
Franke, Leipzig (about 1834)	1
Günther, G. B., Lehre v. d. blutigen Operationen am menschlichen Körper, Leipzig u. Heidelb., 1864, 369.	
Bovet, A.	1
Gaz. des. hôp., Paris, 1865, xxxviii, 105.	

Author and Publication	Number of Cases
Sick, P., Stuttgart	1
Med. Corresp.-Bl. d. württemb. ärztl. Vereins, Stuttgart, 1867, xxxvii, 199.	
Gärtner, Stuttgart	1
Med. Corresp.-Bl. d. württemb. ärztl. Vereins, Stuttgart, 1867, xxxvii, 303.	
Hofmockl,	2
Wien. med. Presse, 1869, x, 39, 64, 90.	
Emmert, Bern	3
Brière, V., Inaug. Dissert., Lausanne, 1871, 40, 41, 42.	
Hopmann, Köln	1
Deutsche Zeitschr. f. Chir., Leipzig, 1873, ii, 185.	
Lücke, A., Bern (1865-72)	10
Deutsche Zeitschr. f. Chir., Leipzig, 1873, ii, 337.	
v. Chelius, F., Dresden	5
Jahresb. d. Gesellschaft f. Natur- und Heilk., Dresden, 1874, 13.	
Kappeler, O., Münsterlingen	28
Chir. Beobachtungen aus dem Thurgauischen Kantonsspital Münsterlingen, 1865-70, Frauenfeld, 1874, 99 (five cases). Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 314 (1868-1882, 28 cases).	
Gärtner, Stuttgart	3
Med. Corresp.-Bl. d. württemb. ärztl. Vereins, Stuttgart, 1876, xlvi, 233.	
Küster, E., Berlin (1875)	1
Bruberger, Deutsche Mil. ärztl. Zeitschr., Berlin, 1876, v, 453.	
v. Bruns, V., Tübingen (1851-70)	28
Süskind, Inaug.-Abhandl., Tübingen, 1877.	
Rose, E. (1878)	5
Arch. f. klin. Chir., Berlin, 1878, xxii, 1.	
Billroth, Th. (1860-81)	84
Wölfler, A., Wien. med. Wochenschr., 1882, xxxii, 5.	
Martin	1
Rev. méd. de la Suisse romande, Genève, 1882, ii, 590.	
v. Riedel	1
Wien. med. Wochenschr., 1882, xxxii, 1109.	
Kocher, Th., Bern (1872-83)	102
Arch. f. klin. Chir., Berlin, 1883, xxix, 300.	
v. Bruns, V. and P., Tübingen (1877-81)	14
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 317.	
Kuhn, St. Gallen (1878-80)	8
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 318.	

Author and Publication	Number of Cases
Czerny, Heidelberg (1872-81)	11
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 319.	
Maas, Freiburg i. B. (1878-81)	10
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 320.	
Kottmann, A., Solothurn (1879-81)	9
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 321.	
Bircher, Aarau	5
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 328.	
Kaufmann, Zürich (1880-81)	3
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 329.	
Niehans, P., Bern (1880-81)	3
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 329.	
Baumgärtner, Baden-Baden	2
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 329.	
Borel, F., Neuchâtel (1877-82)	15
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 330.	
Haffter, Frauenfeld (1881-82)	4
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 333.	
Courvoisier, Riehen (1881)	2
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 334.	
Berney, A., Rolle (1855)	1
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 335.	
Emmert	2
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
Krebs	3
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
Gussenbauer	11
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
Albert	9
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
Boéchat	1
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
Schläpfer (1881)	1
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255.	
v. Muralt, W., Zürich	108
Kocher, Th., Arch. f. klin. Chir., Berlin, 1883, xxix, 255, footnote.	
Julliard, G.	31
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Total	575

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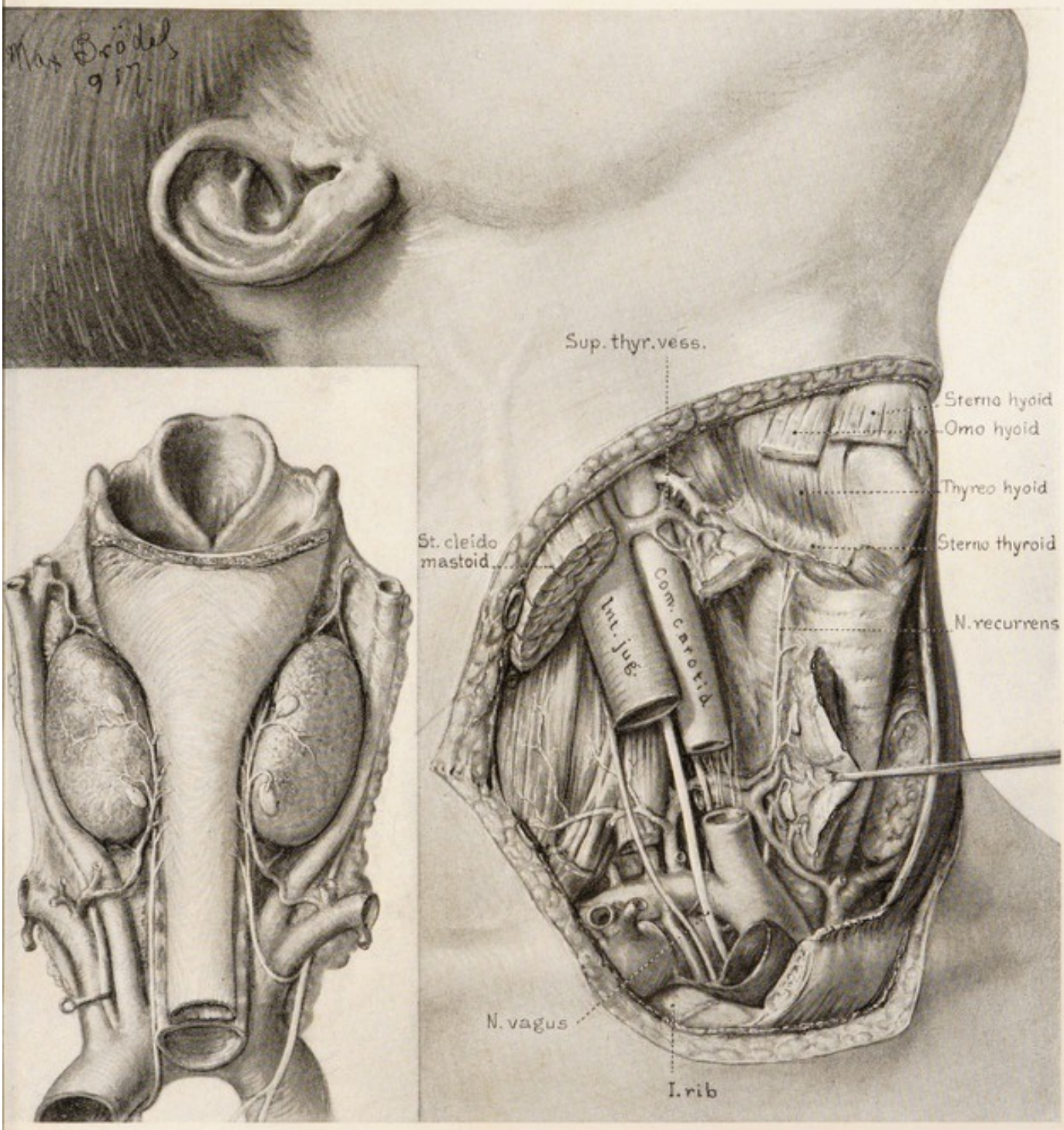
370. *Idem:* Ueber die Entwickelung u. den Bau d. Kropfes. Arch. f. klin. Chir., Berlin, 1883, xxix, 1.
371. Wyeth, J. A.: Some cases of goitre recently treated by excision. Medical Record, N. Y., 1882, xxi, 94.
372. *Idem:* Goitre—excision—cure. Medical Record, N. Y., 1883, xxiv, 566.
373. Zambianchi, F.: Sulla metodica estirpazione del gozzo. Ann. univ. di med. e chir., Milano, 1883, cclxv, 350. (Reports Bottini's cases, Obs. i to x, 356 to 378).
374. Zang: Höring, Rust's Magazin f. d. gesammte Heilkunde, Berlin, 1820, vii, 314.
375. Zartmann: De strumae extirpatione, Dissert., Bonn, 1829. (Unable to verify.)



Dissection of the operative field. The right lobe of the thyroid gland has been removed in the typical manner, a slice having been left posteriorly in order to preserve the integrity of the parathyroid bodies and the recurrent laryngeal nerve. This slice is drawn toward the midline with a hook. The insert, slightly elaborated by Mr. Broedel, was drawn for the author by Mr. H. M. Evans in 1907 from one of many dissections made by the latter for his study of the arterial supply of the parathyroid glands.

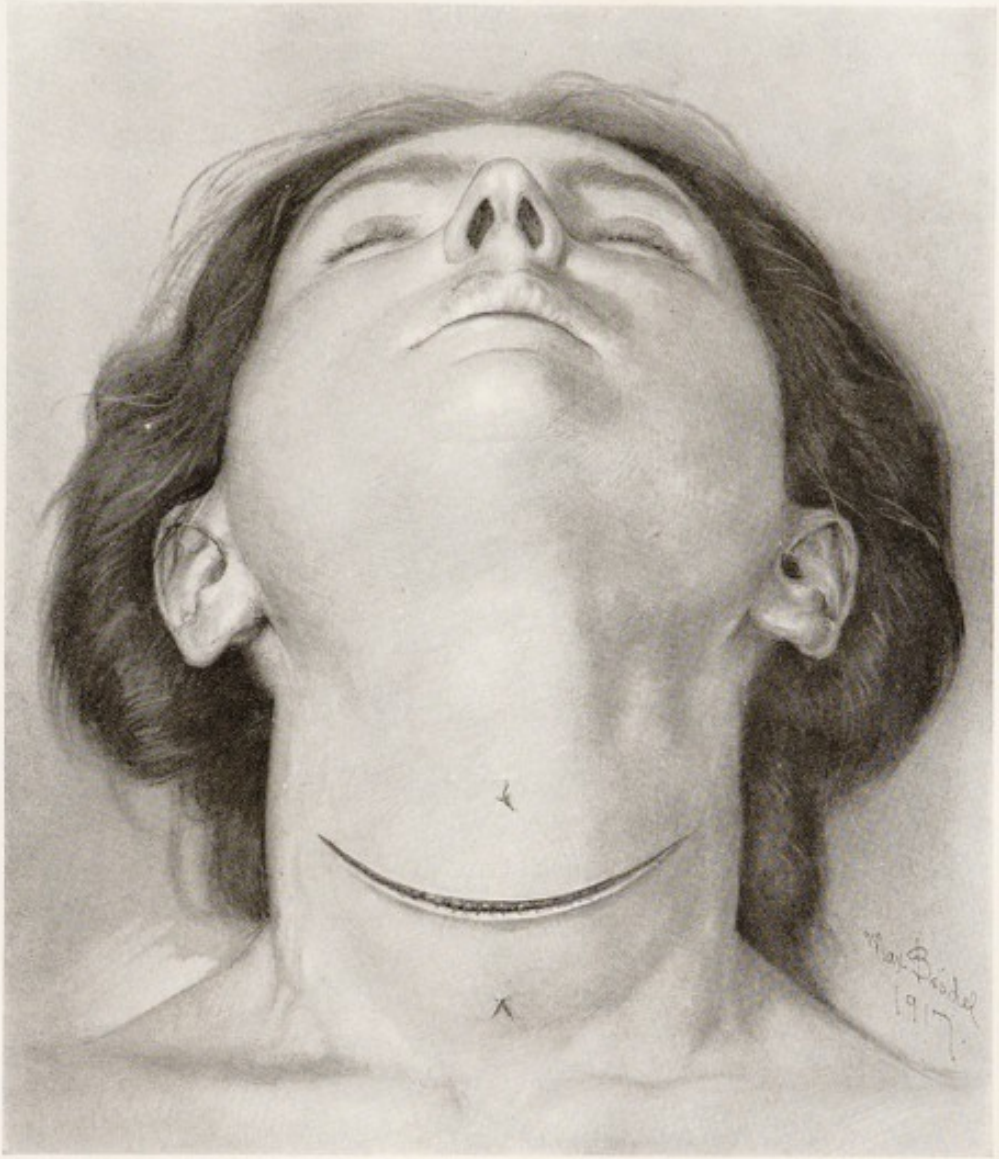


FIG. 1.—The little knots of silk mark the midline and guide the operator in closing the wound.

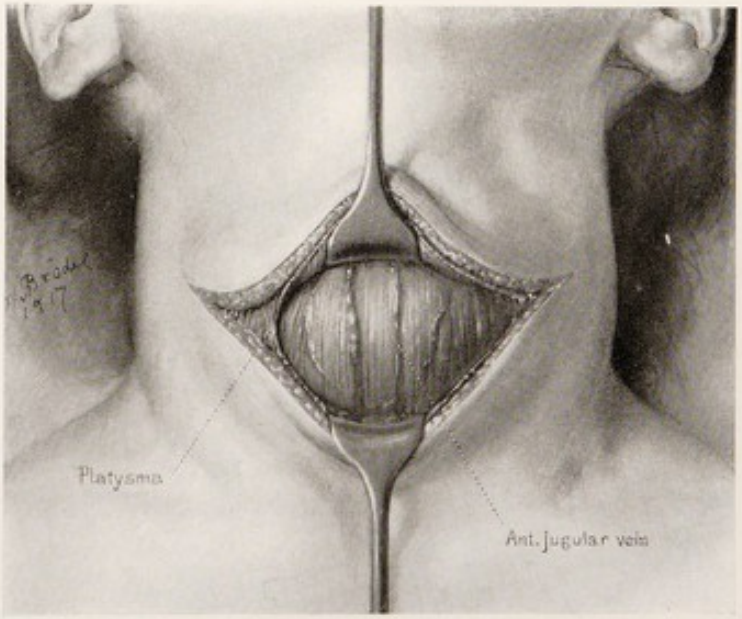


FIG. 2.—The skin and platysma muscle have been divided.

THE OPERATION FOR EXOPHTHALMIC OR HYPERPLASTIC GOITRE.

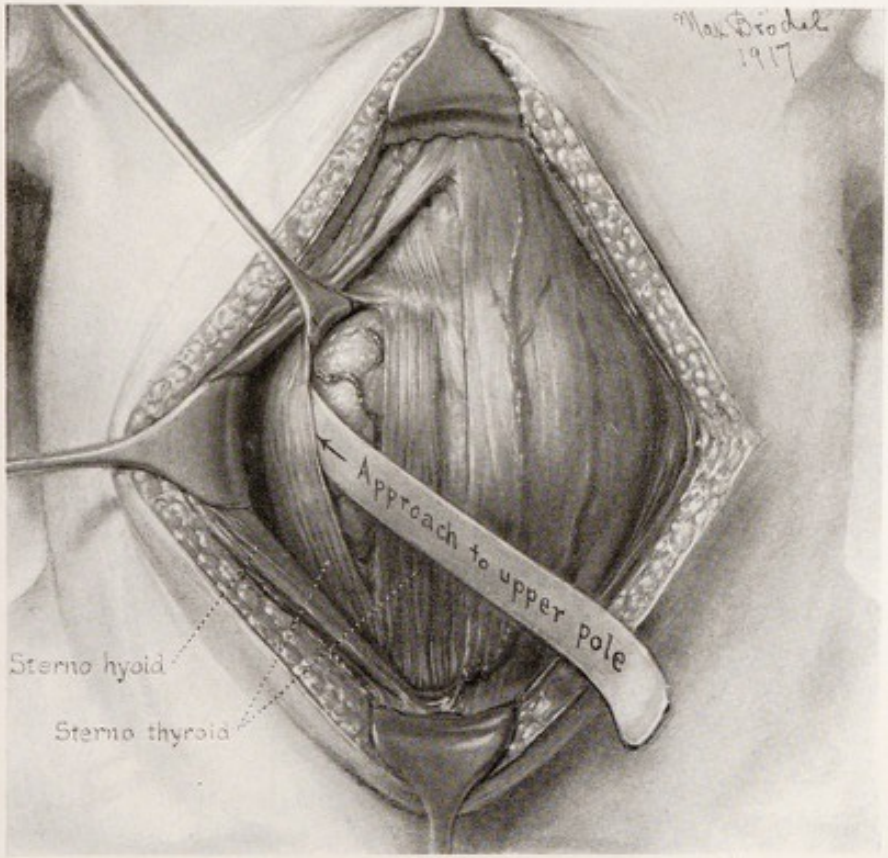


FIG. 1.—The spatula introduced between the gland and the sterno-thyroid muscle is contributed by the artist in order to carry the lettering.

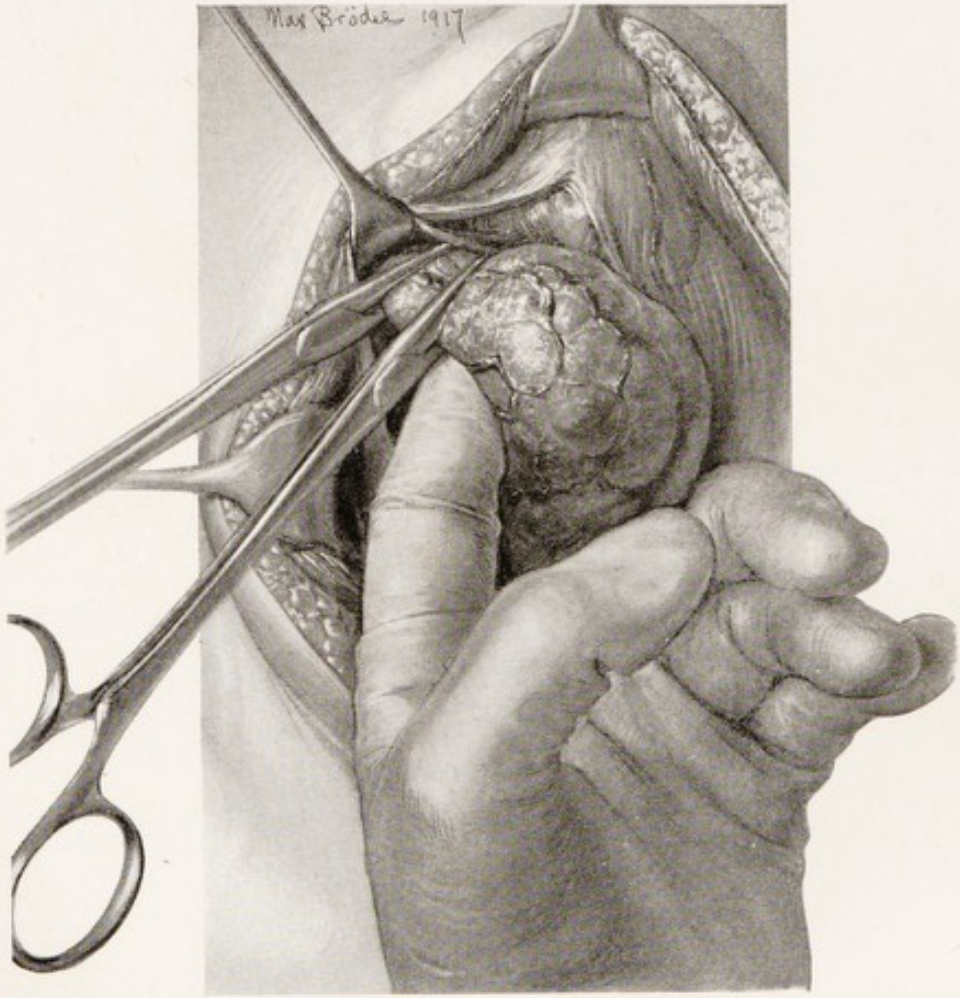


FIG. 2.—At this stage of the operation the muscles are drawn away from the lobe by one broad, deep concave retractor instead of by the two small ones which in this and the preceding drawing serve to define clearly the two retracted muscles. The superior pole is caught between two finely pointed clamps.

THE OPERATION FOR EXOPHTHALMIC OR HYPERPLASTIC GOITRE.

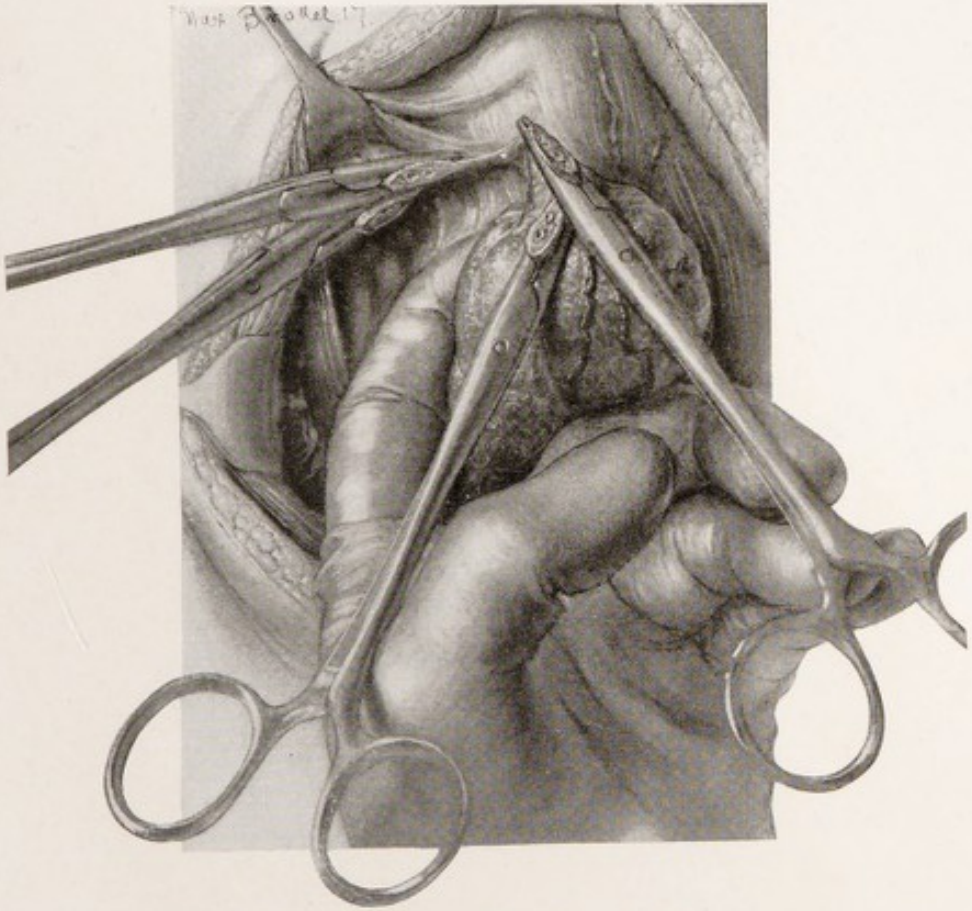


FIG. 1.—The tip of the superior pole has been divided between the clamps.

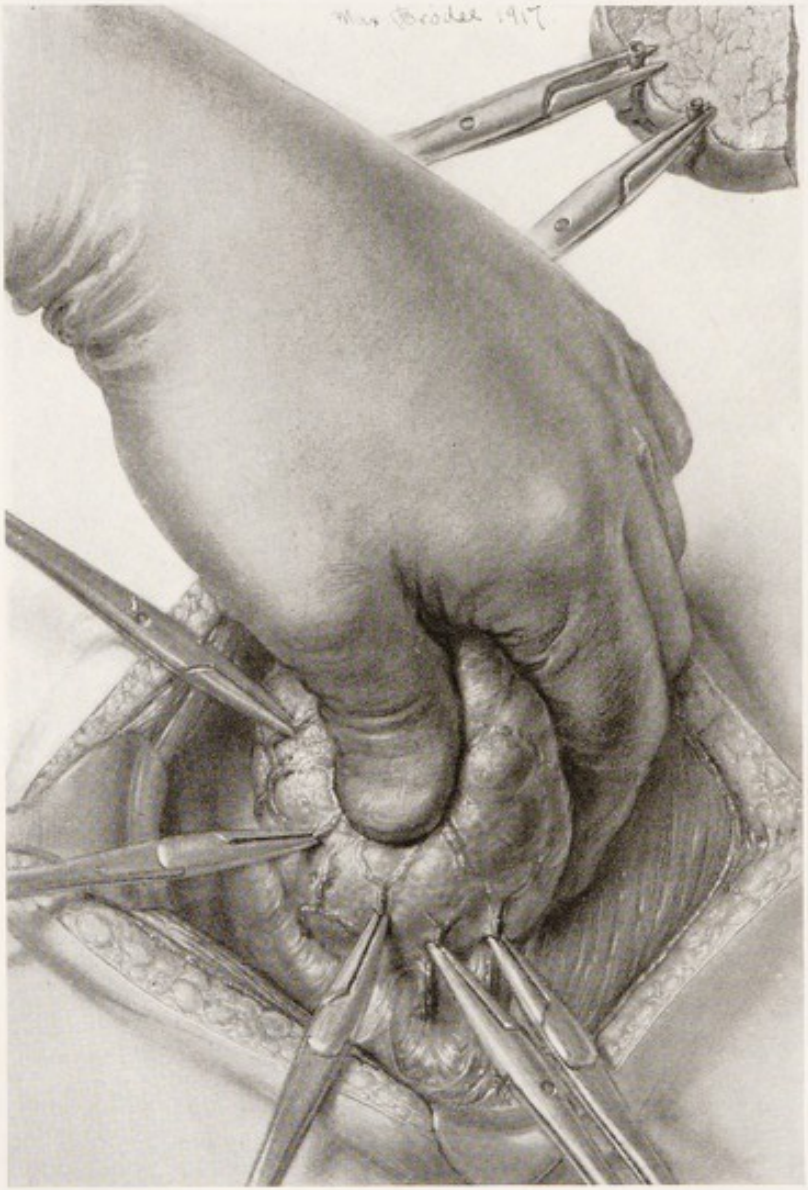


FIG. 2.—The lobe is rolled inwards and the blood vessels have been clamped at a safe distance from the recurrent nerve and the parathyroid glands. Clamps are employed in greater number than is indicated in the drawing.

THE OPERATION FOR EXOPHTHALMIC OR HYPERPLASTIC GOITRE.

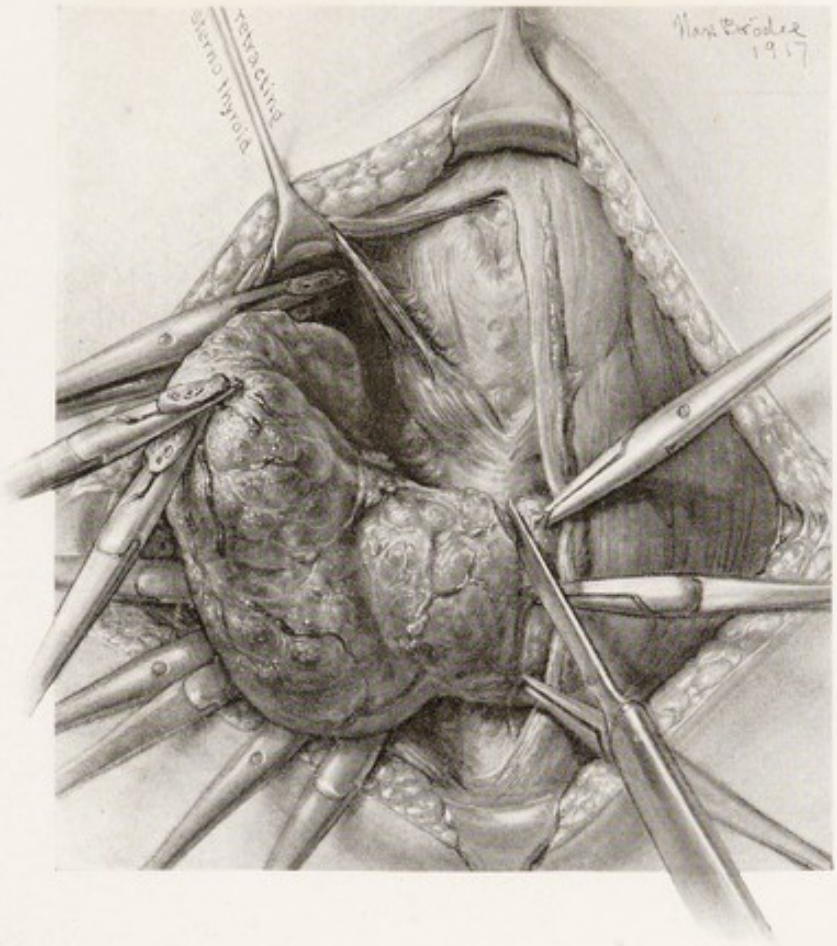


FIG. 1.—The act of dividing the isthmus. Usually, before division, the isthmus is freed from the trachea by a slender blunt dissector and ligated on the hitherto undisturbed side.

FIG. 2.—The isthmus has been divided, and the lobe, rolled outwards, is being sliced through just distal to the girdle of clamps shown in Plate XVII, Fig. 2.

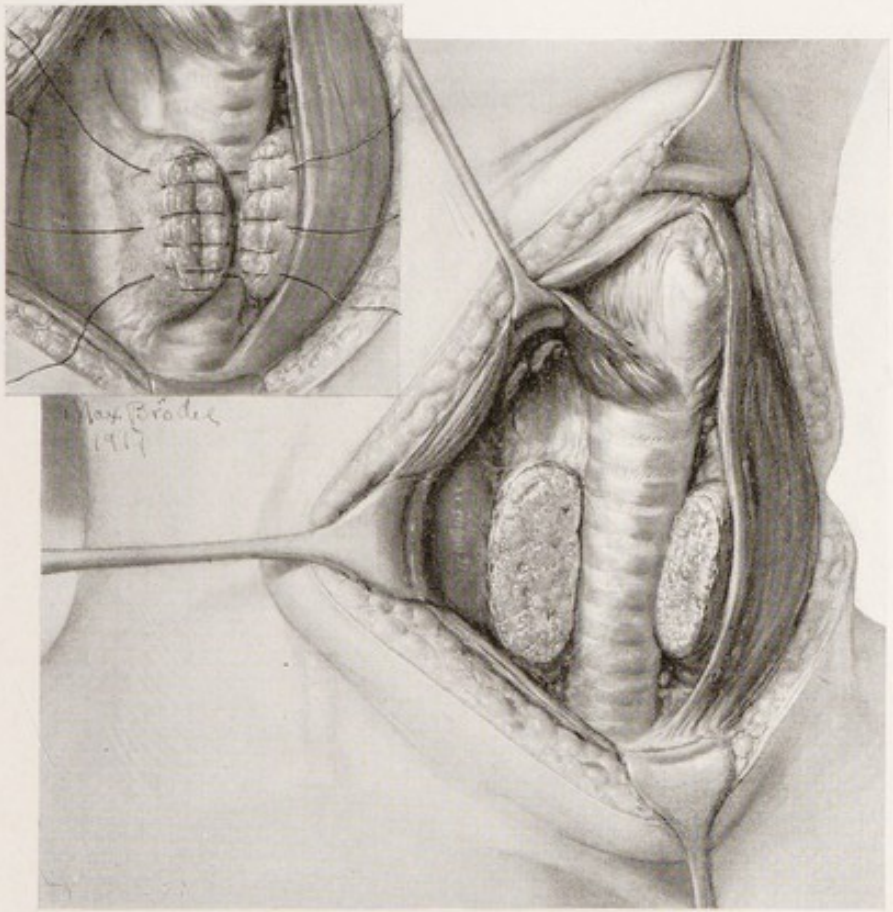


FIG. 1.—Occasionally, but rarely, the stump of the excised lobe rides forward as shown in the insert; and in a few such instances I have sutured it to the stump of the isthmus. The stitches over this stump are usually of the mattress type; in any event they become buried on tying.

FIG. 2.—The wound is closed without drainage. For the sake of clearness the artist has depicted a coarser silk than we use for these sutures.

THE OPERATION FOR EXOPHTHALMIC OR HYPERPLASTIC GOITRE.

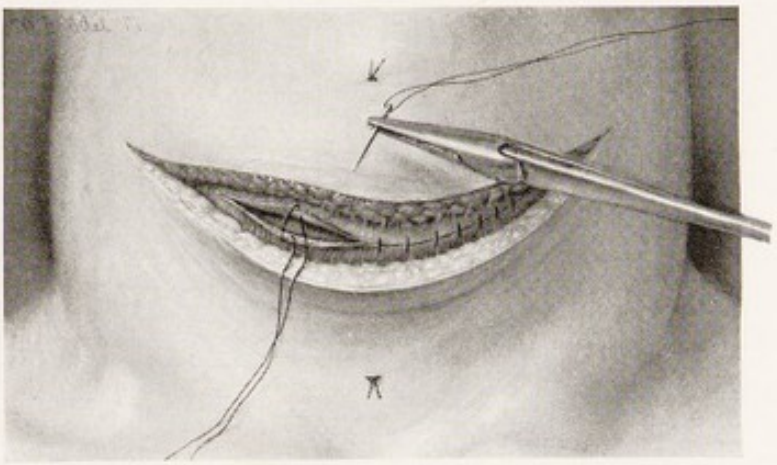


FIG. 1.—The suture of the platysma muscle. Note the short straight needle which is much used in our clinic.

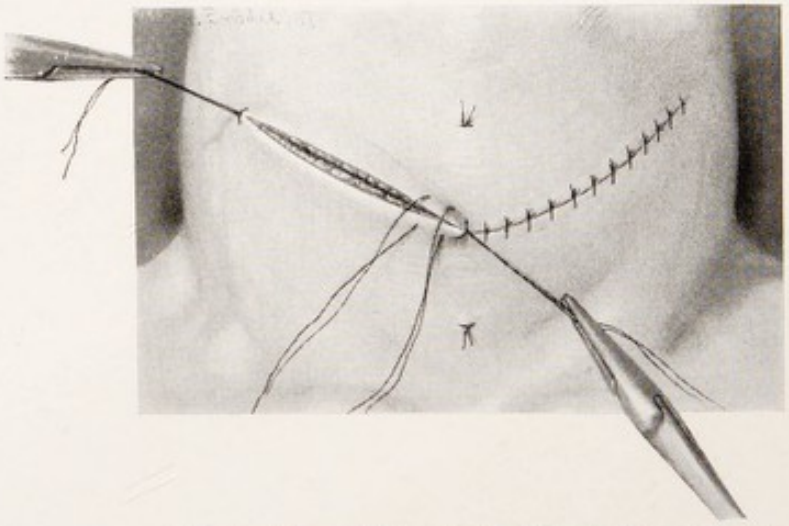


FIG. 2.—Shows the central stitch in line with the landmarks above and below.

THE OPERATION FOR EXOPHTHALMIC OR HYPERPLASTIC GOITRE.

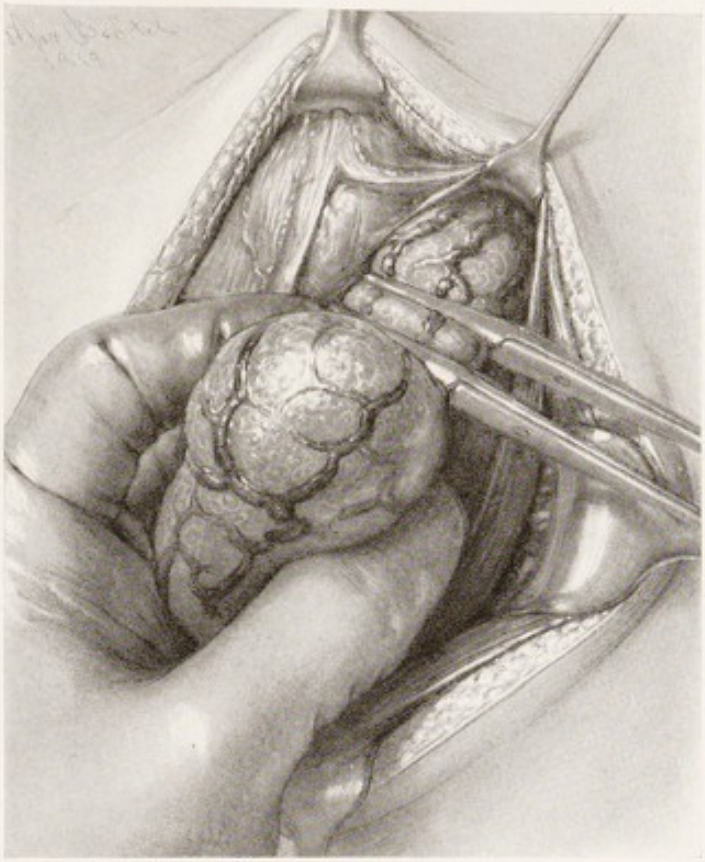


FIG. 1.

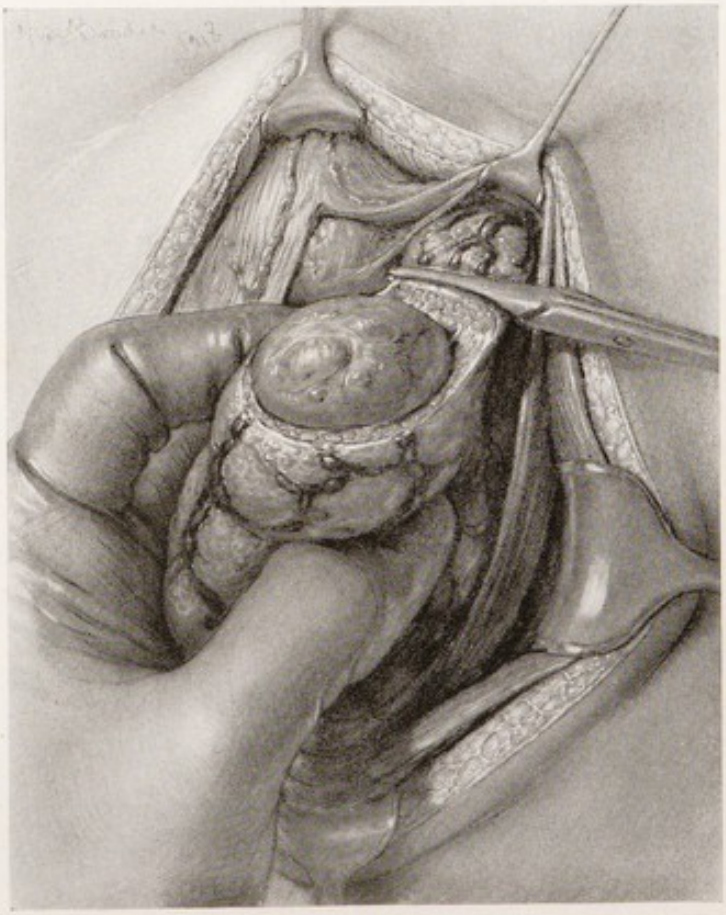
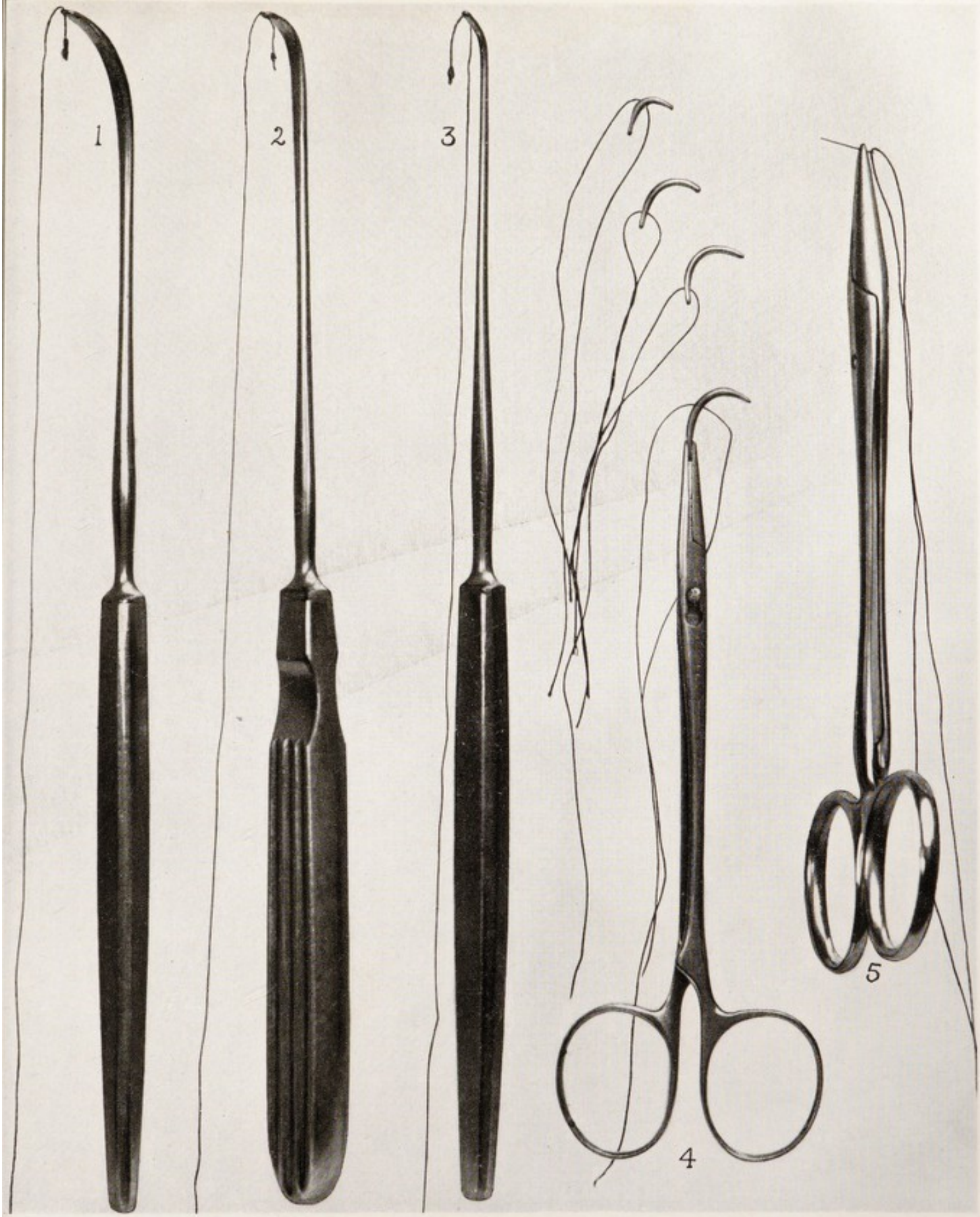


FIG. 2.

FIGS. 1 AND 2.—One of the methods which we employ in enucleating an adenoma. The lower clamp is applied as close as possible to the tumor which partly extrudes itself on removal of this clamp after the incision (Fig. 2) is made between the clamps into or through the superior pole.

ENUCLEATION OF AN ADENOMA.



FIGS. 1 AND 2.—Curved, fine-edged dissectors armed with a thread in the manner described in the text. These instruments are especially useful in the ligation of large deeply situated vessels such as the common iliacs, the innominates (vein and artery) and the left subclavian and carotid arteries within the thorax. The fine thread serves as a leading string for the tape with which we ligate large arteries.

FIG. 3.—Aneurism-needle employed in ligation of the inferior thyroid artery.

FIG. 4.—Mosquito clamp carrying one of the semicircular aneurism-needles; unfortunately, it has lost its original delicate form in the hands of successive instrument makers.

FIG. 5.—This clamp was a decided departure from the forms in use at the time it was designed, about 30 years ago. Except for a modification in the beak it is essentially the same as the clamp made for me in 1878 by Otto and Reiner of New York. The broken off cambric needle in its jaws is a ligature carrier—a form of aneurism-needle we frequently employ.

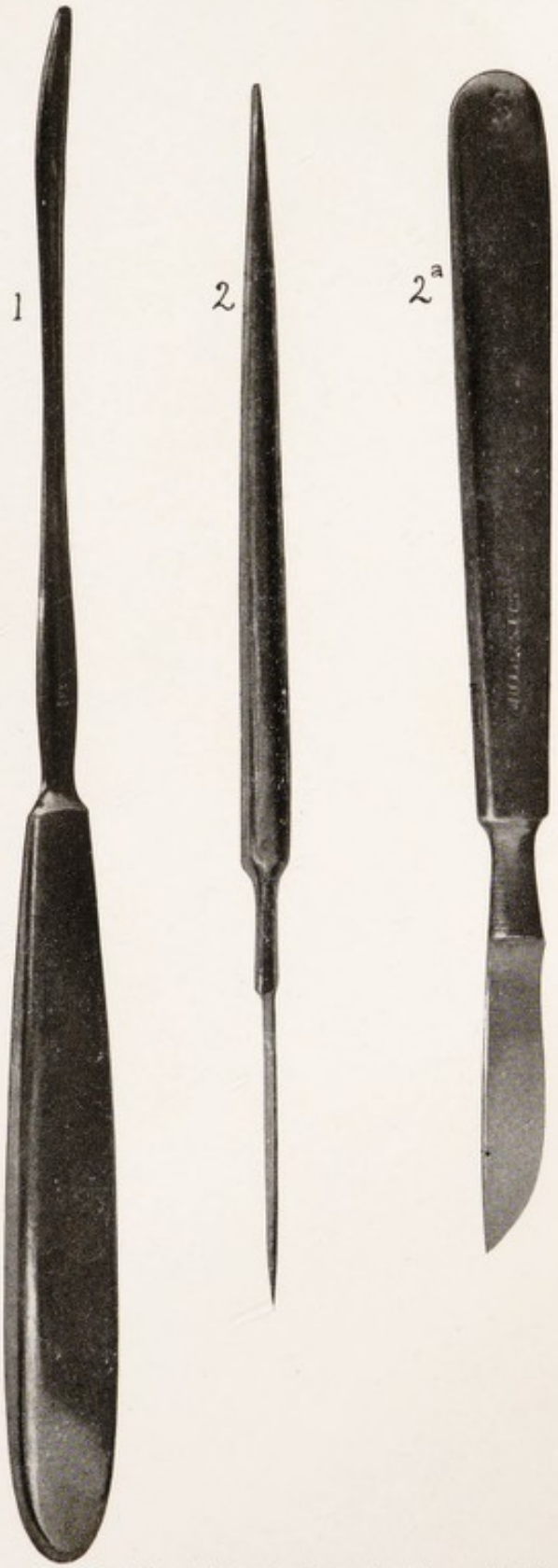
INSTRUMENTS DESIGNED BY THE AUTHOR IN 1888-89 FOR THE JOHNS HOPKINS HOSPITAL.

FIGS. 1 AND 1ª.—Two views of a retractor designed for use in the operation of ligating the inferior thyroid artery. The blades should be very thin, thinner than depicted, in order to take as little space as possible in the small, deep wound.

FIGS. 2 AND 3.—Forms generally used in the clinic.

FIG. 4.—Blood vessel retractor.

INSTRUMENTS DESIGNED BY THE AUTHOR IN 1888-89 FOR THE JOHNS HOPKINS HOSPITAL.



3

FIG. 1.—Blunt dissector for arterial work. The operator should use two of these in freeing an artery, an assistant aiding with a third.

FIGS. 2 AND 2ª.—Two views of the knife. The handle being hollow is well balanced, and its tip, drawn out to a fine edge, makes an excellent dissector.

FIG. 3.—Taken from Günther's *Lehre von den blutigen Operationen am menschlichen Körper*, Leipzig, 1859, Vol. I, Plate 5, opp. p. 36.

INSTRUMENTS DESIGNED BY THE AUTHOR IN 1888-89 FOR THE JOHNS HOPKINS HOSPITAL.