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THE TREATMENT OF GRAVES' DISEASE BY
THYROIDECTOMY.¹

By JAMES J. PUTNAM, M.D.,
Boston, Mass.

EVERY neurologist must have noticed with interest, within the past few years, the growth of a sentiment among the German surgeons in favor of partial removal of the thyroid in the treatment of Graves' disease, a measure which in most neurological text-books, even the most recent, is not spoken of with favor. The number of typical cases in which the operation has been done, is, to be sure, rather small, and the number of surgeons who have done them is smaller still, but the proportion of successful results is very large. Thus, Moebius, who was the first to bring strongly into prominence the idea that Graves' disease is a species of thyroid cachexia (*Zsch. f. Nkr.*, 1890), refers to a few cases in most of which a substantial cure was obtained through operation. Wette, in his admirable analysis of Riedel's operations on goitre in general (*Arch. f. Klin. Chir.* vol. xlv.), gives three new cases of partial thyroidectomy in Graves' disease, and a summary of thirty others. Only one of these ended fatally, while in all but one of the rest cure or great improvement was noted. To this collection a dozen typical cases and several analogous cases can now be added. In fact, the history of thyroidec-

¹ Read at the annual meeting of the American Neurological Association, July, 1893.

tomy in general is largely in point, since the symptoms which have made this operation at once desirable and dangerous have been similar, in the majority of cases, to the symptoms of Graves' disease. The literature of the subject is thoroughly summarized by Moebius in Schmidt's *Jahrb.*, for the past few years.

Woelfler, to be sure, in his exhaustive treatise on the surgical treatment of goitre, expresses some doubt as to whether thyroidectomy is really so very useful in true Graves' disease. He thinks that exophthalmus was not present in many of the cases cited in favor of the operation, and that cardiac and nervous symptoms are so common in cases of ordinary goitre that they ought not to count for much in support of the diagnosis.

In view of the cases which have accumulated within the past two years this criticism falls to the ground. Exophthalmus certainly has been cured by operation; and the nervous symptoms attending ordinary goitre cannot be separated by any sharp line from those of true Graves' disease.²

It is curious and interesting to note in this connection that Winckler (*Wiener. Med. Wochenschr.*, 1892, vol. xlii., p. 1521) in discussing the efficacy of nasal operations in Graves' disease, asserts that exophthalmus may be cured in this way, but that exophthalmus does not necessarily mean Graves' disease. The truth is that typical Graves' disease shades off in various directions into partial forms, often of special origins.

In spite of the attractive picture given by the summaries that I have quoted, there are still many questions for which we must find an answer before we can confidently recommend the operation to our patients as a matter of routine. We need to know how complete a cure is to be looked for; whether the severity of the operation is fairly measured by the death-rate; whether the probability of a favorable result is influenced by the manner in which the disease began, that is, whether the thyroid enlargement was the first, and apparently the

² This opinion is also endorsed by F. Müller in an excellent paper in the *Deutsches Arch. für Klin. Med.*, Vol. LI., 1893.

causal element; whether the character of the growth and its size make a difference as to the result; whether there is danger that tetany, myxœdema or other ills will make their appearance, and the like.

Before attempting an answer to these questions, I wish to report one additional case of operation for Graves' disease, done by Dr. J. C. Warren, partly at my suggestion, on a patient previously under treatment in the neurological department of the Massachusetts General Hospital.

The patient was an unmarried woman, twenty-nine years old. She had never been robust, and had had a number of attacks of protracted vomiting at different times in her life. This is noteworthy, because her present illness was ushered in by such an attack. She had the influenza three times within the four years of our visitation with the epidemic, and with each attack this tendency to protracted vomiting showed itself. The last attack of influenza occurred in April, 1892, and the subsequent vomiting continued more or less for several days, confining her to the house and causing great prostration. Immediately after this, the "lump in the neck" was noticed for the first time. It is possible that these attacks of vomiting either caused some irritability of the vagus centres or indicated that it was present. The prominence of the eyes and the palpitation were noticed a few months after the enlargement of the neck.

The patient first presented herself in the Out-Patient Department of the Massachusetts General Hospital in the autumn of 1892. She had already been under treatment at the private hospital of the Good Samaritan, but in spite of complete rest and good care she had failed to improve. While there her larynx was examined by Dr. Algernon Coolidge, and a lack of tension was found but no unilateral paralysis. All the symptoms of a moderately severe form of Graves' disease were present,—tachycardia, exophthalmus, tremor, nervous agitation, dyspnoea—and beside these there was an unusual amount of muscular twitching, of choreiform character. There was a systolic murmur in the mitral area, transmitted toward

the axilla; and the pulmonic second sound was accentuated. In the neck was a soft, non-pulsating tumor, descending slightly on swallowing, and this extended from the sternum to the thyroid cartilage, and laterally to the middle of the sterno-mastoid muscle. A loud vascular murmur was heard over the tumor when the stethoscope was applied.

After a fair trial of electricity and internal medication, thyroidectomy was proposed to her by both Dr. Coolidge and myself, and she entered the wards of the hospital. The operation was done by Dr. J. C. Warren, on February 2, 1893. There was a large amount of bleeding, but no more than is often met with in such cases. After a large plexus of superficial veins had been clamped and tied, the right lobe of the thyroid was shelled out with the fingers, the isthmus clamped, and the right lobe cut off with the scissors. A silk ligature was passed around the isthmus near the median line and tied. Then the isthmus was cut off close to the ligature. The arteries were tied with catgut and the wound washed with corrosive (1-5,000), and sewed with interrupted silk sutures, two drains being left hanging from the most dependent portion in front. The pulse and respiration were bad during the operation, and subcutaneous injections of brandy and strychnia were given. Wette's careful paper points out that this sort of occurrence is not uncommon, and that in all probability it is usually due to injury of the recurrent nerve, which sometimes happens even when the utmost pains are being taken to prevent it. During the operation the pulse ran up to between 180 and 200, and the prostration was extreme, though there was nothing in the operation itself to cause it. When the patient came out of the ether, much mucus was found to have collected in the throat and had to be swabbed out. This occurrence is worth mentioning, because Wolff speaks of it as probably an occasional cause of death. On the afternoon after the operation the pulse was 185, the temperature 104° F., and there was great difficulty in breathing. For the next four days she remained in what seemed to be a critical

condition. The voice was reduced to a faint whisper. There was great prostration, some vomiting and no desire for food. On the second day after the operation there was considerable cough, pain and dyspnoea, and some delirium. She once tried to tear off the dressing and to get out of bed. The sharp fever indicated by the chart was not to be explained by any septic condition of the wound. A low friction rub was heard below the seventh rib on the right side, in the axillary line, and above this, rales and tubular breathing and bubbling sounds transmitted from the large bronchi. It was difficult to examine thoroughly because she could not easily be moved, but Dr. F. C. Shattuck feared that pneumonia was threatening. These signs were less marked the next day and rapidly disappeared. The course of the case after this was steadily favorable. She remained in the hospital for two weeks, and after leaving it she came again under my care and I have seen her from time to time up to the present date. Up to a month ago she had improved slowly but steadily, and eventually felt better than at any time since first taken sick. The nervous twitching had disappeared. Her pulse had dropped to about a hundred and she felt stronger. Since then, perhaps on account of the hot weather, she has not felt so well, though still decidedly better than before the operation. The remaining portion of the tumor has at times been swelled, evidently from vascular engorgement, but of late it has been steadily diminishing in size. On the whole her prospects for eventual recovery seem to me to have been improved by the operation.

An examination of the larynx, made soon after the operation by Dr. Coolidge, showed a paralysis of the muscles supplied by the right recurrent nerve. Both abduction and adduction of the right cord are deficient, and during phonation the left cord crosses the median line. This paralysis still persists, and the voice is feeble, but clear and articulate.³

³ Three months have passed since this statement was written. At present, the patient is much better than before the operation, but by

I examined the tumor immediately after it was removed, and found it to be of a firm consistency and homogeneous, somewhat granular in appearance. There were a few little cysts about the size of the head of a large pin or a little larger. A number of pieces were immediately placed in Müller's fluid, and were afterwards examined by Prof. Councilman. He reported the structure to be adenomatous in character and not at all like that of the normal thyroid. The arborescent, follicular-looking tufts were covered with a high, cubical epithelium, quite different from the characteristic flat epithelium of the normal gland. There was no colloid to be seen. In two of Müller's cases [l. c.] a similar condition was found.

This observation is important in several respects. In the first place, it was noticed during the first two or three days after the operation that a gelatinous sort of substance oozed out from the wound, which was supposed to come from the cut surface of the gland. It occurred to me at the time that the prostration and other nervous symptoms might have been due in part to the absorption of this material, though I finally abandoned the idea as improbable, for various reasons. I supposed at the time that this matter was colloid, and it is now an interesting subject for speculation what it may have been, and whether it did possess toxic properties. Certainly, where the large cut surface of a thyroid is exposed in this way in an open wound the best opportunity would seem to be furnished for poisoning from excess of thyroid secretion, if such a thing is possible. With a view to test this point, I made a quantity of glycerine extract from the extirpated tumor and injected a large dose under the skin of a cat. This was followed by vomiting and perhaps some prostration, but nothing more serious occurred, and I was unable to pursue the investigation further.

The change in histological structure is also interesting.

no means well. The paralysis has almost disappeared, and the thyroid stump is smaller. The pulse has remained high until recently, but is now 108. The patient is very anæmic, but is gaining slowly.

injured thyroid The only observations that I know of in regard to this point are two in number. The first are those of Halsted and Welch, which were originally communicated in a paper (not yet published) which was read at a meeting of the Association of American Physicians three years ago, and again referred to by Dr. Welch at the last meeting of the same society. These observers found that, with dogs, any injury of the thyroid, even a comparatively slight one, led to the transformation of the normal tissue into one of the same general kind with that which I have described.

The other set of experiments are by Canizzero of Catania (*Deutsche Med. Wochenschr.*, 1892, p. 184). He also found that when the thyroid was injured by being detached from its bed and sewed to the muscles in front, the tissue took on what he calls an embryonic character, and the colloid disappeared.

The disappearance of the colloid is of some intrinsic interest in connection with the pathology of Graves' disease, and is also of importance as giving us some information, though of a negative character, with regard to the chemical nature of the efficient thyroid secretion.

Colloid has been hitherto considered to be a necessary element of the thyroid juice, but apparently this is not the case, for a gland altered in the way I have described, or even a small portion of it, is evidently abundantly able to ward off myxœdema.

It is worth noting in this connection that Vassale and Sacchi found that the removal of the hypophysis caused an increase in the colloid contents of the thyroid, and vice versa, but they concluded, on various grounds, that this did not betoken an increased functional activity.

IMMEDIATE EFFECTS OF OPERATION, AND THE SORTS OF CASES IN WHICH UNFAVORABLE RESULTS OCCUR.

There is some liability to sudden death after operation for Graves' disease as well as for other forms of goitre

(Strümpell, Wolff, Frank), and this danger is the more alarming because we do not fully understand the cause of the fatal result nor how to avoid it. Besides this, symptoms of the following kinds are not unlikely to occur: excessive prostration, dyspnœa, tachycardia of high degree, vomiting, sleeplessness, pain (especially in the shoulder), pneumonia, pleurisy, laryngeal paresis.

The first few days after operation for goitre of any kind are liable to be a distressing period to the patient and an anxious one for the physician. Of the cases of Graves' disease of which I have notes, unpleasant symptoms occurred immediately after the operation in four—or about one out of eight—but it is to be remembered as regards many of the others, that no mention is made of this early period, and that perhaps the reporters of the cases have sometimes passed it over as immaterial when the final result was favorable.

The case which I have related above gives a good picture of several of these mischances. Fortunately, the patient's condition is often less serious than it seems, for the outbreaks of tachycardia and dyspnœa are probably only an exaggeration of those which occur in unoperated cases from time to time, and any one who has witnessed bad forms of these knows how alarming the patient's condition may become and yet eventually clear up entirely.

Of course, the essential thing is not the immediate but final result of the operation; but nevertheless the patient's friends, if not the patient herself, should be warned of what may occur during the earlier periods.

Can we judge beforehand, in any case, whether the operation will be well borne or not? It is probable, but not certain, that to a limited extent we can do so. The nervous centres of a patient with goitre are in a condition of very unstable equilibrium, and it is probably those that show the greatest instability which are most likely to suffer. Nevertheless this is not an invariable rule, since some very bad cases are reported to have done exceedingly well. The dangers present during and after operation are probably due, to a great extent, to the same

influences that make the condition of a goitrous patient at all times distressing and alarming, namely, a weakened or diseased heart and cardiac nerves; a similar condition of the respiratory apparatus; and irritation of the thyroid nerves or of the trunk of the recurrent. To these, the effect of etherization, mucus in a paralyzed larynx, change of shape and softening of the trachea are sometimes superadded. (Compare Wette and Wolff.)

In considering the liability to a fatal result, we ought not to confine ourselves to the cases of Graves' disease alone. Jankowski, in 1885, made a careful study of the published cases of all goitre operations as regards the ill effects of the operation, and found, as one might expect, that with improved surgical technique the mortality rate has been steadily falling. He considered it, however, to be still about 11.6 per cent. Wette's statistics of Riedel's operations in Jena, make, however, a much more favorable showing. Between 1882 and 1891 ninety-two operations were done, with but one death that could fairly be referred to the operation itself. One other patient died, however, apparently from the injury to the recurrent laryngeal nerve, from washing out the wound with a solution of carbolic acid. Nearly 90 per cent. of the remaining patients were nearly or quite relieved of the symptoms for which the operations were done, and it is noteworthy that these were, to a great extent, similar to those from which patients with Graves' disease suffer, namely, disorders of respiration and tachycardia.

Among these cases of goitre there were many which were more serious than those with which we, as neurologists, ordinarily have to deal.

Paresis or paralysis of some of the laryngeal muscles after thyroidectomy is very common. My patient presented them, and Jankowski observed them in 14.03 per cent. of 614 cases. Fortunately, this paralysis almost always passes away in time, though sometimes not for weeks or months. Jankowski calls attention to the importance of making a thorough examination of the larynx before operating, because what often happens is that the

operation only intensifies a pre-existing condition. It is also important to examine the heart carefully before operating, but we should be careful in interpreting the significance of what we find.

The investigations of Schranz have shown that the patients with ordinary goitre, even of the mildest type, are far more likely to show weakness and irritability of the heart, and eventually the structural changes to which this weakness leads, than non-goitrous persons; and this is but one of the many indications that the difference between simple goitre and Graves' disease is mainly one of degree. Schranz says that such patients are liable to bear etherization badly, but this is not invariably true. A patient with Graves' disease, for many years under my care, was recently obliged to undergo an operation for ovariectomy, and it was noteworthy that her pulse became slower and steadier under the ether. Again, attention has recently been called to the fact that chloroform is often of great use in tachycardia of acute "heat-stroke," just because it diminishes the irritability of the cardiac centres.

THE DEGREE AND PERSISTENCE OF IMPROVEMENT, AND PERIOD AT WHICH IT APPEARS AFTER OPERATION.

In some of the cases reported, the symptoms began to improve almost from the moment of the operation. This is especially true of the palpitation, less so of the exophthalmus, though this also occasionally improved early.¹ In other cases, again, the improvement began later and was very gradual, occupying many months. Recurrence of goitre or of nervous symptoms seems to have been very rare, although some of the cases were under observation for a number of years. A certain degree of nervousness and a liability to palpitation on exertion, not enough, however, to prevent even manual labor, remained in a good many instances. An interesting and important

¹ It is probable that when the exophthalmus is of acute or recent onset it is due to congestion, and may therefore quickly disappear. This sometimes occurs spontaneously, as in the cases observed by Gowers and by Coggeshall.

point concerns the liability of the goitre, or that part of it left behind by the operation, to grow larger again. This liability is recognized by the surgeons, though generally overrated. Rose is often quoted as saying that so long as a bit of the gland remained behind the goitre is liable to return and plague you. On the other hand, Wolff, in a recent and careful review of the facts, insists that the shrinkage of the remaining portion is the almost invariable rule, and Wette reports but one case of secondary enlargement.

DOES THE RESULT VARY ACCORDING TO THE CHARACTER OF THE TUMOR?

If it is true that the goitre is a principal cause of the symptoms in some cases but not in others, as suggested by Wette and other observers, we might fairly expect to find that thyroidectomy would be more effective for good in some classes of cases than in others, and more effective where the goitre appeared first, than where it seemed to be secondary, in time of appearance and in prominence, as a symptom. As a matter of fact we do not find this to be the case. The same success seems to have attended the extirpation of vascular, parenchymatous, and cystic growths, and to have been seen in those cases which originated in fright (Lemke), or where the goitre was not the first sign of the disease, as in those of a different order. This fact suggests that we ought not to make too much of the favorable action of thyroidectomy as an argument for the thyroidal origin of Graves' disease. It would seem that however the disease is first initiated, we have to deal eventually with a vicious circle of morbid conditions, of which the enlargement of the thyroid is an important link. The enlarged thyroid evidently becomes, if it is not at first, a centre for the irritation—perhaps the chemical irritation—of important nerves, and it is by getting rid of these irritations that the cure is probably brought about.⁴ In short, we have to deal

⁴ This seems to me, at least, the best explanation now possible.

Mœbius, Müller and others believe in the "Thyroidal Cachexia" theory, but it is by no means proved, or even made probable by the facts now at our command.

with a patient whose nervous system is, in certain respects, in a highly irritable state. Yet there is all the time a certain capacity for improvement, and if even partial rest can be secured for the nervous centres they have a chance to recover their tone, and of this chance they are able to avail themselves. It is only in this way that we can explain the remarkable effects occasionally produced by the treatment of diseases of the nasal cavity, (Hack, Musehold, Hopmann, Fraenkel, Stoker, Semon, Winckler, and others) or by öophorectomy (Jeuttner). We see something similar to this in the effect of operations for facial neuralgia, where great temporary relief is often gained if even a portion of the irritating impulses which fall upon the diseased nervous centre can be removed by the resection of a single one of several diseased nerves.

Not only is it true that among the successful cases of thyroidectomy for Graves' disease we have to deal with a variety of kinds of tumor, but we also find that even the enucleation of a cyst or the removal of a sarcoma may be effective in the same way (Tillaux, Rehn, Ollier). The probability is that the vascular goitres are not characteristic of all stages of Graves' disease, but only of the first stage, and not necessarily met with even in that. As I have already indicated, the tendency is for the gland to assume eventually some such structure as that which I have described, or else to undergo some form of degeneration.

In most of the cases where operation has been done hitherto, the goitre has been large and the symptoms urgent. We still need very much to know whether a good result may be expected where the goitre is small and indolent and the symptoms mild. I should, myself, be inclined to advise operation even in such cases as this, provided other means within the power of the patient had been fairly tried. It is possible that even a relatively slight operation would sometimes be sufficient to make the rest of the gland shrink. Even a division of the isthmus has been known to do this occasionally. It is prob-

able that the tendency to shrinkage is greater with some sorts of goitres than with others, and that it varies with the condition of the patient. (Horsley). The experiments of Beresowski upon dogs show that when a portion of the healthy thyroid is removed, short of the amount which would invite the occurrence of myxœdema, there is always a certain degree of regeneration, but that this ceases long before the original size of the gland has been reached. Halsted and Welch also found regeneration to occur, but, as I have said, with changes in histological structure.

CHARACTER OF THE OPERATION.

With regard to this point I am not prepared to give an expert opinion, and there are many points in regard to which we are still in the dark. It is not clear, for example, why the patient should improve after the removal of one-half or two-thirds of the gland, while the rest remains, for the part which is left is usually much larger than the whole of a normal gland. Wette believes that the benefit is mainly derived from getting rid of a part of the sum of irritations which the diseased nervous centres have had to sustain. Others have supposed that the good was done by diminishing the quantity of secretion. Wette's opinion seems to me the more probable of the two, though Rehn has reported a case where the opening and cleansing of a fistula containing detrital matter brought relief. Perhaps the irritation of the nerves is of chemical origin, or due to the local action of diseased secretion.

Mikulicz has advised an operation which is claimed to avoid the danger of injuring the recurrent laryngeal nerve, besides giving other advantages. This consists in transfixing the gland and resecting all but that which remains attached to the deep structures of the neck.

The operation of tying the four nutrient arteries has also been repeatedly done; (Rudygier, Kocher, Dreesmann) with a view to making the gland shrink. The results, however, do not seem to be quite as brilliant as those obtained by thyroidectomy and the improvement comes on more slowly. Moreover, it is doubtful if the

operation itself is any easier (Lemke). One caution has been suggested by several surgeons (Lemke), namely, that iodine should never be injected if there is any probability that thyroidectomy may be performed later. It is attended with some risk, the results are rarely so effectual as those obtained with the knife, and it renders a subsequent operation more difficult.

More light is needed on the question of how much of the goitre should be removed. Now that we have an assured means of curing or preventing myxœdema, we can afford to be a little more bold than would formerly have been justifiable.

Finally, what shall we say as to the nature of Graves' disease and the relation of the goitre to the other symptoms? This is a question to which a satisfactory answer cannot be given, and fortunately the interests of the therapeutic's inquiry do not seem to make it necessary. The following points are, however, certainly significant.

1. Some of the characteristic symptoms of Graves' disease at least can be excited by irritations of the nerve-filaments in the nose, or by disturbances of the circulation there. It is a mooted topic whether the exophthalmus, tachycardia, and thyroid enlargement occasionally induced in this way, and sometimes relieved by treatment of the nasal cavity, are fully equivalent to real Graves' disease or whether something must be superadded, and this question I will not attempt to discuss here. 2. Simple thyroid enlargement is apt to be associated with similar symptoms, and especially with disturbance of the heart's action. This is seen even in the case of animals, as for example, an interesting instance noticed, where a horse was obliged to run for a long distance. This fact naturally leads to the further question whether the relation between swelling of the thyroid and change in the heart's action may not rest on a physiological as well as a pathological basis.

The thyroid is, it seems to me, to be regarded as a body having a double function. In the universal amazement at the wonderful discoveries with regard to its im-

portance for nutrition, there has been a tendency to slight the arguments for its importance as an erectile organ, and as regulating the blood supply of the brain, and even to scoff at them as trivial.

One series of observations have been published, however, with regard to this point, which deserve more attention than they have received. They were made a few years ago by Stahel, a German physiologist, who has since died, and were reported and endorsed by Waldeyer at a meeting of the Berliner Med. Ges. in 1887. Stahel found that there is an inverse relation, as regards size, between the internal carotid artery and the superior thyroid artery. The internal carotid artery cannot expand in the bony canal of the skull, through which it passes, and the pressure of blood behind it, when excessive, leads to the formation of the carotid bulb, and also finds relief in the expansile circulation of the thyroid. A similar relation exists between the inferior thyroid artery and the vertebral. It is well known that the thyroid is capable of swelling rapidly and containing a very large amount of blood. It is also well known, and the fact is brought into special prominence by the investigations of Schranz, that goitre and functional—eventually organic—diseases of the heart are very apt to go hand and hand. Usually the pulse is more rapid in goitrous patients, and this, as Wette thinks, is either because the accelerator cardiac fibres are stimulated, or because the inhibitory fibres, always the first to suffer, are paralyzed.

Occasionally the influence of goitre seems to be to slow the pulse (Wette), and possibly in health this action is exerted oftener than in disease. Broadly speaking, it is probable that Graves' disease generally occurs only when the regulatory apparatus of the circulation is disturbed, and very frequently this disturbance is associated with emotional excitement. It can hardly be doubted that we shall eventually discover some physiological arrangement of which the symptom-complex of Graves' disease is a caricature.

If the appearance of a person be noted whose attention is suddenly fixed, it will generally be seen that the

eyelids open wide, the eyes get a staring look, the pulse beats perhaps more slowly at first, then faster. If the attention passes into fear, these phenomena may be intensified, and, in addition, the hand may be seen to tremble. If, instead of fear, shame or anger is present, the face may become suffused, and if I am not mistaken, the neck swells. Add to this the fact that emotions often cause a watery secretion in the bowels, and we have a tolerable picture of Graves' disease.

I do not care to insist too much upon the pertinacity of this simile, and certainly not to claim originality for it, but I think it does give us a hint why it is that the vascular apparatus of the orbit and the thyroid are liable to suffer more than other parts of the vasco-motor system. It is especially to be remembered that emotional excitement may give rise to the symptoms of Graves' disease in an acute form, which then pass away under the influence of rest. Gowers records a case of this sort, and my colleague, Dr. F. Coggeshall, has observed the case of a young girl who had acute Graves' disease in consequence of a whipping, but recovered in a few weeks. It seems evident that the anatomical changes—in the form in which we see them—are not the real cause of the symptoms. Neither does the thyroïdal cachexia theory fully stand criticism. It is therefore safest to study the disease, provisionally, as a neurosis and to seek for its physiological analogies.

In conclusion, it seems to me clear enough that we are not obliged to assume that the goitre is the cause of the other symptoms in order to explain the favorable results of thyroidectomy. The thing which is needed for a cure in every case, and in every stage of the disease, is an adequate physiological rest for the disturbed nervous centres, and any influence may secure this which removes a good number of peripheral stimulations, or any influence which increases the stability of the central nervous system. That the diseased and engorged thyroid may be a centre for these abnormal stimuli cannot be doubted.

AUTHOR AND REFERENCE.	AGE.	SEX.	CHARACTER AND DURATION OF SYMPTOMS.	OPERATION AND IMMEDIATE EFFECTS	FINAL RESULT.
Andry. <i>Bull. Med.</i> , June 5, 1889.	43	F.	Eleven years' duration. Dyspnoea marked. Otherwise typical.	Excision. Immediate relief of dyspnoea. Death.	Death from operation.
Barker. <i>Lancet</i> , 1883, No. 24.	21	F.	Seven years' duration. Tumor small and movable, consisting of enlarged right lobe.	Removal of right lobe.	Cure, including relief from neuralgia and amenorrhoea.
Caird. Edinburgh Med. Chir. Soc., 1891, Vol. vi., p. 17.				Excision of right lobe.	Great improvement, diminution in size of remaining lobe.
Determeyer. <i>Deutsche Med. Wochenschrift</i> , 1893, No. 11.	37	F.	Typical case.	Partial excision. Convalescence satisfactory.	Great improvement. Last seen five months after operation.
Dreesmann. <i>Deutsche Med. Wochenschrift</i> , 1892, Vol. xviii., p. 5.	47	F.	Typical case.	Ligature of the thyroid arteries. Convalescence satisfactory. Gradual improvement	Substantially complete cure. Only slight exophthalmus remaining. Patient last seen two years after operation.
<i>Ibid.</i>	23	F.	Typical case.	Ligature of thyroid arteries in two operations. Moderate improvement after each.	Great improvement. Slight exophthalmus remains. Very slight remnant of goitre to be felt.
<i>Ibid.</i>	20	F.	Typical case.	Ligature of thyroid arteries. No change of symptoms at first. Finally gradual improvement.	Great improvement. Slight exophthalmus remains. Tremor and sweating no longer present. Pulse 80. Only a small remnant of goitre to be felt. Patient last seen six months after the operation

AUTHOR AND REFERENCE.	AGE.	SEX.	CHARACTER AND DURATION OF SYMPTOMS.	OPERATION AND IMMEDIATE EFFECTS.	FINAL RESULT.
Dubrueil. <i>Gaz. Med.</i> , 1887, No. 34, p. 397. Frank. <i>Berlin Kl. Wochenschr.</i> , 1888.	22	M.	Typical case. Cystic disease with calcareous degeneration of the walls. Details not given.	Enucleation of cyst. Convalescence satisfactory. Details not given.	Substantially complete cure. Death from operation.
<i>Ibid.</i> <i>Ibid.</i> <i>Ibid.</i> Kummell. <i>Deutsche Med. Wochenschr.</i> , 1890, p. 438. 24 F. Nutrition poor. Tumor of moderate size. Removal of right lobe, and part of left. Convalescence satisfactory. Improvement began early.	Complete cure. No improvement. Result not stated. Great improvement at time of writing. Six weeks after the operation all the symptoms had greatly abated. Pulse was 70 to 80. Substantially complete cure. Diminution in size of remaining lobe, restoration of normal nutrition. Patient last seen at end of a year.
Lemke. <i>Deutsche Med. Wochenschr.</i> , 1891, No. 2.	17	M.	Symptoms of two years' standing.	Removal of left lobe of goitre. Convalescence satisfactory. Improvement rapid.	Substantially complete cure. Only slight nervousness remaining. Patient last seen after a year.
Lemke. <i>Deutsche Med. Wochenschr.</i> , 1892, No. 11.	47	M.	Excessive tachycardia, emaciation.	Removal of largest half of goitre. Convalescence satisfactory.	Substantially complete cure. Only slight nervousness remaining. Patient last seen after a year.
Lemke. Unpublished case communicated by letter.	39	F.	Symptoms apparently due to fright, mental symptoms.	Removal of greater part of goitre.	Great improvement. The only symptom present at time of writing is palpitation on exertion.

Lemke. <i>Deutsche Med. Wochenschr.</i> , 1892, No. 11.	46	F.	Uniform enlargement of the thyroid of moderately large amount. Excessive dyspnoea.	Tracheotomy; three weeks later, extirpation of the right half of the gland. Convalescence satisfactory.	The patient died from acute influenza two months later. Before her illness the exophthalmus had disappeared. The pulse was still irregular.
<i>Ibid.</i>	20	F.	Large goitre.	Extirpation of right half of goitre. Only moderate bleeding. Convalescence satisfactory, and rapid improvement in all the symptoms.	Great improvement, permitting regular work; diminution in size of the remnant of goitre. Patient under treatment at the Polyclinic at the end of nine months.
Lister. Cited by Fraser. <i>Edinburgh Med. Jour.</i> , 1887, Vol. xxxiii., p. 347.	young girl		Typical case.	Removal with knife and curette. Convalescence satisfactory. Improvement began early.	Great improvement.
Mikulicz. <i>Centralbl. f. Chir.</i> , 1885, No. 51.	35	F.	Typical case. Cardiac enlargement.	"Resection" of tumor. Convalescence satisfactory.	Improvement in all the symptoms but not complete cure. Patient last seen at the end of a few months.
<i>Berlin Kl. Wochenschr.</i> , 1886, 4.	21	F.	Typical case. Growth contains a large cyst.	Repeated injections of iodine. Temporary pain and prostration.	Great improvement. No enlargement of the thyroid to be felt.
Ollier. Cited by Benard. <i>Ibid.</i>	22	F.	Soft vascular goitre of size of fist, of several years' duration. Severe nervous symptoms.	Extirpation of whole thyroid. Considerable bleeding. Paresis of recurrent nerve lasting four months.	Recovery. Patient last seen one and a quarter years after operation.
Rehn. <i>Berlin Kl. Wochenschr.</i> , 1884.	36	F.	Hard tumor of right lobe, size of fist, eight years' standing; severe nervous symptoms of a year's standing.	Removal of diseased lobe. Temporary increase of tachycardia and dyspnoea. At end of week pulse normal.	Recovery. At end of a year doing hard work. Last seen after one year.

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<i>Ibid.</i> Cited by Wette. <i>Arch. f. Klin. Chir.</i> , 1892, Vol. xlv., p. 792.	.	M.	Severe case. Poor nutrition and bad hygienic influences.	Removal, except of left lobe. Slow but steady improvement.	Substantial recovery, permitting hard work. Patient last seen four and one-half months after operation.
Riedel. Cited by Wette. <i>Arch. f. Klin. Chir.</i> , 1892, Vol. xlv., p. 796.	20	F.	Goitre of many years' standing. Nervous and mental symptoms of high degree; nutrition greatly impaired; excessive exophthalmus; growth parenchymatous; very vascular	Removal of largest half of goitre. No bad symptoms noted.	Substantially complete cure. Patient able to exert herself freely as in dancing. Exophthalmus gone. Increase in weight from 80 to 135 Patient last seen three years after operation. Substantially complete cure. Patient last seen one year after operation.
<i>Ibid.</i>	23	M.	Goitre of right lobe of thyroid of ten years' standing, of about the size of fist, containing a large colloid cyst; symptoms moderately severe.	Removal of goitre. No bad symptoms noted.	Substantially complete cure. Patient last seen one year after operation.
<i>Ibid.</i>	49	F.	Large bilateral goitre of twenty-four years' standing. Symptoms severe. Tumor contains parenchymatous nodules with fibres and calcareous degeneration; very vascular.	Enucleation of multiple nodules, some of very large size. "Resection" of subclavicular portion. Moderate fall of pulse; bronchitis and pleurisy; great prostration for weeks. Very gradual improvement.	Gradual but steady improvement, and at the end of a year again of forty pounds in weight and only slight nervousness remaining.
Rupprecht. <i>Jour. Ser. der Ges. f. Nat. und Heilkunde</i> , Dresden, 1890, p. 63.	35	M.	Goitre not noticed until three years after tachycardia and palpitation.	Enucleation of goitre. No bad symptoms noted. Rapid improvement.	Substantially complete cure.

<p>Sprengel. <i>Schmidl's J. B.</i>, Vol. ccxxix., p. 138. Steltzner. Cited by Ganser.</p>	<p>Symptoms said to be characteristic.</p>	<p>Removal of whole goitre.</p>	<p>Cure complete, except exophthalmus unchanged.</p>
<p>Abstract in <i>Schmidl's J. B.</i>, Vol. ccxxix., p. 138. <i>Ibid.</i></p>	<p>Slight goitre since childhood and tremor for several years; all conditions worse since the influenza in 1890. Growth "parenchymatous;" very vascular.</p>	<p>Partial removal of goitre.</p>	<p>Tetany and mental enfeeblement.</p>
<p>Stierlein. <i>Beitr. z. Kl. Chir.</i></p>	<p>28 F. Details not given.</p>	<p>Removal of goitre (right lobe). No bad symptoms.</p>	<p>Tetany. Symptoms said not to have improved. Substantially complete cure. Patient last seen one and a half year after operation.</p>
<p>Strümpell. Lehrbuch Vol. ii. Tillaux. <i>Bull. de l'Acad. de Med.</i>, April 27, 1880. <i>Bull. de Soc. de Chir.</i>, August 3, 1881.</p>	<p>29 F. Goitre hereditary in family Cardiac enlargement, mental depression, growth contains large hemorrhagic cysts.</p>	<p>Removal of one-half of goitre. Intra-capsula removal of goitre. Pain in right arm and shoulder; vomiting; secondary hemorrhage; suppuration. After twelve days gradual improvement.</p>	<p>Sudden death immediately after operation. Substantially complete cure. Patient last seen three years after operation.</p>
<p>Trzebichy. <i>Arch. f. Kl. Chir.</i>, 1888, Vol. xxxvii., p. 498. Watson. <i>Edinburgh Med. Jour.</i>, Sept. 1873, p. 252.</p>	<p>young F. Typical case? Duration many years.</p>	<p>Removal of the gland. Excessive hemorrhage.</p>	<p>Substantially complete cure. Good result.</p>

AUTHOR AND REFERENCE.	AGE.	SEX.	CHARACTER AND DURATION OF SYMPTOMS.	OPERATION AND IMMEDIATE EFFECTS.	FINAL RESULT.
Watson. <i>Ibid.</i>	. . .	F.	Duration twenty-three years. Cystic goitre.	Good result.
Watson. <i>Ibid.</i>	. . .	F.	Multilocular cystic goitre.	Good result.
Wolff. <i>Berlin Kl. Wochenschr.</i> , 1887, No. 28.	30	F.	Symptoms due to fright. Exophthalmus and nervous symptoms first, then goitre; voice husky.	Removal of right lobe. Rapid improvement.	Substantially complete cure, permitting hard work.
Wolff. <i>Ibid.</i>	30	F.	One year's standing. Goitre came first, and was vascular in character.	Removal of one lobe, both diseased. Convalescence satisfactory.	Still under observation.
Wolff. <i>Deutsche Med. Wochenschr.</i> , 1893. McNaughton Jones reports a case of recovery after treatment of the goitre by a seton. <i>British Med. Journal</i> , Dec. 1874. Lemke. <i>Deutsche Med. Wochenschr.</i> , 1892, No. 11.	21	M.	Typical case.	Right lobe and isthmus removed. Immediately after operation irregular breathing and cyanosis, tracheotomy, death.	Death. Examination of wound showed nothing to account for it, and it is ascribed either to disturbance of heart action or to the accumulation of mucus in the throat.
Lemke. <i>Deutsche Med. Wochenschr.</i> , 1892, No. 11.	16	M.	Large goitre. Severe palpitation; no exophthalmus.	Extirpation of the right half. No bleeding of consequence. Convalescence entirely satisfactory.	Substantially complete cure.

<p>Rehn. <i>Ibid.</i></p>	<p>F.</p>	<p>Goitre since childhood, now of firm consistency. Moderate symptoms of three years' standing. No exophthalmus</p>	<p>Removal of right middle lobe. Large hemorrhage from rupture of brittle artery. Gradual improvement.</p>	<p>Still Great improvement. palpitation at time. Last seen three years after operation.</p>
<p>Stierlein. <i>Beitr. z. Kl. Chir.</i></p>	<p>25</p>	<p>Goitre of right lobe of thyroid. Palpitation; increase of cardiac dullness to the right; no exophthalmus.</p>	<p>Removal of right lobe. Suppuration; then rapid improvement.</p>	<p>Great improvement; palpitation only on violent exertion. Patient last seen one and a half years after operation.</p>
<p>Tillaux. Cited by Benard. <i>Contrib. a l'etude de Goitre. Exopthal, 1882.</i></p>	<p>M. 33</p>	<p>Nervous symptoms but no exophthalmus Goitrous tendency hereditary. Sarcomatous degeneration of the growth.</p>	<p>Enucleation of diseased portion.</p>	<p>Great improvement.</p>

There was no exophthalmus in the four last cases given. This list might be made very much larger by adding reports for ordinary goitre with nervous symptoms.

Roux [Remarques sur 115 operations du goitre. Weisbaden, Bergmann, 1891.] has reported five favorable cases which came to my notice too late to be incorporated in this list.

In all, the summary includes 51 cases. There were four deaths attributable to the operation, but in almost all the rest, greater or less improvement, and often substantial cure, seems to have taken place. Of course these results are not to be placed entirely to the credit of the operation, since prolonged rest is almost always beneficial, and the influence of time is often of itself useful, and even curative. [See Müller, l. c.]