Management of the Toxic Goiter

WM. MARVIN SCRUGGS, M.D.
Charlotte, N. C.

Reprinted from The Southern Surgeon
August, 1935, Vol. IV, pp. 283-292

Copyright 1935, by
The Southern Surgeon Publishing Co.
478 Peachtree Street, N. E.
Atlanta, Ga.
MANAGEMENT OF THE TOXIC GOITER

WM. MARVIN SCRUGGS, M. D.,
Charlotte, N. C.

A REVIEW of the history and progress of thyroid surgery during the last 50 years reveals one of the most interesting and gratifying accomplishments of modern medicine. The physiology of this gland has been revealed, classification of the different types of goiter clarified and a technic perfected that makes thyroidectomy relatively a safe procedure. During this process of standardization, many problems and difficulties have been encountered and most of them have been overcome. One of the conspicuous remaining problems is the management of the case of highly toxic goiter or the bad risk.

The purpose of this discussion is to emphasize certain points that are known to all of us doing goiter surgery and to outline a plan of procedure for the management of the highly toxic or bad risk case. I have drawn freely on the writing of Lahey, Frazier, Plummer, Bartlett, Waterworth and others, but the material from which this paper has been prepared is drawn for the most part from my observation, treatment and operations in my own practice during a period of fifteen years and reference is made both to the medical and to the surgical experience during this period.

In summarizing my observations with reference to the preoperative treatment and postoperative care of the highly toxic goiter, I am aware that there is but little that is original or unknown to the majority of you. We learn more about the course of a disease and its management from a review of our experiences than in any other way, especially when that experience has been tinctured with mistakes. This paper is merely an effort to direct your attention to those procedures that in my experience and in the experience of others have proved helpful in managing the bad risk in thyroid surgery.

Viewed in the light of our present knowledge of thyrotoxicosis, and based on the recognition of certain fundamental facts as to the nature and progress of the disease, we are in-

Read before the Sixth Annual Assembly of The Southeastern Surgical Congress, in Jacksonville, March 11, 12 and 13, 1935.
clined to the conclusion that the individual that becomes thyrotoxic presents a characteristically typical background and conforms to a distinctly and easily recognizable type. Just as during the late war we recognized a type of individual with an emotional instability that under strain and stress developed shell shock, I believe that if we analyze the thyrotoxic cases we shall find that they have a characteristic history. They have with few exceptions been nervous children, impulsive, and showing a tendency to emotional instabilities of varying degrees. They have lived intensively and have attacked life at an unrelenting pace without any periods of relaxation. Many years ago Tom Williams called attention to a syndrome found in many individuals and characterized by palpitation, precordial pain, choking sensation and a smothering feeling. Individuals with such a syndrome may or may not develop goiter, but it is very important to differentiate them from the true thyrotoxic individual, as surgery on the thyroid in this type of individual is fraught with pitfalls; and, even if goiter develops, removal of the gland may not be effective in restoring the patient to normal or to alter his vagotonic characteristics. The true thyrotoxic patient is prone to typical remissions and exacerbations, but it is usually in the relapsing phase that he presents himself for surgery. It would greatly lessen our anxiety and responsibility if these patients would apply for surgery during a remission, but unfortunately it is only occasionally that one cooperates to this extent.

In my experience over a period of fifteen years I have operated on patients of practically all ages from 10 to 69. The majority has been between 25 and 45 years of age, but the overwhelmingly toxic cases have been between 30 and 45. During this period there have been nine deaths following operation, and all, with one exception, occurred in thyroid crisis. This case I attributed to reaction to procaine as the patient died on the table immediately after the skin had been infiltrated with local anesthetic. All the deaths were in cases of toxic adenomas. There has been one severe postoperative hemorrhage which fortunately was discovered and controlled before it assumed alarming proportion. There have been no permanent nerve injuries. There developed two cases of postoperative tetany, which were satisfactorily controlled and responded promptly to calcium and Collip's serum.
If we are to plan our management of the thyrotoxic case effectively and intelligently, it is necessary to preface the discussion of the treatment of these cases, namely, the plus four toxic goiter, by stating what is meant by the term and to classify these cases accordingly. By “plus four toxic,” I refer first to the acutely toxic, diffuse goiter which may or may not be associated with exophthalmos and is most frequently encountered in patients younger than those with the toxic nodular goiter. In my experience and in the experience of others, this condition has been found most frequently in patients from 12 years of age up to the early forties—the incidence being greater in the early thirties. Second, there is the acutely toxic nodular goiter. This occurs in patients who, as a rule, are older than those with exophthalmic goiter. It is in this type of case that a nodular goiter present for many years, probably had not given any serious trouble until suddenly there is an onset of toxic symptoms. This type is usually encountered in patients from 35 to 50 years of age. In the third type acute symptoms of toxic goiter develop suddenly in pregnancy, or with an infectious process, perhaps of the tonsils or sinuses. There is a fourth type which has been referred to by Lahey as atypical goiter in which the symptoms appear to be neurocardiac. Crile has emphasized that often thyroidectomy produces no improvement in this type of goiter, and maintains that adrenal denervation does much to stabilize and rehabilitate these individuals.

It is in the preparation and management of these different types of cases that frequently the ingenuity and judgment of the surgeon is challenged. In the average case of toxic adenoma or exophthalmic goiter with a moderately increased metabolic rate, that is, constantly below plus 35, I feel that the patient will respond to the ordinary routine treatment of rest, preliminary sedation and the judicious administration of some form of iodine. It is not to these milder toxic cases that I invite your attention, but to the large class of more severely toxic character that is regarded as one of the unfortunate medical and surgical problems, and in which intensive treatment and wise surgical judgment are demanded.

The preoperative use of iodine has reduced considerably the mortality of Graves' disease, and it was earlier thought by some that iodine would control even the most toxic cases.
However, this idea is not entirely correct. Lahey has stated that in a series of 1,118 patients treated for goiter in a year's time the mortality rate from thyroid crisis equaled the post-operative death rate for patients of all types of goiter. If this is accepted as a clinical experience, the conclusion is that we must not place our entire reliance on the use of iodine as a pre-operative measure. Not only must proper measures be instituted before the operation, but the proper time selected and the proper type of operation performed if we are to insure our patient his best chance of recovery.

If this patient is regarded as a bad risk, I prefer to have him in the hospital for a few days prior to operation, the length of time depending on the severity of the symptoms. He is kept as quiet as possible, sedation is resorted to if necessary, and the basal rate is then again determined. If the rate remains high and shows no tendency to regression, I again insist on a few more days' treatment and observation. If there is no improvement and it is economically undesirable for him to remain in the hospital, he is allowed to return home for intensive iodine therapy and rest in bed for 14 to 18 hours a day for two weeks. It is my opinion that more than two weeks preliminary operative treatment gains nothing, for these patients have reached about the maximum improvement in this length of time.

After this preliminary treatment, the patient is again subjected to a careful check-up and decision is made for or against operation. If there has been no improvement in metabolic rate, no increase in appetite or gain in weight, no tendency towards stabilization of the nervous system, or if fibrillation is present, further treatment and observation are required. In the toxic case probably the most important consideration is a gain in weight. Of course, the metabolic rate is an important consideration in intelligently determining the management of a given case, and I should be reluctant to operate in the presence of a rising metabolic rate, even if the patient evidenced an increase in weight and an improvement in general nervous stability. Fibrillation does not denote an absolute contraindication to operation in a patient otherwise stabilized, but one can operate with a greater sense of security and a feeling of lessened hazard if this symptom has abated.

These highly toxic patients should have a complete medical
survey, and the closest cooperation with the internist is necessary. A critical analysis of kidney function, heart action and blood chemistry is valuable. If these cases presenting advanced symptoms are carefully analyzed, it will be found that a certain number of the patients will die while under observation and that over a period of years this percentage will compare with those dying immediately or a few days following operation from a postoperative thyrotoxic crisis.

I have found the intravenous administration of glucose for short periods of time preoperatively of great value. Frazier's investigations on carbohydrate metabolism in hyperthyroidism have revolutionized the management of these severe cases, and they are the most important contribution therapeutically since the epochal establishment of the administration of iodine on a sound, scientific basis. The amount of glucose solution or other fluids administered intravenously must be determined by the record of intake and output, and be stopped on the appearance of edema. A well-balanced diet is indicated, and I have personally found the administration of honey along with the diet of distinct value.

We have less to fear in the exophthalmic than we do in the toxic adenomatous type. We have in Lugol's solution or some form of iodine a drug that is of positive value in the preparation of the exophthalmic case; whereas, in the adenomatous toxic type, the use of iodine is not of striking value preoperatively.

In estimating the operative risk probably the most important criterion is the weight curve; for instance, an individual that has lost 20 or 30 pounds during the previous year, but has maintained his weight for the previous six months is not a particularly bad risk. On the other hand if during the preceding month or so the patient has lost 15 or 20 pounds, he should certainly not have an immediate operation. If operation is done, it should be confined to single lobectomy. Another important criterion is muscular strength, and in estimating the patient's ability to stand operation this must be considered. Creed has stated that a woman who has sufficient strength to do her own housework has sufficient strength to go through a thyroid operation. However, with the more serious cases other methods of evaluation must be resorted to. If the patient has been sufficiently iodinized, there are certain
cases, especially of the exophthalmic type, in which one might operate on estimation of the factors of weight and strength alone.

While the basal metabolic rate is one of our most valuable aids, it may be of little value in estimating the operative risk in any given case. As a rule basal metabolic rates above plus 75 increase the risk and are not therefore favorable; on the other hand, those much below that rate may or may not be good. It is the proper interpretation of the reading, the correct estimation of the reaction of a given individual, and not the height of the metabolism that is important.

One of the most important observations to my mind both from the standpoint of treatment and also of determining a patient’s ability to stand operation, is nervousness or restlessness. It is not always true that the severity of the tremor is proportional to the degree of nervous stability, but it is my feeling that you can almost with certainty foretell the reaction of certain patients from the degree of their nervous instability. One of the most important contraindications to operation is restlessness, and earlier in my experience failure on several occasions to interpret this one observation correctly led me into pitfalls that were later viewed with regret.

In most cases the pulse rate is not of much assistance, as in many of these very toxic cases the pulse rate often varies without much regard to the intensity of the illness. However, a persistently high rate is not indicative of a safe risk. All of us doing much thyroid surgery realize that the worst time to consider operation is when the patient is on the decline, or approaching a crisis, as indicated by nervousness, increase in pulse rate, sleeplessness, and loss of appetite. Anorexia is a significant warning, and I am convinced that we are inviting disaster when we operate on a patient who does not have a good appetite. It is not only bad surgery to operate on a patient approaching a crisis as indicated by symptoms, but it is equally bad to operate too soon after the crisis. A period of from 6 to 10 weeks should elapse after a crisis before surgery is attempted, for it is desirable to allow time for the development of another crisis if it is imminent.

There are many factors involved in determining the best time to operate. But there is the advantage that when we have evaluated the case and realize that an operation is attended
with dangerous possibilities, we can plot our management accordingly and confine surgical interference to ligation or the removal of one lobe at a time. There will be occasional patients who can never meet the requirements for operation. They are apparently destined to die and will only succumb earlier if operated on, and I am in agreement with the dictum laid down by Bartlett that any patient dying within 72 hours after operation indicates that we have failed in our evaluation of the patient's ability to stand whatever was planned, or too much surgery has been done at the wrong time. In determining when to operate, I consider the following things as indicative of a favorable prognosis: if the patient has been intelligently iodinized, or if there has been a gain of a few pounds or at least no recent loss of weight, if his muscular strength conforms to the previously mentioned requirements, if his metabolic rate has been properly estimated and is not rising, if he has no edema and can walk a reasonable distance without becoming short of breath, and if he is able to hold his breath for more than 15 seconds. With these things in favor of the patient, I feel that operation can be undertaken with a reasonable degree of safety.

In considering the use and abuse of iodine in the treatment of goiter, we are confronted with much conflicting opinion. Its usefulness in the preparation for operation has been established beyond question, but its widespread and indiscriminate use has been a menace. Iodine is not a cure for toxic goiter and should be used only as a measure preparatory to operation. There are many cases in which its use fails to induce the characteristic remission of symptoms. In some cases it appears to have no effect upon the disease. Its administration may even accentuate all the symptoms which are present. A decision when and when not to use iodine will be based largely on clinical experience, upon observation in the individual case, and upon consideration of all the symptoms and findings presented. In thyroid surgery the personal equation, the individual factor judged by observation and experience, is often the factor determining recovery or death.

There is a certain percentage of cases in which we do not find any reaction to iodine, and this class of case has been referred to as the iodine resistant thyroid. It is in this type of case that the fractional or stage operation produces the safest
method of approach. The greatest concern is caused and difficulty encountered in those cases where the metabolic rates remain persistently at 50 or above. About 10 per cent of the exophthalmic group will fail to benefit, or may even be made worse by the administration of the usual dose of 10 or 15 drops of iodine three times daily, over a period of from ten to fifteen days. Long-standing symptoms and a history of prolonged use of iodine often explain this tendency to the refractory state. Fractional operations should be more often done in this type of iodine resistant hyperthyroidism. This is specially indicated if the patient is an elderly or fragile individual with marked cardiac damage and long-standing thyrotoxicosis.

A paradox repeatedly emphasized is that iodine, so important in reducing the mortality of thyroidectomy, may by its injudicious and indiscriminate use be the factor which makes operation unusually hazardous, and as a result surgery can only be feasible or resorted to safely when done in stages.

In the adenomatous type of goiter it has been my experience that the use of iodine in the toxic group does not produce the striking improvement that it does in the exophthalmic. In fact there are many cases in which there is no reaction whatsoever, due in most instances to the replacement of the active acini by areas of degeneration incapable of utilizing the iodine administered. However, this fact has been observed, that by the use of iodine in adenomatous cases, we can predict with some degree of accuracy what the postoperative reaction will be. If before operation we observe a marked response to iodine, we can have some assurance that the postoperative course will be happier and there will be less likelihood of severe storm. I have for this reason routinely used iodine in preparing cases of toxic adenoma for operation. The incidence of iodine resistance in the adenomatous group is probably twice as great as that noted in the exophthalmic group; consequently, I feel that the fractional or multiple stage operation is more often indicated in this type of goiter than in the exophthalmic. These observations lead me to the conclusion that iodine must be used judiciously in toxic cases and always with the view to operation at an early date.

Operation cannot be considered in this paper except to insist that the type and extent of each operation should be carefully planned beforehand, and that procedure should be used
which, in the judgment of the operator, best suits the requirements of the individual case. It is important that too much surgery should not be done at one time, and when we are dealing with doubtful operative risks, experience dictates that it is best to divide the operation into two or more stages. This has been emphasized by Clute, who states that "The degree of postoperative reaction in severe hyperthyroidism is exactly related to the amount of surgery performed in each case." Local anesthesia has been employed in 90 per cent of my cases. Nitrous oxide and oxygen is my preference when general anesthesia is required.

The postoperative care is of utmost importance as it is difficult to predict just when a disastrous storm will be encountered, and intensive treatment should be begun early. For this reason anticipation is better than regret, as there are no positive criteria for selecting the cases that will have a stormy postoperative course.

The most useful measures for the control of postoperative crisis are iodine, fluids and drugs which control restlessness and delirium.

Morphine and sodium amytal have been most frequently employed for the control of restlessness and delirium. These patients tolerate large doses of morphine, and I have not hesitated to give it freely, supplementing it when necessary with sodium amytal or nembutal by mouth or rectum. I have on occasions used one or both of these drugs to the point of narcosis.

Fluids are essential, and it is amazing the quantities these patients require and can handle without edema. Saline is given routinely by hypodermoclysis, and I start these patients immediately after operation on continuous venoclysis of glucose in saline. A recent patient was given 5,600 c.c. by venous drip every 24 hours for three days. This is probably our most useful measure in combating high temperatures and controlling the rapid pulse rate. Large amounts of fluid by mouth and rectum can also be given. In 1933 Frazier reported that since the adoption of the glucose venoclysis method of management that there had not been a single operative death on his thyroid service in a consecutive series of 535 operations for thyroid disease, and that the number of days elapsing from
the time of operation to the return of a practically normal afebrile state had been reduced materially.

Iodine used postoperatively will often prove an added weapon in combating or preventing a fatal crisis, and it may be safely used in both the exophthalmic and the toxic adenoma group after operation. It is routinely given by mouth or by rectal drip. We have not used any form of iodine by hypodermoclysis, but many writers state that it is well tolerated in this manner. In very severe cases I do not hesitate to give Lugol’s solution intravenously in saline, and have noted uniformly good results. From 20 to 50 minims in 300 c.c. of saline may be used freely with impunity. In a recent case I gave 160 minims during a 24-hour period intravenously with a very striking response. Goodrich has reported splendid results from the intravenous use of sodium iodide. Experience during the past few years has indicated that Lugol’s solution can be effectively and safely given intravenously, and has unquestionably been a useful and additional measure in handling thyroid crisis.

REFERENCES