FACTORS OF SAFETY IN OPERATING FOR
EXOPHTHALMIC GOITER

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The remarkable progress which has been made during the past twenty years in the surgical treatment of Graves' disease is worthy of comment. This progress is due to a greatly increased knowledge of the disease, and has resulted in a reduction of the mortality, in a greater number of cures, or in greatly lessened disability.

In the early nineties the disease was considered from a purely medical point of view, and very often patients were nearly moribund before surgical aid was given. It has been shown, however, that the disease is chronic and that there are conditions and periods of activity peculiar to it which should be treated medically in preparation for an operation later, unless the improvement be continuous and the recovery complete.

DIAGNOSIS

Because of the severe symptoms which present themselves the majority of cases of exophthalmic goiter can be readily diagnosed as such, but there may be a small number in which the diagnosis is made with difficulty. Most cases in which there is doubt are, in all probability, not true cases of Graves' disease, the symptoms being due to myocarditis, certain forms of nephritis and some obscure nervous manifestations, the causes of which are, as yet, unknown.

Kocher believes that cases of Graves' disease which are difficult to diagnose should be accepted as such only if they show the blood-changes commonly found in acute or active Graves' disease. From an observation of several hundred cases of exophthalmic goiter, Plummer has shown that the disease runs a fairly regular course.

If the average course of the disease be represented by a curve, the greatest height of the intoxication is found to be reached during the latter half of the first year and then rapidly drops to the twelfth month. In many instances it reaches the normal base-line during the next six months, more often it fluctuates with periods of exacerbation for the next two to four years. Secondary symptoms and exophthalmos may remain, but the active course rarely continues over four years without distinct intermissions. The ascent may be gradual, sudden, or irregularly marked by many secondary curves.

There is usually more dilatation of the heart and the symptoms are more acute in the first period; they assume a chronic type in the second. It is well known, however, that a few cases run their course to death within a few weeks, while others have only the most temporary remission, growing progressively worse for a few years, ending in death as a rule. It must be recognized, also, that cases of single or multiple adenomata of the thyroid may undergo a degeneration which acts on the system somewhat like the acute toxemia of hyperthyroidism, causing dilatation of the heart, nephritis and general anasarca. Nervousness, tremor and tachycardia may be present. Protrusion of the eyes does not occur in these cases, but the myocardial change may cause a widening of the palpebral fissure, or Dalrymple's sign. These cases, often called Graves' disease, should be classed as complicated simple goiter, the mortality of operation being fully equal to that of operations in the active and severe types of Graves' disease.

The mortality from operations performed during this early period by surgeons of considerable experience was from 20 to 30 per cent. Our mortality (W. J. and C. H.

Mayo) in the first sixteen cases was 25 per cent. Many of these patients were suffering from advanced myocardial changes, degeneration of the liver and kidneys, so that cure was out of the question, and checking the toxemia with relief of symptoms was all that could be hoped for. The relief of those who survived the operation, however, was so immediate and remarkable that the new patients were often advised to operation by the old. The high mortality, which should and would have been medical with a little more delay, was shifted on to the surgical side, and, like a vicious circle, the higher the mortality the greater the delay, and *vice versa*.

It was not until the beginning of the present century that the experience gained by the early workers in this field bore fruit. The disease became rather generally considered as surgical even by some physicians with a large experience in the medical treatment of simple goiters.

That factors of safety are gradually becoming recognized is proved by the present mortality following surgical operations, which is a varying one, from 1 to 4 per cent. The estimated proportion of cures, based on the examination of patients operated on and from letters and reports, is about 75 per cent. These patients have been restored to usefulness, resuming former occupations, and are free from nearly all former symptoms. Some of the patients with extreme and long-continued exophthalmos may still show symptoms of this condition, but which cause no discomfort; others may occasionally have tachycardia, and a few may have an occasional relapse of the general nervousness. It must be admitted, too, that, if there be an increase in the size of the remaining portion of the gland, a small number of patients will have a partial relapse of all symptoms after being practically well for a long period of time. Should a patient under medical treatment relapse after a period of improvement, the treatment is renewed. Should there be a relapse after surgical treatment, because of too little gland removed, or an increase of the remaining portion, it does not indicate a failure in the surgical principle, but calls for further operation.

Within the past year we have operated, between deaths, on a consecutive series of 278 cases of exophthalmic goiter, without a death. This is a decidedly marked gain over our early work, and I believe it has been caused by taking advantage of the so-called "factors of safety" in the treatment, preparation and operation of these patients.

1. As regards operating during periods of exacerbation or excessive activity of the disease: The mortality in these cases is frequently high, and it is such we would choose for medical treatment, i. e., rest, x-ray, etc., with attention to the heart, stomach and intestines according to the indications presented by the individual case, until the exacerbation of symptoms subsides.

2. Gastric crises and acute delirium are serious manifestations and operation should not be done until the conditions have subsided; the cases, until then, remain medical.

3. Dilatation of the heart which exceeds 1 inch is a serious condition, while that of an inch and a half will give a percentage of unavoidable mortality for the radical operation of thyroidectomy. The line of treatment is, therefore, indicated.

4. Ligation as a method of surgical treatment was practiced in the early part of the last century and again recommended by Wolfler and others in the latter part of the same century. The method now has an accredited

position in the treatment of exophthalmic goiter. Patients seen in the early stages are sometimes wonderfully improved by the simple operation of double ligation. These cases are, however, comparatively few in number, and, since it is this type which may possibly abort, it is difficult to say that the improvement in all cases necessarily comes from the operation.

5. Serious risks are treated by a single ligation of the vessels at the upper left pole. The reaction is about three-fourths as severe as from a double ligation, but the missing one-fourth is an element of safety. If the reaction be very severe, a second ligation of the right upper pole is made a week later. As compared with the first ligation, the reaction following this one is slight. If the reaction be not severe, at the second operation the right lobe, isthmus and possibly a portion of the left lobe is removed. In some cases of extreme emaciation, yet with a temporary fair or improved condition, a double ligation is made at the one operation. In several hundred patients the average gain in those who were below weight at the time of ligation was 22 pounds within four months. At this time a thyroidectomy of one-half or three-fourths of the gland can be made with small risk.

Ligation of vessels should be made close to, or should include some of, the pole itself, so that a reversal of circulation in anastomotic branches with the inferior artery may not occur. Thyroidectomy of three-fifths or more of the gland is indicated in most of the chronic cases in which dilatation of the heart does not exceed one inch and there are not complications—ascites or mental changes.

The small percentage of patients with exophthalmic goiter who relapse in from one to several years after partial thyroidectomy, with an increase in the size of the remaining lobe, should have the benefit of further surgical aid. Unless medical treatment be rapidly beneficial in such cases, the primary procedure should be ligation of the vessels at the superior pole, leaving only the inferior artery and the lateral and inferior veins. Should this operation not restore these individuals to their former improved condition, a part of the gland can be excised at a later period with but little risk.

Ether, preceded by atropin and morphin, is the anesthetic of choice for double ligations and thyroidectomy. If there be extreme nervousness, scopolamin is used, and the worst type of cases with affections of the heart and kidneys are operated by local anesthesia or receive the benefit of Crile's anocia preparation—injection local anesthesia into the field of operation in addition to the other preparations before ether is administered.

Ligations, both single and double, in the worst types of Graves' disease have been followed by a mortality which has fully equaled or exceeded the mortality of thyroidectomy. In the 278 operations there were 105 single and thirteen double ligations.

EXOPHTHALMIC GOITER

Single ligation	105
Double ligation	13
Single ligation followed by thyroidectomy	30
Two single ligations followed by thyroidectomy	21
Double ligation followed by thyroidectomy	26
Thyroidectomy	78
Thyroidectomy followed by ligation	4
Thyroidectomy followed by ligation followed by thyroidectomy	1
Total	278

SOME OBSERVATIONS ON CATHARSIS

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Observations on the movements of the gastro-intestinal contents by means of bismuth and x-ray were begun by Cannon about ten years ago.¹ For some unaccountable reason the subject did not receive the attention it deserved until several years later. Among important recent publications on the subject is that of Satterlee and Lewald,² who last year recorded the results of their observations on the passage of food from the stomach through the small and large intestine. Many other roentgenographers have verified their findings.^{3, 4, 5, 6}

In a normal individual the liquid stomach-contents begin to pass at once into the duodenum. The rate of outflow is governed by the pylorus, which relaxes and allows the gastric contents to pass through as fast as they are neutralized in the duodenum, but no faster.^{7, 8} Through the small intestine there is a steady forward flow toward the cecum. If a pint of bismuth soup be swallowed it takes ordinarily about six hours for all of it to pass into the cecum. But here rapid progress stops. In the cecum the mass remains for from twelve to twenty-four hours, or even longer, before there is much sign of passing on through the transverse colon. During the stay in the cecum and proximal part of the colon the mass becomes smaller and more dense from the absorption of water.

Peristalsis in the jejunum and ileum is continuous as long as there is anything solid touching and stimulating the mucous membrane. The peristaltic waves are short, worm-like and follow closely one after the other. The "rhythmic segmentation," described by Cannon,⁸ is a feature of intestinal digestion and absorption, and not a part of the propulsive force. In the large bowel, on the other hand, peristaltic movement is intermittent and powerful, and may involve a long segment at one time. In the transverse colon the contractions begin with a few short to-and-fro cradle-like movements,^{9, 10} which are probably caused by the longitudinal muscle-bands and are assumed to serve for mixing and lubricating purposes. These side to side movements are immediately followed by a series of ring-like contractions on which the fecal mass may pass rapidly over the splenic flexure and to the sigmoid. After such a functional effort the colon may rest for many hours before its next cycle of peristalsis begins.⁴ Reflex stimulation below the sigmoid causes evacuation.

A so-called antiperistalsis has been noted in the transverse colon,^{9, 10} the peristaltic waves passing for a few moments from left to right. Bloch,³ who claims to have been the first to demonstrate it in the human, thinks it is of rare occurrence, but cannot say whether it is a physiologic or a pathologic phenomenon. Short, on the other hand, thinks antiperistalsis the rule in the first half of the colon.¹⁰

The complicated physiology of digestion and absorption is as yet far from final solution and comprehension. In the upper part of the digestive tract physiologic

1. Cannon: *Am. Jour. Physiol.*, 1902, vi, No. 5.2. Satterlee and Lewald: *THE JOURNAL A. M. A.*, Oct. 14, 1911, p. 1255.3. Bloch: *Fortschr. a. d. Geb. d. Roentgenstrahlen*, 1911, xvii, 121.4. Holzknecht: *München. med. Wehnschr.*, 1909, No. 47.5. Fischl: *München. med. Wehnschr.*, 1911, No. 36.6. Schwarz: *München. med. Wehnschr.*, 1911, No. 39.7. Abderhalden: *Physiol. Chemie*.8. Cannon: *The Mechanical Factors of Digestion*.9. Bergmann and Lentz: *Deutsch. med. Wehnschr.*, 1911, No. 31.10. Short: *The New Physiology in Surgical and General Practice*.