Upsala J Med Sci 80: 122–126, 1975

Results of Partial Thyroidectomy for Thyrotoxicosis

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ABSTRACT

In a retrospective study, two series of surgically treated patients with thyrotoxicosis were compared. The series differed with respect to preoperative treatment and operative technique. In one series a combined preoperative treatment with an antithyroid drug and l-thyroxine was given and the recurrent nerves and parathyroid glands were routinely identified. In the other series no such operative routine was followed and iodine was given preoperatively. The complication rate was low in both series. There was no postoperative mortality. The existing differences, although subtle, in the frequency of recurrent nerve paralysis, postoperative hypoparathyroidism or hypothyroidism, as well as recurrent toxicosis, favoured the surgical approach with the combined preoperative treatment and a meticulous technique with identification of recurrent nerves and parathyroid glands.

INTRODUCTION

Subtotal thyroidectomy is widely employed as therapy for thyrotoxicosis. Clear indications exist for such a treatment and surgery often is thought to offer prompt and permanent relief.

In addition to surgery, antithyroid drugs and radio-iodine must also be considered as sometimes superior modes of therapy. The choice of therapy is debated, however, owing to the simple fact that none is ideal, each having its own advantages and disadvantages.

Immediate surgical complications are mortality and recurrent nerve injuries and as remote sequelae, toxicosis, hypofunction of the thyroid and/or the parathyroids are considered. The complication rate is usually low (2, 6) though the major complication of surgery, hypothyroidism, has been observed in certain studies to have an overall incidence of as high as 49% (7).

Variations in complication rate certainly reflect differences in pre- and postoperative care, as well as the surgical procedure itself. Wide experience in thyroid surgery and careful attention to details in operative techniques seem to lower the complication rate (5, 8, 10, 11).

At the University Hospital of Uppsala we have, since 1965, used standardized methods for the treatment of thyrotoxicosis, employing preoperative antithyroid drugs and *l*-thyroxine, an operative technique where meticulous care is taken in the identification of the parathyroid glands and the recurrent nerves and careful follow-up examinations.

In this retrospective study, the results of the above outlined regimen are compared with those of earlier series without such an established program. The findings favour the principles for surgical treatment of thyrotoxicosis including the preoperative schedule, and operative techniques with routine identification of the parathyroid glands and recurrent nerves.

MATERIAL

Series I, operated between 1968 and 1972

The series consisted of 108 consecutive patients who underwent surgery for thyrotoxicosis. The diagnosis, sex and age distribution are seen in Tables I and II. The yearly incidence from 1968 to 1972 is presented in Table III. Surgery was the primary treatment in 99 cases and 9 patients were referred to surgery when medical treatment led to recurrent toxicosis.

Preoperatively the patients were treated with an antithyroid drug, as a rule Carbimazole (Neomercazol®, British Sheerings Ltd.) supplemented with *l*-thyroxine (Levaxin®, Nyegaard A/S). This treatment was given on an ambulatory basis and usually continued for 3 months. On the day of operation the antithyroid treatment was discontinued. Thyroxine was given postoperatively in most cases with nodular, and in some cases with diffuse, goitre, in an initial daily dose of 0.1 mg.

Bilateral thyroid resection was performed for diffuse and nodular goitre and unilateral thyroid resection for toxic adenomas. In the bilateral resection, thyroid remnants of 4–6 g were left. Important stages in the surgical procedure were as follows:

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Table I. *Diagnosis and sex distribution of patients operated for thyrotoxicosis between 1968 and 1972*

M = Male, F = Female

Diffuse		Nodular		Adenoma		Total	
M	F	M	F	M	F	M	F
10	40	9	40	2	7	21	87
50		*49*		*9*		*108*	

Table III. *Diagnosis and yearly incidence of patients operated for thyrotoxicosis between 1968 and 1972*

	Diffuse	Nodular	Adenoma
1968	15	16	3
1969	16	14	2
1970	11	8	1
1971	4	10	0
1972	4	1	3

1. Transversal skin incision approximately 2 cm above the sterno-clavicular joints.
2. Separation and retraction of the sternothyroid and sternohyoid muscles in the mid-line.
3. Separate ligation of the superior thyroid artery to avoid injury of the external laryngeal nerve.
4. Exposure of inferior thyroid artery with ligation in continuity.
5. Identification of recurrent nerves.
6. Identification, if possible, of parathyroid glands. Before a bilateral resection, a thorough search was made for at least one parathyroid gland. Usually at least two parathyroid glands were identified and left at every operation.
7. Meticulous hemostasis before closing the wound, and drainage catheters (suction drainage according to Redon-Jost) for 48 hours.

The vocal cords were inspected prior to the operation, at the extubation and 3–4 days after surgery. Serum calcium and phosphorous levels were determined before and after the operation. The thyroid status was followed by determinations of protein-bound iodine (PBJ) or serum-thyroxine (T_4) and triiodothyronine (T_3-resine test) as well as by measuring thyroid stimulating hormone (TSH).

The patients were examined 2 weeks, and 2, 6, 18 months postoperatively and thereafter annually. The results of the present study were calculated on a mean follow-up time of 30±2 months.

Series II, operated upon between 1950 and 1964

The series consisted of 114 women and is presented in Table IV. The mean age of the patients at the time of operation was 34 years (16–49). For 2–3 weeks preoperatively the patients were hospitalized and prepared for surgery with oral iodine. This treatment was started with low doses and the dosage was increased until symptoms of thyrotoxicosis disappeared or were significantly reduced. Postoperatively the dosage was successively diminished and the treatment was usually terminated on the fifth day.

The operation consisted, with a few exceptions, of bilateral resection of the thyroid. Parathyroid glands and recurrent nerves were not regularly identified. In other respects the operations followed in principle the procedures described for series I.

At the follow-up examinations all patients were investigated with serum determinations of cholesterol, triglycerides and TSH. PBI and basal metabolic rate (BMR) were also measured when hypothyroidism was suspected. The mean follow-up time was 12 years (6–20) after operation.

Only women fertile at the time of operation were included in this material as the primary aim of the follow-up examination was to study the influence of the surgical treatment of thyrotoxicosis on fertility, pregnancies and children born thereafter. These aspects of the follow-up will be published elsewhere.

In the following text the cases in series I will be referred to as the recent series and those in series II as the early series. The two series were worked up with regard to postoperative bleedings (series I), vocal cord paralysis, hypoparathyroidism, hypothyroidism, and recurrent thyrotoxicosis (series I, II).

The diagnosis of hypothyroidism is based on evaluation of clinical symptoms, and lowered values of PBI, T_4 or T_3, sometimes in combination with an increase in TSH.

Table II. *Diagnosis and age distribution of patients operated for thyrotoxicosis between 1968 and 1972*

Age	Diffuse	Nodular	Adenoma	Total
–20	1	1	0	2
20–29	12	2	1	15
30–39	14	3	2	19
40–49	11	14	2	27
50–59	7	14	1	22
60–69	4	12	2	18
70–79	1	3	1	5
Total	50	49	9	108

RESULTS

Mortality

There was no per- or postoperative mortality in either series I or series II.

Postoperative bleeding

In series I, 6 patients (6 %) had postoperative bleeding which required reoperation with hemostasis. In no case tracheostomy was necessary.

Table IV. *Diagnosis of female patients operated for thyrotoxicosis between 1950 and 1964*

Diffuse	Nodular	"Undetermined"
82	25	7

Paralysis of recurrent nerve

In series I, none of the patients (0%) had persistent paralysis. Unilateral and, within 3 months, transient paralysis occurred in 4 patients (4%).

In series II, 3 patients (2%) suffered persistent unilateral vocal cord paralysis.

Postoperative hypoparathyroidism

In series I, none of the patients (0%) had persistent hypoparathyroidism. Overt but transient hypoparathyroidism arose in 8 patients (7%). Two of these patients required extra calcium for a few days.

In series II, one patient required vitamin D supplementation (Dygratyl®, Ferrosan, Sweden) implying a persistent postoperative hypoparathyroidism of less than 1%.

Postoperative hypothyroidism

In series I, most (84%) of the patients with nodular goitre and many (38%) of those with diffuse goitre had regular administration of thyroxine postoperatively (Table V). 12 patients (11%) were characterized as hypothyroid, with one exception all having been operated for a diffuse goitre.

In series II, 50% of the patients with nodular goitre and 14% of those with diffuse goitre had regular administration of thyroxine postoperatively. 8 women (7%) were classified hypothyroid, 6 of whom were already treated with thyroxine.

The values of TSH, cholesterol and triglycerides in series II found at the follow up are shown in Table VI. The patients submitted to partial thyroidectomy had on the average a higher TSH--value than the corresponding controls (normals). The values of cholesterol and triglycerides did not differ from the normals.

Postoperative recurrent toxicosis

In series I, 2 patients (2%) had a relapse within 12 months of surgery. Both (women, age at time of operation 18 and 27, respectively) were given antithyroid drugs for 2 years and still remain euthyroid 6 and 3 months after discontinued therapy.

In series II, 7 women (6%) had a relapse, 4 of them within 12 months. Only one was treated and cured with a thyrostatic drug, all the others were treated with radioiodine, hitherto remaining euthyroid.

DISCUSSION

The frequency of thyrotoxicosis in this region has been relatively constant for the last 20–25 years. The calculated incidence is around 30/100000, for women, 40/100000. During 1970–72 there was a diminishing number of operations for thyrotoxicosis mainly depending on an increased use of antithyroid drugs for the treatment of the toxic diffuse goitre. However, it has been shown that also after long-term antithyroid drug therapy only 20–35% of the patients experienced prolonged remission (3, 9) and an extension of the antithyroid dose did not obviously reduce the number of recurrences. A still lower frequency of prolonged remission after antithyroid drug therapy is demonstrated in patients with Grave's disease and enlarged goitre (9). Apparently long time antithyroid drug therapy can above all be expected to be successful in cases with small goitre, short duration of symptoms and with a simultaneous reduction in the size of the goitre during the treatment. These facts have in our clinic been reflected in an increased number of operations for toxic goitre during the last 2 years.

In spite of certain differences in the indication, the types of operations have been identical and in both series, with very few exceptions (unilateral resection in toxic adenomas), bilateral, partial resection was performed. However, the modes of

Table V. *Hypothyroidism after operation for thyrotoxicosis, between 1968–1972, with regard to diagnosis and postoperative thyroxine supplementation (+) or not (−)*

	Diffuse $n=50$		Nodular $n=49$		Adenoma $n=9$	
	+	−	+	−	+	−
Postoperative hypothyroidism	3	8	0	1	0	0
Postoperative thyroxine supplementation	19	31	41	8	8	1

Table VI. *Values of TSH, cholesterol and triglycerides in female patients operated between 1950–1964. Normal values of TSH in females of corresponding age are given in parentheses*

	Mean	±SD
TSH (units)	12.9 (5.5)	3.4–49.0 (1.2–25.0)
Cholesterol (mg %)	252	164–384
Triglycerides (mg %)	106	38–290

therapy are definitely different with respect to operative techniques with routine identification of the parathyroid glands and the recurrent nerves in series I, and to the preoperative treatment which is completely changed between the two series.

The complication rate must be considered acceptable in both series, and the differences subtle. Such a similar and low incidence of complications might be explained more by the fact that in both series our preoperative evaluations, as well as the operations, have been performed by experienced surgeons. Some observations are, however, worthy of further elucidation.

None of the series suffered from postoperative mortality due to crisis, haemorrhage or tetany. This can be attributed to the adequate preoperative treatment, either with iodides or antithyroid drugs, and the advantages of modern surgery and anesthesiology. Without a doubt the preoperative treatment of today, antithyroid drugs in combination with thyroxine, allows of an uncomplicated postoperative course—no abnormal increase in pulse rate or elevation of body temperature was found. Not one crisis was observed in the so treated patients, while in the early series one severe thyroid storm appeared, requiring intensive care.

The absence of recurrent nerve paralysis in the series with routine identification of the nerves indicates the importance of such a procedure. Persistent vocal cord paralysis is reported to be rare with such an operative technique 0–0.3 % (4, 12). This observation is also well confirmed in the comparison between our series with and without routine nerve identification, 0 and 2 %, respectively.

Our frequency of permanent postoperative hypoparathyroidism is extremely low and consistent with most recent series, in which, in the hands of experienced surgeons, the percentage ranges from 0 to 1.4 (2).

A routine identification of parathyroid glands is, however, no guarantee for the avoidance of postoperative hypoparathyroidism. It is not always possible to find the parathyroids (12) and in attempting to identify the glands there is always the risk of damaging their vascular supply (1).

Such an injury may explain the overt but transient hypoparathyroidism in the 8 patients in the recent series.

We would nevertheless emphasize the usefulness of the routine identification of the parathyroids, as this technique gives a familiarity with the anatomy leading to an increased skill in the handling of more radical thyroid procedures and parathyroid surgery.

The problem of the exact estimation of the frequency of postoperative hypothyroidism is well known and, in our two series, the liberal postoperative administration of thyroxine, contributes to the difficulty. The reason for our thyroid hormone treatment in nodular goitre is to avoid a recurrency of nodules and, in diffuse goitre, to decrease the risk of the postoperative exophthalmus syndrome. However, the small daily dose, 0.1 mg *l*-thyroxine, cannot conceal the appearance of a real thyroid hypofunction.

Postoperative hypothyroidism usually appears early, and more than 90 % are revealed within 12 months (7).

In the early series only 2 new hypothyroid subjects were discovered 12 years after thyroid surgery, and in the recent series all patients characterized as hypothyrotic were observed within one year.

However, our studies showing elevated TSH-levels in patients followed for an average of 12 years indicate not only an early subtle thyroid hormone deficiency (2); for a considerable time after the operation the thyroid remnants are unable to maintain a state of euthyroidism without an excessive stimulation. Thus there is always the risk of a late postoperative hypothyroidism underlining the importance of life-long follow-up.

Our frequencies of recurrent toxicosis are within those reported in the literature. An interesting observation is that, taken together, the percentage of hyper- and hypothyroidism postoperatively is identical—13—in our two series. These complications reflect our inability to individually and exactly decide the optimal size of the thyroid remnant. The size of the remnant and the degree of lymphoid infiltration are crucial factors for a development of

postoperative hypofunction. In the choice between a recurrent toxicosis or a hypothyroid state, the latter is definitely preferred, since it is amenable to prompt treatment.

The signs of a hitherto lower frequency of recurrent toxicosis in the recent series may be an advocate for a more radical resection, which is certainly the consequence of the more extensive dissection technique needed for the routine identification of recurrent nerves and parathyroid glands.

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Received February 13, 1975

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