TOTAL THYROIDECTOMY IN MULTINODULAR NON-NEOPLASTIC GOITER

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The aim of the study was to describe the experience of the authors in performing total thyroidectomies in patients referred to surgical treatment with the diagnosis of non-neoplastic multinodular goiter.

Material and methods. Over a period of 6 years (2000-2005), 4999 surgical procedures were performed in patients diagnosed as having non-neoplastic goiter at our department. Thus, the analysis does not include patients operated on due to carcinoma of the thyroid, diagnosed either pre- or intraoperatively, or individuals with recurrent goiter. Total thyroidectomies were performed in 408 (8.16%) patients. Subtotal thyroidectomies, i.e. a total lobectomy involving one, dominant thyroid lobe and combined with a subtotal resection of the contralateral lobe, were done in 1251 (25.02%) individuals. In patients with lesions involving one thyroid lobe only, the operators performed a total resection of the affected lobe, while leaving the normal, contralateral lobe without any surgical intervention. Such a procedure was performed in 89 (1.78%) individuals. In very few cases, the operation consisted of a subtotal unilateral lobectomy; such a treatment modality was employed in 39 (0.78%) patients.

The predominantly performed procedure employed in 3212 (64.1%) patients was subtotal bilateral lobectomy of the thyroid gland. The patients were divided into groups according to the type of surgery performed. The groups were then compared for clinical diagnosis and the prevalence of early and late postoperative complications. The Student-t test was employed to calculate the probability and confidence interval values.

Results. Among surgical patients not suspected of thyroid carcinomas, neoplastic lesions were, nevertheless, confirmed by postoperative histopathology in 310 (6.2%) individuals. As shown in the presented data, increased extent of the procedure was associated with thyroid carcinoma, diagnosed only by postoperative histopathology an increased number of complications, among which the most common was hypocalcemia.

Conclusions. 1. Total thyroidectomy may be a preferred method for treating bilateral multinodular goiter; when performed by an experienced endocrine surgeon, it is associated with a low percentage of postoperative complications. 2. Total thyroidectomy in bilateral multinodular goiters lead to a decreased number of secondary operations in patients.

Key words: total thyroidectomy in bilateral multinodular goiters, postoperative complications, benign multinodular goiter

Almost total (subtotal) thyroidectomy is a commonly accepted method of managing non-neoplastic lesions of the thyroid. The method is highly regarded by surgeons who are positive that with this technique, they are capable of decreasing the risk of complications such as damage to the laryngeal nerves and hyperparathyroidism. Many surgeons, including those from Poland, assume that leaving the thyroid stumps in situ may ensure appropriate thyroid function following the surgery. Nevertheless, for the past 20 years or so, surgeons in many countries have postulated the use of total thyroidectomy in patients with bilateral, benign multinodular goiters. These surgeons follow the premise that the risk of inflicting iatrogenic damage in the course of a total thyroidectomy is similar to the risk involved in subtotal thyro-
Total thyroidectomy in multinodular non-neoplastic goiter. They quote arguments for their approach, stressing the fact that a total thyroidectomy eradicates the danger of goiter recurrence, allows for the avoidance of necessary reoperations in cases when malignant tumors of the thyroid have been missed in the diagnostic process, and decreases the risk of postoperative hemorrhage since no thyroid stumps are left in situ that might become a source of bleeding. In addition, in patients with Graves’ disease and progressive ophthalmopathy, such an approach is the method of choice (1-10).

The rate of goiter recurrence in patients subjected to subtotal operations may be as high as 43%, while the risk of damaging the recurrent laryngeal nerves and parathyroid glands in the course of reoperation is many times higher as compared to individuals undergoing primary surgery (11-13).

The objective of the present preliminary report is to describe the experience of the authors in performing total thyroidectomies in patients referred to surgical treatment with the diagnosis of non-neoplastic multinodular goiter, as well as attempt to determine whether procedures involving the thyroid gland that are more extensive as compared to operations performed presently are justified.

MATERIAL AND METHODS

Over the period of 6 years (2000-2005), 4999 surgical procedures were performed in patients diagnosed as having non-neoplastic goiter at the Department of Endocrine Surgery, Third Chair of General Surgery, Collegium Medicum, Jagiellonian University. Thus, the analysis does not include patients operated on due to carcinoma of the thyroid, diagnosed either pre- or intraoperatively, or individuals with recurrent goiter. Total thyroidectomies were performed in 408 (8.16%) patients. Subtotal thyroidectomies, i.e. a total lobectomy involving one, dominant thyroid lobe and combined with a subtotal resection of the contralateral lobe, were done in 1251 (25.02%) individuals. In patients with lesions involving one thyroid lobe only, the operators performed a total resection of the affected lobe, while leaving the normal, contralateral lobe without any surgical intervention. This procedure was performed in 89 (1.78%) individuals. In a very few cases, the operation consisted of a subtotal unilateral lobectomy, which was employed in 39 (0.78%) patients. The predominantly performed procedure, employed in 3212 (64.1%) patients, was subtotal bilateral lobectomy of the thyroid gland. It should be emphasized, however, that within the analyzed period, the number of such procedures decreased (fig. 1). The data were analyzed clinically and statistically. The patients were divided into groups according to the type of surgery performed. The groups were then compared according to clinical diagnosis and the prevalence of early and late postoperative complications. The Student-t test was employed to calculate the probability and confidence interval values.

RESULTS

Postoperative diagnoses based on histopathology are presented in fig. 2. Among surgical patients not suspected of thyroid carcinomas,
neoplastic lesions were, nevertheless, confirmed by postoperative histopathology in 310 (6.2%) individuals. The distribution of postoperative diagnoses in patients with total and subtotal thyroidectomies is presented in fig. 3 and 4, while fig. 5 illustrates the distribution of diagnoses in patients with subtotal bilateral lobectomies. Table 1 shows the prevalence of postoperative complications depending on the extent of surgery. As it follows from the presented data, increased complexity of the procedure was associated with an increased number of complications, among which the most common was hypocalcemia.

DISCUSSION

In each case, surgical management was geared towards achieving the overriding goal of relieving the complaints experienced by the patient, while at the same time ensuring the most comfortable life possible. Surgery of the thyroid gland is based on methods wherein complications are manifested immediately after the procedure, within 24 hours after the operation, or in the subsequent days following the procedure. The incidence rate of complications following thyroid surgery depends on numerous factors. The primary factor is the experience of the surgeon and the number of operations he has performed. However, this is not the only decisive determinant, although it is extremely important. The size of the goiter, its extent and location (either retrosternal or within the chest), the scope of thyroid resection and procedures performed in recurrent goiter are all factors which seem to affect the development of early postoperative complications.

Members of our surgical team have been discussing for the past few years the possible gain for a patient in whom, due to bilateral nodular lesions, a total thyroidectomy is performed, and what loss is there for such a patient, i.e. what degree of risk of early postoperative complications should be anticipated when the surgery is radical. In many centers, total thyroidectomy in multinodular non-neoplastic goiter has been a well-recognized management method for more than 20 years (1, 3-7, 10, 14). Advocates of this treatment modality unanimously state that the incidence of early postoperative complications approximates the rate observed after less radical procedures, such as subtotal lobectomies. Delbridge (1), a major supporter of total thyroidectomies in multinodular goiter, believes the method to be safe; it is routinely employed in Australia and New Zealand. Total thyroidectomy eradicates the danger of goiter recurrence, but such a procedure may be performed by a very limited number of even the most experienced sur-

Fig. 3. Total thyroidectomies (n = 408)

Fig. 4. Subtotal thyroidectomies – unilateral total lobectomy and partial resection of the contralateral lobe (n = 1251)

Fig. 5. Subtotal bilateral lobectomies (n = 3212)

* statistically non-significant,
** p<0.001
Table 1. Postoperative complications depending on the extent of operation

<table>
<thead>
<tr>
<th>Complications</th>
<th>Total number of operations</th>
<th>Total thyroidectomies</th>
<th>Subtotal thyroidectomies</th>
<th>Unilateral lobectomies</th>
<th>Bilateral subtotal lobectomies</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Bilateral paralysis of recurrent laryngeal nerves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transient *</td>
<td>19</td>
<td>0.19% per risk</td>
<td>2</td>
<td>0.24% p.r</td>
<td>5</td>
<td>0.2% p.r</td>
</tr>
<tr>
<td>permanent *</td>
<td>2</td>
<td>0.02% per risk</td>
<td>0</td>
<td></td>
<td>1</td>
<td>0.04% p.r</td>
</tr>
<tr>
<td>Unilateral paralysis of recurrent laryngeal nerves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transient *</td>
<td>241</td>
<td>2.41% per risk</td>
<td>24</td>
<td>2.94% p.r</td>
<td>70</td>
<td>2.8% p.r</td>
</tr>
<tr>
<td>permanent *</td>
<td>62</td>
<td>0.62% per risk</td>
<td>8</td>
<td>0.98% p.r</td>
<td>16</td>
<td>0.64% p.r</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transient **</td>
<td>182</td>
<td>3.64%</td>
<td>44</td>
<td>10.80%</td>
<td>56</td>
<td>4.48%</td>
</tr>
<tr>
<td>permanent **</td>
<td>4</td>
<td>0.08%</td>
<td>1</td>
<td>0.24%</td>
<td>1</td>
<td>0.08%</td>
</tr>
<tr>
<td>Bleeding *</td>
<td>45</td>
<td>0.9%</td>
<td>5</td>
<td>1.22</td>
<td>12</td>
<td>0.96%</td>
</tr>
<tr>
<td>Death *</td>
<td>2</td>
<td>0.04%</td>
<td>0</td>
<td></td>
<td>1</td>
<td>0.08%</td>
</tr>
<tr>
<td>Total number of operations</td>
<td>4999</td>
<td>100</td>
<td>408</td>
<td>8.16</td>
<td>1251</td>
<td>25.02</td>
</tr>
</tbody>
</table>

As it follows from our results, with the exception of hypoparathyroidism, the percentage of laryngeal nerve damage and bleeding was similar to values reported by Delbridge and implemented by Delbridge et al. in the sternocleidomastoid muscle. Nevertheless, as Delbridge reports, of the 3100 operations only 11% of procedures were subtotal resections. It should be noted that the complication rate reported by Delbridge was very low (damage to the nerves, 1.4% in subtotal procedures). In recent years, the percentage of hypocalcemia has been decreasing. Experience demonstrates that appropriate surgical training has resulted in significant decrease in postoperative laryngeal nerve damage and bleeding. However, the complication rate reported by Delbridge was very low (damage to the nerves, 1.4% in subtotal procedures).
A genuine argument against total thyroidectomy is the potential risk of an increase in early postoperative complications. Based on a representative group of German patients, Thomsch et al. (12) expressed their belief that subtotal thyroidectomy should be the method of choice in treating patients with benign multinodular goiter. In their material, the percentage of cases with laryngeal nerve damage was 0.8% after subtotal resections as compared to 2.3% after total resections; the incidence of hypoparathyroidism was 0.9% (subtotal) vs. 10.5% (total thyroidectomies), while bleeding was less common after total procedures (1.1%) as compared to 2.97% after subtotal operations. The above data are in accord with reports of other authors and prove that the risk of bleeding after a total thyroidectomy is lower in comparison to less radical procedures (4, 6, 7, 12). Our data differ: the percentage of postoperative bleedings requiring reoperation was 1.22% after total thyroidectomies and 0.87% in patients subjected to subtotal procedures. The difference is statistically non-significant.

The patient subjected to a total thyroidectomy is condemned to life-long thyroid hormone substitution, but patients subjected to less radical procedures also take thyroid hormones. Based on the analysis of several thousands of patients followed at the Endocrinological Surgery Outpatient Department in Cracow, the respective mean doses employed in these two groups of patients are 94.94±23.47 µg of thyroxin in individuals subjected to total thyroidectomies vs 86.96±32.25 µg after non-radical bilateral lobectomies, the difference being non-significant. On the other hand, the patient that underwent total thyroidectomy is not at risk for recurrent goiter. This is of considerable importance, since goiter recurrence – if reoperation is required – poses a genuine challenge to the surgeon. The prevalence of recurrent goiter in materials presented by various authors is extremely diversified. The problem is difficult to document, since patients with recurrent goiter often resolve to undergo the operation in another center of thyroid surgery rather than in the center where the primary procedure was performed. Thus, there are authors who claim not to observe any recurrence after subtotal lobectomies, while according to other reports, recurrent goiter may appear in as many as 43% of all the surgical patients (7, 13). Although prophylactic thyroid hormone supplementation after goiter surgery decreases the incidence of recurrent disease, such prevention does not eradicate recurrences. Apart from TSH, factors that promote goiter growth also include EGF (epidermal growth factor), IGF (insulin-like growth factor), and most likely other, hitherto unrecognized factors. Thus, inhibition of TSH release does not prevent the effect of other growth factors that may lead to regrowth of the thyroid gland. Reoperations involving the thyroid entail the risk of a high percentage of recurrent laryngeal nerve damage, the rate being as considerable as 20%; they may also pose a danger of permanent hypoparathyroidism that may involve as many as 4% of patients. Some authors represent the view that exposing the laryngeal nerves and parathyroid glands while providing appropriate blood supply prevents damage of the nerves and permanent hypoparathyroidism. In addition, total thyroidectomy with careful ligation of the vessels is believed to decrease the risk of postoperative bleeding, in contrast to situations when well-vascularized tissue is left in situ as represented by the stumps of the thyroid lobes (1, 3, 4, 6, 9, 10, 18). An alternative for a total thyroidectomy is a subtotal thyroidectomy; in the presently analyzed material, the latter procedure was employed in 25% of patients.

An argument against total thyroidectomy for multinodular goiter is the difficulty in establishing a pre- and intraoperative diagnosis of thyroid malignancy. In the analyzed group, 310 (6.2%) patients were diagnosed as having thyroid carcinoma only after the surgery, based on microscopic examinations. In 40 (12.9%) individuals, total thyroidectomies were performed, in 90 (29%) – subtotal procedures, while six patients were subjected to total resections of the affected lobe together with the isthmus. These operations fulfill the criteria of radical procedures and the patients did not require reoperations. In 174 (56.1%) individuals, the operation consisted of subtotal bilateral lobectomies only. The predominant finding in the entire group of 310 subjects was papillary carcinoma (n=216, 69.7%), often representing pT1a stage (n=160, 51.6%), but 81 (26.1%) patients revealed follicular carcinoma, four (1.3%) – medullary carcinoma, and nine (2.9%) – other types of thyroid cancer. In consequence, in 94 patients, secondary radicalization of procedures following prima-
rily sub-total operations was necessitated. In the analyzed period, the percentage of such procedures consistently decreased, from 2.55% in 2000 to 1.24% in 2005.

What conclusions can be derived from our, albeit still limited, experience in performing more radical procedures in multinodular goiter? Such procedures have been carried out in one-third of our surgical patients (8% of total and 25% of subtotal thyroidectomies). The number of such procedures has been consistently growing and regardless of whether they are accepted by other surgical centers in Poland, we would like to appeal to our fellow-surgeons to perform a total excision of at least one thyroid lobe while managing their patients with goiter. If, for any reason, there is a need for reoperating on the patient in the future, the procedure will be easier to perform, as it will be limited to one side only and thus associated with a decreased risk of complications.

How should one operate, then, in order to minimize the risk of postoperative complications? The procedure should be performed anatomically and careful hemostasis should be maintained. The laryngeal nerves should be exposed, the parathyroid glands identified and in no case should a thyroidectomy be attempted without prior visualization of these structures. Should technical problems arise, the surgeon should abandon the planned total resection of the thyroid in favor of preserving a margin of thyroid tissue sufficient to prevent damage to the recurrent laryngeal nerves and parathyroid glands. In our opinion, total thyroidectomies may constitute a preferred method in bilateral multinodular goiter, although it should not be considered a method of choice in unilateral multinodular goiter. Such radical procedures should be carried out only by experienced surgeons. An additional argument for radical procedures is also the fact that radical operations are performed in pre- and intraoperatively undiagnosed malignant disease.

CONCLUSIONS

1. Total thyroidectomy may be a preferred method in bilateral multinodular goiter; when performed by an experienced endocrine surgeon, it is associated with a low percentage of postoperative complications.

2. Total thyroidectomy in bilateral multinodular goiters leads to a decreased number of secondary operations in patients with thyroid carcinoma diagnosed solely by postoperative histopathology.

REFERENCES

This study deals with a subject that has been recently presented in numerous reports worldwide, but only sporadically in our country. It comes from a centre with extensive experience in thyroid surgery – over 800 operations on thyroid glands annually – where the extent of thyroidectomy is adjusted to individual cases.

In the presented material of 4999 goitre surgeries, in which no malignancy had been recognised preoperatively, a typical bilateral subtotal lobectomy was the basic surgical procedure. The surgery was carried out in 64.1% of patients; 25% of patients were subjected to subtotal and 8.2% (408) to total thyroidectomy. The remaining surgical procedures, hemithyroidectomy and partial excision of one lobe, were performed rarely, in 1.8% and 0.8% of cases, respectively.

Unfortunately, the Authors have not shown in detail classification criteria affecting the selection of a definite extent of surgeries. Therefore, I would like to present my own observations on this subject. I have been performing total thyroidectomy for many years (apart from for thyroid malignancies) nearly always in case of relapse, exophthalmic or neutral nodular goitres with numerous bilateral focal lesions, i.e. for indications similar to those outlined by the authors. This surgery involves bilateral identification of the recurrent laryngeal nerves and at least two parathyroid glands, frequently combined with autotransplantation. Such management, in my opinion, provides a low percentage of reoperations due to latent thyroid cancer, nearly no goitre relapses, a low percentage of parathyroid and nervous complications comparable to the authors’ data, and nearly complete lack of postoperative bleeding; only one event with the necessity for revision was noted in the last five years.

The data demonstrated in fig. 1 and 3 indicate that the Authors’ radical approach towards surgery and the percentage of total thyroidectomy increase in the discussed period of time and relates mainly to neutral, nodular goitre.

This approach is in accordance with that expressed by the supporters and promoters of this method, who have been cited by the Authors. The presented trend concerns abandonment of the concept of functional thyroid resection and results in the elevated percentage of patients who require postoperative hormonal replacement therapy. When levothyroxine agents were commonly available, adjustment of the hormone substitution dose did not pose any problem. If we agree with the idea that postoperative hypothyroidism is not a complication but a normal consequence of the surgery associated with the need for administration of thyroxine hormone supplement, the idea that the surgery decreases the risk for appearance of other complications is justifiable. The following issues can be considered in these observations:

The percentage of the most frequently occurring complications after thyroidectomy – hypoparathyroidism and paresis of laryngeal nerves – increases in many surgical centres along with the extent of surgeries; see the study of Tomusch et al. cited by the Authors (position 12).

The percentages of the most common post-surgical complications indicated by the Authors are low, which is an additional argument for conducting thyroidectomies in the specialized centres. Enlargement of the surgical field has not resulted in a significant rise in pareses of laryngeal nerve function – on which the Authors ought to be congratulated; however, it has elevated the percentage of hypoparathyroidism,
which should not be associated with gland excision but rather with postoperative impairment of blood supply.

The second important issue in my observation is the percentage of thyroid cancers revealed only in postoperative histological examination: 40 (9.8%) out of 408 patients after total thyroidectomy, 90 (7.2%) out of 1251 after hemithyroidectomy and partial surgery of the second lobe, and 173 (5.4%) of 3212 patients subjected to subtotal goitre resection were found to have thyroid cancer.

The Authors do not specify the type and progression of the accidentally diagnosed malignant tumours. However, according to the accepted recommendations, patients with type 1 cancer are not likely to require complementary surgery. The remaining patients with cancer are candidates for resurgery, being a prerequisite for further complementary treatment. Therefore, they are at risk of significantly higher complication rates, what is indicated by the report from the Oncological Institute in Gliwice.

The third essential issue, while performing total thyroidectomy in the case of Graves’ goitre, is elimination of the antigen against which antibodies are directed and breakage of the immune reaction chain.

The Authors have not discussed the subject of total unilateral or bilateral lobectomy, which appears to be a fundamental procedure in minimally invasive surgeries performed by means of the videscopic or video assisted technique.

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