TOTAL THYROIDECTOMY FOR NODULAR, BENIGN THYROID DISEASES IN TERMS OF LARYNX FUNCTION EXAMINATIONS – IS IT A NEW TREATMENT STANDARD?

KRZYSZTOF KACZKA¹, WOJCIECH JANKOWSKI¹, JERZY KOPCZYŃSKI², JOANNA KWIECIEŃ², LECH POMORSKI¹

Department of General and Oncological Surgery, Medical University in Łódź¹
Kierownik: prof. dr hab. L. Pomorski
Department of Otolaryngology, Maria Skłodowska-Curie Memorial Hospital in Zgierz²
Kierownik: dr n. med. J. Kopczyński

Aim of the study was the assessment of total thyroidectomy (TT) value as a treatment method of goiter with particular emphasis on the results of laryngological examination.

Material and methods. From 15th April 2008 to 1st July 2009 there were 125 (72.7%) TTs, 12 (7%) TTs and appropriate lymphadenectomies, 9 (5.2%) near TTs, 14 (8.1%) lobectomies, 5 (2.9%) completion thyroidectomies and 6 (3.4%) other operations. Vocal cords function was assessed routinely one day before, two days after operation by an otolaryngologist. Voice quality was assessed by patients in VHI questionnaire theirselves.

Results. Five patients had one-sided vocal cord paralysis before the operation. The one-sided transient recurrent laryngeal nerve injuries was observed in 16 other patients (9.3% among patients and 4.6% among nerves at risk) in the second day after the operation. There was no bilateral recurrent laryngeal nerve injury. From three to six months after the operation, 21 (among 23) patients with vocal cord movement disability were examined once again by the same otolaryngologist. The same vocal cord paralysis was observed in 4 sickers (one person died), which was found preoperatively. Seven (4%) other patients had permanent one vocal cord paresis. This represents 2% the nerves at risk. Three of them were recognized benign lesions and four thyroid cancer. Our percentage of early, postoperative hypoparathyroidism was 6.4% and persistent was 1.7%. VHI score in the group with paresis or paralysis of vocal cord gave the score of 4 to 90 points – an average of 49 points. In patients with proper vocal cord movement there were results from 0 to 6 points – an average of 2 points.

Conclusions. 1. Total thyroidectomy in the treatment of bilateral goiter without malignancy features is radical and safe procedure. 2. It protects against goiter relapse and its consequences. 3. Complications rates after total thyroidectomy are at acceptable and comparable proportions to the other operation types.

Key words: nodular goiter, total thyroidectomy, subtotal thyroidectomy, recurrent laryngeal nerve, hypoparathyroidism

Total thyroidectomy is an operation that is generally acceptable for the management of thyroid cancer. Consensus guidelines of surgical treatment recommend the total extracapsular thyroid excision with appropriate lymphadenectomy rather than other operations, as the initial procedure of choice, given its advantages of removing potential multicentric neoplasm, facilitating maximal uptake of adjuvant radioactive iodine, and facilitating the post-treatment follow-up by monitoring serum thyroglobulin (Tg) levels. Although there are still some authors who think that total thyroidectomy is almost never justified even in cases of thyroid cancer (1, 2).
More controversial is total thyroidectomy performing for benign thyroid diseases such as: toxic or non-toxic multinodular goiter (3, 4). There are increasing number of reports suggesting using it for bilateral benign multinodular goiter or Graves-Basedow’s disease (3, 4, 5).

According to the latest great review total thyroidectomy is even the procedure of choice for the surgical management of benign multinodular goiter (6). In many reports complications rates of permanent recurrent laryngeal nerve palsy and permanent hypoparathyreoidism following total thyroidectomy are similar to those following subtotal thyroidectomy (6-9).

When the whole gland is involved in sick with multinodular goiter, a bilateral ST, although reducing the bulk of the glandular tissue, is less than optimal treatment. After such operation the patients have a high recurrence rate of goiter even if they take appropriate doses of L-thyroxine (10). Anyway, most patients use them till the end of life. Complication rates of damage of parathyroid glands and laryngeal nerves in reoperation are significantly greater than at the first operation (11, 12). According to some even up to 20 times (13).

In contrast, radical gland excision removes all abnormal tissue in the neck. After it there is also no recurrence. In addition, after total thyroidectomy, hormone replacement with L-thyroxine is relatively easy, cheap and can be monitored by TSH serum levels. The incidence of thyroid carcinoma in nodular goiter patients, often in its occult type, could be even 15% (14, 15, 16).

In such patients total thyroidectomy can be a definite surgical management.

Since 2008 in our department we generally have been performing only two kinds of thyroid operations in benign lesions: total thyroidectomy or lobectomy with istmus resection (hemithyroidectomy). We also have made total thyroidectomy in cases of recurrent goiter after previous partial thyroidectomy.

In this article we would like to review our experience with total thyroidectomy for multinodular goiter and to make an assessment on the justification of the approach taken toward total thyroidectomy for multinodular goiter. We also evaluate the complications risk after such procedure. We assume, that total thyroidectomy may be a typical operation for benign goiter. Although it is radical treatment, it is possible to perform it with minimal, acceptable number of complications.

Aim of the study was the assessment of total thyroidectomy value as an operative treatment method of goiter with particular emphasis on the results of laryngological examination.

**MATERIAL AND METHODS**

Goiter operations were evaluated in prospective review from 15th April 2008 to 1st July 2009. The patients had referrals to hospital from endocrinological departments and outpatient clinics. The majority of them were prepared outside the department. Each patient was performed necessary, laboratory examinations before the operation and thyroid ultrasound, chest X-ray examination, TSH level and many patients also fT3 and fT4 levels.

Each goiter patient had FNAB. The patients previously operated on because of benign or malignant goiter were usually made the scintigraphic examination in the referral unit. Computerized tomography was done in retrosternal goiter and some neoplasm patients selectively in hospital. Vocal cords function was assessed routinely one day before, two days after operation by an otolaryngologist.

The patients with vocal cord paralysis or plegia were treated in an out-patient clinic. Repeated videolaryngoscopic examination was performed in these patients in period from 3 to 6 months after operation. All patients with vocal cord movement disorders assessed theirselves voice quality by VHI questionnaire. It concerns the impact of voice disorders on socio-biological functions and the quality of life.

The patient personally fill the questionnaire. In test VHI points scale is from 0 to 120. Score 0-30 is a standard, 31-60- mild voice disability, 61-120 severe voice disability.

All toxic-goiter patients received tyreostatics and often also beta-blockers until the day of the surgery. Iodine drugs were used to prepare for the operation. The toxic-goiter patients were operated only when they were in euthyreosis.

All the operations were performed under general anesthesia by the same team.

The patients were informed about the extent of the operation and possible complications. The permission for strict operation was obtained. Total extracapsular thyroid excision
was made in majority of the patients with both lobes lesions. When there were one-sided changes in ultrasound and intraoperative examination (observation and palpation) lobe with nodule/nodules and isthmus excision was performed. Total thyroidectomy was also made in case of Graves-Basedow disease.

Total thyroidectomy means for us completely extra-capsular thyroid gland excision. Procedure was performed after the identification and preservation both laryngeal nerves (recurrent and external) bilaterally and at least three parathyroid glands. All the patients were left parathyroid glands in their primary localization and own vascularization. If they were accidentally removed or devascularized they were autotransplanted into the one-sided sternocleidomastoid muscle after fragmentation.

The operation was extended by appropriate lymphadenectomy if the indication for the operation was thyroid cancer.

The postoperative wound was drained usually by one Redon’s drain for 24 hours. The patients without any complications were discharged from hospital two days after operation.

In exceptional cases- old age, long home way, worse general state, the hospital stay was extended of 1-2 days. The patients with postoperative hypocalcaemia stayed in the department until calcium levels were normal during oral supplementation.

One hundred seventy two patients underwent thyroid operation from 15th April 2008 to 1st July 2009. The age rates from 16 to 71 years (mean age 49.8). There were 147 (85.5%) females and 25 (14.5%) males- ratio 5.9:1.

The indications and the kind of the thyroid operations are summarized in tab. 1 and 2.

During the research period total thyroidectomies were carried out the most often. They were 125 (72.7%) among all types of our operations. There were 14 (8.1%) lobectomies in our patients. In all, these cases not removed lobe was examined by ultrasound before the operation and by palpation intraoperatively.

In 9 (5.2%) patients we performed near total thyroidectomy according to Consensus Development Conference of DTC (Holland 1987) (17). All thyroid cancer patients had total thyroidectomy with appropriate lymphadenectomy. The extent of lymph node excision was established according to the Polish guidelines from Thyroid Conference from Szczyrk 2005. It means central compartment lymphadenectomy in all cases and appropriate lateral department lymphadenectomy according to the primary localization of tumor. In 5 (2.9%) patients we performed the radicalization (completion thyroidectomy which means the resection of thyroid lobes stumps and lymphadenectomy). All for these operations, the patients had a referrals from other departments where the first operation was performed. In one patient we removed the pyramid lobe regrowth.

### RESULTS

Five our patients had one-sided vocal cord paralysis before the operation. The one-sided transient recurrent laryngeal nerve injuries was observed in 16 other patients (9.3% among patients and 4.6% among threatened nerves) in the second day after the operation. There was no bilateral recurrent laryngeal nerve injury.

Our percentage of early, postoperative hypoparathyroidism was 6.4% and persistent (requiring calcium and vitamine D supplementation) was 1.7%. There were no deaths re-

---

**Table 1. The indications for the operation according to histopatology**

<table>
<thead>
<tr>
<th>Preliminary diagnosis</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-toxic goiter</td>
<td>112</td>
<td>65,1</td>
</tr>
<tr>
<td>Toxic goiter</td>
<td>32</td>
<td>18,6</td>
</tr>
<tr>
<td>Papillary cancer</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Follicular cancer</td>
<td>8</td>
<td>4,7</td>
</tr>
<tr>
<td>Medullary cancer</td>
<td>1</td>
<td>0,6</td>
</tr>
<tr>
<td>Anaplastic cancer</td>
<td>1</td>
<td>0,6</td>
</tr>
<tr>
<td>Oxyphillic tumor</td>
<td>3</td>
<td>1,8</td>
</tr>
<tr>
<td>Graves-Basedow’s disease</td>
<td>3</td>
<td>1,8</td>
</tr>
</tbody>
</table>

**Table 2. The types of the performed operations**

<table>
<thead>
<tr>
<th>Operation type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total thyroidectomy</td>
<td>125</td>
<td>72,7</td>
</tr>
<tr>
<td>Total thyroidectomy and appropriate lymphadenectomy</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Lobectomy (hemithyroidectomy)</td>
<td>9</td>
<td>5,2</td>
</tr>
<tr>
<td>Near total thyroidectomy</td>
<td>14</td>
<td>8,1</td>
</tr>
<tr>
<td>Pyramid lobe excision</td>
<td>1</td>
<td>0,6</td>
</tr>
<tr>
<td>Completion thyroidectomy</td>
<td>5</td>
<td>2,9</td>
</tr>
<tr>
<td>Other – futher reoperation, partial lobe excision, lymphadenectomy</td>
<td>6</td>
<td>3,4</td>
</tr>
</tbody>
</table>
lated to the operation. Although two persons died due to thyroid neoplasms 1–3 months after the operation— one patient had lymphoma, the other one undifferentiated thyroid cancer. We had two major hemorrhages after the operation. One of them was in female after extensive thyroid cancer operation. They required evacuation of hematoma and control of operation wound under general anesthesia.

From three to six months after the thyroid operation, 21 (among 23) patients with vocal cord movement disability were examined once again by the same otolaryngologist. The same vocal cord paralysis was observed in 4 sick (one person died), which was found preoperatively.

Seven (4%) other patients, included 4 thyroid cancer patients, had permanent one vocal cord paresis. It is 2% the nerves at risk. Excluding thyroid cancer patients, because of the need for radical surgery and lymphadenectomy, it is clear that one permanent vocal cord paresis was seen in 3 of 112 patients with benign lesions. This represents 2.6% of patients and 1.3% of nerves at risk.

VHI score in the group with paresis or paralysis of vocal cord gave the score of 4 to 90 points— an average of 49 points. In patients with proper vocal cord movement there were results from 0 to 6 points— an average of 2 points.

**DISCUSSION**

In discussion we should refer to total thyroidectomy desirability in case of benign goiter, rate of complications and the balance of profits and losses. Previously, different extended partial resections of the gland were performed in the treatment of benign thyroid diseases.

The classification concerning extent of thyroid gland excision was classified during the Conference in Holland in 1987 (17).

Total thyroidectomy is the operation that is generally acceptable for the management of thyroid cancer as a surgical treatment of choice. Although there are some authors who even do not agree with that, considering as sufficient less extensive gland excision (1, 2).

According to Cady and others hemithyroidectomy is appropriate for a large group of patients with good-prognosis thyroid cancer (1). But the vast majority of surgeons prefer total thyreiodectomy in the treatment of thyroid cancer either a less aggressive clinical course (e.g. papillary thyroid cancer) or a rapidly progressive course (anaplastic thyroid cancer) (18–21).

They remark that more radical operation results in a lower locoregional recurrence rate and increases survival. It also makes an ability to scan and treat metastases with radioactive iodine and to follow-up with serum thyroglobulin measurement. Total thyroidectomy is also recommend because thyroid cancer is often multifocal. Lang reported that even in 48% patients (22), Baudin in 40% (23). This percentage was even higher in the study, which was attended by one of the authors (24).

Like many endocrine surgeons we think total thyroidectomy is very good option for the treatment almost all thyroid benign diseases. According to us it is valuable procedure especially when the entire thyroid has nodules. In these cases there is no possibility to leave morphologically normal thyroid tissue. The percentage of cancer recognized in postoperative examination of goiter, operated as benign reaches several percent. Total excision of the gland can be consider in most of these case—microcarciomas as sufficient surgical treatment.

Total thyroidectomy should be strongly recommended for patients with Grave-Basedows’ disease because it eliminates the source of autoantibodies responsible for this disease.

There is some evidence that thyrotropin receptor antibodies levels normalize after total thyroidectomy (25). It has been already reported also in the home literature (26).

It depends on the extent of resection, kind of goiter and various grow factors including TSH level. The part of the patients with recurrence need surgery.

Total thyroidectomy, as the first operation, completely eliminates possibility of disease recurrence. In the study from Rome there were no disease recurrence during a mean follow-up of 44 months (2). The same conclusion was drawn from the latest review from 1987 to 2007 (27).

It also decreases any associated endocrine opthalmopathy in 80–85% patients (efremidou). All our Graves-Basedows’ disease patients were treated by total thyroidectomy. On the other hand, nontotal thyroidectomy, such as subtotal
thyroidectomy or lobectomy is a less satisfactory procedure. Up to 45% patients after such operations may have a recurrent disease that is not treatable by thyroxin therapy and may require the second surgery (1, 2, 28).

Repeat operation for recurrent thyroid diseases carries significantly higher risk than the primary operation, with the incidences of recurrent laryngeal nerve palsy and permanent hypoparathyroidism as high as 20% (29).

Non total thyroidectomy reduce the volume of the involved thyroid tissue but it do not prevent the necessity for long-term thyroxine replacement therapy. Attempts to suppress regrowth of that remaining gland by thyroxine not always guarantee success. The thyroid remnants may hypertrophy in many years after operation, causing pressure symptoms or suspicion of neoplasia if the remnant recurrence is nodular. This fact may not be recognized unless long-term data are reviewed after primary non total thyroidectomy. According to Reeve and others the peak incidence of the second operation appears 13 years after subtotal thyroidectomy (3, 30). During a subtotal thyroidectomy it is also possibility to remain the small posterior-lateral part of the thyroid tissue (Zuckerkandl’s tuberculum) (13, 20, 31).

In case of goiter recurrence, this tissue often can grow into the retrotracheal and retroesophageal area causing pressure symptoms. Without the full mobilization of the lobes necessary for a total thyroidectomy there is very difficult to recognize this Zuckerkandl’s tuberculum. There is also possibility that recurrent remnant may cause thyrotoxicosis (9).

When one of the lobes is morphologically normal in non-toxic goiter, total thyroidectomy is not recommended although in the longer term follow-up approximately 12% of these patients develop recurrence and half of them require the second operation (32).

The next advantage of total thyroidectomy is a fact that it gives a definite histological diagnosis. It is important when clinical features or FNAB results indicate the possibility of thyroid malignancy. The one of the most fact in discussion against or for total thyroidectomy is the rate of the complications. Like in other operations, there is good evidence to show that with increasing experience and the use of appropriate surgical technique total thyroidectomy can be performed with minimal complication rate.

In case of total thyroidectomy this way of operating is called “capsular dissection”. The main inferior thyroid artery should not be ligated which preserves proper parathyroid glands blood supply. According to us the recurrent laryngeal nerve ought to be visualize in all cases not only during the reoperations or thyroid cancer operations. It must be seen constantly when we operate close to or in the tracheosophageal groove. It minimizes inadvertent damage of recurrent laryngeal nerve.

The incidence of permanent laryngeal nerve injure varies considerably in surgical departments. High complication rates of total thyroidectomy was reported in some studies (33,34) whereas in many others the reported incidence was low (1, 2, 5) or is even 0% (2).

The percentage of identified vocal cord paralysis and paresis also depends on the nerve structure. Its main trunk can enter the larynx as a one structure or divide into small branches before entering the larynx. Their damage without main trunk changes can cause subtle losses and disorders of the vocal cord movement. Videolaryngoscopy and applied VHI test allow fairly verification of damage of voice function of the larynx.

There were 4.6% postoperative, early injuries of laryngeal nerves at risk. In distant examination, the percentage of paralysis was only 2% of all nerves at risk. In benign lesions patients persistent paresis was observed in 2.6% of them and 1.3% nerves at risk. VHI test in his group showed moderate voice disability. According to the German multicenter study, complications rate increases with the extent of surgery (35).

Other reports indicate, however, that there is no difference of complications rates between the total and subtotal thyroidectomy (36, 37).

We do not make generally subtotal thyroidectomy so we could not draw definite conclusion but it seems not safer procedure than total thyroidectomy. It is quite easy to injury the nerve when it is tried to achieve hemostasis of the leaving thyroid tissue. In addition there is no reliable method of assessing the amount of thyroid tissue to be preserved in individual patients treated by subtotal thyroidectomy. These factors and high risk of goiter recurrence and complications of the repeated operation cause that the most common operation made by our team is total thyroidect-
Total thyroidectomy for nodular, benign thyroid diseases in terms of larynx function examinations

Total thyroidectomy for nodular, benign thyroid diseases in terms of larynx function examinations. When there is no indication for it we perform lobe and isthmus excision. It gives euthyreosis. In case of appearing nodules in the other lobe and operation need, the procedure is performed in conditions similar to primary operation.

In thyroid cancer operation, the risk of nerve damage depends not only on the surgical technique but also on the degree of spread of the malignancy. For example Perzik reported 0.4% laryngeal nerve injury during benign thyroid disease operation and 5% injury for thyroid cancer operation (3).

Complications rates were shown to be higher after total thyroidectomy when it was performed by surgeons who were not specialized in endocrine surgery (10, 13, 38).

Our percentage of early, postoperative hypoparathyroidism was 6.4% and persistent (requiring calcium and vitamine D supplementation) was 1.7%. Transitory hypocalcemia was observed more often in toxic goiter patients. There are studies showing that an incidence of less than 1% is achievable (36).

We do not agree with Moore and others who recommend that all patients having total thyroidectomy should have routine calcium supplementation prior to discharge from the department (39). We order calcium supplementation only when the patients has clinical and biochemical signs of hypocalcemia. We do not routinely make autotransplantation of parathyroid gland in every case of total thyroidectomy. We do it into strap muscles only when we unintentionally remove the gland or ligature their blood vessels. According to some studies, the higher main complication rates after thyroidectomy are observed in patients with hyperthyroidism (40, 41, 42).

Although the great multivariate study from Germany did not confirm that hyperthyroidism is a risk factor for the development of RLN injury (35).

There is no doubt that hemostasis is more assured after total thyroidectomy when all vessels are individually ligated than when dealing with an intact mass of residual vascularized thyroid tissue.

Two our patients required reoperation because of strong hemorrhage after operation. In one patient it was caused by damage of superficial, neck vein by drain. In other one by not proper ligature of superior thyroid artery. It seems that the incidence of this complication does not depend on the thyroid operation kind.

In 9 (5.2%) patients we performed near total thyroidectomy. Like Delbrighe we are not sure that it is justified to leave a small amount of abnormal tissue to reduce complication rates especially temporary hypocalcaemia (5). This problem requires further studies. Maybe in future it will be operation of choice for nodular goiter patients. There was no wound infection among our patients.

In this study we have proved that total thyroidectomy can be performed in all cases of thyroid diseases with minimal complication rates. It is achieved by the use of proper technique of thyroidectomy, whereby dissection and ligation of the multiple vessels on the thyroid capsule preserves the blood supply of the parathyroids and visualization of parathyroids and the recurrent laryngeal nerve minimizes possibility of injury. Our data suggest that total thyroidectomy gives immediate and permanent cure with no risk of disease recurrence and the second operation. In case of occult thyroid cancer it may be definite surgical treatment. Nowadays long-term euthyroidism is quite easy achieved by L-thyroxine substitution.

Taking one pill a day is acceptable price for the lack of disease’s relapse and its potential unpleasant consequences.

CONCLUSIONS

1. Total thyroidectomy in the treatment of bilateral goiter without malignancy features is radical and safe procedure.
2. It protects against goiter relapse and its consequences.
3. Complications rates after such surgery are at acceptable and comparable proportions to the other operation types.

REFERENCES

1. Cady B: Our AMES is true: how an old concept still hits the mark; or, risk group assignment points
2. arrow to rational therapy selection in differentia
37. De Roy van Zuidewijn DBW, Songun I, Kiewit J: The aetiology, investigation and management of

Received: 22.10.2009 r.
Adress correspondence: 95-100 Zgierz, ul. Parzęczewska 35