Int J Clin Exp Med 2015;8(3):4596-4600
www.ijcem.com /ISSN:1940-5901/IJCEM0005491

Original Article

Total versus bilateral subtotal thyroidectomy for benign multi-nodular goiter

Fatih Ciftci[1], Erdal Sakalli[1], Ibrahim Abdurrahman[2]

[1]*The School of Health Care Professions Avcılar, Istanbul Gelisim University, Istanbul, Turkey;* [2]*Department of Internal Medicine, Safa Hospital, Istanbul, Turkey*

Received January 4, 2015; Accepted February 21, 2015; Epub March 15, 2015; Published March 30, 2015

Abstract: Purpose: To compare the postoperative early-stage complications of total and bilateral subtotal thyroidectomy for benign multi-nodular goiter. Material and methods: There were 409 patients. The patients were divided into two groups. A total of 258 (63%) patients underwent total thyroidectomy, and 151 (37%) patients underwent bilateral subtotal thyroidectomy. Results: Recurrent laryngeal nerve palsy occurred in six (2.3%) of the total thyroidectomy patients and in three (1.9%) of the bilateral subtotal thyroidectomy patients (P>0.05). No permanent palsy was observed in either of the thyroidectomy groups. Hypocalcemia occurred in 40 (15.5%) of the total thyroidectomy patients and in 27 (17.8%) of those who underwent bilateral subtotal thyroidectomy (P>0.05). Also, no statistically significant differences were found between the two groups with respect to the development rates of hematoma and incision site infection (P>0.05). Conclusion: Because of its low complication rates, total thyroidectomy is a safe procedure for benign multı-nodular goiter.

Keywords: Multi-nodular goiter, total thyroidectomy, subtotal thyroidectomy, complication

Introduction

Thyroidectomy methods range from nodulectomy to total thyroidectomy (TT) in benign thyroid disorders. TT and bilateral subtotal thyroidectomy (BST) are the most commonly preferred methods by surgeons for BMNG. The selected surgical method for thyroid disease should aim to eradicate the disease as well as to minimize postoperative complications, and the main reason for choosing the BST method is a presumed lower incidence of postoperative complications. However, goiter might recur in patients with BST, and it is well known that reoperation greatly increases the risk of injury to the recurrent laryngeal nerve (RLN) and the parathyroid glands [1, 2]. In recent years, many studies have recommended TT as opposed to BST for BMNG. These studies note that the TT procedure has an incidence of postoperative complications that is similar to that of the BST procedure [1-4].

In this study, we aimed to compare postoperative early-stage complications in patients who underwent BST and those who underwent TT for BMNG.

Material and methods

A total of 409 patients who underwent thyroidectomy for toxic and nontoxic multi-nodular goiter between January 2008 and July 2013 at the Department of General Surgery within the Safa Private Hospital (Istanbul, Turkey) were reviewed retrospectively. The study protocol was approved by the ethics committee before the onset of the study. The demographic properties of patients, the indications for surgery, postoperative early-stage morbidity (transient and permanent recurrent laryngeal nerve palsy, transient and persistent hypocalcemia, postoperative bleeding, and wound site infection) and length of stay in hospital were evaluated. Thyroid functions and biochemistry tests were performed on each patient. Thyroid gland ultrasonography and indirect laryngoscopic examinations were done on every patient before the surgical procedure. Those patients found to have hyperthyroidism before the operation

Table 1. Patients properties

Group	TT (n=258)	BST (n=151)	*P* value
Age	42.2±12.4	40.3±12.4	0.081
Gender			
Male n (%)	53 (20.5)	32 (21.2)	0.903
Female n (%)	205 (79.5)	119 (78.8)	
Indication for operation			
MNG n (%)	190 (64.2)	106 (35.8)	0.521
TMNG n (%)	67 (59.3)	46 (40.7)	
Lengh of stay in hospital (day)	3.5±2.5	3.7±2.3	0.111
Hormonal status (%)			
Hypothyroidism	3 (1.1)	4 (2.6)	
Euthyroidism	195 (75.5)	104 (68.8)	0.122
Hyperthyroidism	60 (23.2)	43 (28.4)	

TT: Total Thyroidectomy; BST: Bilateral Subtotal thyroidectomy; MNG: Multinoduler Goiter; TMNG: Toxic Multinodular Goiter.

were treated with antithyroid drugs (propylthiouracil, methimazole), until they became euthyroid, and were then operated on. Patients who underwent unilateral lobectomy, completion thyroidectomy, thyroidectomy due to Basedow-Graves disease, thyroiditis and thyroid cancer were not included in the study. The selected patients were divided into two groups, namely, the TT and BST groups. All patients in both groups were operated on by the same experienced surgeon. Effort was made to see the parathyroid glands during all operations. For the cases in which the parathyroid glands were not visible, the glands were sought at possible ectopic sites. Those parathyroid glands whose blood perfusion were destroyed were cut into 1 mm^3 pieces and then transplanted into the ipsilateral sternocleidomastoid muscle [5]. In the TT group, the RLN was seen during surgery and was preserved.

After the surgery, the vocal cords of all patients were examined with indirect laryngoscopy by an otorhinolaryngology specialist. During the follow-up period, those whose vocal cord movements turned to normal were regarded as having transient RLN palsy. When vocal cord palsy lasted more than six months, it was regarded as persistent RLN palsy [3, 6].

Serum calcium levels were determined preoperatively in all patients and on the first postoperative day. Calcium levels were re-determined on the subsequent postoperative days as necessary. Patients with hypocalcemia symptoms were treated with vitamin D and calcium replacement. Patients with hypocalcemia symptoms lasting more than six months were accepted as having persistent hypoparathyroidism [3, 6].

Statistical analysis

For the statistical evaluation, the SPSS 15.0 for Windows (SPSS Inc. Chicago, IL, USA) program was used to analyze the definitive statistics of the results. In the definitive statistics, continuous variables were shown as mean ± standard deviations, and for the categorical variables, percentages and the number of cases were used. The chi-square test was used to evaluate the qualitative data, and the Student's t-test was used to compare the two groups. A value of $P<0.05$ was accepted as statistically significant.

Results

There were 409 thyroidectomy cases of which 258 (63%) and 151 (37%) underwent TT and BST, respectively. The indications for surgery were multi-nodular goiter (MNG) and toxic multinodular goiter (TMNG). The mean age was 41.5±12.7 years for all patients, 42.2±12.4 years in the TT group and 40.3±12.4 years in the BST group. The youngest patient was 17, and the oldest was 80. There were 324 (79.2%) females and 85 (20.8%) males. A total of 296 (72.4%) patients were operated for MNG and 113 (27.6%) for TMNG. Among the MNG patients, 190 (64.2%) were in the TT group, and 106 (35.8%) were in the BST group. Among the TMNG patients, 67 (59.3%) were in the TT group, and 46 (40.7%) were in the BST group. Of the 258 patients in the TT group, 195 (75.6%) were presented with euthyroidism while 43 (28.5%) were presented with hyperthyroidism. The mean length of stay in hospital was 3.52±2.54 days in the TT group and 3.76±2.37 days in the BST group. There were no significant differences between the two groups with respect to age, gender, hormonal status, duration of stay in hospital, and indications for surgery (**Table 1**).

Hematoma developed in three (1.9%) cases while wound site infection developed in one (0.6%) patient in the BST group. In the TT group, hematoma developed in three (1.1%) cases

Table 2. Postoperative complication rates of the patients

Compliaction/Group	TT n (%)	BST n (%)	*P* value
Hematoma	3 (1.1)	3 (1.9)	0.514
Wound site infection	3 (1.1)	1 (0.6)	0.611
Hypocalcemia			
Transient	40 (15.5)	27 (17.8)	0.571
Persistant	–	–	
Recurrent laryngeal nerve palsy			
Transient	6 (2.3)	3 (1.9)	0.805
Permanent	–	–	

while wound site infection developed in three (1.1%) patients. No statistically significant differences were found between the two groups with respect to the development rate of hematoma and wound site infection (P>0.05). Subsequent to the thyroidectomies in the overall wound site, problems (infection and hematoma) developed in 10 (2.4%) cases. RLN palsy occurred in six (2.3%) cases in the TT group and in three (1.9%) cases in the BST group. All RLN palsy cases were unilateral. Permanent palsy was not documented in either group, and there was no statistical difference between the groups with respect to RLN palsy (P>0.05). In the postoperative period, hypocalcemia developed in 40 (15.5%) cases in the TT group and in 27 (17.8%) patients in the BST group. Whereas no persistent hypocalcemia was observed in the BST group, it was observed in one (0.4%) case in the TT group. With respect to hypocalcemia, no significant statistical differences were found between the two groups (P>0.05). The evaluation of all the patients revealed that hypocalcemia occurred in 67 (16%) patients. No other complications were noted in either group. The postoperative complication rates of the groups are shown in **Table 2**.

Discussion

Up until the end of the 20th century, TT was the standard procedure in thyroid cancer cases. Because of its high complication rates, this procedure was rarely employed in non-cancerous cases [6]. High recurrence rates, despite hormone suppression treatment after subtotal thyroidectomy for benign thyroid diseases, increased the interest in total resection [7-9]. In recent years, TT has become more acceptable in the treatment of MBNG [3, 7-10].

Forty percent of the nodules are positioned near the posterior capsule of the thyroid gland in BMNG, so some nodules remain unresected in BST [8, 11, 12]. The greatest disadvantage of BST in BMNG is the high recurrence rate [3]. Pappalardo and colleagues [8] reported a recurrence rate of 14.5% in patients who received medical treatment after subtotal thyroidectomy and 43% in patients who did not. Rojdmark and colleagues [13] reported a 42% recurrence rate in a 30-year follow-up of subtotal thyroidectomy patients. Recurrence in thyroid disease nevertheless poses difficulties for reoperation as fibrous tissues lead to loss of the normal anatomic structure, which, in turn, leads to very high complication rates. Reoperations due to recurrence have a 10-fold increase in RLN and parathyroid gland injuries [14]. Wound infection and bleeding rates are also higher in reoperations [8, 12].

Another important factor leading to abstention from the subtotal intervention of MNG is the malignancy potential of the thyroid nodules. The occult cancer rate is generally between seven and ten percent [15]. Castro and colleagues [16] reported that five percent of all thyroid nodules have malign characteristics. Moreover, the most common reason for reoperation in thyroid surgery is the incidental finding of malignancy in pathological examinations.

Hoarseness due to RLN palsy, hypocalcemia due to parathyroid gland injury, and early-stage hemorrhage due to ineffective bleeding control are the most significant complications occurring after thyroidectomy operations. Some studies have reported that TT is associated with a higher risk of complications [17, 18]. Notwithstanding, Pattou and colleagues [19], and Gough and Wilkinson [9] found the complication risk associated with TT to be lower. However, in many other studies, no significant differences were found in terms of the rate of complication between TT and SBT [15, 20]. Moreover, our study did not find any significant differences in postoperative complications between TT and BST.

The existing literature shows the permanent RLN palsy rate after TT (0-0.7%) and BST (0-1.3%) [22] are performed by experienced surgeons. A particular study showed transient and permanent RLN palsy rates of 1.7% and 0% for TT and BST [23], respectively. Ozbaş and

colleagues [3] reported a transient RLN palsy rate of 1.9% and a permanent RLN palsy rate of 0% after TT. In that same study, the rate of transient and permanent RLN palsy were reported as 4% and 1%, respectively, after BST. In our study, the transient RLN palsy rate was reported as 1.9%, and there were no permanent palsy cases after TT was performed. Likewise, the transient RLN palsy rate was 1.9%, and there were no permanent palsy cases after BST was performed. We found no statistically significant difference with respect to the rates of transient and permanent RLN palsy between the TT and BST groups.

The causes of transient hypocalcemia may include parathyroid gland ischemia, postoperative hemodilution, and thyroid gland manipulation leading to increased calcitonin secretion. Persistent hypocalcemia results from an unintentional removal of the parathyroid glands along with the thyroid glands or from the disruption of blood perfusion of the parathyroid glands [24]. According to the literature, following TT, transient hypocalcemia rates range from 1.6% to 30%, and the persistent hypocalcemia rate ranges from 0% to 3.8%. However, following BST, the transient hypocalcemia rate ranges from 1.6% to 22%, and that of persistent hypocalcemia ranges from 0% to 0.2% [8, 9, 12, 15, 23]. Tezelman and colleagues [25] reported that transient and persistent hypocalcemia rates were 8.4% and 0.8%, respectively, after TT and 1.4% and 0.4%, respectively, after BST. We found the rates of transient hypocalcemia to be 15.1% and that of persistent hypocalcemia to be 0.4% after TT. Also, the transient hypocalcemia rate was 17.5%, and that of persistent hypocalcemia was 0% after BST. No significant statistical differences were observed with respect to transient and persistent hypocalcemia between the TT and BST groups.

According to the literature, the frequency of postoperative hemorrhage and wound infection ranges between 0% and 2% [3, 6, 25-27]. In the study by Ozbaş and colleagues [3], the hemorrhage rate was 0.4% after TT and 0% after BST, and the wound site infection rate was 0% after TT and 0.6% after BST. In our series of cases, no severe hemorrhage or wound site infection needing reoperation was reported. The hematoma and wound site infection rates were both 1.1% after TT. In the BST group, hematoma and wound site infection occurred at the rates of 1.9% and 0.6%, respectively. Incision site problems (wound site infection and hematoma) occurred in a total of 10 (2.4%) patients. Patients with wound site infections were treated with appropriate antibiotherapy and wound dressing, and those with hematomas had them drained. We found no statistically significant differences with respect to wound site infection and hematomas between the groups.

Like many other studies, our study results illustrated that using TT for benign thyroid diseases can be done with little morbidity. The most important factor in decreasing morbidity in thyroid surgery is the surgical technique employed. We believe that during the mobilization and dissection of the thyroid lobes, exposing the RLN, employing effective hemostasis during operation to ensure clear operation, viewing the four parathyroid glands, and protecting their perfusion vessels may help to reduce complications.

Conclusion

Our study showed that there is no significant difference with respect to early-stage postoperative complications between TT and BST. However, TT has the advantage of avoiding the risk of disease recurrence and reoperation and eliminates any subsequent risk of malignant change in radiated thyroid glands. TT should therefore be considered for treating BMNG.

Acknowledgements

The authors express their gratitutude and thanks to all participating patients and do clinical staff.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Fatih Ciftci, The School of Health Care Professions Avcılar, Istanbul Gelisim University, Basaksehir mah. 2.etap. D 35/24. Basakkonutları, Basaksehir/Istanbul-Turkey. Tel: 90 505 616 4248; Fax: 90 212 462 7056; E-mail: oprdrfatihciftci@gmail.com

References

[1] Bononi M, De Cesare A, Atella F, Angelini M, Fierro A, Fiori E. Surgical treatment of multinodular goiter: ıncidence of lesions of the re-

current nerves after total thyroidectomy. Int Surg 2000; 85: 190-193.
[2] Siragusa G, Lanzara P, Di Pace G. Subtotal thyroidectomy or total thyroidectomy in the treatment of benign thyroid diseases. Our experience. Minerva Chir 1998; 53: 233-238.
[3] Ozbas S, Kocak S, Aydintug S. Comparison of the complications of subtotal, near total and total thyroidectomy in the surgical management of multinodular goitre. Endocr J 2005; 52: 199-205.
[4] Lombardi CP, Raffaelli M, De Crea C. Complications in thyroid surgery. Minerva Chir 2007; 62: 395-408.
[5] Lal G, Clark OH. Thyroid, Parathyroid and Adrenal. In: Schwartz SI, editors. Principles of Surgery. 8th editon. New York: F.C.Brunicardi-Hill Book Comp; 2005. pp. 1395-1470.
[6] Alimoglu O, Akdag M, Sahin M. Comparison of surgical techniques for treatment of benign toxic multinodular goiter. World J Surg 2005; 29: 921-924.
[7] Bhattacharyya N, Fried MP. Assessment of the morbidity and complications of total thyroidectomy. Arch Otolaryngol Head Neck Surg 2002; 128: 389-392.
[8] Pappalarado G, Guadalaxara A, Frattalori FM, Illomei G, Falaschi P. Total compared with subtotal thyroidectomy in benign nodular disease: personal series and review of published reports. Eur J Surg 1998; 164: 501-506.
[9] Gough İR, Wilkinson D. Total thyroidectomy for management of thyroid disease. World J Surg 2000; 24: 962-965.
[10] Zambudio AR, Rodriguez J, Riquelme J, Soria T, Canteras M, Parrilla P. Prospective study of postoperative complications after total thyroidectomy for multinodular goiters by surgeons with experience in endocrine surgery. Ann Surg 2004; 240: 18-25.
[11] Ignjatović M, Kostić Z. Thyroidectomy with Liga Sure. Surg Today 2011; 41: 767-73.
[12] Müller PE, Kabus S, Robens E, Spelsberg F. Indications, risks, and acceptance of total thyroidectomy for multinodular benign goiter. Surg Today 2001; 31: 958-962.
[13] Rojdmark J, Jarhult J. High long-term recurrence rate after subtotal thyroidectomy for nodular goiter. Eur J Surg 1995; 161: 725.
[14] Reeve TS, Delbridge L, Brady P, Crummer P, Smyth C. Secondary thyroidectomy: a twenty-year experience. World J Surg 1988; 12: 449-453.
[15] Delbridge L, Guinea AI, Reeve TS. Total thyroidectomy for bilateral benign multinodular goiter: effect of changing practice. Arch Surg 1999; 134: 1389-1393.
[16] Castro MR, Gharib H. Thyroid nodules and cancer. When to wait and watch, when to refer. Postgrad Med 2000; 107: 113-116.
[17] Thomusch O, Machens A, Sekulla C. Multivariate analysis of risk factors for postoperative complications in benign goiter surgery: prospective multicenter study in Germany. World J Surg 2000; 24: 1335.
[18] Wahl RA, Rimpl I. Selective (= morphology and function dependent) surgery of nodular struma: relationship to risk of recurrent laryngeal nerve paralysis by dissection and manipulation of the nerve. Langenbecks Arch Chir Suppl Kongressbd 1998; 115: 1051-1054.
[19] Pattou F, Combemale F, Fabre S. Hypocalcemia following thyroid surgery: incidence and prediction of outcome. World J Surg 1998; 22: 718-720.
[20] De Roy van Zuidewijn DB, Songun I, Kievit J. Complications of thyroid surgery. Ann Surg Oncol 1995; 2: 56-60.
[21] Khadra M, Delbridge L, Reeve TS, Poole AG, Crummer P. Total thyroidectomy: its role in the management of thyroid disease. Aust NZ J Surg 1992; 62: 91-95.
[22] Jatzko GR, Lisborg PH, Muller MG, Wette VM. Recurrent nerve palsy after thyroid operations: principal nerve identification and literature review. Surgery 1994; 115: 139-144.
[23] Koyuncu A, Dökmetas HS, Turan M. Comparison of different thyroidectomy techniques for benign thyroid disease. Endocr J 2003; 50: 723-727.
[24] Payne RJ, Hier MP, Tamilia M, Young J, NacMara E, Black MJ. Postoperative parathyroid hormone level as a predictor of postthyroidectomy hypocalcemia. J Otolaryngol 2003; 32: 362-367.
[25] Tezelman S, Borucu I, Senyurek Giles Y, Tunca F, Terzioglu T. The change in surgical practice from subtotal to near-total or total thyroidectomy in the treatment of patients with benign multinodular goiter. World J Surg 2009; 33: 400-405.
[26] Efremidou EI, Papageorgiou MS, Liratzopoulos N, Manolas KJ. The efficacy and safety of total thyroidectomy in the management of benign thyroid disease: a review of 932 cases. Can J Surg 2009; 52: 39-44.
[27] Friguglietti CU, Lin CS, Kulcsar MA. Total thyroidectomy for benign thyroid disease. Laryngoscope 2003; 113: 1820-1826.