



# Total and Near-total Thyroidectomy is Better Than Subtotal Thyroidectomy for the Treatment of Bilateral Benign Multinodular Goiter; A Prospective Analysis

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## ABSTRACT

**Objective:** To analyze the safety and effectiveness of total thyroidectomy in the surgical management of bilateral benign multinodular goiter.

**Materials and Methods:** A prospective review of patients with bilateral benign multinodular goiter undergoing subtotal thyroidectomy (Group 1), and near-total thyroidectomy and total thyroidectomy (Group 2) during 5-year period was undertaken. Patients' demographics, indications for surgery, type of operation performed, final histological diagnosis and complications were recorded. Transient and permanent complications regarding hypoparathyroidism and recurrent laryngeal nerve paralysis were analyzed for each surgical procedure.

**Results:** Out of a total of 207 patients, recurrence of benign multinodular goiter was recorded in 27 (30%) cases in group 1 while there was no recurrence in group 2 ( $p < 0.01$ ). Completion thyroidectomies were performed in 31 (34%) patients in group 1 whereas none was required in group 2 ( $p < 0.01$ ). Incidental thyroid malignancy was found to be 18% ( $n = 38/207$ ) in this study which necessitated completion thyroidectomy in group 1 patients. Permanent hypoparathyroidism was documented in 4 (4%) and 3 (1.8%) and transient hypoparathyroidism in 5 (6%) and 4 (2.8%) cases in groups 1 and 2, respectively;  $p$  value not significant. Permanent hypoparathyroidism and transient RLN palsy were recorded in 9 (29%) and 8 (25%) patients, respectively in those patients who underwent second thyroid surgery ( $P < 0.05$ ).

**Conclusion:** Total or near-total thyroidectomy is effective and safe for the surgical treatment of bilateral multinodular goiter to prevent recurrence and to eliminate the need for completion thyroidectomy in case of final diagnosis of incidental thyroid malignancy.

**Keywords:** Bilateral multinodular goiter, hypoparathyroidism, subtotal thyroidectomy, total thyroidectomy, recurrent laryngeal nerve paralysis;

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## **1. INTRODUCTION**

The outcome of endocrine surgical diseases is measured by the success of the operation at relieving the endocrinopathy and the ability of the surgeon to minimize postoperative morbidity (Reeve et al., 1987). Currently, opinions differ on both the proper extent of primary resection and the need for re-operation for benign multi nodular goiter (BMNG) (Wilson et al., 1998). Subtotal thyroidectomy (ST) was advocated to be safer than total thyroidectomy (TT) as it was thought that leaving behind some thyroid tissue would prevent subsequent thyroxine replacement (Hay et al., 1987). However, nodules can also arise from portions of the gland that were previously normal, and small nodules can become symptomatic. In addition, recurrence rates as high as 42 to 45 % have been reported following subtotal thyroidectomy for BMNG (Rojdmark and Jarhult, 1995; Geerdson and Frolund, 1984). The incidence of recurrence has been directly related to a long postoperative follow up and to large amounts of remnant thyroid tissue (Piraneo, et al., 1997; Zelmanovitz et al., 1995). The most alarming fact is the appearance of malignant neoplasms in the remaining tissue reported to be 7.5 to 13 % (McCall et al., 1986; Koh and Chang, 1992; Chao et al., 1997), highest being 60% (Liu et al., 1998). The relatively high rate of completion thyroidectomy and the associated high rate of complications are additional arguments which support TT for BMNG. It has been documented that total thyroidectomy can be performed safely in BMNG, but reoperations carry a five-fold risk of surgical complications where both sides had been dissected previously (Gough and Wilkinson, 2000; Bron and O'Brien, 2004). Vaiman et al. (2008) reported significantly high rates of reoperations (21.5%) in BMNG after ST while they did not find statistically significant differences between TT, ST, and near-total thyroidectomy (NT) with respect to recurrent laryngeal nerve (RLN) injuries, hypoparathyroidism, and hypothyroidism. The central premise of this study is to evaluate the outcome of total thyroidectomy for benign thyroid affections in a tertiary care institution.

## **2. MATERIALS AND METHODS**

This prospective study incorporated all patients undergoing ST (Group 1), and NT and TT (Group 2) for bilateral BMNG during 5-year period from January 2002 to December 2007. Exclusion criteria included patients with known or suspicion of thyroid malignancy, hyperthyroidism, recurrent goiter, solitary thyroid nodules, and those who were previously treated by unilateral lobectomy. Data was extracted regarding patients' demographics, indications for surgery, operation performed, final histological diagnosis and complications. Goiter was evaluated by three components: thyroid function test by free thyroxine and thyroid stimulating hormone, fine needle aspiration cytology (FNAC) to exclude malignancy and ultrasonography to define the extent of disease. CT scan was used selectively in patients with massive, retrosternal or clinically malignant goiter, or in a suspected posterior extension of the nodules. Preoperative hypothyroidism was defined as a baseline Thyroid Stimulating Hormone (TSH) level of  $> 5.5 \text{ U ml}^{-1}$ . Hypothyroidism was considered permanent when it persisted for 6 months or longer after surgery. A preoperative serum calcium concentration (total and corrected) was checked routinely and laryngoscopic examination of the vocal cords was done, if necessary. Surgeon's assessment of the patients' voice was a reliable method to suspect vocal cord palsy during the postoperative period (Gough and Wilkinson, 2000).

Thyroidectomies were performed by a standard technique of capsular dissection. The total amount of estimated remnant thyroid tissue was estimated to be 5 gram or more in group 1 and none or less than 1 gram in group 2. The amount of remnant tissue was estimated as  $1 \text{ cm}^3 = 1 \text{ g}$ . The TT technique involved the removal of entire gland from one tracheoesophageal groove to the other. In NT technique, few grams of thyroid tissue was left along the posterior aspect of the contralateral lobe, while in ST 25% of both lobes was left intact. Recurrent laryngeal nerves (RLN) were routinely identified on both sides and every attempt was made to identify and preserve the parathyroid glands. Those glands with compromised blood supply were excised, diced and reimplanted in the sternocleidomastoid muscle. All wounds were closed with suction drains and in the absence of any complication patients were discharged on the third day. All surgical specimens were routinely subjected for histological analysis. Postoperative serum calcium levels were estimated twice daily for 48 hours after surgery and then subsequently as required. Calcium supplement was given if serum calcium level dropped below  $1.9 \text{ mmol L}^{-1}$  or in case of symptomatic hypocalcemia. Postoperative permanent vocal cord palsy and permanent hypoparathyroidism were

determined whenever 6 months had elapsed after primary operation. Oral thyroxine supplementation was started on the day of discharge at a dose of 100-200 microgram per day, according to the body weight. Follow up was planned two weeks after discharge, every three months for the first year and then every six month thereafter with thyroid function test and serum calcium, if indicated. The data analysis was performed on SPSS 13.0 software package (SPSS Inc., Chicago, IL). Differences between the groups were analyzed with the chi square test (95% confidence interval) and  $p < 0.05$  was considered significant.

### 3. RESULTS

Of the 207 patients enrolled in this series, there were 169 (82%) women and 38 (18%) men with mean age of 39.1 years. Mean post-operative follow-up was 3 years and 7 months. 90 ST (group 1) and 117 TT and NT (group 2) were performed as shown in Table 1. Recurrence of BMNG was recorded in 27 (30%) cases in group 1 while there was no recurrence in group 2 ( $p < 0.01$ ). Completion thyroidectomies were performed in 31 (34%) patients in group 1 whereas none was required in group 2 ( $p < 0.01$ ). The residual tissue was reported to be benign in all group 2 patients.

**Table 1. Patients' characteristics and postoperative outcome in group 1 (subtotal thyroidectomy) and group 2 (total and near total thyroidectomy)**

Feature	No (%)	Female	Male	Completion thyroidectomy	Recurrence	Malignancy
<b>Group 1</b>	90 (43)	71 (79)	19 (21)	31 (34)	27 (30)	21 (23)
<b>Group 2</b>						
TT	60 (29)	50 (29)	10 (26)	0 (0)	0 (0)	10 (16)
NT	57 (28)	48 (28)	9 (23)	0 (0)	0 (0)	7 (12)
<b>Total</b>	207	169 (81)	38 (19)	31 (34)	27 (30)	38 (18)

TT: total thyroidectomy, NT: neartotal thyroidectomy

Transient RLN palsy was recorded in 4 (4%) and 4 (2%) cases, while permanent unilateral RLN was noted in 2 (2%) and 2 (1%) in groups 1 and 2, respectively;  $p$  value not significant (Table 2).

**Table 2. Complications of total, subtotal, and subtotal thyroidectomy in the treatment of benign multinodular goiter**

Complication	Group 1	Group 2		P value
		TT	NT	
Hemorrhage	6 (6 %)	3 (2 %)	4 (3 %)	Not significant
Wound seroma	2 (2%)	4 (3%)	1 (1%)	
<b>RLN palsy</b>				
Temporary	4 (4%)	2 (1%)	2 (1%)	
Permanent	2 (2%)	2 (1%)	-	
<b>Hypoparathyroidism</b>				
Temporary	5 (6%)	1 (0.8%)	3 (2%)	
Permanent	4 (4%)	2 (1%)	1 (0.8%)	

RLN: recurrent laryngeal nerve palsy

Permanent bilateral RLN palsy was not encountered in any patient in this study. Permanent hypoparathyroidism occurred in 4(4%) and 3(1.8%) and transient hypoparathyroidism in 5 (6%) and 4 (2.8%) cases in groups 1 and 2, respectively;  $p$  value not significant. The data revealed no statistically significant differences between the two groups concerning the RLN injuries and hypoparathyroidism ( $P$  not significant). Permanent hypoparathyroidism and transient RLN palsy were recorded in 9 (29%) and 8

(25%) patients, respectively in those patients who underwent second thyroid surgery. This incidence was significantly higher as compared to those encountered in the primary thyroid operations ( $P < 0.05$ ). The incidence of incidental thyroid malignancy was found to be 18% ( $n= 38/207$ ), as outlined in Table 3.

**Table 3. Incidental thyroid malignancy reported in the study ( $n=38/207$ )**

No.	Thyroid Malignancy	No (%)
1	Papillary carcinoma	19 (9)
2	Follicular carcinoma	11 (5)
3	Anaplastic carcinoma	7 (3)
4	Lymphoma	1 (0.4)
	<b>Total</b>	<b>38 (18)</b>

#### 4. DISCUSSION

Although total thyroidectomy represents almost half of all thyroid operations carried out (Khadra et al., 1992; Rossi et al., 1986), its role in the treatment of BMNG is not established. There is growing evidence that total thyroidectomy is appropriate for patients with BMNG when there is significant nodular disease involving both lobes (Mishra et al., 2001; Delbridge et al., 1999). In general, about half of the patients who develop recurrence of benign goiter require surgical re-excision, which carries a greatly increased risk of permanent complications (Colak et al., 2004). At the same time, several studies have demonstrated that total thyroidectomy can be performed with a morbidity rate comparable to that for lesser procedures (Menegaux et al., 1999). Total thyroidectomy is a well-accepted surgical therapy for well-differentiated thyroid carcinoma. This approach has also been indicated for patients with hyperthyroidism especially with ophthalmopathy or thyroiditis, large thyroid glands, or who have nodules with suspicious cytology (Tezelman et al., 2009). If the goiter is voluminous with symptoms of compression or if it is not possible to leave a grossly homogenous thyroid remnant tissue because of the location of its possible nodules, total thyroidectomy is also recommended (Liu et al., 1998). The goal of surgical treatment in BMNG should be to eliminate the disease with a low complication rate and to minimize the necessity for reoperation because the risk of permanent complications has been found to be higher in reoperations for recurrent disease than in primary operations with extensive disease. There is usually no normal tissue in patients with BMNG. If a surgeon leaves abnormal thyroid tissue, in a patient with BMNG, subsequent reoperation might be required (Thomusch et al., 2000). Reoperations are undertaken if there is postoperative histological evidence of thyroid carcinoma or uninodular/multinodular goiter during further follow-up and they are associated with higher complication rates as compared with the primary procedures (Siragusa et al., 1998). In the present study, there were 31 (34%) completion thyroidectomies in Group 1 due to recurrence and unexpected malignancies. We documented 17 (28%) unexpected thyroid malignancies in Group 2 which did not require completion thyroidectomy due to the completeness of surgical procedure at the first instance. Published data described 47 to 53% incidence for malignancy in prophylactic completion thyroidectomy specimens after initial lobectomy for solitary thyroid nodule (Eroglu et al., 1995; Pasiaka et al., 1992). Menegaux et al. (1999) reported that in their series of 203 thyroid reoperations for benign thyroid disease, permanent complication rate was higher than in primary thyroid operations. Our study revealed high rate of permanent hypoparathyroidism and transient RLN palsy in reoperations than primary thyroid surgery i.e. 9 (29%) and 8 (25%) vs. 4 (4%) and 3 (1.8%). Difficult dissection due to adhesions from previous operation might be responsible for this high rate of complications. Higher rates of complications in reoperations stress the significance of TT or near-total thyroidectomy as the primary surgical procedure which obviates the need of a secondary procedure.

Equal rates of complications have been reported in TT and partial thyroidectomies (Colak et al., 2004), which are consistent with the results of our study. This improvement in performing TT is related to routine identification of the RLN, as advocated in the recent decades (Palestini et al., 2005). Some reports have described TT using capsular dissection to gain lower rates of complications (Liu et al., 1998). Recently a very comprehensive prospective quality assurance study of 5,195 patients was performed to justify TT in

the treatment of benign MNG (Thomusch et al., 2003). The authors of this survey did not support our views, but they mention that "in the hands of well-trained surgeons using an appropriate intraoperative technique," TT is justified if the patient has an increased risk of recurrent goiter. Although the risk of recurrent goiter is hard to assess, we understand that our recommendations are indeed limited to "well-trained surgeons using an appropriate intraoperative technique."

The presumed function of the remaining thyroid tissue in cases of partial thyroidectomy is another important factor in the management of benign thyroid pathology; however, only a few reports have dealt with this assumption. Ozbas et al. (2005) reported administration of L-thyroxine in all cases of partial and total thyroidectomy in their study. The use of L-thyroxine supplementation has been suggested to efficiently prevent recurrence (Kraimps et al., 1993). Although postoperative thyroxine treatment reduced the rate of recurrence, limited unilateral procedures were associated with a high rate of recurrence (Anderson et al., 1990). Therefore, no advantage in performing partial thyroidectomy with respect to supplement hormone therapy was proven. In our series, all patients in Group 1 were given lifelong L-thyroxine. The incidence of recurrence is directly related to a long postoperative follow-up period and to large amounts of remnant thyroid tissue (Rojdmark and Jarhult, 1995). Although some researchers recommend 30 years of follow-up to determine the actual outcome, most of the recurrences developed in 10-20 years after the primary surgery (Candela et al., 2006). Although postoperative follow-up period was relatively short in this study, significant recurrences were documented in Group 1.

## **5. CONCLUSION**

To conclude, total thyroidectomy is a safe and effective alternate for the treatment of bilateral benign multinodular goiter. This procedure prevents the future need of surgery for recurrence and incidental thyroid cancer.

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