

## Are total thyroidectomy and loboisthmectomy effective and safe in benign thyroid diseases? An analysis of 420 patients

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### ABSTRACT

**Objectives.** Ideal thyroid surgery is still a debated issue due to preoperative pathology and varying rates of postoperative incidental carcinoma and complications. In our clinic loboisthmectomy and bilateral total thyroidectomy are the treatment of choice in benign nodular thyroid diseases. The objective of this study was to analyse effectiveness and safety of bilateral total thyroidectomy and loboisthmectomy for treating benign thyroid diseases. **Methods.** Patient charts of the subjects that have undergone thyroid surgery due to benign thyroid diseases between 2009-2015 were evaluated retrospectively. We extracted data including number of patients, type of surgery, preoperative and postoperative pathologies and postoperative complications from departments medical records. **Results.** Four hundred and twenty patients including 98 (23.3%) male and 322 (76.7%) females aged between 14-80 years (mean;  $47.3 \pm 12.5$ ) were included into the study. Bilateral total thyroidectomy was performed in 348 (82.9%) patients and loboisthmectomy was performed in 72 (17.1%). Mean duration of follow-up was 41 (range: 15-70) months. Incidental thyroid carcinoma rate was 24.5% (n = 103) in postoperative pathological examination. Temporary and permanent hypocalcemia was seen in 53 (15.2%) patients and 8 (2.3%), respectively. Permanent and transient recurrent laryngeal nerve palsy rate were 2.6% and 2.1%, respectively. Postoperative hematoma was observed in 7 (1.7%) patients. **Conclusions.** Incidental thyroid carcinoma is frequent in patients who had surgical operation for benign thyroid diseases. When revision surgeries and additional complications due to revision surgery in the remaining cases are kept in mind, bilateral total thyroidectomy or loboisthmectomy at the minimum can be considered as the ideal surgical approach for benign thyroid diseases.

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**Keywords:** Benign thyroid disease, multinodular goiter, thyroid surgery, papillary thyroid microcarcinoma, hypoparathyroidism

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## Introduction

The main determinant in surgical treatment of thyroid disease is the findings of thyroid Fine Needle Aspiration Biopsy (FNAB) as well as subjective symptoms and suspicious ultrasonography (USG) results. FNAB findings were classified into 6 groups in 2008 by National Cancer Institute (NCI) according to Bethesda cytopathology as non-diagnostic and unsatisfactory, benign, atypia of undetermined significance or follicular lesion of undetermined significance, follicular neoplasm or suspicious for a follicular neoplasm, suspicious for malignancy and malignant [1].

The current preferred surgical approaches in benign thyroid diseases are bilateral subtotal thyroidectomy, Dunhill procedure (hemithyroidectomy and subtotal resection of the other side), lobeisthmectomy (LI) (hemi-thyroidectomy and isthmectomy) and bilateral total thyroidectomy (BTT) [2, 3]. Ideal thyroid surgery is still a debated issue due to preoperative pathology and varying rates of postoperative incidental carcinoma [4, 5] and complications [2, 6-8].

In our clinic LI is the treatment of choice in benign nodular thyroid diseases involving one thyroid lobe but sparing the other lobe; however, BTT is the treatment of choice in benign multinodular goitre. The objective of this study was to analyse effectiveness and safety of total thyroidectomy and LI operations performed in our clinic in the light of literature data.

## Methods

The study was approved by the Clinical Research Ethics Committee (No: 2016/184). Patient charts of the subjects that had undergone thyroid surgery due to benign thyroid diseases between 2009-2015 were evaluated retrospectively. Results of FNABs were classified according to Bethesda thyroid cytopathology system published in 2009 [9]. Patients with preoperative FNAB findings such as suspicion of malignancy or established malignant cytology, history of radiotherapy targeting neck region, history of familial thyroid carcinoma, patients with Graves' disease, who underwent complementary thyroidectomy, had pre-operative hypocalcemia or vocal cord paralysis and patients who also had parathyroid surgery because of co-existing parathyroid nodule were excluded from the study.

In patients with total thyroidectomy, calcium levels were measured at postoperative 6, 24 and 48 hours. If two consecutive measurements were lower than 8 mg/dl or if the patients have symptoms such as numbness, contractions or Chvostek or Trousseau signs, they were considered hypocalcemic [7]. Ongoing requirement of calcium and vitamin D supplementation after 1 year or having PTH level < 10 pg/ml were considered as permanent hypoparathyroidism [3]. If postoperative recurrent laryngeal nerve palsy (RLNP) improved within one year, it was considered transient, while those lasting more than one year were considered permanent [10]. We extracted data including number of patients, type of surgery, preoperative and postoperative pathology results and postoperative complications from the medical records of our department.

### Statistical Analysis

Data are shown as the mean  $\pm$  the standard deviation of the mean or number (percent) when necessary.

## Results

Four hundred and twenty patients aged between 14-80 years (mean:  $47.3 \pm 12.5$ ) were included in the study. Ninety-eight patients (23.3%) were male and 322 (76.7%) were females. Preoperative pathology was classified according to Bethesda thyroid cytopathology system (Table 1). BTT was performed in 348 (82.9%) patients and LI was performed in 72 (17.1%) patients. Mean duration of follow-up was 41 (range; 15-70) months.

Postoperative pathological examination of surgical specimen was done (Table 2). Malignant pathology rate was 24.5% (n = 103) in postoperative pathological examinations (Table 3). In 41 (80.4%) patients with malignant pathology, additional surgery was not required since BTT was done previously.

However, during follow-up period, revision surgery was performed in 3 (0.9%) patients who had undergone BTT due to recurrent disease. In 10 (19.6%) patients who had undergone LI, complementary total thyroidectomy was done since malignancy was detected. However, in 9 patients with papillary microcarcinoma no additional surgery was performed. Postoperative complications are shown in Table 4. Transient hypocalcemia occurred in 53 (15.2%) the patients, when permanent hypocalcemia occurred in 8 (2.3%). There was no hypocalcemia in

**Table 1.** Preoperative Bethesda thyroid cytopathology

	<b>BTT</b> <b>(n = 348)</b>	<b>LI</b> <b>(n = 72)</b>	<b>Total</b> <b>(n = 420)</b>
Benign Cytology	195	41	236 (56.2%)
Follicular Neoplasia or Suspicion of Follicular Neoplasia	78	11	89 (21.2%)
Non-diagnostic Cytology	51	15	66 (15.7%)
Atypia of undetermined significance or follicular lesion of undetermined significance	24	5	29 (6.9%)

Data are show as number or number (percent). BTT = bilateral total thyroidectomy, LI = loboisthmectomy

**Table 2.** Distribution of postoperative final histopathologic results

<b>Pathology</b>	<b>BTT</b> <b>(n = 348)</b>	<b>LI</b> <b>(n = 72)</b>	<b>Total</b> <b>(n = 420)</b>
Adenomatous Hyperplasia	225	38	263 (62.6%)
Papillary Microcarcinoma	43	9	52 (12.4%)
Papillary Thyroid Carcinoma	38	8	46 (11%)
Follicular Adenoma	28	14	42 (10%)
Hashimoto Thyroiditis	8	0	8 (1.9%)
Subacute Thyroiditis	3	0	3 (0.7%)
Follicular Carcinoma	2	1	3 (0.7%)
Medullary Carcinoma	1	1	2 (0.5%)
Riedel Thyroiditis	0	1	1 (0.2)

Data are show as number or number (percent). BTT = bilateral total thyroidectomy, LI = loboisthmectomy

**Table 3.** Histological classification of patients with incidental thyroid carcinoma

<b>Pathology</b>	<b>BTT</b> <b>(n = 84/348)</b>	<b>LI</b> <b>(n = 19/72)</b>	<b>Total</b> <b>(n =103/420, 24.5%)</b>
Papillary Microcarcinoma	43	9	52 (12.4%)
Papillary Thyroid Carcinoma	38	8	46 (10.9%)
Follicular Carcinoma	2	1	3 (0.7%)
Medullary Carcinoma	1	1	2 (0.5%)

Data are show as number or number (percent). BTT = bilateral total thyroidectomy, LI = loboisthmectomy

patients who had undergone LI. Permanent RLNP rate was 2.6% and transient RLNP rate was 2.1%. Permanent bilateral RLNP was found in one (0.3%) patient. When unilateral permanent RLNP was dominant at right side, unilateral transient RLNP was dominant at left side. Postoperative hematoma was observed in 7 (1.7%) patients.

## Discussion

Incidental thyroid carcinoma was detected in

24.5% of patients who had undergone surgery due to benign thyroid disease. In the literature, incidental carcinoma rates were reported as 8.6-27.4% [11-14]. These rates may stem from insufficient FNAP. High specificity and sensitivity rates of FNAB are reported in the literature [15]. However, since FNAP is usually performed after a suspicious or dominant nodule was found on USG examination, foci of cancer at other locations may be missed. In addition, presence of multiple nodules in benign thyroid diseases poses a difficulty for sampling from every single nodule [5]. Furthermore, it is reported that FNAB is not adequate

**Table 4.** Postoperative complication rates of bilateral total thyroidectomy and loboisthmectomy

	<b>BTT</b> <b>(n = 348)</b>	<b>LI</b> <b>(n = 72)</b>	<b>Total</b> <b>(n = 420)</b>
<b>Hypocalcemia</b>	61		61 (17.5%)
Transient	53	0	53 (15.2%)
Permanent	8	0	8 (2.3%)
<b>Permanent RLNP</b>	10	1	11 (2.6%)
Right	8	1	9 (2.2%)
Left	1	0	1 (0.2%)
Bilateral	1	0	1 (0.2%)
<b>Transient RLNP</b>	8	1	9 (2.1%)
Right	1	0	1 (0.2%)
Left	6	1	7 (1.7%)
Bilateral	1	0	1 (0.2%)
<b>Hematoma</b>	6	1	7 (1.7%)

Data are show as number or number (percent). BTT = bilateral total thyroidectomy, LI = loboisthmectomy, RLNP = recurrent laryngeal nerve palsy

for revealing capsule invasion that is a pre-requisite for follicular neoplasia diagnosis [16].

In our study, we have performed BTT in 80.4% of patients who had incidental carcinoma except papillary microcarcinoma detected postoperatively. So, the second operation was not required. Over half of the incidental cancers were papillary microcarcinoma. Miccoli *et al.* [5] have reported that 58.6% of incidental carcinoma cases were papillary microcarcinoma. There is no consensus in the follow-up of incidentally detected papillary microcarcinoma cases in the literature. Some authors recommend only follow-up, the others recommend complementary thyroidectomy along with ipsilateral central neck dissection and radioactive iodine therapy [17]. However, unilateral LI is strongly recommended for differentiated carcinomas, if the cancer is less than 1 cm in diameter, unifocal and there is no lymph-node involvement [18].

Only 9 patients who had undergone LI and had papillary microcarcinoma have been followed up in our study and no recurrence requiring surgery was observed, but on the other hand 17.6% of patients who had LI have also undergone complementary thyroidectomy for cancers other than papillary microcarcinoma.

Complications have a strong impact on surgical treatment choices in benign thyroid diseases. The main postoperative complication associated with thyroidectomy is hypocalcemia which is a consequence of hypoparathyroidism. In the literature, the rates of transient hypocalcemia and permanent hypocalcemia have been reported in a wide range of

frequencies, which are 0.9-45% and 0-24.2%, respectively [19-21]. In our study the rate of transient hypocalcemia was 15.2% and permanent hypocalcemia was 2.3% that are accepted reasonable in the literature.

Another complication that effects quality of life negatively is RLNP. The rate of transient RLNP is reported as 0.5-13.6% and permanent RLNP as 0-5.9% [6, 22-24]. In our study, the rate of transient RLNP was 2.1% and permanent RLNP was 2.6% in concordance with in the literature. Life-threatening bilateral RLNP developed in 2 (0.47%) patients. However, no additional surgery was needed in both patients. Similar rates were reported in the literature [25]. A meticulous capsular dissection and proceeding to surgery after finding the nerve is recommended to prevent RLN injury [10]. We use a similar technique in our clinic. It was shown that using intraoperative nerve monitor does not prevent RLNP; however, it was stated that it can be used as an adjunctive tool in difficult cases [10].

Hematoma, which is a serious complication requiring reoperation, has a frequency of 1-2.1% in the early postoperative period and has been found as 1.7% in our study [26, 27].

Recurrent disease was reported as 0.5-14% in the long-term follow-up in patients operated due to benign multinodular goitre and the rates were higher particularly in patients who had undergone subtotal thyroidectomy or Dunhill procedure [2, 28]. In surgeries other than total thyroidectomy for benign thyroid diseases, it has been shown that preserved tissue was pathologic in 62% of the cases [29]. In this

study, we performed revision surgery in 3 (0.7%) patients' due to recurrent disease during 41 months of follow-up. There was no recurrence requiring surgery in patients who underwent LI. The high rate of pathology in the preserved tissue, high rate of incidental carcinoma and increased complications following revision surgery may lead to the decision that ideal minimum surgery is LI as primary surgical treatment. It has been reported that postoperative complications increases after revision surgeries [8, 30, 31]. However, complication risk of complementary surgery is same as primary surgery in LI since there is no intervention to contralateral lobe in the first operation [20]. Further studies are needed in order to differentiate patients with incidental carcinoma in the preoperative period.

## Conclusions

Incidental thyroid carcinoma is frequent in patients who had surgical operation for benign thyroid diseases. More than half of the incidental carcinomas are papillary microcarcinoma. When revision surgeries and additional complications due to revision surgery for remaining cancers are kept in mind, bilateral total thyroidectomy or LI at the minimum can be considered as the ideal surgical approach in the surgical treatment of benign thyroid diseases.

### Conflict of interest

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All authors listed meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors, and all authors are in agreement with the manuscript.

### Author contributions

Concept –HD, ÖY; Design –HD, BH, ÖY; Supervision –HD, ÖY; Resources and materials –HD,

BH, AVS; Data collection and processing –HD, BH, AVS; Analysis interpretation and literature search –HD, BH; Writing manuscript –HD, BH; Critical review –ÖY, BH.

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