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ORIGINAL ARTICLE

# The Need for Completion Thyroidectomy in Cases of Differentiated Thyroid Cancer

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**Abstract** There are no definitive criteria for the presence of malignancy in the opposite lobe in cases of unilateral lobectomy due to a thyroid mass in which the malignancy was diagnosed histologically. Study design is retrospective, cross sectional study. The present study included patients who underwent a lobectomy in our clinic between 2001 and 2016 with an initial diagnosis of atypia with undetermined significance or suspected malignancy according to fine-needle aspiration biopsy and adult patients who received a thyroidectomy based on thyroid cancer detected in pathological examinations. Tumor histopathological diagnosis, tumor size, and capsular, vascular, or lymphatic invasion were assessed in patients who received thyroid lobectomy. The presence of a multifocal tumor (52.3%) significantly increased the risk of malignancy in the opposite lobe over the risk association with a unifocal tumor (8.9%; $p < 0001$). In patients with a tumor diameter greater than 4 cm (83.3%), the risk of malignancy in the opposite lobe was higher than that in patients with a tumor diameter less than 4 cm (22.3%; $p < 0.001$). Significant differences were not observed between groups with and without vascular or capsular invasion of the opposite lobe ($p = 0.913$ and $p = 0.840$, respectively). We determined risk factors for the presence of multifocal disease in unilateral lobectomy materials; an aggressive tumor subtype and a size larger than 4 cm are the most important factors that increase the risk of malignancy in the opposite lobe.

*Level of evidence* Level 4—Case–control studies.

**Keywords** Thyroid cancer · Thyroid surgery · Thyroidectomy · Malignancy · Invasion

## Introduction

Thyroid cancers are the most common endocrine malignancies, and papillary thyroid cancers constitute 80–90% of all thyroid cancers [1–5]. The 10-year survival rates in patients with papillary cancers are reportedly over 98% [6, 7]. During clinical examination, the most important findings of malignant thyroid pathologies are thyroid nodules, which are observed frequently in clinical practice. The incidence of palpable nodules is 5–6% in females and 1–1.5% in males. The incidence of palpable nodules increases with age, reaching 9–10% in patients over 75 years of age. The majority of thyroid nodules are benign, and only 5% of cases are considered malignant [1, 2]. More frequent use of neck ultrasonography (USG) has resulted in the identification of nonpalpable thyroid nodules smaller than 1 cm. An increase in fine-needle aspiration biopsy (FNAB) applications along with USG has resulted in more frequent detection of small-sized thyroid malignancies [3, 8].

Lobectomy is the minimum surgical treatment of choice for patients in whom malignancy is detected in one lobe as a result of FNAB. However, after FNAB, when the suspicious malignancy findings (Bethesda 3 and 4) are questionable, diagnostic lobectomy is common [3]. When the results of FNAB are benign and the nodule size, ultrasound features, and age and gender are evaluated collectively,

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surgical treatment is also suggested for patients at risk of malignancy [3].

The choice of surgical treatment for patients diagnosed with micropapillar thyroid carcinoma in a single lobe remains controversial [9–11]. According to Western literature, total thyroidectomy and postoperative radioactive iodine (RAI) ablation are generally recommended, whereas, in Japan, successful results have been reported with lobectomy [9–11]. After a definitive diagnosis of malignant tumor following lobectomy, a completion thyroidectomy is required, and the patient should be consulted. Although various approaches to papillary thyroid cancers have been devised, no consensus exists. Indeed, there are no definitive criteria for determining the presence of disease in the opposite lobe of patients who received unilateral lobectomy due to thyroid malignancy. Therefore, pathological findings after a unilateral lobectomy constitute the basis for the treatment of the opposite lobe. In our study, we investigated the histopathological features of the tumor in the opposite lobe after lobectomy, determined the incidence of cancer in the opposite lobe of patients who underwent completion thyroidectomy due to differentiated thyroid cancer, and evaluated the factors affecting this incidence.

## Materials and Methods

The Ethics Committee of Acıbadem University School of Medicine approved this retrospective research. All patients provided written informed consent regarding the surgical procedures performed.

The files of 1127 patients who received a thyroidectomy at our otorhinolaryngology and head-neck surgery clinic in 2001–2016 and included radiological, FNAB, postoperative biopsy results, and follow-up reports were evaluated retrospectively.

In terms of the primary surgical treatment of cases in which FNAB identified the initial diagnosis as atypia with undetermined significance (Bethesda 3) or with suspected malignancy (Bethesda 4), a total thyroidectomy was performed in 768 patients and a lobectomy was performed in 359 cases. Of the 142 patients diagnosed with thyroid cancer who underwent lobectomy, 119 underwent completion thyroidectomy and were included in our study.

Of those, 23 patients had lower-risk tumors, tumors that had settled within the thyroid, or tumors that were smaller than 1 cm or unifocal and were excluded from the study.

The pathological specimens obtained from the patients who received thyroid lobectomy were examined. In addition to demographic characteristics and tumor histopathology, tumor size and capsular, vascular, or lymphatic invasion were assessed (Table 1).

### Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences version 13.0 software for Windows (SPSS Inc, Chicago, IL, USA). All quantitative variables were estimated using measures of central location (i.e., mean and median) and measures of dispersion (i.e., standard deviation, SD). Data normality was checked using Kolmogorov–Smirnov tests of normality. Independent-samples *t*-tests were used for comparing the intergroup quantitative data, and a $p$ value $<0.05$ was considered to indicate statistical significance.

## Results

In total, 26 males and 116 females underwent lobectomies. The average age of females was 46.79 years, and that of males was 48.11; the average age of the total sample was 47.03 years (18–81 years).

Among the 359 patients, 142 (39.5%) received a lobectomy and were diagnosed with differentiated thyroid cancer. Of those, 119 underwent a completion thyroidectomy (116 females and 26 males; age range, 10–81 years; average age, 47.03 years). However, a completion thyroidectomy was not performed in 23 patients due to intrathyroid settlement, unifocality, small size (less than 1 cm), and features that rendered them of low risk.

Papillary thyroid cancer was observed in 109 of 119 of the patients (91.5%) who received a completion thyroidectomy, whereas follicular cancer was observed in 10 of these patients (8.5%). Papillary microcarcinoma was detected in the opposite lobe in 28 of the 109 patients (25.68%). Tumors were not observed in the opposite lobe of patients with follicular cancer. Two patients had long-celled and one had columnar-celled histological subtypes. Both patients with long-cell variants had multicentric tumors. Malignancy was detected in the opposite side of the materials of the completion thyroidectomy in the three patients.

Of the 109 patients diagnosed with papillary cancer based on their first surgical specimen, the tumor was unifocal in 67 patients (61.5%), and it was multifocal in 42 patients (38.5%). After completion thyroidectomy, 6 of the 67 patients (8.9%) with unifocal papillary cancer had multifocal features, and malignancy was detected in the opposite lobe in 22 of the 42 patients (52.3%). The presence of a multifocal tumor in the first surgical specimen significantly increased the risk of malignancy in the opposite lobe ($p < 0.001$).

Additionally, among the 109 patients with papillary cancer who received a completion thyroidectomy, capsular invasion was observed in 30 patients and vascular invasion

**Table 1** Tumor size and incidence of multifocal disease

| Tumor size (cm) | Unifocal | Multifocal | Total |
|---|---|---|---|
| 0–1 | 23 | 16 | 39 |
| 1–2 | 51 | 15 | 66 |
| 2–4 | 13 | 8 | 21 |
| >4 | 3 | 3 | 6 |
| Total | 100 | 42 | 132 |

was observed in 28. Tumors were observed in the opposite lobe in eight patients with capsular invasion (26.6%) and in six patients with vascular invasion (21.4%). In terms of lobe involvement, significant differences were not observed in patients with and without vascular invasion ($p = 0.913$). Tumors in the opposite lobe were observed in 20 of the 79 patients without capsular invasion (25.3%) and in 20 of the 81 patients without vascular invasion (24.6%). In terms of lobe involvement, significant differences were not observed in patients with and without capsular invasion ($p = 0.840$).

A papillary cancer focus was detected in the opposite lobe in 28 of the 109 patients (25.6%) with papillary cancer. After a completion thyroidectomy, a multifocal disease was observed in 42 of the 109 patients (38.5%), and malignancy was detected in the opposite lobe in 22 of these 42 patients (52.3%). Unifocal disease was observed in 67 of these 109 patients, and malignancy in the opposite lobe was observed in 6 of these patients (8.9%). The presence of a multifocal tumor in the first surgical specimen significantly increased the risk of a tumor in the opposite lobe ($p < 0.001$).

Evaluation of the tumors of patients diagnosed with papillary cancer following thyroid lobectomy revealed that 23 had tumors that were unifocal and less than 1 cm in size, and surgery was not performed on the opposite side. However, the tumors of the remaining 109 patients with papillary cancer were less than 1 cm in size and multicentric in 16 patients, between 1 and 2 cm in 66 patients (15 were multicentric), between 2 and 4 cm in 21 patients (8 were multicentric), and 4 cm in six patients (3 were multicentric). Contralateral metastasis was detected in five of six patients (83.3%); tumors were observed in the opposite lobe in 23 of 103 patients and were larger than 4 cm in size (22.3%; $p < 0.001$; Table 2).

## Discussion

The basic diagnostic tools for evaluating thyroid nodules are USG and FNAB. In total, 15–30% of cases that undergo FNAB are reported as atypia of undetermined significance, and surgical treatment is required due to the risk of malignancy [12–16]. The use of FNAB results in a detection rate of atypia of undetermined significance of between 12 and 48% in various studies. Additionally, according to the ATA (American Thyroid Association) guidelines, thyroid lobectomy is recommended as the first surgical intervention for patients with atypia with undetermined significance [12–16].

A completion thyroidectomy and appropriate treatment planning is necessary for patients with a definifitive diagnosis of malignant nodule after lobectomy. In this situation, it is important to determine the approach for the opposite lobe.

The reasons behind decisions to perform a completion thyroidectomy can vary, and they include eliminating possible cancer pathology in the opposite lobe, providing appropriate conditions for effective postoperative RAI treatment, following up thyroglobulin levels, and treating postoperative recurrences [15, 16].

Total thyroidectomy is the accepted form of initial treatment in patients with well-differentiated thyroid cancer. However, the criteria for thyroidectomy width (total or lobectomy) and postoperative RAI treatments remain controversial- [16].

No consensus regarding the width of resection for the surgical treatment of micropapillary thyroid cancer exists. Specifically, the approach to the other lobe in cases in which micropapillary thyroid cancer is detected in one lobe remains debatable. Consideration of the potential surgical complication risks renders performance of a completion

**Table 2** Histopathological analysis of 109 patients with papillary thyroid cancer

| Tumor size (cm) | First surgery | | | Opposite-lobe tumor total | Opposite-lobe tumor in multicentric cases | Opposite-lobe tumor in unifocal cases |
|---|---|---|---|---|---|---|
| | Total | Unifocal | Multifocal | | | |
| 0–1 | 16 | 0 | 16 | 7 | 7 | 0 |
| 1–2 | 66 | 51 | 15 | 9 | 7 | 2 |
| 2–4 | 21 | 13 | 8 | 7 | 6 | 1 |
| >4 | 6 | 3 | 3 | 5 | 2 | 3 |
| Total | 109 | 67 | 42 | 28 | 22 | 6 |

thyroidectomy in these patients even more controversial. When the width of surgical resection increases, the risk of complications also increases [10, 11].

The lack of a definitive determinant of the probability of malignancy in the opposite lobe renders treatment planning difficult. According to the thyroid papillary cancer guidelines in United States and Europe, a total thyroidectomy is recommended as the standard initial treatment for thyroid cancer, and the addition of postoperative RAI to the treatment is recommended [3, 17–19]. Although lobectomy is recommended in low-risk patients, low risk has not been clearly defined [3, 17–23].

Unlike in Western countries, in Japan, thyroid lobectomy is used as the primary treatment of patients with papillary thyroid cancer, and total thyroidectomy is performed only when necessary [20]. According to the relevant Japanese literature, numerous cases of papillary thyroid cancer are treated with lobectomy. Matsuzu et al. reported that, of 1088 patients treated with lobectomy in whom RAI treatment was not used, those under the 45 years of age had an excellent survival rate when no lymphatic metastasis was present, the papillary tumor was less than 4 cm in size without extrathyroid spread; thus, they concluded that this constitutes an alternative to total thyroidectomy [24, 27–29]. Based on a follow-up period of 25 years, Matsuzu et al. [24] reported that, in 1088 patients, the recurrence rate in the remaining lobe was 6.5% and that in the regional lymph nodes was 9.4%; the rate of distant metastases was 6.4%. They also reported that the results were significantly worse in patients with lymphatic spread, extrathyroid spread larger than 4 cm, or lymphatic metastasis [24]. Other studies have supported the results of Matsuzu et al. [24, 27–29].

According to follow-up studies, the first choice of treatment in papillary thyroid cancer is total thyroidectomy. Bilimoria et al. [25] reported that the survival rates of 52,173 patients with papillary thyroid cancer over 1 cm in size were better with total thyroidectomy, and this study constituted the strongest basis for the ATA guidelines. However, that study did not consider extrathyroid invasion and lymphatic metastasis features, recurrence issues, and survival analysis evaluations. Furthermore, several studies showed that total thyroidectomy does not improve the survival rates of high-risk patients [11, 26].

The most important argument for recommending total thyroidectomy as the initial treatment for papillary thyroid cancer is the possible presence of intrathyroid tumor in the opposite lobe. Studies on papillary thyroid cancers reported bilateral involvement rates ranging from 35 to 80% [30–32]. However, it is questionable whether the occurrence rates in biologically active areas are high in the opposite lobe and whether they have the potential to become aggressive. Several studies reported that similar differences were also observed between clinical recurrence rates and potential recurrence rates and that all contralateral multicentric tumors do not become manifest [30–32].

In the present study, tumors were present in 25.6% of the patients, which is in conflict with the study conducted by Matsuzu et al. However, prediction of which tumors are biologically active and whether they will recur is difficult. Based on this, the possibility of intrathyroid metastasis in the contralateral lobe is not a sufficient reason to perform a routine total thyroidectomy in patients with papillary thyroid cancer. Nonetheless, one reason to perform total thyroidectomy is to prepare for RAI ablation treatment. However, postoperative RAI ablation treatment indications are not clearly defined, and several studies have reported positive outcomes after RAI, which is contrary to the results of other studies [33–35]. Gepalakrishn et al. [36] reported RAI ablation was not beneficial, showed that patients with papillary thyroid cancer are at a higher risk of secondary carcinogenesis, and suggested that RAI treatment should be carefully considered in patients younger than 45 years of age.

According to US national cancer data, RAI treatment was performed in 56% of patients who received total thyroidectomy. In the present study, approximately half the papillary thyroid cancer patients treated with a total thyroidectomy as preparation for RAI treatment did not need a total thyroidectomy [25]. The most important advantage of adding RAI treatment after total thyroidectomy is that thyroglobulin levels can be used as a sensitive marker for recurrence. However, surgical complications are observed more frequently in a total thyroidectomy than in a lobectomy. After a total thyroidectomy, permanent recurrence paralysis and hypoparathyroidism may occur even with experienced surgeons and in very low-risk patients. However, all thyroidectomies cannot be performed by experienced surgeons. Additionally, bilateral vocal cord paralysis and permanent hypoparathyroidism are not observed in lobectomy.

In our study, the risk of a tumor in the opposite lobe was significantly higher when multifocal tumors were present in the first surgical specimen ($p < 0.001$). The presence of multifocal disease in the first lobe was considered the most important predictor of malignancy or bilateral disease in the opposite lobe. Therefore, a preliminary diagnosis of malignancy was not made, and dissection was not performed to recurrencial chain or paratracheal lymph nodes in any of the patients. Therefore, lymph node metastases could not be evaluated as a predictive factor. In this study, such factors as presence of capsular invasion ($p = 0.840$) and vascular invasion ($p = 0.913$) did not significantly increase the risk of malignancy in the opposite lobe.

## Conclusion

Definitive criteria for the presence of disease in the opposite lobe are not available for patients diagnosed with differentiated thyroid cancer who have undergone unilateral lobectomy. In this study, we evaluated the histopathological findings obtained after lobectomy and investigated the factors that increased the risk of malignancy in the opposite lobe. The presence of multifocal disease in unilateral lobectomy materials, an aggressive tumor subtype, and a tumor larger than 4 cm were the most important factors that increase the risk of malignancy in the opposite lobe.

**Compliance with Ethical Standards**

**Conflict of interest** None

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