



## Incidence of thyroid gland invasion in locally advanced laryngeal carcinoma

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### ABSTRACT

**Objectives:** This study aims to determine the frequency of thyroid gland invasion in patients with locally advanced laryngeal carcinoma who were treated with total laryngectomy and neck dissection as well as hemi- or total thyroidectomy.

**Patients and Methods:** Between April 2000 and February 2016, 127 patients (123 males, 4 females; mean age 57 years; range, 41 to 74 years) who underwent total laryngectomy and neck dissection with laryngeal squamous cell carcinoma were retrospectively reviewed in our clinic. Patients' demographic characteristics, preoperative tumor stage, postoperative laryngectomy pathology report, tumor invasion, neck lymph node invasion and thyroid gland invasion were evaluated.

**Results:** In 127 patients, 43 with subglottic extension, extralaryngeal extension and cricothyroid membrane invasion underwent total or hemithyroidectomy in addition to laryngectomy and neck dissection. Squamous cell carcinoma infiltration was found in one patient (2.3%) in the thyroid gland. This patient was diagnosed as T<sub>4</sub>N<sub>1</sub>M<sub>0</sub> in the pathological stage. Thyroid cartilage invasion and subglottic extension were detected in the preoperative evaluation.

**Conclusion:** Thyroidectomy is performed in our clinic only when subglottic extension, extralaryngeal invasion or cricothyroid membrane invasion is present. Hence, thyroid gland invasion is not common in carcinoma of the larynx. For this reason, we recommend selective thyroidectomy to protect patients from the morbidity of routine thyroidectomy.

**Keywords:** Laryngeal carcinoma; neck dissection; thyroidectomy; total laryngectomy.

In advanced stage laryngeal carcinomas, even if there is no apparent thyroid gland invasion, hemi- or total thyroidectomy may be performed as part of the surgical treatment in addition to total laryngectomy and neck dissection. Treatment protocols published by the American National Cancer Network (National Comprehensive

Cancer Network) also suggest ipsilateral hemithyroidectomy with laryngectomy in advanced stage laryngeal carcinomas.<sup>[1]</sup> However, some clinical trials indicate that thyroidectomy is only suggested with laryngectomy in the presence of thyroid gland invasion, subglottic extension, or involvement of the pyriform sinus

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apex.<sup>[2-6]</sup> On the other hand, patients who undergo thyroidectomy may become hypothyroid or even hypoparathyroid, and they may need lifelong thyroid hormone and calcium replacement. Adjuvant radiotherapy is used in the majority of these patients, which increases the risk of hypothyroidism.<sup>[4,7]</sup> In the early stages of the postoperative period, low thyroid hormone levels are associated with fistula formation, impairment of wound healing and systemic morbidities.<sup>[7]</sup> In our clinic, locally advanced laryngeal carcinoma cases were treated with total laryngectomy and bilateral neck dissection plus hemi- or total thyroidectomy in the presence of subglottic extension, extralaryngeal expansion, cricothyroid membrane invasion or thyroid gland invasion. Thus, in this study, we aimed to determine the frequency of thyroid gland invasion in patients with locally advanced laryngeal carcinoma who were treated with total laryngectomy and neck dissection as well as hemi- or total thyroidectomy.

## PATIENTS AND METHODS

Between April 2000 and February 2016, 127 patients (123 males, 4 females; mean age 57 years; range, 41 to 74 years) who underwent total laryngectomy and bilateral neck dissection with laryngeal squamous cell carcinoma (SCC) were retrospectively reviewed in the 3<sup>rd</sup> clinic of Otorhinolaryngology and Head Neck Surgery, Ankara Numune Training and Research Hospital. The study included patients with laryngeal SCC treated with primary surgery. Patients who underwent laryngectomy after chemoradiotherapy failure were excluded. Patients with primary thyroid cancer or previous thyroidectomy were also excluded. This study was approved by the Ethical Committee of Ankara Numune Training and Research Hospital (E-17-1230/08.02.2017). A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Age, gender, preoperative findings of the laryngeal examination and neck examination findings were obtained from the patients' medical files. All patients had computed tomography (CT) imaging to include head and neck and thorax before laryngectomy. In all patients, a diagnosis

was established by direct laryngoscopy and biopsy. According to the staging system of the American Joint Committee on Cancer, valid during the period when patients were diagnosed with laryngeal cancer, the data was present in the medical files. Patients' demographic characteristics, preoperative tumor stage, postoperative laryngectomy pathology report, tumor invasion, neck lymph node invasion and thyroid gland invasion were evaluated.

## RESULTS

We found that in 127 patients, 44 with subglottic extension, extralaryngeal extension and cricothyroid membrane invasion underwent total or hemithyroidectomy (isthmectomy and thyroid lobectomy) in addition to total laryngectomy and bilateral neck dissection. Forty-three patients were treated with primary surgery and one patient was treated with surgery after being diagnosed as chemoradiotherapy failure. The lymphatic drainage of the laryngeal structures might change due to radiotherapy of the larynx and neck, so we excluded the patient who had a recurrence of laryngeal cancer after chemoradiotherapy. Demographic characteristics of the patients were shown in Table 1. Histopathologically, the tumor was poorly differentiated in five patients, moderately differentiated in 22 patients, and well differentiated in 16 patients. Also, when neck dissection materials were evaluated, 12 patients had neck metastasis. Moreover, thyroidectomy type was noted in those patients. We found that 10 patients were performed total thyroidectomy, and 33 patients were performed hemithyroidectomy, which was on the side

**Table 1.** Demographic characteristics of 43 patients

	n	Mean±SD
Age (year)		58.5±15
Gender		
Male	42	
Female	1	
Hemithyroidectomy	33	
Total thyroidectomy	10	
Lymph node metastases	12	
Thyroid gland invasion	1	

SD: Standard deviation.

where the tumor was predominant. In addition, patients who were performed tracheostomy before laryngectomy were noted and we detected eight patients having tracheostomy before laryngectomy. The mean interval time between tracheostomy and laryngectomy was two weeks. Tracheostomy was performed after the diagnostic direct laryngoscopy and biopsy due to respiratory distress during the extubation period of general anesthesia or at the initial admission of the patient with respiratory distress.

Histologically, SCC infiltration of thyroid gland was observed in one out of 43 patients (2.3%) who were treated primarily with surgery due laryngeal cancer. Subglottic extension and thyroid cartilage destruction were detected in this patient with CT evaluation. However, there was no definitive radiologic image about the invasion of thyroid gland before the operation. The tumor was histopathologically moderately differentiated and showed both vascular and neural invasion. The pathological stage of the patient was identified as T<sub>4</sub>N<sub>1</sub>M<sub>0</sub>. Also, this patient did not undergo tracheostomy before laryngectomy. Unfortunately, we did not have enough information about the local recurrence rates due to the inadequacy of medical records.

## DISCUSSION

Larynx cancer is one of the most common malignancies of the head and neck region.<sup>[4]</sup> Most of these cases are SCCs and most commonly seen in the glottic area. By definition, local advanced laryngeal carcinoma refers to carcinomas of the larynx that metastasize to regional lymph nodes, have caused vocal cord fixation or spread to thyroid cartilage, cricoid cartilage or other neighboring tissues such as trachea, thyroid gland or esophagus.<sup>[4,6]</sup> The anatomic position of the thyroid gland makes it prone to involvement in locally advanced laryngeal carcinomas.<sup>[6]</sup> Thyroid gland involvement may occur in three ways: direct invasion, lymphoid spread or hematogenous spread.<sup>[5]</sup> Direct invasion occurs mainly from the anterior margin of the thyroid cartilage and the cricothyroid membrane.<sup>[4,5]</sup> Subglottic tumors rapidly invade the perichondrium of the thyroid and cricoid cartilages, so the destruction of these cartilages leads to the invasion of the neighboring tissues

of the larynx. Also, those tumors move outside of the larynx by penetrating the cricothyroid membrane, which causes the invasion of the thyroid gland and other neighboring tissues. Lymphogenous involvement of the thyroid gland may be associated with the direction of lymphatic drainage of the subglottic region.<sup>[5,6]</sup>

Routine total or hemithyroidectomy in local advanced laryngeal carcinomas is still controversial. According to a literature review, several studies identified a risk of thyroid gland invasion, ranging from 0 to 30% in locally advanced laryngeal carcinomas.<sup>[3]</sup> Many studies suggest that thyroidectomy should be performed in the presence of various factors, including the following: over 1 cm subglottic extension; involvement of the pyriform sinus apex, thyroid cartilage, cricoid cartilage or paraglottic space; tumoral invasion in paralaryngeal tissues and involvement of paratracheal lymph nodes. Among these factors, the most commonly accepted is the subglottic extension of more than 1 cm.<sup>[2-12]</sup> On the other hand, an important issue is to perform central neck dissection in locally advanced laryngeal carcinoma for preventing locoregional recurrences. Prelaryngeal, pretracheal and paratracheal lymph nodes are in proximity to the thyroid gland. Also, the isthmus part of the thyroid gland is settled over the first four tracheal rings and tightly adhered to the anterior tracheal wall by the investing fascia called Berry ligament. Therefore, there is a necessity to perform total or hemithyroidectomy for dissecting the lymph nodes of central neck compartment.

Selective thyroidectomy during laryngectomy contributes to reducing the incidence of postoperative hypothyroidism. Laryngectomy with hemithyroidectomy increases the risk of hypothyroidism by three times compared to patients who were only laryngectomized, and develops hypothyroidism in more than 50% of patients.<sup>[13,14]</sup> Adjuvant radiotherapy increases the incidence of hypothyroidism in later years.<sup>[13]</sup> Hypothyroidism has been shown to be associated with fistula formation, wound healing, constipation and depression.<sup>[7]</sup>

In this retrospective study, the incidence of thyroid gland involvement in our clinic was 2.3%

in patients who underwent total laryngectomy and total or hemithyroidectomy due to locally advanced larynx squamous cell carcinoma. This is the rate of SCC infiltration of thyroid gland, which was detected in cases who were performed selective thyroidectomies with an indication of subglottic extension, extralaryngeal spread and cricothyroid membrane invasion.

This study has a major limitation. We did not have enough information about the local recurrence and peristomal recurrence rates due to lack of medical records. So we did not have a chance to compare the difference between the patients who were performed thyroidectomy and patients who had protected thyroid gland.

Thyroidectomy is performed in our clinic only when subglottic extension, extralaryngeal invasion or cricothyroid membrane invasion is present. Even in these patients, rate of thyroid gland SCC invasion was low. Hence, thyroid gland invasion is not common in carcinoma of the larynx. For this reason, we recommend selective thyroidectomy to protect patients from the morbidity of routine thyroidectomy.

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