

# Intraoperative Nerve Monitoring Ought to be Used In Complementary Thyroidectomy

## Tamamlayıcı Tiroidektomide İntraoperatif Sinir Monitörizasyonun Kullanılması Gereklidir

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### Abstract

**Background:** Injuries to the recurrent inferior laryngeal nerve (RLN) remain one of the major post-operative complications after thyroid surgery. In studies, temporary RLN damage during thyroidectomy is %2-11, and the rate of permanent RLN damage is %0.6-1.6. Complementary thyroidectomies have a higher complication rate compared to the first surgical procedure. In the last two decades, intraoperative neural monitoring has become a powerful tool for risk minimization. In our study, we aimed to retrospectively examine the patients who underwent complementary thyroidectomy and intraoperative nerve monitoring.

**Materials and Methods:** Between January 2016 and February 2020, the files of 54 patients, who underwent complementary thyroidectomy and nerve monitoring in our clinic, were analyzed retrospectively. Patients who did not undergo nerve monitoring were not included in the study. The age, gender, pathology and indication, first surgery type, and the length of hospital stay of the patients, the reason for undergoing complementary thyroidectomy, and whether or not postoperative complications developed in the patients, were all recorded.

**Results:** The mean age of the patients was 44.4 (16-82 years). The average length of hospital stay of the patients was 2.37 (1-5 days). According to the initial pathology results of the patients who underwent complementary thyroidectomy, 34 had papillary thyroid cancer, 6 had follicular thyroid carcinoma or suspicion, 1 had medullary thyroid carcinoma, 1 patient had Anaplastic thyroid carcinoma suspicion and 12 patients had Multinodular Goiter recurrence.

**Conclusions:** As a result, complementary thyroid surgery poses an important problem for surgeons. It has a high rate of complications due to the formation of scar and loss of normal tissue planes. Therefore, we think that the use of intraoperative nerve monitoring during complementary thyroidectomy surgery may be helpful in reducing the occurrence of permanent or temporary recurrent laryngeal nerve damage.

**Key Words:** Intraoperative Nerve Monitoring Complementary Thyroidectomy, Complication

### Öz

**Amaç:** Rekürren inferior laringeal sinir (RLN) yaralanmaları, tiroid cerrahisinden sonra en önemli postoperatif komplikasyonlardan biri olmaya devam etmektedir. Yapılan çalışmalarda tiroidektomi sırasında geçici RLN hasarı %2-11, kalıcı RLN hasarı oranı %0.6-1.6'dır. Tamamlayıcı tiroidektomilerde ilk cerrahi işleme göre komplikasyon oranı daha fazladır. Son yirmi yılda, intraoperatif sinir monitörizasyonu riski en aza indirmek için güçlü bir araç haline geldi. Çalışmamızda; tamamlayıcı tiroidektomi sırasında intraoperatif sinir monitörizasyonu kullanılan hastaları retrospektif olarak incelemeyi amaçladık.

**Materyal ve Metod:** Ocak 2016-Şubat 2020 tarihleri arasında kliniğimizde tamamlayıcı tiroidektomi ve sinir monitörizasyonu yapılan 54 hastanın dosyaları retrospektif olarak incelendi. Sinir monitörizasyonu yapılmayan hastalar çalışmaya dahil edilmedi. Hastaların yaşı, cinsiyeti, patolojisi ve endikasyonu, ilk ameliyat şekli ve hastanede kalış süreleri, tamamlayıcı tiroidektomi uygulanma nedenleri ve hastalarda postoperatif komplikasyon gelişip gelişmediği kaydedildi.

**Bulgular:** Hastaların ortalama yaşı 44.4 (16-82 yıl) idi. Hastaların ortalama hastanede kalış süresi 2.37 (1-5 gün) idi. Tamamlayıcı tiroidektomi yapılan hastaların ilk patoloji sonuçlarına göre 34'ünde papiller tiroid kanseri, 6'sında foliküler tiroid kanseri veya şüphesi, 1'inde medüller tiroid kanseri, 1'inde Anaplastik tiroid kanseri şüphesi ve 12'sinde Multinodüler Guatr nüksü saptandı.

**Sonuç:** Sonuç olarak tamamlayıcı tiroid cerrahisi cerrahlar için önemli bir sorun teşkil etmektedir. Skar oluşumu ve normal doku planlarının kaybı nedeniyle komplikasyon oranı yüksektir. Bu nedenle tamamlayıcı tiroidektomi cerrahisi sırasında intraoperatif sinir monitörizasyonunun kullanılmasının kalıcı veya geçici rekürren laringeal sinir hasarı oluşumunu azaltmada yardımcı olabileceğini düşünüyoruz.

**Anahtar Kelimeler:** İntraoperatif Sinir Monitörizasyonu, Tamamlayıcı Tiroidektomi, Komplikasyon

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Received / Geliş tarihi: 04.04.2022

Accepted / Kabul tarihi: 04.05.2022

DOI: 10.35440/hutfd.1090667

## Introduction

The most common complications seen after thyroid surgeries are recurrent laryngeal nerve (RLN) injury and hypoparathyroidism (1, 2). According to the studies conducted, temporary RLN damage rate and permanent RLN damage rate are found to be 2-11% and 0.6-1.6%, respectively (3, 4). RLN injury is the most serious complication of thyroid surgery, thus causing temporary or permanent voice changes. Therefore, it is one of the most common causes of medical cases (5).

The main indications for complementary thyroidectomy are as follows; Development of recurrence in patients with thyroid tissue left due to benign pathology, failure to make a benign-malignant distinction due to not being able to show capsule invasion in follicular lesions as a result of examination of frozen section or in needle biopsy, and the cases of malignancy found in pathology results after non-total thyroidectomy (6). Complementary thyroidectomy has a high complication rate compared to the first surgical procedure (7). Pelizzo et al. reported temporary and permanent RLN paralysis rates in patients who underwent complementary thyroidectomy after subtotal thyroidectomy as 9.6% and 2.7%, respectively (8).

According to the strategy applied for thyroid surgery nowadays, it is said that RLN should be defined on a routine basis (9). Therefore, the use of intraoperative nerve monitoring for functional RLN evaluation is increasing gradually. There are two different types of nerve monitoring: continuous intraoperative nerve monitoring and intermittent intraoperative nerve monitoring.

In our study, we aimed to retrospectively examine the patients who underwent complementary thyroidectomy and intraoperative nerve monitoring.

## Materials and Methods

The present study was approved by the local ethics committee of the Harran University Medical Faculty in Turkey (Approval date-number: HRU/20.06.03). Between January 2016 and February 2020, the files of 54 patients, who underwent complementary thyroidectomy and nerve monitoring in our clinic, were analyzed retrospectively. Patients who did not undergo nerve monitoring were not included in the study. The age, gender, pathology and indication, first surgery type, and the length of hospital stay of the patients, the reason for undergoing complementary thyroidectomy, and whether or not postoperative complications developed in the patients, were all recorded. Vocal cords of the patients were evaluated on a routine basis by direct laryngoscope before the operation. RLN and traction were monitored using intraoperative nerve monitoring in all patients during the operation. At the end of the operation, an direct laryngoscopy was performed to assess the vocal cord by anesthesia during the wake-up phase.

Blood calcium values of all patients were examined on postoperative day 1. The patients with corrected serum calcium values below 8 mg/dl were followed-up. Patients who

received oral calcium therapy for more than 6 months were defined as permanent hypocalcemia. Indirect laryngoscopy was performed for the evaluation of vocal cords of the patients with changes in voice quality observed during post op follow-up. Pathology results were recorded after complementary thyroidectomy.

## Statistical Analysis

SPSS (Statistical Package for the Social sciences) version 16 statistics program (SPSS® Inc, Chicago, IL, USA) was used for statistical evaluation. Numerical data were presented as mean ± standard deviation. One Sample Kolmogorov-Smirnov test was used in order to evaluate whether or not the distribution of numerical data was normal. Independent-Samples T test was used in the evaluation of the numerical data with normal distribution. Pearson Chi-Square test was used in order to evaluate non-numerical data. Those with a P value below 0.05 were considered to be significant.

## Results

Of 54 patients included in the study, 48 (88.8%) were female and 6 (11.2%) were male. The mean age of the patients was 44.4 (16-82 years). The average length of hospital stay of the patients was 2.37 (1-5 days). According to the initial pathology results of the patients who underwent complementary thyroidectomy, 34 had papillary thyroid cancer, 6 had follicular thyroid carcinoma or suspicion, 1 had medullary thyroid carcinoma, 1 patient had Anaplastic thyroid carcinoma suspicion and 12 patients had Multinodular Goiter recurrence. Bilateral central neck dissection was performed along with the complementary thyroidectomy, in the patient who was diagnosed with a medullary thyroid carcinoma during reoperation (Table 1).

**Table 1.** First pathology results of patients who underwent complementary thyroidectomy

Disease	Number of Patients
Papillary Thyroid Carcinoma	34
Follicular Thyroid Carcinoma	6
Medullary Thyroid Carcinoma	1
Anaplastic Thyroid Carcinoma	1
Multinodular Goiter Recurrence	12

Transient vocal cord paralysis was observed in only 1 (1.85%) of 54 patients who underwent complementary thyroidectomy. Permanent vocal cord paralysis was not observed. Transient hypocalcemia was observed in only 3(5.5%) patients. Patients who developed this hypocalcemia showed complete improvement with oral calcium supplementation after 6 months of follow-up.

According to the pathology results recorded after complementary thyroidectomy, Medullary thyroid carcinoma was detected in 1 patient, Papillary thyroid carcinoma was detected in 22 patients, Follicular thyroid carcinoma was de-

tected in 1 patient, and thyroid benign neoplasms were detected in 30 patients (Table 2).

**Table 2.** Pathology results of patients who underwent complementary thyroidectomy

Disease	Number of Patients
Papillary Thyroid Carcinoma	22
Follicular Thyroid Carcinoma	1
Medullary Thyroid Carcinoma	1
Anaplastic Thyroid Carcinoma	--
Benign Thyroid Neoplasms	30

## Discussion

The main cause of the most important complication after thyroid surgery is vocal cord paralysis due to RLN damage during thyroidectomy. The visualization and protection of RLN during thyroidectomy has been defined as the gold standard for preventing RLN damage (10). There are many different mechanisms that cause RLN injury during surgery, and the most common injury mechanisms include nerve stretching, cutting, clamping, thermal damage, traction and ischemia. In a study conducted by Chiang et al., it was shown that excessive stretching of the nerve especially due to thyroid lobe traction plays an important role in RLN damage at Berry ligament level during thyroidectomy (11).

The use of intraoperative nerve monitoring makes it possible to identify the nerve, detect anatomical variations and predict postoperative vocal cord functions. Therefore, we expect a decrease in the incidence of recurrent laryngeal nerve injury in patients who undergo intraoperative neuromonitoring. However, when we look at the literature, the results are not satisfying. As a result of their study on 684 patients, Shindo M et al. reported that the intraoperative nerve monitoring does not change the incidence of temporary or permanent vocal cord paralysis (12). Similarly, in the studies conducted by Pinasu et al., and Malik et al., no difference was detected in the rate of recurrent laryngeal nerve damage by intraoperative neuromonitoring (13, 14). However, in case of signal loss during resection of the dominant thyroid lobe, the most important advantage of intraoperative neuromonitoring is that it enables gradual thyroidectomy option and thus reduces the risk of bilateral vocal cord paralysis (15).

Complementary thyroidectomy is a rarely performed and difficult surgical procedure. The incidence of complication is higher than the first surgical procedure performed in the patient. Scarring, edema and fibrosis in tissues, disruption of the anatomical structure, and indication of reoperative surgery make the surgery dangerous (16, 17). Intraoperative neuromonitoring is useful in reoperative thyroid surgery because the anatomical situation is different from normal. Thus, the morbidity of reoperative thyroid surgery can be reduced (18). In a study conducted by Medas F et al. on 152 patients who underwent complementary thyroidectomy, the rate of temporary vocal cord paralysis and the rate of permanent vocal cord paralysis were determined to

be 4.6% and 0.7%, respectively. According to them, more detailed studies are needed to confirm that intraoperative neuromonitoring can be particularly useful for reoperative thyroid surgery and can facilitate the detection of the nerve in the scar tissue, however, they do not have sufficient data to confirm whether or not this approach can significantly reduce the rate of nerve injury. While only one of the patients in our study had temporary vocal cord paralysis, permanent vocal cord paralysis was not observed.

As a result, complementary thyroid surgery poses an important problem for surgeons. It has a high rate of complications due to the formation of scar and loss of normal tissue planes. Therefore, we think that the use of intraoperative nerve monitoring during complementary thyroidectomy surgery may be helpful in reducing the occurrence of permanent or temporary recurrent laryngeal nerve damage.

**Ethical Approval:** The present study was approved by the local ethics committee of the Harran University Medical Faculty in Turkey (Approval date-number: HRU/20.06.03).

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**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** Authors declared no financial support.

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