



Evaluation of Thyroidectomy Results Performed at a Tertiary Academic Center

Original Investigation

✉ Fatih Yunus Emre¹, ✉ Ersoy Doğan¹, ✉ Pembe Keskinoglu²,
✉ Merih Güray Durak³, ✉ Sölen Sarıoğlu³, ✉ Ahmet Ömer İkiz¹

¹Department of Otorhinolaryngology, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey

²Department of Biostatistics and Medical Informatics, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey

³Department of Pathology, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey

Abstract

Objective: The aim of the study was to retrospectively analyze the patients who underwent thyroidectomy at a tertiary academic center regarding their surgical indications, histopathological diagnosis, and surgical complications.

Methods: The study included a total of 739 consecutive patients who underwent lobectomy, total thyroidectomy, or completion thyroidectomy performed under intraoperative nerve monitoring (IONM) at the Department of Otorhinolaryngology-Head and Neck Surgery of Dokuz Eylül University between January 2009 and December 2019. Demographic data of the patients, preoperative clinicopathological characteristics, postoperative complications, characteristics of surgery and histopathological results were evaluated.

Results: There were 619 patients in the primary surgery and 120 patients in the revision surgery groups. Indications for surgery were suspicion of malignancy in 486, multinodular goiter in 214, and hyperthyroidism in 39 patients. Final histopathological evaluation of specimens revealed malignancy in a total of 507 (68.6%) patients. Rates of transient and permanent hypocalcemia were 7.3% (54/739) and 2.2% (16/739) in the whole group, while this was 6.6% (41/619) and 1.5% (9/619), respectively, among primary total thyroidectomy patients. There were 61 (8.3%) patients with transient recurrent laryngeal nerve (RLN) paralysis (unilateral in 60 patients, bilateral in one patient) and five (0.7%) patients with permanent unilateral RLN paralysis as postoperative complications. Rates for postoperative hematoma, seroma, wound infection and chylous fistula were 2.2%, 3.7%, 0.1%, and 0.5%, respectively.

Conclusion: Our results support the safety of thyroid surgery performed under IONM in tertiary academic centers. Every institution should document and share its own results to properly inform its patients preoperatively.

Keywords: Thyroidectomy, hypocalcemia, vocal cord paralysis, recurrent laryngeal nerve

ORCID IDs of the authors:

F.Y.E. 0000-0002-5383-9892;

E.D. 0000-0003-0539-4232;

P.K. 0000-0002-3459-1828;

M.G.D. 0000-0003-3516-952X;

S.S. 0000-0003-4877-3064;

A.Ö.İ. 0000-0002-1636-9457.

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Corresponding Author:

Fatih Yunus Emre;
fyunus07@gmail.com

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Introduction

Thyroid surgeries are considered safe surgeries with low complication rates, however, different complications such as hypocalcemia, recurrent laryngeal nerve

(RLN) paralysis, and hemorrhage can be occurred after thyroidectomy. The most common complication after bilateral total thyroidectomy is hypocalcemia. In the literature, transient hypocalcemia has been reported between 1.36–50.0%, and

permanent hypocalcemia between 0.0–3.0% (1, 2). RLN injury is the main cause of morbidity that affects the quality of life after thyroidectomy. The incidence of transient RLN injury has been reported as 0.36–30.00%, and the incidence of permanent RLN injury as 0.5–5.2% (3–6). The incidence of postoperative hematoma has been reported between 0.0–6.5%, and this complication is a rare but a serious one that usually occurs within the first six hours postoperatively (7, 8). Chylous fistula is a rare complication usually seen in patients who undergo simultaneous lateral neck dissection (9). The incidence of surgical wound infection was reported as 0.4% (10).

The aim of the presented study was to retrospectively evaluate the patients who underwent thyroidectomy in our clinic regarding their surgical indications, histopathological diagnosis, and surgical complications.

Methods

All consecutive patients operated on by the Department of Otorhinolaryngology-Head and Neck Surgery of Dokuz Eylül University between January 2009 and December 2019 with the indication of total or completion thyroidectomy were included in the study. Intraoperative nerve monitoring (IONM) was used routinely in all patients. Patients' age, gender, indications for surgery, ultrasonography results, thyroid autoantibody results, vocal cord movements before and in the early and late periods after surgery, surgical characteristics (total or completion thyroidectomy, presence of neck dissection, drain placement), pathology results, serum calcium (Ca) and parathormone levels measured before and during the first week and in the later periods after surgery, postoperative complications and their time of occurrence were recorded in the data recording form.

For serum Ca evaluations, patients with a Ca value below 8.0 mg/dL in a single measurement after surgery were considered hypocalcemic. Hypocalcemia lasting shorter than 12 months was defined as transient, and hypocalcemia lasting longer than 12 months was defined as permanent hypocalcemia. Analyses for transient and permanent hypocalcemia were done for the whole group as well as the primary total thyroidectomy group with the exclusion of hemithyroidectomy patients and patients who underwent parathyroid adenoma surgery simultaneously with total thyroidectomy.

During IONM, a response less than 100 mV for 1 milliamper stimulus given to the RLN during the operation was considered a loss of signal. Vocal cord paralysis lasting longer than 12 months was defined as permanent vocal cord paralysis, and vocal cord paralysis lasting less than 12 months was defined as temporary vocal cord paralysis. Since the written records of the vocal cord examination in the fiberoptic nasal endoscopy routinely performed before

and after the surgery were fully accessible in 737 of 739 patients, the rates of vocal cord paralysis were evaluated on 737 patients.

Our retrospective study was approved by Dokuz Eylül University Non-Interventional Research Ethics Committee with decision number 2021/02-44 (date: 18.01.2021) but informed consent was not obtained from the patients because of the anonymous and retrospective design of the study.

Statistical Analysis

In data analysis, frequencies and percentages are presented as descriptors. Analytical frequencies were compared with the chi-square test, a p-value less than 0.05 was accepted as statistically significant. Statistical analyses were done with the IBM SPSS 24.0 program (Armonk, NY: IBM Corp).

Results

There were 739 consecutive patients who underwent lobectomy, total thyroidectomy, or completion thyroidectomy. Of these patients, 554 (75.0%) were female and 185 (25.0%) were male. The mean age of the patients was 47.16 ± 13.50 years.

There were 619 patients in the primary surgery and 120 patients in the revision surgery groups. Indications for surgery were suspicion of malignancy in 448, multinodular goiter (MNG) in 132, and hyperthyroidism in 39 patients in the primary surgery group, while there were 38 patients with suspicion of malignancy and 82 patients with MNG and compression symptoms in the revision thyroid surgery group.

When evaluated in terms of retrosternal extension, there were 67 (9.1%) patients with retrosternal extension and 672 (90.9%) patients without. A total of 527 (71.3%) patients underwent total thyroidectomy, 120 (16.2%) underwent completion thyroidectomy, and 92 (12.4%) underwent hemithyroidectomy. Thyroidectomy was performed without neck dissection in 618 (83.6%) of the patients. In addition to thyroidectomy, central neck dissection was performed in 56 (7.6%) patients, and central and lateral neck dissection was performed in 63 (8.5%) patients. Lateral neck dissection was performed in two (0.3%) patients with a history of thyroid surgery and central neck dissection. Drains were used during the operation in 233 (31.5%) of the cases, while drains were not used in 506 (68.5%) cases.

Final histopathological evaluation of thyroidectomy specimens revealed malignancy in 507 (68.6%) patients. In the malignancy group, 457 (90.1%) patients had early-stage (T1 and T2), and 50 (9.9%) patients had late-stage (T3 and T4) tumors. Papillary carcinoma was identified in 465 (91.7%) patients with malignant pathology, follicular carcinoma in 18 (3.6%) patients, and medullary carcinoma in 10 (2.0%) patients. The remaining 14 (2.7%) patients had

different types of rare thyroid carcinomas such as Hurthle cell carcinoma, mixed type carcinoma, poorly differentiated carcinoma, and anaplastic carcinoma.

In the evaluations made in terms of hypocalcemia, a total of 70 (9.5%) hypocalcemic cases were found in the total group of 739 cases whose serum Ca levels fell below 8.0 mg/dL in a single measurement after surgery. Among all patients, transient hypocalcemia developed in 54 (7.3%) cases and permanent hypocalcemia in 16 (2.2%) cases. After the exclusion of 115 patients who underwent hemithyroidectomy and parathyroid adenoma excision in addition to thyroid surgery, evaluation for hypocalcemia was also performed for primary total thyroidectomy (n=502) and completion thyroidectomy (n=120) patients. Rates of transient and permanent hypocalcemia were 8.2% (41/502) and 1.8% (9/502), respectively, for primary total thyroidectomy patients; and 10.8% (13/120) and 5.8% (7/120), respectively, for completion thyroidectomy patients.

Of the 739 patients 25 (3.4%) had pre-operative vocal cord paralysis. After the exclusion of pre-operative paralytic nerves, there were 1300 pre-operatively functioning nerves at risk (NAR), of which 1046 were in 527 total thyroidectomy patients, 90 in 92 hemithyroidectomy patients, and 164 RLN in 120 completion thyroidectomy patients. In the routine flexible endoscopic examination performed during the follow-up period postoperative vocal cord paralysis was detected in 68 patients. In two of these patients, the RLNs had to be sacrificed due to invasion by thyroid malignancy and were not classified as a surgical complication. Therefore, a total of 66 patients (8.9%) had vocal cord paralysis as a complication of the surgery with right vocal cord paralysis in 31 (4.1%) patients, left vocal cord paralysis in 34 (4.6%) patients, and bilateral vocal cord paralysis in one patient. Vocal cord paralysis was found to be temporary in 61 (8.3%) and permanent in five (0.7%) patients. In the evaluation made in terms of NAR, 67 (5.2%) of 1300 RLNs had RLN paralysis as a surgical complication in the early postoperative period. Temporary and permanent RLN paralysis rates were found in 62 (4.8%) and five (0.4%) NAR.

In the postoperative follow-up, hematoma occurred in 16 (2.2%) patients, seroma in 27 (3.7%) patients, chylous fistula in four (0.5%) patients. There was one wound infection (0.1%) on the seventh postoperative day, and the patient was hospitalized and treated for a week.

Transient hypoglossal nerve injury was observed in one (0.1%) patient who underwent completion total thyroidectomy and simultaneous central and lateral neck dissection.

Hematoma occurred in 11 (68.7%) of 16 patients within the first 24 hours and after 24 hours in the remaining five (31.3%) patients. Eight of these patients (50%) underwent

neck exploration due to hematoma, while eight patients (50%) were managed with conservative follow-up.

In the evaluation of hematoma development and drain placement, 10 of 233 patients (4.3%) with drains and six of 506 patients (1.2%) without drains had hematoma (p=0.007). Although hematoma was observed more often in patients with drains, it was also found that drain placement was statistically significantly higher in surgeries with a high risk of complications such as revision thyroid surgery, retrosternal thyroid extension, advanced tumor stage, and performance of simultaneous neck dissection (Table 1).

Discussion

Indications for thyroidectomy are generally classified as malignancy risk, local compression symptoms, and hyperthyroidism (11). Indications for surgery were similar in our study, namely, suspicion of malignancy in 448, MNG in 132, and hyperthyroidism in 39 patients in the primary surgery group; and suspicion of malignancy in 38 patients and MNG and compression symptoms in 82 patients in the revision thyroid surgery group.

The most common thyroid cancer is papillary thyroid cancer (>88%), followed by follicular thyroid cancer (8%) and Hurthle cell carcinoma (2.3%). The incidence of medullary thyroid cancer which originates from the parafollicular cells is approximately 2% (11). In our patient sample of 507 patients with malignant pathology in their specimens, 465 (91.7%) had papillary carcinoma, 18 (3.6%) had follicular carcinoma,

Table 1. Patient groups with and without drains

	Drain placement		p-value**
	Yes number (%)*	No number (%)*	
History of thyroid surgery			
Yes	63 (52.5)	57 (47.5)	<0.05
No	170 (27.5)	449 (72.5)	
Retrosternal extension			
Yes	45 (67.2)	22 (32.8)	<0.05
No	188 (28.0)	484 (72.0)	
Malignancy			
Yes	69 (29.7)	163 (70.3)	0.479
No	164 (32.3)	343 (67.7)	
T-stage			
Stage 1-2	128 (28.0)	329 (72.0)	<0.05
Stage 3-4	36 (72.0)	14 (28.0)	
Neck dissection			
Yes	102 (84.3)	19 (15.7)	<0.05
No	131 (21.2)	487 (78.8)	

*Row percentages are given. **P-values were calculated with the Pearson's chi-square test

10 (2.0%) had medullary carcinoma while 14 (2.7%) patients had rare thyroid carcinomas such as Hurthle cell carcinoma, mixed type carcinoma, poorly differentiated carcinoma, and anaplastic carcinoma. Papillary thyroid cancer and medullary thyroid cancer rates were comparable to those reported in the literature, whereas follicular thyroid cancer was found at a lower rate.

The most common complication after total thyroidectomy is hypocalcemia. Its incidence has been reported between 1–50% after total thyroidectomy (1, 12-14). Cho et al. (1) found the rate of transient hypocalcemia as 19–38% and the rate of permanent hypocalcemia as 0–3% after thyroidectomy. In their study, Tutar et al. (15) found the rate of temporary hypocalcemia after thyroidectomy as 15%.

In our study, a single serum Ca level less than 8.0 mg/dL, regardless of whether or not the patients were symptomatic, was defined as hypocalcemia. In our series, transient hypocalcemia was reported in 54 patients, and permanent hypocalcemia was reported in 16 patients after surgery. Our rates of temporary and permanent hypocalcemia were 7.3% and 2.2%, respectively, in the whole series of 739 cases. In subgroup analyses, rates of transient and permanent hypocalcemia were 8.2% (41/502) and 1.8% (9/502), respectively, for primary total thyroidectomy patients, and 10.8% (13/120) and 5.8% (7/120), respectively, for completion thyroidectomy patients. Although our results for hypocalcemia rates are among the lower rates given in the literature, it was observed that patients in the completion thyroidectomy group had more than a threefold risk of permanent hypocalcemia when compared to the patients in the primary thyroidectomy group (5).

In the literature, the incidence of temporary and permanent paralysis of RLN after thyroidectomy has been reported as 0.36–30.00% and 0.5–5.2%, respectively (4-6, 16, 17). In their study including 1547 patients and 2527 RLNs at risk, Dhillon et al. (4) reported that RLN paralysis developed in 73 (2.9%) RLNs, and paralysis was permanent in nine (0.4%) patients. The study by Aspinall et al. (18), in which 218 surgeons were evaluated according to their annual thyroidectomy volumes, showed that the risk of postoperative hypocalcemia and vocal cord paralysis was significantly lower among the cases of surgeons with high annual operating volumes. In our study, we found a total of 1300 RLNs to be at risk, including 1046 in 527 total thyroidectomy patients, 90 in 92 hemithyroidectomy patients, and 164 RLN in 120 completion thyroidectomy patients. Temporary vocal cord paralysis was detected in 61 patients and permanent vocal cord paralysis in five patients. In the evaluation of NAR, 62 of the 1300 RLNs had transient, and five had permanent RLN paralysis. Temporary and permanent vocal cord paralysis rates were 8.3% and 0.7% on a patient basis, and 4.8% and 0.4% on a NAR basis. Our paralysis rates are among the low

incidence rates reported in the literature. The high number of thyroid surgeries performed in our clinic and the routine use of IONM during surgeries are deemed to have contributed to the low rates of temporary and permanent vocal cord paralysis in our series.

In the literature, the incidence of hematoma after thyroid surgery has been reported between 0.43% and 6.54%. Risk factors that can lead to hematoma are advanced age, male gender, revision surgery, hypertension, neck dissection, bilateral surgery, increased thyroid gland volume, use of antithrombotic drugs, and autoimmune thyroiditis (19, 20). In our study, postoperative hematoma occurred in 16 patients and the rate of hematoma was calculated as 2.2%. There are studies in the literature supporting that the use of drains during operation is not associated with lower incidences of postoperative hematoma and prolongs the hospitalization period of patients (19, 20). In our study, hematoma was occurred in 4.3% of the cases in which a drain was placed, and in 1.2% of the cases in which a drain was not placed, and it was found that hematoma occurrence was statistically more common in cases in which a drain was placed ($p < 0.05$). When further factors were evaluated, however, the higher rate of hematoma in cases with drain insertion was attributed to higher-risk surgeries such as revision surgery, retrosternal extension, advanced-stage tumor surgery, and performance simultaneous neck dissection (Table 1).

According to the literature, the reported incidence of seroma after thyroid surgery ranges from 1.3% to 7.0%. While there are studies showing advanced age and obesity as risk factors for the development of seroma, there are also studies showing that gender and the use of a drain are not associated with seroma (21, 22). In our study, seroma was observed in 27 (3.7%) patients, and this rate is consistent with the literature data.

Chylous fistula is a rare complication usually occurred in patients with simultaneous lateral neck dissection or with an intrathoracic thyroid nodule. If it occurs, conservative treatment is recommended as the first approach. However, when a complicated or high-flow fistula is observed, surgical ligation of the duct is required (9, 23). Polistena et al. (9) in their study involving 13,224 cases, found chylous fistula in 0.01% of the cases and treatment was conservative in 30% of patients. In our study, chylous fistula occurred in four (0.5%) cases. Two patients required neck exploration due to chylous fistula, while the chylous fistulas of two patients were treated conservatively with a low-fat diet. In our study, 50% of the patients who occurred chylous fistula were treated conservatively, an approach similar to those in the literature.

The incidence of wound infection after thyroidectomy has been reported as 0.4%. Advanced age, male gender, smoking and alcohol use, and obesity are among the risk factors (10, 24). Elfenbein et al. (10) found the rate of

wound infection as 0.36% in their study including 49,326 cases who underwent thyroidectomy. In our study, there was one wound infection (0.1%) on the seventh postoperative day, and the patient was hospitalized and treated for a week.

Conclusion

Surgical indications, pathology results, and complication rates in our study are consistent with the results given in the literature and support that thyroid surgeries performed with IONM in experienced centers are among safe surgeries with low complication rates. However, although the complication rates associated with thyroidectomy are low in experienced centers, institutions should document and share their own results to properly inform their patients.

Ethics Committee Approval: Our retrospective study was approved by Dokuz Eylül University Non-Interventional Research Ethics Committee with decision number 2021/02-44 (date: 18.01.2021).

Informed Consent: Informed consent was not obtained from the patients because of the anonymous and retrospective design of the study.

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Authorship Contributions

Surgical and Medical Practices: F.Y.E., E.D., M.G.D., S.S., A.Ö.İ., Concept: F.Y.E., A.Ö.İ., Design: F.Y.E., A.Ö.İ., Data Collection and/or Processing: F.Y.E., A.Ö.İ., Analysis and/or Interpretation: F.Y.E., P.K., A.Ö.İ., Literature Search: F.Y.E., A.Ö.İ., Writing: F.Y.E., A.Ö.İ.

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

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Main Points

- We aimed to retrospectively evaluate the patients who underwent thyroidectomy in our clinic regarding their surgical indications, histopathological diagnosis, and surgical complications.
- Thyroid surgeries performed with IONM in experienced centers are among safe surgeries with low complication rates.
- Institutions should document and share their own results to properly inform their patients.

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