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Original Article

The relation between the excised thyroid gland weight and postoperative complications in total thyroidectomy patients

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Abstract

Aim: The purpose of this study was to determine the postoperative complications in total thyroidectomy patients based on the weight of the thyroid gland with retrospective screening.

Material and Methods: A total of 263 adult patients, who underwent total thyroidectomy were included. The data automation system of the hospital and the files of the patients were examined retrospectively.

Results: The total complication incidence was 24.3%, and these were determined as hypocalcemia, vocal cord paralyses (VCP), and hemorrhage and seroma at the surgery area. The rate of temporary hypocalcemia and permanent hypocalcemia rate was 20.1% and 1.5% respectively. The temporary VCP rate was 0.3% (n=1), and no permanent VCP was observed in the patients. The median thyroid weight was measured as 50 gr in patients without postoperative hypocalcemia, and as 40 g in the patients with hypocalcemia (p=0.283). There was no significant relation between the variability in the weight of the thyroid and postoperative hypocalcemia. However, the cervical lymph node dissection (LND) (p=0.006) and cervical dissection site (p=0.031) were significant in terms of postoperative complication development. In the multivariate analyses, it was found that female gender and LND were independent risk factors in the development of postoperative complications.

Conclusion: It was determined that cervical LND and female gender were independent risk factors. Consistent with the literature findings, no significant results were found in the risk factors like heavy thyroid gland, presence of thyroid operation history, malignant thyroid pathology, retrosternal localization of the thyroid tissue, and hyperthyroidism.

Keywords: Complications; hypocalcemia; thyroid weight; total thyroidectomy.

INTRODUCTION

In our present day, thyroid-related illnesses are among the most important endocrine pathologies. Total thyroidectomy is performed as a standard surgical procedure for functional, tumoral, inflammatory or cosmetic illnesses of the two thyroid gland lobes (1). The morbidity of the total thyroidectomy may be minimized by surgical experience, selecting proper surgical technique, and the developments in preoperative and postoperative patient management despite the high postoperative complication incidence (2). Thyroid surgery is at the highest point in the most commonly performed surgery list of general surgery. Although the complications and morbidities have decreased after thyroid surgery throughout historical developments, surgeons still have to cope with some problems that have high clinical importance. The complications related to the thyroid surgery are hypocalcemia due to hypoparathyroidism, hoarseness because of recurrent laryngeal nerve (RLN) injury, postoperative bleeding and seroma formation, thyroid crisis, infection, sympathetic nerve damage, damage to neighboring organs and vascular structures like cheilosis fistula (3,4). The increase in the size of the thyroid gland causes that the structural anatomy of the gland changes, and bleedings occur that disrupt the exposure in intraoperative terms, and failures happen in providing the dissection plan that is needed for preserving

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the important anatomical structures, which in turn increases the postoperative complication frequency (5-8). The data investigating the weight of the thyroid gland and postoperative complications are very few in the literature. With this study, the purpose was to determine the results of the surgery carried out in thyroid diseases based on the effects of the weight of the thyroid gland, to reveal the reasons that cause postoperative complications, and define the precautions for these reasons.

MATERIAL and METHODS

A total of 263 adult patients who had surgical indications due to benign or malign diseases of the thyroid gland, whose postoperative specimen weights were measured by the pathology department between January 2011 and October 2015 were included in this study. The data were recorded by examining the hospital automation system and the patient files retrospectively. The demographic characteristics of the patients, their preoperative ultrasonography, scintigraphy and tomography, preoperative laboratory values, fine needle aspiration biopsy results, preoperative diagnoses, postoperative pathological diagnoses and thyroid specimen weights, and postoperative complications like bleeding, seroma accumulation, hypocalcemia, vocal cord paralyses (VCPs), infection and hospitalization periods were examined. The necessary data of the patients that were missing in the system was completed by calling the patients to the clinic or by contacting them through phone. The preoperative, postoperative 24th and 72nd hour, and 1st, 3rd, 6th and 12th-month calcium values of the patients who were included in the study were recorded. All of the patients were selected from those who were operated with standard technique to remove all thyroid tissue along with the capsule. The postoperative drainage follow-ups and serum electrolyte follow-ups of the patients were also recorded. It was recorded whether the patients who had postoperative hemorrhage, hematoma, and based on this, hemodynamic instability were re-operated for hemostasis. The medical treatment plan that was implemented to those with hypocalcemia was recorded. The patients with thyroid disease, primary/secondary/tertiary hyperparathyroidism, paraneoplastic hypercalcemia or other malignant diseases with bone metastasis in their backgrounds were excluded from the study. Having serum calcium value less than 8 mg/dl at postoperative 24th-72nd hours after thyroidectomy was considered as hypocalcemia; the hypocalcemia that improved with treatment up to postoperative 1 year was considered as transient hypocalcemia; and the hypocalcemia that required Vitamin D and exogenous calcium after 1 year were considered as permanent hypocalcemia.

This study was produced from specialist thesis project and presented at the "21th National Surgery Congress", "11-15 April 2018", "Antalya, Turkey".

Ethics Committee Approval

Ethics committee approval was received for this study from the Ethics Committee of the Erciyes University Research Health Science Center. As a retrospective study, it was not deemed necessary to obtain informed consent by the decision of the ethics committee.

All procedures were in accordance with the ethical standards of the institutional and/or National Research Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Statistical analyses

The statistical analyzes that were made when evaluating the study data were performed by employing Statistical Package for Social Sciences (SPSS) version 22.0 (IBM Corp.; Armonk, NY, USA). The fitness of the data to normal distribution was evaluated by histogram, q-q graphics and Shapiro-Wilk test. Since parametric assumptions could not be met, nonparametric tests were used to evaluate the quantitative data. The quantitative data were presented as median (1st Quarter - 3rd Quarter). For the quantitative variables in the comparisons made between the paired groups, the Man Whitney-U test was used. The Kruskal Wallis test was used for the comparisons made between more than two groups. The Dunn-Bonferroni Test was used for multiple comparisons. The test statistics of the categorical data were investigated with the Pearson's Chi-Square Test and tested with the exact method. The logistic regression analysis was employed for multivariate analysis. The significance level of the analysis was taken as $p<0.05$.

RESULTS

The clinicopathologic features of the patients are given in Table 1. A total of 186 (70.7%) of the 263 cases were females and 77 (29.3%) were males. The female/male ratio was determined as 2.41/1. The mean age of the patients was found to be 49.8 (18-92), and the median value was found as 49 years. The mean discharge duration of the patients was 1.95 (the median value: 2) days. The shortest hospital stay was 1 day and the longest hospital stay was recorded as 9 days.

Postoperative complications were included in Table 2. There were no complications like pneumothorax, esophageal/tracheal injury, air emboli, brachial plexus injury, wound area infection, thyroid crisis and vascular damage. A total of 49 of the 53 patients who had hypocalcemia had this due to postoperative parathyroid gland ischemia, and 4 patients had this due to parathyroidectomy. Three of the 4 patients who had permanent hypocalcemia had this due to parathyroid gland ischemia, and 1 had this due to parathyroidectomy. The VCP developed in 1 patient was transient, and it was observed in the laryngoscopy after 4-month postoperative steroid treatment that the vocal cord mobility was intact. Permanent VCP was not determined in any of the patients.

The cross-comparative results of the variables that were included in Table 3.

It was determined in the univariate analysis results (in the patients with postoperative complications) (Table 4);

Table 1. The evaluation of the demographic and other characteristics of the patients

Demographic and Other Characteristics	n=263 (%)
Age	49.8 (18-92)
Gender	
Female	186 (70.7)
Male	77 (29.3)
Specimen weight	72.2 gr (10-500gr)
<20 gr	17 (6.5)
21-50 gr	128 (48.7)
51-100gr	76 (28.9)
101gr>	42 (16.0)
Thyroid Function Test	
Euthyroidi	179 (68.0)
Hypothyroidi	12 (4.7)
Hyperthyroidi	72 (27.3)
Thyroid Pathology	
Benign	212 (80.6)
Nodular Colloidal Goiter	137 (64.6))
Graves	49 (23.1)
Toxic Nodular Goiter	13 (6.1)
Hashimoto Thyroiditis	12 (5.7)
De Quervain Thyroiditis	1 (0.5)
Malign	51 (19.4)
Papillary CA	46 (90.1)
Follicular CA	2 (3.9)
Medullary CA	1 (1.9)
Anaplastic CA	1 (1.9)
Squamosal Cell CA	1 (1.9)
Retrosternal Extension	
Yes	33 (12.5)
No	230 (87.5)
Lymph Node Dissection	23 (8.7)
CLND	14 (60.8)
UCLND+ CLND	7 (30.4)
BCLND+ CLND	2 (8.6)
Thyroid Surgery History	
Yes	8 (3.0)
No	255 (97)
Postoperative Complication	
Yes	64 (24.3)
No	199 (75.7)

CA: cancer, CLND: cervical lymph node dissection, UCLND: unilateral cervical lymph node dissection, BCLND: bilateral cervical lymph node dissection

Table 2. The complications that developed postoperatively and their frequencies

Complications	The patients who had complication (n:64) n (%)	Among all patients (n:263) %
Hypocalcemia	57 (89.1)	21.6
Transient	53 (92.9)	20.1
Permanent	4 (7.1)	1.5
Vocal Cord Paralysis	1 (1.5)	0.3
Temporary	1 (100)	0.3
Permanent	-	-
Hematoma	4 (6.2)	1.5
Seroma	2 (3.1)	0.7
Wound Area Infection	-	-
Adjacent organ or major vessel injury	-	-

Table 3. Analysis of some variables in terms of postoperative complication development

Risk factors		COMPLICATION			
		No n (%)	Yes n (%)	P	X^2
Age	18-30	22 (73.3)	8 (26.4)	0.467	4.590
	31-40	25 (65.8)	13 (34.2)		
	41-50	57 (75)	19 (25)		
	51-60	39 (75)	13 (25)		
	61-70	44 (84.6)	8 (15.4)		
	>70	12 (80)	3 (20)		
Gender	Male	68 (88.3)	9 (11.7)	0.020*	9.457
	Female	131 (70.4)	55 (29.6)		
TFT	Euthyroid	139 (77.7)	40 (22.3)	0.241	2.616
	Hypothyroidi	7 (58.3)	5 (41.7)		
	Hyperthyroidi	53 (73.6)	19 (26.4)		
Thyroid Surgery History	Yes	6 (75)	2 (25)	0.965	0.002
	No	193 (75.7)	62 (24.3)		
Lymph Node Dissection	Yes	53 (82.8)	11 (17.2)	0,006*	7.554
	No	187 (94.0)	12 (6.0)		
	Central Dissection	10 (71.4)	4 (28.6)	0.031*	6.097
	Unilateral Dissection	1 (14.3)	6 (85.7)		
	Bilateral Dissection	1 (50)	1 (50)		
Retrosternal Extension	Yes	28 (84.8)	5 (15.2)	0.189	1.728
	No	171 (74.3)	59 (25.7)		
Pathology Results	Benign	162 (76.4)	50 (23.6)	0.563	0.334
	Malign	37(72.5)	14 (27.5)		
Specimen Weight	<21 gr.	12 (70.6)	5 (29.4)	0.828	0.947
	21-50 gr.	95 (74.2)	33 (25.8)		
	51-100 gr.	60 (78.9)	16 (21.1)		
	>100gr	32 (76.2)	10 (23.8)		
Benign Thyroid Pathologies	NCG	110 (80.3)	27 (19.7)	0.179	7.280
	Graves	36 (73.5)	13 (26.5)		
	Toxic Adenoma	9 (69.2)	4 (30.8)		
	Hashimoto	7 (58.3)	5 (41.7)		
	De-quervain	-	1 (100)		
Malign Thyroid Pathologies	Papillary CA	34 (73.9)	12 (26.1)	0.243	6.231
	Follicular CA	2 (100)	-		
	Medullary CA	-	1 (100)		
	Anaplastic CA	1 (100)	-		
	Squamosal CA	-	1 (100)		

*Significant difference, p<0.05, NCG: nodular colloidal goiter, CA: cancer

Table 4. Univariate and Multivariate Regression Analyses of various risk factors in terms of postoperative complication development

Risk Factors		Univariate Analysis		Multivariate Analysis	
		OR(CI)	p	OR(CI)	P
	Male	1.00	-	1.00	-
	Female	3.17 (1.48-6.81)	0.003*	3.11 (1.44-6.72)	0.004*
Age	18-30	1.00	-	-	-
	31-40	1.43 (0.50-4.09)	0.505	-	-
	41-50	0.92 (0.35-2,39)	0.859	-	-
	51-60	0.92 (0.33-2.55)	0.868	-	-
	61-70	0.50 (0.17-1.51)	0.219	-	-
	70>	0,69 (0.15-3.09)	0.688	-	-
TFT	Euthyroidi	1.00	-	-	-
	Hypothyroidi	2,48 (0.75-8.24)	0,138	-	-
	Hyperthyroidi	1.24 (0.67-2.34)	0.495	-	-
Thyroid Weight	20gr<	1.00	-	-	-
	21-50gr	0.83 (0.27-2.55)	0.749	-	-
	51-100gr	0.64 (0.20-2.08)	0.459	-	-
	100gr>	0.75 (0.21-2.65)	0.655	-	-
Pathology Report	Benign	1.00	-	-	-
	Malign	1.23 (0.82-3.26)	0.564	-	-
Retrosternal Extension	No	1.00	-	-	-
	Yes	0.52 (0.19-1.40)	0.195	-	-
Lymph Node Dissection	No	1.00	-	1.00	-
	Yes	3.23 (1.35-7.74)	0.008*	3.12 (1.28-7.64)	0.013*
Thyroid Surgery History	No	1.00	-	-	-
	Yes	1.04 (0.20-5.27)	0.964	-	-

1. In terms of postoperative complication development, the female gender was found to be 3.17 times higher risky than the male gender; and this situation was considered to be significant (p=0.003).

2. In terms of postoperative complication development, the group in the 7th decade was found to be 0.50 times less risky compared with the 3rd decade in age groups, and this was not considered to be significant (p=0.219). However, although the group in 4th decade was found to be 1.43 times higher risky, the difference was not significant (p=0.505).

3. When the TFT results of the patients were evaluated in terms of postoperative complications, it was determined that the hypothyroid group (Hashimoto Thyroiditis) was found to be 2.48 times more risky compared to the euthyroid group; however, this result was not significant (p=0.138).

4. The excised thyroid gland weight was not considered as a risk factor in postoperative complication development (p>0.250).

5.The risk of postoperative complication development in patients with malignant pathology was found to be 1.23 times higher compared with the group with benign thyroid diseases. However, this was not found to be significant (p=0.564).

6. The complication development in patients with thyroid gland with retrosternal extension was found to be 0.52 times less risky than the patients with thyroid gland with cervical localization; however, this was not found to be significant (p=0.195).

7. The postoperative complication development risk in the patients who underwent LND together with thyroidectomy was found to be 3.23 times higher than the group that did not undergo this. This was found to be significant (p=0.008).

8. The postoperative complication development risk in the patients with thyroid surgery history prior to the surgery was 1.04 times higher than in the patients without a history of prior thyroid surgery. This was not found to be significant (p=0.964).

The female gender was found to have 3.11 times higher risk compared to the male gender, which was found to be significant (p=0.004). The risk of postoperative complication development in patients who underwent LND was found to be 3.12 times higher compared to those who did not undergo LND, and this was found to be significant (p=0.013) (Table 4).

DISCUSSION

In our study, the purpose was to reveal the predisposing factors of the complications that might develop due to the surgery after total thyroidectomy. In the analyses we made, hypocalcemia was found to be 21.6%, VCP was 0.3%, hematoma was 1.5%, and seroma was 0.7% in the complications after total thyroidectomy. As the predisposing factors to these complications, when the risk factors like age, gender, thyroid specimen weight, TFT, LND, cervicomediastinal location of the thyroid gland and thyroid surgery history were evaluated as risk factors, only female gender and LND were found to be statistically significant in our study. We associated the other risk factors being determined as insignificant with the inadequacy of the number of patients.

According to some studies in the literature, the female/male ratio of the patients with thyroidectomy has been reported as 3.4-6.3 (9). This ratio was found to be 2.41 in our study. The median value of the thyroid weight of the male patients was found to be 70 gr in our study; and the median value of the thyroid weight of the female patients was found as 40 gr. In an autopsy series conducted on 1400 people with normal thyroid glands by Brian G. Pankow et al. in 1985 reported in the literature, the standard values for male and female individuals were found to be 20 g and 17 g, respectively (10). These findings were found to be similar to those of Mochizuki et al., who conducted a study of autopsy series in 1963 (11).

In the literature, the most common complications in thyroid surgery are listed as hypocalcemia, voice disorders and hemorrhage (2,4). In our study, the most common complications following the total thyroidectomy were hypocalcemia (21.6%), hematoma (1.5%), seroma (0.7%) and VCP (0.3%). No wound infections, large vessel or adjacent organ injuries were detected in any of the patients.

When there is thyroiditis, the surgical capsule of the thyroid gland shows adhesions with the perithyroid tissues due to inflammation, and there may be bleeding leaks disrupting the exposure during dissection. During the control of bleeding, hypoparathyroidism may develop due to parathyroid gland ischemia or undesired parathyroidectomy (8). In our study İn the univariate analysis, the complication risk following total thyroidectomy in thyroiditis patients increased 1.67 times more compared to the other patients but this was not found to be significant (p=0.142). In a study conducted by Catherine McManus et al., similar to the results of our study, they determined that the postoperative complication development was significantly higher in patients with thyroiditis (12).

Hypoparathyroidism frequency varies depending on the underlying thyroid disease, surgical experience and the technique implemented in the surgery. In the literature, the rate of temporary hypocalcemia after surgery is reported as 19-38%; and the rate of permanent hypocalcemia is reported as 0-3% (13). In our study, consistent with the literature, temporary hypocalcemia developed in 53 (92.9%) of the 57 patients who developed postoperative hypocalcemia, and permanent hypocalcemia developed in 4 (7.1%) patients.

Thyroid volume is an important factor that affects the postoperative results of thyroidectomy. In the literature, the number of studies that analyze the thyroid volume and complication and morbidity following surgery is very low. In our study there were no significant differences were detected between the difference in the specimen weight following thyroidectomy and postoperative hypocalcemia development. Karabeyoğlu et al. analyzed thyroid volumes prospectively with preoperative ultrasound, and determined that the hypocalcemia risk increased in patients with smaller thyroid volumes (<50 mL); and RLN damage and preoperative bleeding risk was high in patients with larger thyroid volume (8). In the study conducted by Ölmez A. et al., they found out that the patients with low thyroid gland weight who had hyperthyroidism had the risk of permanent hypocalcemia; and those with heavy thyroid glands above 100 g had the risk of nerve damage (14). Contrary to these studies, McHenry et al. conducted a study and reported an increase in postoperative hypoparathyroidism in cases that had thyroid volume more than 100 grams, although it was not significant (6). In a series of 301 patients, Antonio Rios-Zambudio et al. reported that there was a statistically significant increase in both hypocalcemia and RLN damage when the resected specimen weighed over 110 g (7). In the study conducted by R. Fernando et al., they determined that the frequency rates of the permanent hypocalcemia and RLN damage increased although it was not at a statistically significant level especially in patients who had thyroid gland weight 100 gr and above together with the increase in the size of the thyroid gland (5).

The thyroid gland has a hypervascular structure due to hyperthyroidism (15). Especially in graves patients, the bleeding in this hypervascular structure during thyroidectomy makes the detection of the anatomic localization of the parathyroid glands difficult, which may result in undesired parathyroid gland excision. In addition, a turn-over increase occurs in bone formation and destruction due to hyperthyroidism especially in women with the effect of hormones on calcium metabolism (16). The decrease in the thyroid hormones following surgery leads to a change in the calcium balance mechanism, and this leads to “hungry bone syndrome”, which shows itself with hypocalcemia, hypophosphatemia and hypomagnesaemia (17). In our study hyperthyroidism was not found significant. We believe that this is due to inadequate number of patients who had hyperthyroidism. In a study conducted by Jesús Herranz et al., hypocalcemia developed in 13 (50%) of the 26 patients who were operated for graves at a significant level following the surgery (11). In the study conducted by Antonio Rios-Zambudio et al., 69 patients who underwent thyroidectomy hd hyperthyroidism; hypocalcemia developed in 28 (45%) of these; and it was determined in statistical analyses that it was at a significant level (7).

In the study conducted by Lisa Caulley et al. investigating

the complications after total thyroidectomy with 40.025 cases, the incidence of postoperative complications in malignant thyroid pathologies was higher at a statistically significant level when compared to benign thyroid pathologies (3). This finding is consistent with the studies of Balentine C. J. et al., Sorensen K. R. et al., Doran H. E. et al., Goldfarb M. et al. with smaller sampling size, and was significant in statistical terms (18-21). In our study, postoperative complications in malign thyroid diseases compared to the patients operated due to benign pathology was higher; however, this was not significant. It was considered that this stemmed from the insufficient number of the patients with malign thyroid pathology.

The patients who undergo LND together with thyroid malignancies have a very high injury risk in terms of parathyroid glands; for this reason, special attention must be given to the anatomical blood flow of the glands to avoid postoperative hypocalcemia (22). In our study, in the univariate and multivariate analyzes we carried out, "LND" was found as an independent risk factor in terms of the development of hypocalcemia and other complications; and the postoperative complication risk increased 3.23 times more in patients who underwent LND. In the study conducted by Jong-Lyel Roh et al., it was found that postoperative hypocalcemia and other morbidities increased at a statistically significant level in patients who underwent LND (23).

Similar to the findings obtained in our study, Henry J. F. et al. found that the postoperative hypocalcemia incidence was 18% in patients with central neck LND (24). In a literature review conducted by Davide Giordano et al. with 1087 cases, this rate was found as 16.2% (11). In a study conducted by Han Seok Yoo et al., the postoperative hypocalcemia incidence was found as 33.7% in patients who underwent unilateral cervical LND, and 43.7% in patients who underwent bilateral cervical LND (25).

Consistent with the literature data, transient hypocalcemia developed in 43.4% of the patients who underwent LND, and permanent hypocalcemia developed in 4.3% of the patients. In the literature, the postoperative temporary hypocalcemia incidence was observed to be 23.2-51.9% in the patients who underwent nodal dissection, and the permanent hypoparathyroidism incidence was determined to be 0-16.2% (9,23,26,27).

In the literature, it was seen that the patients who underwent thyroid surgery had cervicomediastinal localization at approximately 5.4% (28-29). This rate was found to be 12.5% in ours study. In the literature, the rate of temporary hypocalcemia after surgery varies between 0.6-83% in patients who have thyroid gland with retrosternal extension, and permanent hypocalcemia is observed in 0-32% (29,30). The temporary RLN paralysis incidence following surgery is found as 0.5-18%, and permanent RLN paralysis is observed less commonly (0-4%) (29-33). In our study, no statistically significant differences were detected when the postoperative calcium values of the patients were compared with the patients who had cervical-localized thyroid gland. In a study conducted by Hermann M. et al., they found that the hypocalcemia and other morbidity development following thyroidectomy increased at a statistically significant level in the patients who had thyroid tissue with intrathoracic localization in statistical analyzes (34). However, as a finding that was contrary to the literature data, the cervicomediastinal localization was not found to be significant. This may be associated with the insufficient number of patients.

In the literature, the complication rates of the preoperative thyroid surgery are higher when compared to the patients who are operated for the first time, it was reported that especially the rate of hypocalcemia increased 2 to 10 times when compared to the primary operations (35-36). In our study the thyroid surgery history status was not found to be significant. This may be associated with the insufficient number of patients.

The opinion that is generally accepted is that larger thyroids are more complex cases (34-37). In our study, only in one patient postoperative temporary VCP occurred, and in the laryngoscopy that was performed in the postoperative 4th month, it was observed that vocal cord movements were intact. In this case, the thyroid gland weight was measured as 77 g. No statistical analysis could be performed between thyroid volume and voice disorder because of the insufficient number of patients. According to Runkel et al., the rate of nerve injury was 2.7% in patients who had normal thyroid gland volume, and it increased to 12.9% in patients who had a thyroid gland volume that was higher than 50 ml (37).

The development of hematoma, which is potentially fatal because it may cause acute respiratory distress, is a complication requiring urgent surgical intervention (38). The incidence of hematoma was found to be 1.5% in our study. According to recent studies, the neck hematoma incidence following surgery varies between 0.30-1.7% (39-40). In our study, in terms of postoperative hematoma development, the change in the thyroid weight was not found to be significant at a statistical level.

The limitations of this study:

1) The findings of the desired parameters of the patients could not be obtained for desired times due to the retrospective nature of the study;

2) The lack of polyclinic follow-ups of some patients who could not be contacted through phone;

3) It was seen in the retrospective study performed in the time interval we determined in the study that the specimen weights were measured only in approximately 300 patients from among the approximately 1000 patients who underwent total thyroidectomy. The number of the patients decreased to 263 after the cases that were eliminated according to the exclusion criteria in our study. Including only these patients may have caused that the results of our study does not reflect the results of the general population.

4) The lack of statistical analyses of complications like vocal cord paralysis, hematoma, seroma, etc. and the predisposing factors due to the inadequate number of patients is another factor that decreases the statistical power of our study.

CONCLUSION

It was found in our study that the risk of postoperative complications increases in parallel with the female gender and LND. However, there was no relation between the weight of the thyroid gland and complications. Considering with these findings, preoperative measures may reduce the frequency of postoperative complications.

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