ORIGINAL RESEARCH

Associations between body mass index and complications after total thyroidectomy: An analysis of patient records at a large public hospital in Ankara, Turkey

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Abstract

Background

Obesity is a major public health problem, with increasing rates noted globally. This study aimed to compare the surgical outcomes of total thyroidectomy in normal-weight, overweight, and obese patients.

Methods

We retrospectively reviewed 601 patients who underwent thyroidectomy between 2009 and 2016. Recorded data included patient demographics, preoperative diagnosis, preoperative biochemical markers, length of stay, operative time, postoperative histopathologic diagnosis, and complications. Patients were categorized into 3 groups based on body mass index: group A (normal weight), group B (overweight), and group C (obese).

Results

Of the 415 patients who underwent total thyroidectomy, 81 patients (19.5%) were in group A, 164 patients (39.5%) were in group B, and 170 patients (41%) were in group C. No statistically significant differences were observed among the groups in terms of age, comorbid illness, preoperative biochemical markers, or postoperative diagnosis, except for gender distribution. Similarly, no differences were noted among the groups in terms of postoperative length of stay or operative time ($P>0.05$). The incidence of postoperative complications did not significantly vary among groups ($P>0.05$).

Conclusions

Our findings suggest that obese and overweight patients did not experience higher rates of complications while undergoing total thyroidectomy relative to their normal-weight counterparts.

Keywords: thyroidectomy, surgical complications, body mass index, obesity, Turkey

Introduction

Obesity is a major public health problem, with rates increasing globally.[1]-[4] A high body mass index (BMI) is a significant risk factor for developing many comorbidities, including diabetes mellitus, musculoskeletal diseases, cardiovascular disorders, and certain types of cancer, such as thyroid carcinoma. It is assumed that these comorbidities increase the risk associated with surgical interventions and also lead to significant increases in medical costs.[4],[5]

Several studies have indicated that obesity is a risk factor for postoperative complications, including those associated with thyroid surgery.[6]-[9] The presence of increased adipose tissue often hinders adequate exploration during surgery. Additionally, the hyperextension of the neck required for thyroid surgery is frequently limited in obese patients because of their proportionally wider and shorter necks. This can be associated with insufficient exposure of the surgical site, potentially leading to complications.[5]

The literature comparing obese and normal-weight patients concerning thyroid surgery and its outcomes is scant. While some reports suggest that thyroidectomy can be performed safely on obese patients, others indicate higher morbidity in this group.[9]-[11] Currently, there is no consensus on whether obesity increases the risk of postoperative complications after thyroidectomy.

This study aimed to compare the surgical outcomes of total thyroidectomy among normal-weight, overweight, and obese patients.

Methods

Data were collected retrospectively on a total of 601 patients who underwent thyroidectomy for multinodular goitre, thyrotoxicosis, and malignancy or suspected malignancy at our clinic between January 2009 and June 2016, following ethical approval by the Ankara City Hospital Ethics Committee (E1-20-281). The study was conducted in compliance with the Declaration of Helsinki. Written informed consent was obtained from all patients at the time of registration.

During the preoperative period, all patients were assessed by experienced endocrinologists using ultrasonography. Fine-needle aspiration was performed on patients with suspicious nodules, and cytopathologic examinations were conducted. Eligible patients were those with benign or malignant diagnoses who were approved by our hospital's endocrine council for treatment with total thyroidectomy after diagnosis and examination procedures. Patients with incomplete data, age <18 years, or follow-up <1 year were excluded. Those with previous thyroid surgery, preoperative recurrent laryngeal nerve (RLN) palsy, or parathyroid disorders were also excluded. A total of 186 patients were excluded from the study because they had undergone subtotal thyroidectomy, central and lateral lymph node dissection, or simultaneous thoracotomy for retrosternal goitre.

Patients were categorized into 3 groups based on BMI: group A (normal, BMI 18.5 to <25 kg/m^2), group B (overweight, BMI 25 to <30 kg/m^2), and group C (obese, BMI ≥30 kg/m^2). BMI categories were aligned with the standard classifications set by the World Health Organization.[12]

All operations were performed by surgeons with experience in thyroid surgery (more than 50 operations per year). Patients were operated on in the supine position with neck extension under general anaesthesia. A cervical Kocher incision was made after draping. Neurovascular structures were visualized. The vessels of the thyroid's upper and lower poles were ligated and cut, while the external branch of the superior RLN and other nerves were preserved when possible. Total thyroidectomy was conducted with parathyroid gland preservation. The thyroid gland was entirely removed in all cases. The operative field was irrigated with saline, followed by meticulous attainment of haemostasis. Drainage was placed in the wound before layer-by-layer closure of the soft tissue and skin.

Patient data were collected from an electronic database. Demographics, preoperative diagnosis, preoperative biochemical markers, length of stay (LOS), operative time, postoperative histopathologic diagnosis, and complications were documented. BMI was calculated by dividing weight (in kilograms) by the square of height (in metres) from the first clinical visit to our department.

Hypocalcaemia, vocal cord palsy, haematoma formation, wound infection, and death were classified as postoperative complications. Hypocalcaemia was defined as a serum calcium level <8.0 mg/dL, corrected for the albumin level on postoperative day 2, with a parathyroid hormone concentration <15 mg/L. All patients underwent evaluation of vocal cord mobility with an indirect laryngoscope during the preoperative and postoperative periods. RLN palsy was considered persistent if it lasted for more than 6 months.

Statistical analysis

Statistical analyses were conducted using SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to investigate the distribution of the variables and ascertain whether they were normally distributed. Descriptive analyses were conducted, with means and standard deviations determined for normally distributed variables, along with medians and interquartile ranges for ordinal variables and data with skewed distributions. Frequency tables were employed when analysing ordinal variables. One-way ANOVA (analysis of variance) was applied to compare normally distributed variables, while the Levene test was used to evaluate the homogeneity of the variances. When statistically significant variation among the groups was determined, and the variances were not homogeneous, pairwise post hoc analysis was conducted using the Games-Howell test. The Kruskal–Wallis test was employed for intergroup comparisons in terms of variables with skewed or ordinal data. *P* values <0.05 were considered statistically significant.

Results

A total of 415 patients who underwent total thyroidectomy were included in the analysis. The mean age was 48.4±12.2 years; 315 were women (75.9%), and 100 were men (24.1%). Of these patients, 81 (19.5%), 164 (39.5%), and 170 (41%) were in groups A (normal weight), B (overweight), and C (obese), respectively.

The preoperative diagnoses were euthyroid multinodular goitre in 311 patients (74.9%), toxic multinodular goitre in 76 (18.3%), toxic diffuse goitre in 17 (4.1%), pure thyroiditis in 5 (1.2%), and malignancy in 6 (1.4%). The postoperative diagnoses were nodular hyperplasia in 248 patients (59.8%), thyroiditis in 36 (8.7%), micropapillary cancer in 75 (18.1%), macropapillary cancer in 42 (10%), follicular cancer in 4 (1%), and mixed type in 10 (2.3%).

Demographic data, comorbid illnesses, preoperative thyroid hormone levels, and calcium-related biochemical panel findings are summarized in Table 1.

The mean surgical time was 84.3±24.6 minutes (range, 45-180 minutes). The mean LOS was 1.6±1.1 days (range, 1-10 days). There was no intergroup variation regarding LOS or operative times (Table 2).

Table 1. Demographic data and preoperative findings

Variable	Group A (normal) (n = 81)	Group B (overweight) (n = 164)	Group C (obese) (n = 170)	*P* value
Age, median (IQR), years	40 (20)	45.5 (20)	45 (20)	0.16
Sex				
Female n (%)	78 (96.3)	78 (47.6)	159 (93.5)	0.04
Male n (%)	3 (3.7)	86 (52.4)	11 (6.5)	
BMI, median (IQR), kg/m²	23.3 (2.3)	27.4 (2.04)	33.6 (4.1)	<0.001
Comorbid illness, n (%)				
Absent	46 (56.8)	93 (56.7)	105 (61.8)	0.37
Present	35 (43.2)	71 (43.3)	65 (38.2)	
Preoperative serum TSH, median (IQR), mIU/mL	0.71 (1.94)	0.92 (1.56)	1.11 (0.61)	0.06
Serum calcium, mean ± SD, mg/dL	9.5 ± 0.48	9.4 ± 0.43	9.40 ± 0.34	0.48
Serum phosphate, mean ± SD, mg/dL	3.1 ± 0.54	3.34 ± 0.60	3.22 ± 0.59	0.76
Serum PTH, mean ± SD, pg/mL	53.9 ± 24.8	54.4 ± 18.1	61.7 ± 17.9	0.12
Serum vitamin D, median (IQR), ng/mL	12.6 (24.5)	12.8 (11.9)	12.08 (12.7)	0.53
Preoperative diagnosis, n (%)				
Benign	80 (98.8)	163 (99.4)	167 (99.2)	0.577
Malignant	1 (1.2)	1 (0.6)	3 (1.8)	

BMI, body mass index; IQR, interquartile range; PTH, parathyroid hormone; SD, standard deviation; TSH, thyroid-stimulating hormone

Transient hypocalcaemia occurred in 23 patients (5.5%), persistent vocal cord palsy was observed in 12 patients (2.9%), transient vocal cord palsy was documented for 11 patients (2.7%), and haematoma formation was noted in 3 patients (0.7%) There were no cases of persistent hypocalcaemia, wound infection, or recurrence, and there were no deaths during the period under study. No statistically significant differences in postoperative complications were observed among the groups. Details about postoperative complications are provided in Table 2.

Statistically significant variation was found among the groups in terms of postoperative diagnoses (P=0.035). Subsequent pairwise comparisons revealed a statistically significant difference between the obese and overweight groups (P=0.017).

Discussion

Obesity is often considered by surgeons, including endocrine surgeons, to be associated with poorer surgical outcomes and an increase in postoperative complications. Nevertheless, considerable controversy exists in the literature regarding the relationship between a high BMI and postoperative morbidity and mortality across various surgical disciplines.[5] Several authors posit that obesity is a risk factor for postoperative complications, including in thyroid surgery.[6]-[8],[13],[14] However, our findings do not align with this perspective. In our study, we observed no statistically significant variation among the groups concerning postoperative complications following total thyroidectomy. Similarly, the study by Trésallet et al.,[13] which examined 1216 patients who underwent thyroidectomy for papillary thyroid carcinoma, noted no significant disparity in overall postoperative complications, including hypocalcaemia, haematoma requiring drainage, and abscess formation. However, they found that obese patients were at increased risk of permanent complications, especially RLN lesions. It is important to note, however, that their study population included patients with malignancies, unlike ours.

In another study, Buerba et al.[9] reviewed 30-day surgical outcomes from thyroidectomies and parathyroidectomies in patients with high BMIs. They concluded that patients with high BMIs experienced longer operative times and more morbidity following cervical endocrine procedures than those with normal BMIs, though these differences were not deemed clinically significant. Their study, however, did not specify the type of surgical procedures performed. Our study differed in several aspects: it exclusively focused on surgical outcomes from total thyroidectomy, our clinic serves as a referral centre for endocrine surgery, and we investigated outcomes from 1 year of follow-up.

Table 2. Surgical time, length of stay, postoperative complications, and histopathological results

Variable	Group A (normal) (n = 81)	Group B (overweight) (n = 164)	Group C (obese) (n = 170)	*P* value
Surgical time, median (IQR), minutes	80 (30)	80 (30)	75 (45)	0.92
Length of stay, median (IQR), days	1 (1)	1 (1)	1 (1)	0.10
Hypocalcaemia, n (%)				
Absent	73 (90.1)	155 (94.5)	164 (96.5)	0.12
Present	8 (9.9)	9 (5.5)	6 (3.5)	
Vocal cord palsy, n (%)				
None	77 (95.1)	151 (92.1)	164 (96.5)	0.26
Transient	2 (2.5)	5 (3)	4 (2.4)	
Persistent	2 (2.5)	8 (4.9)	2 (1.2)	
Hematoma, n (%)	–	2 (1.2)	1 (0.6)	–
Presence of thyroiditis, n (%)				
Yes	9 (11.1)	9 (5.5)	18 (10.6)	0.77
No	72 (88.9)	155 (94.5)	152 (89.4)	
Presence of incidental parathyroidectomy, n (%)				
Yes	9 (11.1)	24 (14.6)	23 (13,5)	0.43
No	72 (88.9)	140 (85.4)	147 (86.5)	
Postoperative diagnosis, n (%)				
Benign	59 (72.8)	120 (73.2)	105 (61.8)	0.035
Malignant	22 (27.')	44 (26.8)	65 (38.2)	

IQR, interquartile range

Milone et al.[10] contend that despite the associated long operative times, thyroidectomy can be safely performed on patients with BMIs ≥25 kg/m^2. Their study, which comprised 2 groups, included 266 patients, of which 162 were overweight or obese. Farag et al.[11] compared surgical outcomes and complications among obese and nonobese patients following thyroid surgery. They found that there was no significant intergroup difference in operative times or LOS, nor was there a significant difference in complication rates. Notably, these studies did not differentiate between overweight and obese patients as separate categories. In contrast, our study included a larger cohort of patients and delineated 3 distinct groups: normal-weight, overweight, and obese individuals.

In a prospective study by Blanchard et al.,[15] patients who underwent total thyroidectomy were categorized into 5 groups: underweight, normal weight, overweight, obese, and severely obese. Their findings align with ours, suggesting that obesity does not increase the morbidity associated with total thyroidectomy. However, their analysis was limited to RLN palsy and hypocalcaemia. Our study expanded on this by considering hypocalcaemia, vocal cord palsy, haematoma, wound infection, and mortality as postoperative complications. Furthermore, Blanchard et al. did not standardize age and preoperative biochemical markers, such as vitamin D levels, which are crucial for postoperative hypocalcaemia; our study, however, did account for these variables.

Obese patients present both technical and clinical challenges for surgeons.[16] Obesity among patients undergoing thyroidectomy has been associated with longer operative times.[9],[10] In our study, there was no intergroup variation in terms of operative times or LOS, corroborating the findings of Farag et al.[11] However, in contrast with our study, the most frequently performed thyroid procedure in their study was lobectomy, which is associated with fewer complications and shorter operative times. Otherwise, a substantial body of research investigating the influence of BMI on postoperative morbidity following thyroid surgery supports our observations.[1],[10],[11],[15],[17]-[19]

Limitations

The principal limitation of our study was its retrospective design, precluding the performance of a power

analysis. Nonetheless, several aspects of our study contribute to its significance. Firstly, it encompassed groups of overweight, obese, and normal-weight patients, which were not distinctly categorized in prior studies. Secondly, the relatively large sample size enhanced the statistical robustness of our analyses.

Conclusions

In this study, obese and overweight patients did not experience elevated rates of complications associated with total thyroidectomy. Future prospective studies are warranted to validate or expand on these findings, and further insights may contribute to refinements in preoperative planning and risk stratification for thyroid surgery.

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