

Risk of Complications in Patients Undergoing Complete Thyroidectomy. A Retrospective Study

Igli Kokalari

Surgeon at Regional Hospital of Gjirokastra, Albania

Lila Shundi

Institute of Public Health, Tirana, Albania

Erjona Abazaj

Institute of Public Health, Tirana, Albania

University Medicine, Faculty of Technical Medicine Science

Ela Ali

Institute of Public Health, Tirana, Albania

Ledina Nikolla

University Medicine, Faculty of Technical Medicine Science

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Abstract

Introduction: The main aim of this study was to determine the influence of surgery on postoperative complications in patients undergoing total thyroidectomy. **Methods:** Patients diagnosed with goiter and undergoing total thyroidectomy for more than ten years were retrospectively enrolled, and the main study outcomes were postoperative complications. Statistical analysis was done by chi-square and t-test with a p-value <0.05 as significant. **Results** A total of 116 patients with goiter were identified (mean age, 45.3 ± 8.75 years, with minimum and maximum age of 23 to 69). The most affected age with goiter resulted in 41-50 years old with 41.4% (95% CI, 37.4 to 45.8%). The majority of patients with goiter were women (85.3%), with a mean age of 47 years. After the thyroid surgery, male patients had significantly higher rates of hospital readmission than females with a risk ratio [RR] of 1.05; 95% CI [0.67–1.52], p-value = 0.02. Either hemorrhage/hematoma occurred in 4.7% and cardiopulmonary and

thromboembolic events in 3.1% of the patients undergoing total thyroidectomy. In addition, either hypoparathyroidism was observed in 3.1% and temporary recurrent laryngeal nerve palsy (RLN) in 1.56%. **Conclusion:** The current study demonstrates that total thyroidectomy is associated with an increased rate of hemorrhagic complications. RLN palsies and hypoparathyroidism are less observed. Male patients undergoing thyroidectomy have higher rates of readmission and ICU admission. Furthermore, male patients revealed higher rates of hemorrhage and wound infection, while hypoparathyroidism or temporary recurrent laryngeal nerve palsy was more frequent among female patients.

Keywords: Thyroidectomy, complications undergoing patients, surgery

Introduction

According to the 2015 American Thyroid Association (ATA) guidelines, patients with thyroid nodular disease with indeterminate cytology can undergo a total thyroidectomy or a hemithyroidectomy (Haugen, et al., 2015). Surgical procedures have the potential for complications, and thyroidectomy is no exception (Ready & Barnes, 1994). When complications occur, they fall into several categories, including errors of omission or commission; and they may be inevitable or unanticipated. They may occur during the preoperative, operative, or postoperative phase; and they adversely affect anatomic structures, physiologic function, or both (Reeve & Thompson, 2000). A carefully obtained history that emphasizes symptoms, general physical status, genetic abnormalities, drug intake (particularly aspirin or other anticoagulants), response to previous surgery, and any previous abnormal bleeding problems are important factors to elicit and consider in a workup directed toward thyroidectomy. A thorough physical examination can alert the surgeon to possible preoperative and intraoperative difficulties and allow steps to be taken to reduce problems by making the appropriate referral to an endocrinologist, cardiologist, radiologist, or anesthesiologist; appropriate steps can be taken before the operation (Ready & Barnes, 1994). Complications can be roughly divided into milder (or minor) and more serious (or major) ones. The formation of a seroma and more pronounced scarring of the wound are classified as milder complications (Lukinović & Bilić, 2020) Thyroid surgery risks include general postoperative complications, such as postoperative fever, infection, hematoma/hemorrhage, cardiopulmonary and thromboembolic events, and thyroid surgery-specific complications, such as hypoparathyroidism/hypocalcemia and vocal cord/fold paralysis (Ardito, et al., 2016; Hauch, et al., 2014; Burge, et al., 1998). The long-term consequences of injury to the recurrent laryngeal nerve (RLN) should occur

in fewer than 1% of patients undergoing thyroidectomy. Although prevention of injury can never be absolute, careful observation during every operative step to monitor the wide range of possible variations in the course of the nerve should substantially reduce the risk (Sadowski, et al., 2017; Shen, et al., 2013). The cause of hypoparathyroidism after thyroidectomy is not always readily explicable. There is a risk of iatrogenic injury to the parathyroid glands during any operation in which both lobes of the thyroid gland are explored or resected, although permanent hypoparathyroidism may not be due to direct injury alone. Hypocalcemia following thyroidectomy is usually temporary. There is a wide variation in the reported incidence ranging from 1.6% to 50.0%, although most surgical units experienced in total thyroidectomy report a 2% or less incidence of persistent dysfunction. Hypocalcemia is considered permanent if calcium levels do not normalize within 6 months (1.3-3.0% of cases) (Tredici, et al., 2011; Abboud, et al., 2002).

Hemorrhage within a thyroidectomy wound usually occurs within 24 hours of operation, with most significant hematomas becoming apparent within 6 to 8 hours. Acute respiratory embarrassment is potentially lethal unless surgically relieved as an emergency procedure [3]. In an extensive study performed by Promberger et al., postoperative bleeding occurred in 336 (80.6%) of 417 patients within the first 6 hours after surgery (Prgomet, et al., 2012). Upon review of 6 other studies, we found that the incidence within the first 8 hours varied from 0-25% and the largest study being the one by Lacoste on more than 3000 thyroidectomies (Lo Gerfo, 1998; Balentine & Sippel, 2016; Schwartz, et al., 1998; Lacoste, et al., 1993; Hurtado-López, et al., 2002; Abbas, et al., 2001). Bleeding occurs very rarely after 24 hours (Shaha & Jaffe, 1994). The main aim of this study was to assess the rate of complications in patients undergoing thyroidectomy.

Materials and Methods

This is a retrospective, observational study on patients of the General Surgery Unit at a secondary health center situated in the district of Gjirokastra, Albania. Patients included in this study underwent the procedure of total thyroidectomy between January 2008 and December 2018. Data were collected from hospital patient records files. The study comprised 116 who obtained the service at the surgical ward in the city of Gjirokastrë. In this study, we included patients of both sexes that had files with complete data. While excluded from the study were subjects with inadequate specimens for diagnosis, incomplete data, or data acquisition errors. The clinical history of each patient was taken throughout the examination. The information regarding the general socio-demographic data, which includes, age, gender, residential area, marital status, occupation, education level, economic status,

and family history was collected from the record files of each patient. Based on the previously reported literature and a priori knowledge of risk factors for postoperative complications, we included preoperative risk variables to analyze the primary endpoint of interest, 30-day postoperative complication rates for inpatient versus outpatient total thyroidectomy (Abraham, et al., 2014). A composite outcome of interest, overall postoperative complication rates, was established. Overall postoperative complication rates included: pneumonia, pulmonary embolism, ventilator requirement >48 hours, progressive renal insufficiency, acute renal failure, urinary tract infection, stroke with neurological deficit, coma >24 hours, cardiac arrest, myocardial infarction, deep vein thrombosis, sepsis, septic shock, readmission, superficial, deep and organ space surgical site infection, wound disruption, We generated descriptive statistics for our study cohort, including the frequency of general and thyroid surgery-specific postoperative complications. Univariate analyses were conducted to determine the association of patient characteristics with cardiopulmonary/thromboembolic complications, postoperative fever/local complications, hypoparathyroidism/hypocalcemia, and vocal cord/fold paralysis. Multivariable logistic regression was used to identify factors associated with general and thyroid surgery-specific complications. The χ^2 test for linear trend was used to determine trends of general and thyroid surgery-specific postoperative complications according to SEER thyroid cancer stage, patient age, and Charlson/Deyo comorbidity score. All data were analyzed using the software SPSS version 26.0.

Results

In this study, we involved one hundred sixteen patients presented with goiter. The mean age of patients is 45.3 ± 8.75 years, with minimum and maximum ages of 23 to 69 respectively. Table 1 shows the baseline socio-demographic characteristics of the patients. About 85.3% of patients with goiter were women whereas the other 14.7% were men. The most affected age resulted in 41-50 years old with 41.4% (95% CI, 37.4 to 45.8%). Patients from the urban 67.2% were the most predominant compared with patients from the rural area, married were more than 70.7%, the most predominant patients 68.1% resulted with high school level, employment was most than half of the patients 52.6% and approximately 55.2% resulted in moderate economic status.

Related to some of the risk factors, 36.2% reported a family history of goiter, most of them 44% consummated salt at a moderate level, whereas 41.4% at a low level. According to the body mass index of patients, 3.4% were underweight, 22.4% in normal weight, 33.6% in overweight, 27.6% in obese class I, and 12.9% in obese class II and III. Most of them 74.1% have a

sedentary life, almost one quarter 24.1% were alcohol users, and 31.9% were smoker users.

Table 1. Baseline socio-demographic characteristics of the patients

Variables		N (%)
Gender	Women	99 (85.3)
	Men	17 (14.7)
Age	< 30 years old	8 (6.9)
	31-40 years old	13 (11.2)
	41-50 years old	48 (41.4)
	51-60 years old	27 (23.3)
	≥61 years old	20 (17.2)
Residence	Rural	38 (32.8)
	Urban	78 (67.2)
Marital status	Singe	4 (3.4)
	Married	82 (70.7)
	Divorced	17 (14.6)
	Widow	13 (11.2)
Education	Primary level	11 (9.5)
	High school	79 (68.1)
	University	26 (22.4)
Occupation	No	55 (47.4)
	Yes	61 (52.6)
Economic status	Low Income	32 (27.6)
	Moderate	64 (55.2)
	High Income	20 (17.2)
History family	No	74 (63.8)
	Yes	42 (36.2)
Salt consumption	Low	48 (41.4)
	Moderate	51 (44.0)
	High	17 (14.7)
BMI	underweight (BMI: ≤18.4kg/ m2)	4 (3.4)
	normal weight (BMI: 18.5–24.9kg/m2)	26 (22.4)
	overweight (BMI: 25.0–29.9kg/m2)	39 (33.6)
	obese class I (BMI: 30.0– 34.9kg/m2)	32 (27.6)
	obese class II–III (BMI: ≥35.0kg/m2)	15 (12.9)
Physical activities	No	86 (74.1)
	Yes	30 (25.9)
Alcohol use	No	88 (75.9)
	Yes	28 (24.1)
Smoking use	No	79 (68.1)
	Yes	37 (31.9)

Additionally, 26.7% of patients have referred presence of hypertension, 16.4% have diabetes mellitus, and 14.6% have cardiovascular diseases. Regarding the histology of goiter, 57.7% presented a goiter diffuse, 26.7% solitary nodule, and 15.5% multinodular. Almost 43.75% underwent total thyroidectomy, and the majority of patients were women (85.3%), with

a mean age of 47 years. After the thyroid surgery, men patients had significantly higher rates of hospital readmission than women with a risk ratio [RR] of 1.05; 95% CI [0.67–1.52], p-value = 0.02. Additionally, the men presented also a higher risk for postoperative admission with a RR of 1.38; 95% CI, [0.85–1.79], p-value = 0.04. We have evaluated the short-term and long-term complications of patients undergoing total thyroidectomy. Fever, infection, and seroma were the most predominant short-term complications in patients undergoing total thyroidectomy. Hematoma/hemorrhage in 4.7% of the patients whereas fever, infection, and seroma in 17.2%, 12.5%, and 7.8% respectively. In addition, either hypoparathyroidism was observed in 3.1%, temporary recurrent laryngeal nerve palsy (RLN) in 1.56% whereas cosmetic scares and dysphonia were the most predominant long-term complications in 20.3% and 6.25% respectively.

Table 2. Clinical data and risk factors complication of patients

Variables		Number (%)	P value
Metabolic syndrome	Hypertension	31 (26.7)	0.001
	Diabetes	19 (16.4)	
	Cardiovascular diseases	17 (14.6)	
Histopathology of goiter	Diffuse	67 (57.7)	0.02
	Solitary nodule	31 (26.7)	
	Multinodular	18 (15.5)	
Surgery	Yes	64 (55.2)	0.08
	No	52 (44.8)	
General postoperative complications (No=241)	Yes	28 (43.75)	0.007
	No	36 (56.25)	
Short-term complications	Hematoma/hemorrhage	3 (4.7)	0.004
	Fever	11 (17.2)	
	Infection	8 (12.5)	
	Seroma	5 (7.8)	
	Cardiopulmonary and thromboembolic events	2 (3.1)	
	Dyspnea	10 (15.6)	
	Dysphonia	12 (18.75)	
	Paresthesia	4 (6.25)	
Long-term complications	Recurrent nerve palsy	1 (1.56)	0.009
	Cosmetic scares	13 (20.3)	
	Dysphonia	4 (6.25)	
	Hypocalcemia	3 (4.7)	
	Hypoparathyroidism	2 (3.1)	

Table 3 shows the logistic regression of some of the risk factors and postoperative complications. Based on logistic regression of data, patients in

age over 41 years old, women and patients with BMI $\geq 30\text{kg}/\text{m}^2$ presented a higher risk for complication with a significant association, p-value <0.05 . Related to metabolic syndrome, a higher risk was seen for patients with diabetes and patients with cardiovascular diseases, with a p-value <0.05 .

Table 3. Logistic regression of risk factors and postoperative complications of patient

Predictors	Odds ratio	95% confidence interval	p-value
Age ≥ 41 years old vs ≤ 40 years old	1.3	[0.78-2.24]	0.03
Women vs men	1.8	[0.91-3.52]	0.04
BMI $\geq 30\text{kg}/\text{m}^2$ vs $\leq 29\text{kg}/\text{m}^2$	2.3	[1.05-5.67]	0.005
Hypertension yes vs no	1.1	[0.34-2.31]	0.07
Diabetes yes vs no	1.6	[0.58-2.49]	0.041
Cardiovascular diseases yes vs no	1.48	[0.73-2.86]	0.003
History family yes vs no	2.2	[0.90-4.3]	0.01
Salt consumption low vs	1.06	[0.48-2.61]	0.045
Physical activities yes vs no	0.89	[0.04-1.72]	0.7
Alcohol use yes vs no	0.94	[0.33-1.69]	0.8
Smoking use yes vs no	1.4	[0.40-2.81]	0.03
Short-term complications	2.7	[1.03-3.46]	0.008
Long-term complications	1.8	[0.92-3.40]	0.04

Discussion

Historically, total thyroidectomy has been performed in inpatient surgery due to the associated risk of life-threatening complications including hypocalcemia and airway obstruction, either due to the bilateral recurrent laryngeal nerve (RLN) injury or neck hematoma (McHenry, 1997). Even though there has been a trend towards performing procedures as an outpatient as permitted by advancements in anesthetic and surgical techniques (Steward, 2014) again, patients are more inclined to perform inpatient thyroidectomy due to significant comorbidity, simultaneous neck, and mediastinal procedures, and social circumstances not conducive to outpatient surgery (Balentine & Sippel, 2016; Sahmkow, et al., 2012; Sørensen & Klug, 2015).

In this study, we found that the rates of complications after total thyroidectomy surgery are relatively high compared to previously reported data from another study (Pandey, et al., 2015). We found that patients older than 41 years old and with one or more comorbid conditions were at increased risk for postoperative complications. These findings are similar to another study conducted by Papaleontiou et al, 2017 (Papaleontiou, et al., 2017).

Dehal et al, and Narayanan et al, highlighted in their study that hemorrhage/hematoma are the most predominant postoperative complication rates after the total thyroidectomy. The range of hemorrhage/ hematoma varied from 0.3% to 5% (Narayanan, et al., 2016; Dehal, et al., 2014).

Whereas Christou and Mathonnet report another range for the two most common early complications of thyroid surgery such as hypocalcemia in a range (20-30%) and recurrent laryngeal nerve injury (5-11%) (Christou & Mathonnet, 2013). Additionally, Grogan et al, reported that the increased age and the presence of comorbidities were found to be significant risk factors for pulmonary, cardiac, and infectious complications in a prior population-based study that had a 30-day postoperative follow-up (Grogan, et al., 2012). In this study, Hematoma/hemorrhage resulted in 4.7%, whereas cardiopulmonary and thromboembolic events in 3.1%. the most predominant short-term complications were fever, 17.2%, infection 12.5%, and seroma 7.8%. In addition to long-term complications, cosmetic scares were more frequent at 20.3%, dysphonia at 6.25%, and hypocalcemia at 4.7%. Moreover, we found a significant association, between total thyroidectomy and short-term and long-term complications.

Conclusion

The current study demonstrates that total thyroidectomy is associated with an increased rate of hemorrhagic complications. RLN palsies and hypoparathyroidism are less observed. Male patients undergoing thyroidectomy have higher rates of readmission and ICU admission. Furthermore, male patients revealed higher rates of hemorrhage and wound infection, while hypoparathyroidism or temporary recurrent laryngeal nerve palsy was more frequent among female patients.

Conflict of interest: The authors declare that there is no financial or non-financial conflict of interest. All the data presented in this paper have been collected on my part and the participant's anonymity is preserved.

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