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Indications and Complications of Total Thyroidectomy in the Management of Thyroid Diseases: A Five-Year Retrospective Study in a Greek Population

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Abstract

Objective. This retrospective study aimed to record, analyze, and evaluate data concerning patients who underwent total thyroidectomy, focusing on the main indications that led to surgical therapy, as well as postoperative complications and oncological outcomes. **Materials and Methods.** A retrospective study was conducted on 312 patients who underwent total thyroidectomy or lobectomy at the First Department of Surgery of Sismanogleio General Hospital in Athens between 2019 and 2024. Demographic data, indications, intraoperative parameters, complications, and histological findings were recorded. Statistical analyses were performed using SPSS v29.0. **Results.** Among the 312 patients, 222 (71.2%) were female, and 90 (28.8%) were male, with a mean age of 54.3±13.3 years. Total thyroidectomy was performed in 96.5% of the cases. The main indications were nodular hyperplasia (31.4%), autoimmune thyroiditis (18.9%), multinodular goiter (12.8%), and papillary carcinoma (17.3%). The overall complication rate was 31.7%, with transient postoperative hypocalcemia being the most common complication (25.3%). Permanent hypocalcemia occurred in 1.9% of patients, hemorrhage in 3.5%, and recurrent laryngeal nerve palsy in 1.3% of patients. Papillary carcinoma was the most frequent malignancy, followed by follicular, medullary, and anaplastic carcinomas. Approximately 20% of patients were diagnosed with incidental carcinoma—mostly papillary microcarcinoma—emphasizing the importance of total thyroidectomy, even for benign thyroid diseases. **Conclusions.** Total thyroidectomy is a safe and effective therapeutic option with low rates of permanent complications. The systematic identification and preservation of the parathyroid glands, intraoperative nerve monitoring, and meticulous hemostasis are key factors for minimizing inadvertent complications and optimizing outcomes.

Key Words: Total Thyroidectomy ▪ Hypocalcemia ▪ Complications ▪ Incidental Carcinoma ▪ Thyroid Surgery.

Introduction

Thyroidectomy is one of the most frequently performed endocrine surgical procedures worldwide. When performed in specialized centers, it is considered a safe and standardized operation; however, postoperative complications—particularly hypocalcemia and recurrent laryngeal nerve (RLN) injury—remain clinically significant.

Although numerous international studies have evaluated the indications and complication rates of total thyroidectomy, contemporary region-specific data reflecting current surgical practice patterns remain limited, particularly in Southeast Europe. Differences in epidemiology, healthcare structure, and institutional protocols may influence operative strategy and reported outcomes. In Mediterranean populations, thyroid nodular disease is highly prevalent, with multinodular goiter affecting up to 20–30% of adults in iodine-sufficient regions. In Greece, the widespread use of high-resolution ultrasonography and fine-needle aspiration has also contributed to the increasing detection of papillary thyroid microcarcinoma and incidental thyroid malignancies (1, 2). These epidemiological characteristics may influence

both surgical indications and final histopathological outcomes. Furthermore, the optimal extent of thyroid surgery and predictors of postoperative hypocalcemia remain areas of ongoing clinical interest. Hypocalcemia is the most common complication following total thyroidectomy and may result from temporary or permanent impairment of parathyroid gland function. Several studies have demonstrated that the extent of surgical resection, inadvertent parathyroid injury, and patient-related factors may contribute to postoperative calcium disturbances (3, 4).

The surgical management of the thyroid gland has progressed remarkably over the past century. Advances in surgical techniques, anesthesia, and perioperative care have significantly improved the safety of thyroidectomy over the past century, transforming it into a standardized and safe surgical procedure (5, 6). Surgeons must have a thorough understanding of the indications, surgical techniques, and potential complications to ensure the best possible patient outcomes. Thyroidectomy (total or subtotal) remains an important therapeutic option for various benign and malignant thyroid disorders (7). The indication for surgical intervention is based on clinical, imaging, and cytological factors, as well as the patient's symptoms. The main indications for thyroidectomy include large or substernal goiters causing compressive symptoms (dysphagia, hoarseness, or dyspnea), toxic multinodular goiter, hyperthyroidism, and Hashimoto's thyroiditis with a painful or suspicious nodule. Furthermore, the absolute indications for surgery include thyroid nodules with cytological findings suspicious for malignancy (Bethesda categories V–VI) and confirmed thyroid cancer (papillary, follicular, medullary, or anaplastic carcinoma) (8).

The present five-year retrospective study aims to evaluate the indications for thyroidectomy, postoperative complications, independent predictors of hypocalcemia, and histopathological findings in a contemporary Greek tertiary cohort, thereby contributing updated regional data to the existing literature.

Materials and Methods

The study included 312 patients who underwent thyroidectomy or lobectomy at the First Department of Surgery, Sismanogleio General Hospital of Athens, Greece, between 2019 and 2024. All patients were evaluated for demographic data, type of surgery, preoperative assessment, intraoperative techniques, and postoperative complications. Data were collected using a standardized data extraction form that was uniformly applied to all medical records. The variables were retrieved from electronic and written charts, operative reports, anesthesia records, and histopathology reports. The data were collected as part of routine diagnostic evaluations and therapeutic interventions, and their analysis was conducted anonymously using coded identifiers, with full respect for patients' personal information, particularly the patient identification number assigned upon admission to the clinic.

The inclusion criteria were as follows: adult patients (18 years) who underwent total thyroidectomy, completion thyroidectomy, or lobectomy between 2019 and 2024, and patients with complete perioperative and histopathological data. The exclusion criteria included simultaneous thyroidectomy and parathyroidectomy for concurrent pathology of the parathyroid glands, abnormal preoperative calcium levels, the presence of parathyroid disorders affecting calcium homeostasis, and thyroidectomy performed as part of other oncological procedures, such as laryngectomy, in collaboration with the hospital's Otorhinolaryngology Department. Pediatric patients and those with incomplete medical records were also excluded.

The primary outcome of this study was the incidence of postoperative complications, with particular emphasis on postoperative hypocalcemia (both transient and permanent). Secondary outcomes included the identification of risk factors for hypocalcemia, postoperative hemorrhage, recurrent laryngeal nerve injury, histopathological findings, and rates of incidental thyroid carcinoma. Transient hypocalcemia was defined as serum calcium <8.6 mg/dL or the need for calcium/

vitamin D supplementation resolving within 12 months postoperatively. Permanent hypocalcemia was defined as persistence beyond 12 months.

Postoperative hypocalcemia monitoring included serial serum calcium measurements and routine immediate postoperative parathyroid hormone (PTH) assessment in all patients. PTH levels were measured within the first hours after surgery. A value below 15 pg/mL, corresponding to the lower laboratory reference limit, was considered indicative of increased risk for postoperative hypocalcemia and was used to guide the calcium and vitamin D supplementation strategy. Recurrent laryngeal nerve (RLN) palsy was classified as transient if vocal cord mobility recovered within 6 months and permanent if dysfunction persisted beyond that period. Histopathological diagnoses were classified according to World Health Organization (WHO) criteria. Malignancy was confirmed histopathologically in all cases based on the final surgical specimen. TNM staging was determined according to the AJCC 8th edition criteria and was based exclusively on postoperative pathological findings rather than on preoperative clinical assessment.

This study was conducted in accordance with the principles of the Declaration of Helsinki and in compliance with national and institutional data protection regulations. The study design was retrospective and based exclusively on anonymized data obtained from medical records collected during routine clinical care. No identifiable patient information was recorded, and no intervention or deviation from standard clinical practice was performed for the purposes of this study.

Ethics Statement

According to institutional policy, retrospective observational studies using anonymized data do not require formal approval by an institutional ethics committee, nor is written informed consent required. Therefore, ethical approval and individual informed consent were waived.

Statistical Analyses

All data were handled confidentially, and patient privacy was strictly protected throughout the study. Continuous variables were expressed as mean ± standard deviation, and categorical variables as number (percentage). Normality of continuous variables was assessed using the Shapiro–Wilk test. Normally distributed continuous variables were compared using the independent samples t-test, while non-normally distributed variables were analyzed using the Mann–Whitney U test, as appropriate. Univariate analysis was performed using the chi-square or Fisher's exact test for categorical variables. Variables with a P-value <0.10 in the univariate analysis were entered into the multivariate logistic regression model, in order to avoid excluding potentially relevant predictors, in accordance with established methodological recommendations (9, 10). Results were reported as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at $P<0.05$. Analysis was performed using SPSS v29.0.

Results

The baseline demographic and clinical characteristics are presented in Table 1.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population (N=312)

Characteristic	Value
Age (years), mean ± SD (range)*	54.3±13.3 (21–84)
Sex†	
Female	222 (71.2)
Male	90 (28.8)
Type of surgery†	
Total thyroidectomy	302 (96.5)
Lobectomy	8 (2.5)
Completion thyroidectomy‡	2 (0.6)
Hospital stay (days), mean±SD (range)*	3.11±0.42 (2–7)
Central lymph node dissection†	55 (17.6)
Lateral lymph node dissection†	5 (1.6)
Accidental parathyroid excision†	100 (32.0)
Parathyroid autotransplantation†	5 (1.6)

*Continuous variables are presented as mean±standard deviation (SD). †Categorical variables are presented as numbers (percentages). ‡Due to >5% residual thyroid parenchyma, as confirmed by postoperative ultrasound.

The study population was predominantly female, and total thyroidectomy represented the main surgical approach. The overall hospital stay was short, reflecting standardized perioperative management. Two patients underwent completion thyroidectomy within two months due to >5% residual thyroid parenchyma, as confirmed by postoperative ultrasound. Both cases involved papillary carcinoma, and radioiodine therapy was subsequently administered. Reoperation was performed in one case due to positive margins in the initial specimen. The overall hospital stay was short, reflecting standardized perioperative management.

This duration reflects the institutional admission protocol, whereby patients were admitted one day prior to surgery for preoperative evaluation, underwent thyroidectomy on the second day, and were discharged on the first postoperative day in uncomplicated cases (11, 12).

The most frequent indications for surgery are presented in Table 2. Benign thyroid diseases, particularly nodular hyperplasia and autoimmune thyroiditis, were the most common indications, while papillary carcinoma was the leading malignant cause. Histopathological examination revealed accidental parathyroid excision in 32% of cases, of which 76% were intrathyroidal. The mean number of identified and preserved parathyroid glands was 2.65±1.05, and autotransplantation of inadvertently removed parathyroid tissue was performed in five patients (1.6%).

Table 2. Indications for Total Thyroidectomy (N=312)

Pathology*	N (%)
Nodular hyperplasia	98 (31.4)
Autoimmune thyroiditis	59 (18.9)
Papillary carcinoma	54 (17.3)
Multinodular goiter	40 (12.8)
Substernal (retrosternal) goiter	30 (9.6)
Toxic multinodular goiter	15 (4.8)
Graves' disease	11 (3.6)
Follicular neoplasm / carcinoma	3 (1.0)
De Quervain's thyroiditis	2 (0.6)

*Histopathological diagnoses were classified according to WHO criteria.

Postoperative complications occurred in 31.7% of patients and are summarized in Table 3. The majority of patients had an uneventful postoperative course.

Table 3. Postoperative Complications

Complication	Number (%)
Transient hypocalcemia*	79 (25.3)
Permanent hypocalcemia†	6 (1.9)
Hemorrhage	11 (3.5)
Wound infection	4 (1.3)
Recurrent laryngeal nerve palsy‡	4 (1.3)
Permanent recurrent laryngeal nerve palsy§	1 (0.3)
30-day mortality	0 (0)

*Transient hypocalcemia was defined as serum calcium <8.6 mg/dL or need for calcium/vitamin D supplementation resolving within 12 months postoperatively; †Permanent hypocalcemia was defined as persistence beyond 12 months; ‡Recurrent laryngeal nerve (RLN) palsy was classified as§ transient if vocal cord mobility recovered within 6 months and permanent if dysfunction persisted beyond that period.

Transient hypocalcemia was the most frequent complication, whereas permanent complications occurred at low rates. Of the 11 patients who experienced postoperative bleeding, six were treated conservatively with observation, transfusion, and intravenous tranexamic acid, while five required reoperation, and only one patient had an identifiable bleeding vessel. Early postoperative PTH measurements were performed in all patients and contributed to risk stratification and postoperative supplementation decisions. During follow-up, 85.3% of patients received prophylactic oral calcium and alfacalcidol supplementation for one month postoperatively until endocrine evaluation. Two patients (0.6%) required readmission due to symptomatic hypocalcemia after discharge. Both cases were managed conservatively with IV calcium supplementation, and no long-term sequelae were observed.

Histopathological findings and TNM staging are shown in Table 4. Papillary thyroid carcinoma was the most common malignancy, and most tumors were diagnosed at an early stage, whereas advanced stages were rare.

Table 4. Histopathological Findings and TNM Staging

Histological Diagnosis	Number (%)
Papillary carcinoma	140 (45)
Follicular carcinoma	6 (1.9)
Medullary carcinoma*	4 (1.3)
Hürthle cell carcinoma*	2 (0.6)
MALT lymphoma*	2 (0.6)
Anaplastic carcinoma*	1 (0.3)
Benign lesions	157 (50.3)
TNM Staging†	
pT1a	85 (27)
pT1aN1	2 (0.6)
pT1b	22 (7)
pT1N1	4 (1.2)
pT2	25 (8)
pT2N1	7 (2.2)
pT3	4 (1.2)
pT3N1	5 (1.5)
pT4 (pT4aN1)	1 (0.3)

*Rare malignancies (medullary, anaplastic carcinoma, and MALT lymphoma) are reported descriptively due to small case numbers; †TNM staging was performed according to the AJCC 8th edition.

Multivariate analysis was performed to identify predictors of postoperative hypocalcemia, and the results are presented in Table 5. It identified total thyroidectomy and inadvertent parathyroid excision as independent predictors of postoperative hypocalcemia.

Table 5. Multivariate Logistic Regression Analysis for Predictors of Postoperative Hypocalcemia

Variable*	Odds Ratio (OR)	95% Confidence Interval‡	P-value†
Total thyroidectomy (vs less extensive surgery)	1.92	1.01-3.65	0.050
Inadvertent parathyroid excision	3.84	1.78-8.29	0.001
Female sex	1.21	0.52-2.81	0.680
Age (>55 years)	1.08	0.59-1.96	0.810
Malignant pathology	1.34	0.71-2.54	0.360

*Multivariate analysis was performed using logistic regression; †Variables with P<0.10 in univariate analysis were entered into the model; ‡Results are presented as odds ratios (OR) with 95% confidence intervals (CI); †Statistical significance was set at P<0.05.

Univariate analysis demonstrated a significant association between nodular hyperplasia and postoperative hemorrhage, whereas no other variables showed statistical significance. The results of this analysis are presented in Table 6.

Table 6. Univariate Analysis of Factors Associated With Postoperative Hemorrhage

Variable*	P-value
Nodular hyperplasia	0.033
Sex	0.74
Age (>55 years)	0.68
Extent of surgery	0.59
Malignant pathology	0.81

*Univariate analysis was performed using the chi-square or Fisher's exact test, as appropriate. Multivariate analysis was not conducted due to the small number of hemorrhagic events.

Discussion

This five-year retrospective study describes the outcomes and complications of thyroid surgery at a single center in Greece, focusing on the indications, complications, and histopathological outcomes of total thyroidectomy. The most notable finding of this study is the relatively high rate of incidental thyroid carcinoma (approximately 20%) identified in patients undergoing surgery for presumed benign thyroid disease. This observation is consistent with contemporary literature and reflects the increasing detection of papillary microcarcinoma in the era of widespread ultrasonography and fine-needle aspiration (13,14). From a clinical perspective, this finding supports the role of total thyroidectomy in selected patients, particularly in populations with a high prevalence of multinodular thyroid disease, as it allows complete histopathological evaluation and may reduce the need for reoperation in cases of occult malignancy (15, 16).

The majority of patients were female, consistent with international data, as thyroid diseases have a well-documented female predominance (10). The mean hospital stay was approximately 3 days; however, the overwhelming majority of patients were

discharged on the first postoperative day. Although early 24-hour discharge protocols have been widely adopted in high-volume endocrine centers, the observed three-day hospitalization primarily reflects institutional admission logistics rather than prolonged postoperative recovery. Effective postoperative hospitalization was approximately 24 hours in uncomplicated cases. The mean age corresponds to the typical demographic affected by both benign and malignant thyroid disorders. Total thyroidectomy was the treatment of choice, highlighting the increasing predominance of complete gland removal over lobectomy, in accordance with contemporary guidelines (17, 18). The rate of central lymph node dissection aligns with the current, more selective approach: prophylactic central dissection is not universally recommended for all cN0 patients but should be individualized according to the residual disease risk, histological subtype, and surgical expertise (19).

The overall postoperative complication rate was consistent with global series (20-22), with the vast majority being transient and mild. Transient hypocalcemia was the most frequent complication, mainly resulting from temporary ischemia or minor trauma to the parathyroid glands. Permanent hypocalcemia was rare and within internationally acceptable limits. Postoperative hemorrhage and recurrent laryngeal nerve (RLN) injury were also very rare. The rates of permanent hypocalcemia and permanent RLN palsy fall within internationally reported ranges of 1–3% and 0.5-2%, respectively, in high-volume endocrine centers (22). Intraoperative nerve monitoring, visual identification of the RLN, and meticulous hemostasis are now considered standard practices for minimizing these risks (23). The proportion of malignant thyroid disease in this retrospective series is consistent with international surgical reports, in which differentiated thyroid cancer (DTC) accounts for 10–25% of operated cases (13). Papillary thyroid carcinoma (PTC) was the most common histological type, while follicular and micropapillary variants were less frequent, confirming the well-known global predominance of PTC (15, 24). TNM staging revealed a predominance of early-stage tumors, in accordance with the modern trend toward early diagnosis, mainly due to the extensive use of ultrasonography and fine-needle aspiration (FNA). The low rate of advanced stages reflects both the favorable biological behavior of DTC and the benefits of early surgical intervention (25, 26). The strong correlation between cytological findings suspicious for malignancy (Bethesda category V) and malignant cytology (Bethesda category VI) and final histology underscores the diagnostic reliability of preoperative FNA (27).

Among the 61 patients with preoperatively confirmed malignancy, total thyroidectomy was performed in 98.3% of the cases. Although oncological outcomes were favorable and the majority of malignant cases were diagnosed at an early stage, formal survival analyses were not performed, as long-term follow-up was not a predefined objective of this retrospective study. Consequently, conclusions regarding overall or disease-free survival cannot be drawn from the present data.

Multivariate logistic regression analysis was performed to identify independent predictors of postoperative hypocalcemia. Total thyroidectomy, as the extent of surgery, was independently associated with an increased risk of postoperative hypocalcemia. Inadvertent parathyroid excision of at least one gland was identified as the strongest independent predictor. Although advanced intraoperative fluorescence-guided techniques, such as indocyanine green angiography, may enhance parathyroid identification, they were not routinely available at our center during the study period. Female sex showed a higher incidence of hypocalcemia (28.8% vs. 16.9%) but did not reach statistical significance. According to the literature (27, 28), the higher frequency of hypocalcemia in women may be related to hormonal influences on parathyroid hormone secretion, anatomical differences, and genetic variations in calcium signaling pathways (29). In addition, women have higher rates of vitamin D and calcium deficiency, especially postmenopause, which may increase their vulnerability to postoperative hypocalcemia (30, 31). Given the complex anatomy of the region, the systematic identification of all parathyroid glands can be

technically challenging and may increase the risk of devascularization or trauma (32). The optimal technique involves careful subcapsular dissection (33) with ligation of the terminal branches of the thyroid arteries close to the true thyroid capsule, thereby preserving parathyroid vascularization without requiring exhaustive identification of all four glands (33, 34). Extensive exploration aimed at identifying all glands may paradoxically increase the risk of injury and is best avoided when recognition is difficult or time-consuming (34-36). At our institution, immediate postoperative PTH measurement was routinely performed in all patients and used in conjunction with serial calcium monitoring to guide supplementation and discharge planning. This approach aligns with contemporary evidence supporting early PTH-guided management to identify patients at risk for hypocalcemia and facilitate safe postoperative care (22, 35). Early PTH and calcium monitoring, meticulous dissection respecting parathyroid vascularity, autotransplantation of accidentally removed glands, and prophylactic calcium/vitamin D supplementation in high-risk patients can reduce symptoms, hospital stays, and readmission rates (18). Although the present study was not primarily designed to stratify complications according to surgical indication, nodular hyperplasia was significantly associated with postoperative hemorrhage in the univariate analysis. Increased vascularity and tissue friability in hyperplastic glands may render hemostasis more technically demanding.

Postoperative hemorrhage occurred in 3.5% of patients, consistent with international data (37). To explore the factors associated with postoperative bleeding, a univariate analysis was performed to examine patient- and pathology-related variables. A statistically significant association was identified between histopathological diagnosis and postoperative hemorrhage. Specifically, patients operated for nodular hyperplasia demonstrated a higher incidence of postoperative bleeding compared with other indications. This finding may be attributed to increased gland vascularity and tissue friability, commonly observed in nodular hyperplasia, which can render meticulous hemostasis more technically demanding. Due to the relatively small number of hemorrhagic events, multivariate analysis was not performed for this outcome, and results should be interpreted with caution.

Interestingly, approximately 20% of patients who underwent surgery for benign indications were found to have incidental malignancy—mostly papillary microcarcinoma (microPTC, pT1a)—upon histopathological examination. This finding aligns with international data on incidental carcinomas, typically reported in 10–20% of thyroidectomy specimens for benign disease (22). Non-incidental papillary microcarcinomas were included within the group of preoperatively diagnosed papillary carcinoma cases, whereas incidental microcarcinomas were identified exclusively in patients operated for benign indications. Our observed rate is at the higher end of the spectrum. It reflects several factors: (1) extensive tissue sampling and detailed histopathological analysis (38), (2) the high prevalence of multinodular goiter and Hashimoto's thyroiditis in the Greek population (both associated with incidental PTC), (3) the near-universal use of total thyroidectomy, allowing complete histological examination (39), and (4) the recent era characterized by increased diagnostic sensitivity and widespread use of ultrasound and FNA (14), contributing to the recognized phenomenon of "overdiagnosis." The high rate of incidental PTC underlines the need to fully inform patients preoperatively, as there is a substantial likelihood of post-surgical cancer diagnosis (40). This consideration affects the extent of the initial surgery, lymph node assessment, and postoperative management (Tg/TSH monitoring and possible radioiodine therapy). Therefore, total thyroidectomy remains the most appropriate endocrine and oncologic surgical approach, even for benign thyroid diseases, ensuring both complete cure and oncologic safety.

In recent years, minimally invasive techniques such as radiofrequency ablation (RFA), microwave ablation (MWA), and nano-pulse ablation have emerged as alternatives for selected benign nodules and low-risk microcarcinomas. These approaches may offer reduced procedural morbidity

and shorter recovery times (41, 42). However, they do not allow for complete histopathological evaluation and may not address multifocal or occult malignancy. In such epidemiological settings, total thyroidectomy continues to provide definitive oncologic management.

Comparative studies suggest that initial total thyroidectomy may reduce the need for reoperation compared to the staged approach (lobectomy followed by completion thyroidectomy), thereby minimizing the cumulative surgical risk (15, 16). Contemporary ATA guidelines emphasize individualized decision-making regarding the extent of surgery in low-risk differentiated thyroid carcinoma, balancing oncologic adequacy and complication risk (15).

The present study reflects contemporary thyroid surgical practice in Greece, where multinodular goiter and autoimmune thyroiditis remain highly prevalent. These epidemiological characteristics may partly explain the high rate of incidental papillary microcarcinoma observed in our cohort. Furthermore, the near-universal adoption of total thyroidectomy at our center provides insight into institutional surgical strategy in a Mediterranean population, where bilateral nodular disease is common. The rate of incidental carcinoma in our cohort lies at the upper range of internationally reported series and highlights the potential oncologic relevance of total thyroidectomy in patients initially operated for benign disease. The study period reflects the modern diagnostic era, characterized by the widespread use of high-resolution ultrasonography and fine-needle aspiration, potentially influencing surgical indications and incidental detection rates. The findings of this study have important clinical implications. First, the high rate of incidental carcinoma underscores the need for thorough preoperative patient counseling, as a significant proportion of patients operated on for benign disease may ultimately be diagnosed with malignancy. Second, the identification of modifiable surgical risk factors highlights the importance of surgical expertise and standardized techniques in reducing complication rates. Finally, these results support the use of total thyroidectomy as a definitive surgical approach in appropriately selected patients, balancing oncological adequacy with acceptable morbidity.

Limitations of the Study

This study has several limitations. First, it was conducted at a single tertiary care center, which may limit the external validity and generalizability of the findings to other clinical settings or populations. This study is limited by its retrospective design and relatively short follow-up period, which does not allow for the assessment of long-term oncological outcomes or quality-of-life measures. Healthcare utilization parameters, such as readmission rates, outpatient visits, and cost analysis, were not systematically assessed, limiting the evaluation of the economic impact of thyroidectomy in our setting (11, 23). Furthermore, neither institutional review board (IRB) approval nor written informed consent was obtained. In addition, conclusions regarding rare malignancies, such as medullary or anaplastic carcinoma, should be interpreted with caution due to the small number of cases.

Conclusions

Total thyroidectomy remains a safe and effective surgical procedure when performed in specialized centers. The main indications remain either benign thyroid disorders, such as nodular hyperplasia and autoimmune thyroiditis, being the most common, or papillary carcinoma, which is the predominant malignant indication. Postoperative hypocalcemia was identified as the most frequent complication, and it was primarily transient and self-limiting. Severe complications were extremely rare. Inadvertent parathyroid excision and the extent of surgery were identified as the strongest independent predictors of postoperative hypocalcemia, highlighting the importance of meticulous surgical technique and preservation of parathyroid gland vascularization. The relatively high rate of incidental thyroid carcinoma observed in this study underscores the importance of performing total thyroidectomy even in benign thyroid conditions,

as it ensures complete removal of potential occult malignancies, provides a definitive cure for thyroid disease, and maintains a low rate of postoperative complications or recurrence. Overall, these findings support the role of total thyroidectomy as a reliable and effective surgical approach for the management of thyroid diseases when appropriately indicated.

What Is Already Known on This Topic:

Total thyroidectomy is one of the most well-established procedures in general and endocrine surgery. The indication for surgical intervention is based on clinical, imaging, and cytological factors, as well as the patient's symptoms. The main indications for thyroidectomy include large or substernal goiters causing compressive symptoms, toxic multinodular goiter, hyperthyroidism, and Hashimoto's thyroiditis with a painful or suspicious nodule. Furthermore, the absolute indications for surgery include thyroid nodules with cytological findings suspicious for malignancy (Bethesda categories V–VI) and confirmed thyroid cancer.

What This Study Adds:

Approximately 20% of patients were diagnosed with incidental carcinoma—mostly papillary microcarcinoma—emphasizing the importance of total thyroidectomy, even for benign thyroid diseases. In our retrospective study, postoperative hypocalcemia was identified as the most frequent complication, and it was primarily transient and self-limiting. Severe complications, such as permanent hypoparathyroidism or recurrent laryngeal nerve injury, were extremely rare. Multivariate analysis identified the extent of surgery (total thyroidectomy) and the inadvertent removal of at least one parathyroid gland as the strongest independent predictors of hypocalcemia. Additionally, patients with nodular hyperplasia had higher bleeding rates, possibly due to increased vascularity and tissue friability, making hemostasis more challenging.

Authors' Contributions: Conception and design: GK and DC; Acquisition, analysis and interpretation of data: PV and VP; Drafting the article: PV and VP; Revising it critically for important intellectual content: MP; Approved final version of the manuscript: TT.

Conflict of Interest: The authors declare that they have no conflict of interest.

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