POSTOPERATIVE OUTCOMES OF TOTAL THYROIDECTOMY IN CUSCO, PERU: INSIGHTS FROM A HIGH-ALTITUDE REGION

Yuri André Ramírez Paliza[2,3,4,A], Yuri Patrick Ramírez Chacón[1,B,C*]

1 Hospital Antonio Lorena, Cusco, Perú.
2 Universidad Peruana Cayetano Heredia, Lima, Perú.
a. Estudiante de Medicina Humana
b. Cirujano Oncólogo

Abstract

Introduction: Total thyroidectomy is a common procedure in the treatment of thyroid diseases. However, geographical factors such as high altitude may influence postoperative outcomes.

Objective: To evaluate the incidence of postoperative complications following total thyroidectomy and identify associated risk factors in a high-altitude setting in Cusco, Peru.

Methods: This was a retrospective and observational study based on the review of medical records from 85 patients who underwent total thyroidectomy at Hospital Antonio Lorena between 2014 and 2024. Demographic, surgical, and postoperative data were analyzed using descriptive statistics and logistic regression.

Results: The mean age was 45 ± 12 years, with a predominance of female patients (69.4%). Thyroid cancer (82.4%) was the most common surgical indication. The overall complication rate was 47.1%, with transient hypocalcemia being the most frequent (40%). Permanent hypocalcemia occurred in 2.4% of cases, and recurrent laryngeal nerve injury in 9.4%. Postoperative hemorrhage (1.2%) and surgical site infections (2.4%) were rare. The average hospital stay was 4.2 ± 1.1 days. Calcium supplementation was required in 80% of patients, and all received levothyroxine.

Conclusion: Total thyroidectomy can be safely performed in high-altitude regions, with mostly transient complications. The findings suggest that altitude may influence the complication profile, highlighting the need for further research on its impact on surgical outcomes.

Keywords: Total thyroidectomy; postoperative outcomes; thyroid neoplasm

* Correo electrónico: yurich12343@gmail.com

Introduction

Total thyroidectomy is a common procedure for benign and malignant thyroid diseases, such as multinodular goiter, Graves' disease, and differentiated thyroid carcinoma.[1,2] Despite its effectiveness, postoperative complications are a major concern, affecting both short- and long-term outcomes.[3] Hypocalcemia is a frequent complication, typically caused by parathyroid injury or devascularization. Transient hypocalcemia occurs in 20%-50% of cases, while permanent hypoparathyroidism affects 1%-3%.[4,5] Risk factors include the extent of thyroidectomy, preoperative vitamin D deficiency, and parathyroid autotransplantation.[6] Calcium supplementation and intraoperative parathyroid preservation can reduce these risks.[7,8]

Recurrent laryngeal nerve (RLN) injury can lead to voice changes, aspiration, or respiratory distress. Temporary RLN palsy occurs in 3%-10% of cases, and permanent injury in 0.5%-2%.[9-12] Intraoperative nerve monitoring (IONM) reduces RLN injury, especially in complex surgeries.[9] Postoperative hemorrhage and hematomas are rare but serious, occurring in 0.1%-1% of cases.[13] Hematomas can obstruct the airway, requiring urgent intervention.[14-16] Proper hemostasis and careful surgical technique minimize this risk. Surgical site infections are uncommon (0.3%-2%), but they can cause abscesses and extended hospital stays.[17-19] Hypothyroidism is inevitable after total thyroidectomy, requiring lifelong levothyroxine therapy to prevent myxedema and metabolic disturbances.[20-23]

High-altitude environments complicate postoperative care. Cusco, at 3,600 meters above sea level, poses challenges due to hypoxia, which impairs wound healing and immune function, increasing infection risk and delayed recovery.[24,25] Studies show longer hospital stays and higher complication rates in high-altitude surgical patients.[26] Medication metabolism, including pain relievers and anesthetics, can also be altered.[27,28] Calcium metabolism may be affected at high altitudes, altering parathyroid hormone secretion and complicating hypocalcemia management.[29,30] Similarly, airway management after hematomas is more challenging in hypoxic environments.[33]

Given these factors, this study assesses postoperative complications in thyroidectomy patients from high-altitude regions like Cusco. We hypothesize that complications occur more frequently and with altered characteristics in these patients. The primary objective is to evaluate the incidence and nature of complications at a tertiary hospital in Cusco, while the secondary objective is to identify specific risk factors for higher complication rates in this unique environment. Findings will provide insights into managing thyroid surgery at high altitudes and contribute to better clinical strategies.

Methods

Study Design

This cross-sectional, retrospective, observational, and descriptive study was based on secondary analysis of medical records.

Population and Sample

A total of 85 patients who underwent total thyroidectomy at Antonio Lorena Hospital in Cusco, Peru, between 2014 and 2024 were included. Eligible participants were patients aged 18 to 80 years with complete medical records and a diagnosis of either benign or malignant thyroid disease. Cases with incomplete information were excluded.

Procedures

Medical records were reviewed from the hospital's central physical and electronic archives. A data collection sheet was created, including the following variables: age, sex, comorbidities, type and duration of surgery, intraoperative complications, and postoperative complications. The postoperative complications evaluated were hypocalcemia, recurrent laryngeal nerve (RLN) injury, hemorrhage, surgical site infections, and hypothyroidism.

Data Analysis

Descriptive statistics were used for the analysis of the variables. Categorical variables were reported as absolute and relative frequencies (percentages), and continuous variables were expressed as means. Data were processed using Statistical Package for the Social Sciences (SPSS) version 26.

Ethical Considerations

The study was approved by the Ethics Committee of Antonio Lorena Hospital. Patient data were anonymized to protect confidentiality, and the study adhered to the ethical guidelines outlined in the Declaration of Helsinki (2013). Despite potential limitations such as incomplete

data due to the retrospective design, this research aims to provide valuable insights into the incidence and risk factors of postoperative complications following total thyroidectomy. The findings aim to improve clinical practice and patient care locally, with implications for similar healthcare contexts.

Results

A total of 85 patients underwent total thyroidectomy, with a mean age of 45 ± 12 years. The age distribution was as follows: 11.8% were under 30, 52.9% between 30 and 50, and 35.3% over 50 (Table I). Most patients were female (69.4%), while 30.6% were male. The most common comorbidities were hypertension (24.7%), diabetes (17.6%), and cardiovascular diseases (7.1%) (Table I).

Regarding surgical indications, 82.4% of patients underwent surgery for thyroid cancer, 8.2% for multinodular goiter, and 4.7% for uncontrolled hyperthyroidism. Most surgeries were total thyroidectomies (95.3%), with a mean duration of 120 ± 30 minutes. Intraoperative complications were rare, with accidental RLN injury occurring in 2.4% of cases (Table II).

Table I. Demographic Variables

VARIABLE	NUMBER OF CASES	PERCENTAGE (%)
Mean Age	45 ± 12 years	
Age Range		
• <30 years	10	11.8%
• 30-50 years	45	52.9%
• >50 years	30	35.3%
Sex		
• Female	59	69.4%
• Male	26	30.6%
Comorbidities		
• Hypertension	21	24.7%
• Diabetes	15	17.6%
• Cardiovascular Diseases	6	7.1%
• Other	18	21.2%

Table II. Surgical Variables

VARIABLE	NUMBER OF CASES	PERCENTAGE (%)
Indications for Surgery		
• Thyroid Cancer	70	82.4%
• Multinodular Goiter	7	8.2%
• Graves' Disease	4	4.7%
• Other	4	4.7%
Type of Surgery		
• Total Thyroidectomy	81	95.3%
• Subtotal Thyroidectomy	4	4.7%
Duration of Surgery (minutes)	120 ± 30	
Intraoperative Complications		
• Accidental Recurrent Laryngeal Nerve Injury	2	2.4%
• Excessive Bleeding	1	1.2%
• Other Complications	4	4.7%

Postoperative complications included transient hypocalcemia in 40% of patients and permanent hypocalcemia in 2.4%. Recurrent laryngeal nerve injury occurred in 9.4% of patients, with 8.2% having temporary injury and 1.2% permanent injury. Hemorrhage requiring intervention occurred in 1.2%, and minor hematomas in 2.4%. Surgical site infections were rare, with 1.2% of patients experiencing superficial infections and 1.2% developing deep infections (abscesses). Hypothyroidism was observed in 100% of patients (Table III).

The mean postoperative hospital stay was 4.2 ± 1.1 days. The majority of patients (64.7%) stayed between 3 to 5 days, with 14.1% discharged in less than 3 days, and 21.2% requiring more than 5 days for recovery (Table IV).

Postoperative treatment included calcium supplementation in 80% of cases, and 91.8% of patients were monitored for calcium levels. Levothyroxine was administered to all patients, and 65.9% received vitamin D supplementation as part of their postoperative management (Table V).

Table III. Postoperative Complications

VARIABLE	NUMBER OF CASES	PERCENTAGE (%)
Hypocalcemia		
• Transient Hypocalcemia	34	40%
• Permanent Hypocalcemia	2	2.4%
Recurrent Laryngeal Nerve Injury		
• Temporary Injury	7	8.2%
• Permanent Injury	1	1.2%
Postoperative Hemorrhage / Hematoma		
• Hemorrhage Requiring Intervention	1	1.2%
• Minor Hematoma	2	2.4%
Surgical Site Infections		
• Superficial Infection	1	1.2%
• Deep Infection (Abscess)	1	1.2%
Hypothyroidism	85	100%

Table IV. Length of Hospital Stay

VARIABLE	NUMBER OF CASES	PERCENTAGE (%)
Mean Postoperative Stay	4.2 ± 1.1 days	
Stay < 3 days	12	14.1%
Stay 3-5 days	55	64.7%
Stay > 5 days	18	21.2%

Table V. Postoperative Treatment

VARIABLE	NUMBER OF CASES	PERCENTAGE (%)
Calcium Supplementation	68	80%
Levothyroxine Treatment	85	100%
Calcium Monitoring	78	91.8%
Vitamin D Use	56	65.9%

Discussion

In this study, we evaluated the incidence and factors associated with postoperative complications following total thyroidectomy in 85 patients at Antonio Lorena Hospital in Cusco, Peru. Our findings offer important insights into thyroidectomy outcomes in a high-altitude context, which may differ from those at lower altitudes due to the unique physiological conditions. The mean age of patients was 45 ± 12 years, with most being in the 30-50 age range, consistent with other studies where thyroidectomy is common in middle-aged adults.[34] The majority were female (69.4%), reflecting the higher prevalence of thyroid disease in women, especially conditions like multinodular goiter and thyroid cancer.[35] Interestingly, 82.4% of surgeries were for thyroid cancer, a higher proportion compared to other studies where benign conditions are more common.[36] This could reflect regional differences in the prevalence of thyroid cancer and access to healthcare. Most surgeries were total thyroidectomies (95.3%), aligning with current guidelines for differentiated thyroid cancer.[37]

Regarding postoperative complications, 40% of patients had transient hypocalcemia, consistent with literature where transient hypocalcemia occurs in 20%-50% of cases.[38] Altitude-related changes in calcium metabolism may have contributed to this higher incidence.[39] Permanent hypocalcemia occurred in 2.4%, similar to the reported 1%-3% in other studies.[9] The lower rate of permanent hypocalcemia suggests effective intraoperative techniques and calcium supplementation.

Recurrent laryngeal nerve (RLN) injury was noted in 9.4% of patients, with 8.2% having temporary and 1.2% permanent injury. This rate is slightly higher than the typical 3%-10% for temporary injury and 0.5%-2% for permanent injury (40). The increased RLN injury rate may be attributed to the complexity of surgeries, particularly in patients with large or advanced thyroid tumors. The absence of intraoperative nerve monitoring (IONM) at our institution might also have contributed, as IONM reduces RLN injury, especially in complex surgeries.[41]

Postoperative hemorrhage or hematoma occurred in 3.6%, consistent with the rare but serious complications seen in 0.1%-1% of cases.[13] Minor hematomas (2.4%) were within expected ranges and generally required no significant intervention. Surgical site infections (SSIs) were rare (2.4%), similar to other studies where SSIs are infrequent, ranging from 0.3%-2%.[19] This suggests that infection control and sterility practices were effective.

The average postoperative hospital stay was 4.2 ± 1.1 days, with 64.7% staying between 3 and 5 days, which aligns with typical recovery times. Shorter (14.1%) and longer stays (21.2%) were observed, likely due to complications or comorbidities. Postoperative care followed best practices, with 80% of patients receiving calcium supplementation and 91.8% monitored for calcium levels, in line with current standards.[4] Levothyroxine therapy was given to all patients, as required after total thyroidectomy to maintain euthyroidism.[21] Vitamin D supplementation was provided to 65.9% of patients, consistent with guidelines recommending it to enhance calcium absorption and prevent hypocalcemia post-surgery.[42]

While this study provides valuable data, there are limitations. The retrospective design may introduce biases, such as incomplete data. The findings may also not be generalizable to populations outside high-altitude regions like Cusco, as altitude could affect recovery and complication rates. Altitude's impact on thyroid surgery outcomes warrants further study, as it may alter calcium metabolism and recovery times.[39] Additionally, the lack of intraoperative nerve monitoring at our institution may explain the higher rate of RLN injury compared to studies using this technique.[41] Future prospective studies comparing outcomes across different altitudes and with nerve monitoring could provide a clearer understanding of factors influencing postoperative complications in thyroid surgery.

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Conclusions

This study is the first to explore postoperative complications following total thyroidectomy in Cusco, Peru, a high-altitude region at 3,600 meters above sea level. It highlights key findings, including a 40% incidence of transient hypocalcemia, with lower-than-expected rates of permanent hypocalcemia (2.4%) and recurrent laryngeal nerve injury (1.2%). These results suggest that effective surgical techniques and postoperative care can minimize complications even in challenging high-altitude environments.

The study is novel in examining how high-altitude conditions might impact postoperative recovery, particularly concerning calcium metabolism and healing. Altered physiological changes at high altitudes could influence complication rates and recovery times, an area that remains underexplored in thyroid surgery literature. This research opens the door for further studies on the effects of altitude on thyroidectomy outcomes.

Overall, this study provides valuable insights into thyroid surgery in high-altitude regions and encourages further investigation into how altitude affects surgical outcomes. Understanding these factors can improve perioperative management and enhance patient care in similar regions worldwide.

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Appendix

Abbreviation	*Full Term*
RLN	Recurrent Laryngeal Nerve
IONM	Intraoperative Nerve Monitoring
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
SSIs	Surgical Site Infection