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Research Article

Comparing Complication Rates in Total Thyroidectomy versus Partial Thyroidectomy

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Abstract

Background: Thyroidectomy, a common surgical procedure, is performed as either a Total Thyroidectomy (TT) or a Partial Thyroidectomy (PT). The choice of procedure is influenced by the underlying pathology, with a key consideration being the risk of complications, primarily recurrent laryngeal nerve (RLN) injury and hypoparathyroidism.

Objective: To compare the incidence of early postoperative complications between patients undergoing TT and those undergoing PT.

Methods: A prospective cohort study was conducted on 64 patients who underwent thyroidectomy at a single institution. Patients were allocated to either the TT group (n=32) or the PT group (n=32) based on preoperative and intraoperative indications. The primary outcomes measured were the rates of transient and permanent hypocalcemia and RLN palsy. Data were analyzed using Chi-square and Fisher's exact tests.

Results: The overall complication rate was significantly higher in the TT group (37.5%) compared to the PT group (12.5%) ($p = 0.021$). Transient hypocalcemia was the most common complication, occurring in 25.0% of TT patients versus 6.3% of PT patients ($p = 0.037$). There was one case (3.1%) of permanent hypocalcemia in the TT group and none in the PT group. The rate of transient RLN palsy was 9.4% in the TT group and 6.3% in the PT group, a difference that was not statistically significant ($p = 0.646$). No permanent RLN palsy was observed in either group.

Conclusion: Total thyroidectomy is associated with a significantly higher overall complication rate, driven primarily by a greater incidence of postoperative hypocalcemia. Partial thyroidectomy remains a safer procedure in terms of early postoperative morbidity, particularly for benign disease where it is an appropriate option. Surgeons must weigh the completeness of resection offered by TT against the increased risk of complications.

Keywords: Thyroidectomy, Total Thyroidectomy, Partial Thyroidectomy, Hemithyroidectomy, Hypocalcemia, Recurrent Laryngeal Nerve Palsy, Surgical Complications.

Introduction

Thyroid disorders, including benign nodules, hyperthyroidism, and malignancy, represent a significant global health burden. Surgical intervention, primarily thyroidectomy, is a definitive treatment for many of these conditions. The two principal surgical approaches are Total Thyroidectomy (TT), involving the removal of the entire gland, and Partial Thyroidectomy (PT), which includes procedures like lobectomy or subtotal thyroidectomy, preserving a portion of the thyroid tissue.

The choice between TT and PT is multifactorial, dictated by the preoperative diagnosis, risk stratification, and surgeon preference. TT is often indicated for malignancy, large multinodular

goiters, and Graves' disease to minimize the risk of recurrence. Conversely, PT is frequently employed for unilateral benign disease, offering the potential for preserved thyroid function and reduced risk to vital structures like the parathyroid glands and recurrent laryngeal nerves (RLN).

The primary trade-off lies in the complication profile. TT inherently carries a higher risk of bilateral structural damage, leading to hypoparathyroidism and subsequent hypocalcemia, as well as potential bilateral RLN injury. PT, by sparing one side, theoretically mitigates these risks. While numerous large-scale studies and meta-analyses have explored this, data from smaller, focused cohorts can provide valuable insights into institutional outcomes and surgical quality assurance.

This study aims to prospectively compare the rates of early postoperative complications, specifically hypocalcemia and RLN palsy, between patients undergoing TT and PT within a controlled sample of 64 patients at a single surgical center

Methods

Study Design and Population

A prospective cohort study was conducted over an 08-month period. The study protocol was approved by the institutional ethics committee, and informed consent was obtained from all participants. A total of 64 consecutive patients scheduled for thyroidectomy were enrolled. Patients were allocated to the TT group (n=32) or the PT group (n=32) based on standardized indications:

- **TT Group:** Diagnosis of thyroid cancer, bilateral benign disease, Graves' disease, or compressive multinodular goiter.
- **PT Group:** Diagnosis of a unilateral benign nodule, follicular lesion of undetermined significance, or unilateral autonomous nodule. Exclusion criteria included revision thyroid

surgery, concurrent parathyroid surgery, and pre-existing vocal cord palsy or hypocalcemia.

Surgical Technique

All procedures were performed by one of two experienced endocrine surgeons. Standard technique included identification and preservation of the RLN and meticulous capsular dissection to identify and preserve the parathyroid glands with their vascular supply. In cases of inadvertent devascularization, parathyroid auto-transplantation was performed. Intraoperative nerve monitoring was used selectively.

Data Collection and Outcome Measures

Patient demographics, preoperative diagnosis, and operative details were recorded. Serum calcium and albumin levels were measured preoperatively and on postoperative days 1 and 14. Symptomatic assessment for hypocalcemia (perioral numbness, paresthesia, Chvostek's or Trousseau's sign) was performed daily during hospitalization.
The primary outcome measures were:

1. **Hypocalcemia:**
    - *Transient:* Corrected serum calcium < 8.0 mg/dL or symptoms requiring calcium/vitamin D supplementation, resolving within 6 months.
    - *Permanent:* Requirement for calcium/vitamin D supplementation persisting beyond 6 months.

2. **Recurrent Laryngeal Nerve Palsy:**
    - *Transient:* Hoarseness and confirmed vocal cord paresis on laryngoscopy, resolving within 6 months.
    - *Permanent:* Vocal cord paresis persisting beyond 6 months.

All patients with voice changes underwent postoperative laryngoscopy.

Statistical Analysis

Data were analyzed using SPSS Statistics Version 28.0. Continuous variables (e.g., age) were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables (e.g., complication rates) were expressed as numbers and percentages and compared using the Chi-square test or Fisher's exact test, as appropriate. A p-value of < 0.05 was considered statistically significant.

Table 1: Patient Demographics and Preoperative Characteristics

Characteristic	Total Thyroidectomy (n=32)	Partial Thyroidectomy (n=32)	p-value
Mean Age (years ± SD)	48.5 ± 12.3	45.9 ± 14.1	0.421
Gender, n (%)			0.543
- Female	26 (81.3%)	24 (75.0%)	
- Male	6 (18.7%)	8 (25.0%)	
Preoperative Diagnosis, n (%)			
- Malignancy	14 (43.8%)	4 (12.5%)	

Characteristic	Total Thyroidectomy (n=32)	Partial Thyroidectomy (n=32)	p-value
- Benign Nodular Disease	12 (37.5%)	26 (81.3%)	
- Graves' Disease	6 (18.7%)	2 (6.2%)	

Table 2: Postoperative Complication Rates

Complication	Total Thyroidectomy (n=32)	Partial Thyroidectomy (n=32)	p-value
Any Complication	12 (37.5%)	4 (12.5%)	**0.021**
Hypocalcemia			
- Transient	8 (25.0%)	2 (6.3%)	**0.037**
- Permanent	1 (3.1%)	0 (0%)	0.314*
RLN Palsy			
- Transient	3 (9.4%)	2 (6.3%)	0.646*
- Permanent	0 (0%)	0 (0%)	-
Other Complications			
- Hematoma	0 (0%)	0 (0%)	-
- Wound Infection	0 (0%)	0 (0%)	-

The baseline characteristics of the 64 patients, stratified into the Total Thyroidectomy (TT) and Partial Thyroidectomy (PT) groups, are presented in Table 1. The two cohorts were comparable in terms of age and gender distribution. The mean age was 48.5 ± 12.3 years in the TT group and

45.9 ± 14.1 years in the PT group (p = 0.421). The majority of patients in both groups were female, constituting 81.3% (n=26) of the TT group and 75.0% (n=24) of the PT group (p = 0.543). As expected, the preoperative diagnosis differed significantly between the groups, reflecting the standard indications for each procedure. Malignancy was the most common indication for TT (43.8%, n=14), while benign nodular disease was the predominant indication for PT (81.3%, n=26).

*Analysis performed using Fisher's Exact Test.

A comprehensive analysis of postoperative complications is detailed in Table 2. The overall complication rate was significantly higher in the Total Thyroidectomy group. Twelve patients (37.5%) in the TT group experienced at least one complication, compared to only four patients (12.5%) in the PT group (p = 0.021).

This difference was primarily driven by the incidence of hypocalcemia. Transient hypocalcemia was the most frequent complication, occurring in eight patients (25.0%) in the TT group, compared to two patients (6.3%) in the PT group, a difference that was statistically significant (p = 0.037). Furthermore, one patient (3.1%) in the TT group developed permanent hypoparathyroidism, requiring long-term supplementation, while no cases of permanent hypocalcemia were observed in the PT group.

In contrast, the rates of recurrent laryngeal nerve (RLN) palsy were not significantly different between the groups. Transient RLN palsy was observed in three patients (9.4%) who underwent TT and two patients (6.3%) who underwent PT (p = 0.646). Notably, there were no instances of permanent RLN palsy in either surgical cohort. Other major complications, such as postoperative hematoma or surgical site infection, were not encountered in this study population.

Discussion

This prospective comparative analysis of 64 patients demonstrates a clear and significant divergence in the early postoperative morbidity profiles of total and partial thyroidectomy. The principal finding of our study is that total thyroidectomy (TT) is associated with a significantly higher overall complication rate compared to partial thyroidectomy (PT), a disparity predominantly driven by a marked increase in the incidence of postoperative hypocalcemia. These findings contribute to the ongoing surgical dialogue regarding the critical balance between the completeness of resection and the imperative to minimize patient harm.

The most salient result from our data is the threefold higher rate of transient hypocalcemia in the TT group (25.0% vs. 6.3%, p=0.037). This is a logically consistent and widely documented consequence of the bilateral cervical dissection inherent to a total thyroidectomy, which places all four parathyroid glands at risk of devascularization or inadvertent excision. Our findings align closely with those of a large multicentric study by Rosato et al. (2004), which analyzed over 14,000 thyroidectomies and found transient hypocalcemia rates of 8.3% after TT versus 1.5% after PT, and permanent hypocalcemia rates of 1.9% versus 0.2%, respectively. The physiological basis for this is straightforward: PT preserves the functional integrity of the contralateral lobe and its associated parathyroid glands, providing a robust biological safeguard against hypoparathyroidism. The single case of permanent hypoparathyroidism (3.1%) in our TT cohort, while unfortunate for the patient, falls within the widely accepted reported range of 1-5% and underscores this persistent risk even with meticulous surgical technique.

In contrast to the clear findings on hypocalcemia, our study found no statistically significant difference in the rates of recurrent laryngeal nerve (RLN) palsy between the two procedures. The rates of transient RLN palsy were 9.4% for TT and 6.3% for PT (p=0.646), and no permanent nerve injuries were observed. This suggests that the risk of nerve injury is more intimately tied to factors such as surgical anatomy, the complexity of the dissection (e.g., in large goiters or re-operative surgery), and surgeon experience, rather than being a simple function of the extent of resection on its own. This observation is supported by the work of Duclos et al. (2002), who prospectively demonstrated that individual surgeon experience was a more critical determinant of complication rates than the specific type of thyroid procedure performed. Our data reinforces that in the hands of experienced surgeons, a properly indicated and carefully executed thyroidectomy, whether total or partial, can yield excellent and comparable outcomes with respect to vocal cord function.

When contextualizing our overall complication rate of 37.5% for TT versus 12.5% for PT, it is important to consider the indications for surgery. The significantly higher prevalence of malignancy and Graves' disease in our TT group are pathologies that themselves can complicate dissection and elevate risk. This does not, however, negate the core clinical implication: for unilateral, benign disease, where PT is a sound oncological and functional option, it offers a substantially safer postoperative course. This risk-benefit analysis is central to preoperative counseling and shared decision-making. Patients must be informed that while TT provides the advantage of complete tissue removal and obviates the risk of recurrence in the contralateral lobe, this comes at the cost of a significantly higher probability of transient hypocalcemia and a small but real risk of permanent hormone replacement.

Conclusion

In conclusion, this study provides clear evidence that within our cohort, total thyroidectomy carries a significantly higher risk of postoperative complications, with hypocalcemia being the predominant concern. Partial thyroidectomy remains the procedure of choice for unilateral benign pathology, offering a markedly superior safety profile. The decision to perform a total thyroidectomy should be reserved for clear and compelling indications, such as malignancy or bilateral disease, where the clinical benefits justify the accepted increase in surgical morbidity. Ultimately, the choice of procedure must be tailored to the individual patient, with a carefully weighed decision that prioritizes both therapeutic efficacy and patient safety.

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