

Post-Thyroidectomy Hypocalcemia and Recurrent Laryngeal Nerve Palsy: Incidence and Associated Risk Factors in a Single-Centre Study**N.S. Hari Prasath¹, A.K. Malhotra², Subimal Gupta³, Gopal V.K.⁴, Nilanjan Patra⁵**¹PDT Surgical Oncology, AIIMS Bilaspur²Principal Consultant, General Surgery, Central Hospital, South Eastern Railway³Senior Consultant, General Surgery, Central Hospital, South Eastern Railway⁴ADMO General Surgery, Central Hospital, South Eastern Railway⁵DNB General Surgery Resident, Central Hospital, South Eastern Railway

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Conflict of interest: Nil

Abstract

Background: Hypocalcemia and recurrent laryngeal nerve (RLN) injury remain clinically important complications of thyroid surgery despite improvements in operative technique. This study evaluated their incidence and associated risk factors among patients undergoing elective thyroid surgery at a tertiary-care railway hospital in Kolkata.

Methods: This prospective and retrospective cross-sectional observational study included 104 adults undergoing elective thyroid surgery in the Department of General Surgery, Central Hospital, South Eastern Railway, Garden Reach, Kolkata, between August 2020 and August 2022. Preoperative evaluation included thyroid profile, serum calcium, ultrasonography, fine-needle aspiration cytology and vocal-cord examination. Postoperatively, serum calcium and laryngoscopic vocal-cord assessment were performed. Frequencies were summarized descriptively and associations were tested at a 5% significance level using SPSS version 26.

Results: Of 104 patients, 85 (81.7%) were women and the commonest age group was 41–50 years (37.5%). Multinodular goitre was the most frequent indication for surgery (49.0%). Subtotal thyroidectomy was performed in 59 patients (56.7%), total thyroidectomy in 24 (23.1%) and lobectomy in 21 (20.2%). Postoperative hypocalcemia occurred in 15 patients (14.4%) and RLN palsy in 5 (4.8%); bleeding/hematoma and wound infection occurred in 4 (3.8%) and 2 (1.9%) patients, respectively. Thyroid malignancy and total thyroidectomy were significantly associated with RLN injury. Hypocalcemia was significantly associated with surgical indication, high TSH, and subtotal/total thyroidectomy, while age and sex were not significant predictors.

Conclusion: Hypocalcemia was the most frequent postoperative complication, followed by RLN palsy. Greater extent of thyroid resection and malignant pathology were associated with higher complication risk. Careful patient selection, meticulous dissection and structured postoperative surveillance remain important for reducing morbidity.

Keywords: Thyroidectomy; Hypocalcemia; Recurrent Laryngeal Nerve Palsy; Thyroid Surgery; Postoperative Complications; Risk Factors.

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Introduction

Thyroidectomy is a commonly performed endocrine surgical procedure for benign and malignant thyroid disease. Although advances in anatomy, anesthesia, surgical technique and perioperative care have markedly reduced mortality, postoperative morbidity remains clinically relevant. Among the most important complications are hypocalcemia due to transient or permanent hypoparathyroidism and recurrent laryngeal nerve (RLN) injury, both of which may substantially affect recovery and quality of life.

RLN injury may present with hoarseness, dysphonia, swallowing difficulty or, in bilateral injury, potentially life-threatening airway compromise. Reported incidence varies according to operative indication, extent of resection, reoperative surgery, and method of postoperative laryngeal assessment and duration of follow-up. Hypocalcemia is more common and may result from parathyroid devascularization, inadvertent excision or injury during dissection. Reported rates vary widely because studies use different

biochemical thresholds and definitions of transient and permanent hypocalcemia. Identifying procedure- and disease-related risk factors can help refine preoperative counselling, operative strategy and postoperative monitoring. The present study was undertaken to determine the incidence of RLN injury and postoperative hypocalcemia after thyroid surgery and to analyze associated risk factors in a single tertiary-care centre.

Objectives

- To evaluate the incidence of recurrent laryngeal nerve injury and postoperative hypocalcemia following thyroid surgery.
- To analyze risk factors associated with recurrent laryngeal nerve injury.
- To analyze risk factors associated with postoperative hypocalcemia.

Materials and Methods

Study Design and Setting: A prospective and retrospective, cross-sectional observational study was conducted among patients undergoing thyroid surgery in the Department of General Surgery, Central Hospital, South Eastern Railway, Garden Reach, Kolkata. The study period was August 2020 to August 2022. Convenience sampling was used and 104 participants were included.

Eligibility Criteria: Patients of either sex undergoing elective thyroid surgery, categorized as American Society of Anesthesiologists (ASA) physical status I or II, ambulatory preoperatively, in good nutritional status, and considered compliant and suitable for the perioperative pathway were included. Patients younger than 18 years or older than 80 years, emergency thyroid surgery, primary parathyroid pathology and previous neck irradiation were excluded. The source thesis also lists congenital thyroid/parathyroid anomalies among the exclusion criteria.

Perioperative Assessment: Preoperative assessment included patient selection and education, optimization of comorbidities, serum calcium measurement, vocal-cord examination by indirect laryngoscopy, neck ultrasonography and

fine-needle aspiration cytology (FNAC). Intraoperatively, RLN anatomy and parathyroid gland location were assessed. Postoperative evaluation included serum calcium measurement and repeat vocal-cord examination by indirect laryngoscopy. Serum calcium was recorded preoperatively and at 24 hours, 48 hours and one month after surgery.

Outcomes: The primary outcomes were postoperative hypocalcemia and RLN palsy. Secondary postoperative complications included bleeding/hematoma and wound infection. Associations of RLN palsy and hypocalcemia with age, sex, comorbidity, indication for surgery, thyroid profile, FNAC findings and type of surgery were evaluated.

Ethics: Institutional ethics approval was obtained before commencement of the study and written informed consent was obtained from participants. The ethics approval number should be inserted from the institutional approval document before journal submission.

Statistical Analysis: Data were entered and analyzed using SPSS version 26. Categorical variables were summarized as frequencies and percentages. Associations between potential risk factors and postoperative outcomes were assessed using appropriate categorical tests as reported in the source analysis. A two-sided p value <0.05 was considered statistically significant, corresponding to a 95% confidence level.

Results

Patient Characteristics and Indications: Among 104 patients, 85 (81.7%) were female and 19 (18.3%) were male. The most common age group was 41–50 years (39 patients, 37.5%), followed by 51–60 years (32, 30.8%). Hypertension (32.69%) and diabetes mellitus (18.27%) were the most frequently reported comorbidities. Multinodular goitre was the leading indication for surgery (51 patients, 49.0%), followed by papillary carcinoma (20, 19.2%). Cervical swelling was the most common presenting symptom (75.0%).

Table 1:

Characteristic	n	%
Age ≤40 years	10	9.6
Age 41–50 years	39	37.5
Age 51–60 years	32	30.8
Age 61–70 years	23	22.1
Female sex	85	81.7
Male sex	19	18.3
Multinodular goitre	51	49.0
Papillary carcinoma	20	19.2
Cystic lesion	8	7.7
Solitary nodule	7	6.7

Follicular carcinoma	6	5.8
Recurrent simple goitre	5	4.8
MEN2 prophylaxis	5	4.8
Hyperthyroidism	2	1.9

Operative procedures: Subtotal thyroidectomy was the most frequently performed procedure (59 patients, 56.7%), followed by total thyroidectomy (24, 23.1%) and lobectomy (21, 20.2%).

Table 2:

Procedure	n	%
Lobectomy	21	20.2
Subtotal thyroidectomy	59	56.7
Total thyroidectomy	24	23.1

Postoperative complications:

Postoperative hypocalcemia occurred in 15 patients (14.4%), making it the most frequent recorded complication. RLN palsy occurred in 5 patients (4.8%). Bleeding/hematoma was reported in 4 patients (3.8%) and wound infection in 2 (1.9%).

Serum calcium was below the study's reference range in 30 patients (28.8%) at both 24 and 48 hours and in 24 patients (23.1%) at one month; however, the source thesis classified 15 patients (14.4%) as having the postoperative hypocalcemia outcome.

Table 3:

Postoperative outcome	n	%
Hypocalcemia	15	14.4
Recurrent laryngeal nerve palsy	5	4.8
Bleeding/hematoma	4	3.8
Wound infection	2	1.9

Risk factors for recurrent laryngeal nerve palsy: RLN palsy was not significantly associated with age ($p=0.075$), sex ($p=0.778$), comorbidity ($p=0.982$) or thyroid profile (all $p>0.05$). The indication for surgery was significantly associated with RLN palsy (reported $p=0.024$), with events occurring predominantly in papillary and follicular carcinoma. Type of operation was strongly associated with RLN palsy ($p<0.001$): four of the five cases occurred after total thyroidectomy, one after subtotal thyroidectomy and none after lobectomy.

Risk factors for postoperative hypocalcemia: Hypocalcemia was not significantly associated with age ($p=0.639$), sex ($p=0.713$), comorbidity ($p=0.260$), T3 ($p=0.438$) or T4 ($p=0.438$). Significant associations were reported for surgical indication ($p=0.014$ in the source results table; $p=0.024$ in the narrative summary), TSH category ($p=0.001$), FNAC category ($p=0.004$) and type of surgery ($p<0.001$). Nine hypocalcemia events occurred after subtotal thyroidectomy and six after total thyroidectomy, with none after lobectomy.

Table 4:

Outcome	Factor	Events	p value
RLN palsy	Age	1 / 1 / 3 / 0 by age groups	0.075
RLN palsy	Sex	Female 4; Male 1	0.778
RLN palsy	Indication for surgery	Papillary 3; Follicular 1; MNG 1	0.024
RLN palsy	Type of surgery	Total 4; Subtotal 1; Lobectomy 0	<0.001
Hypocalcemia	Age	1 / 5 / 6 / 3 by age groups	0.639
Hypocalcemia	Sex	Female 13; Male 2	0.713
Hypocalcemia	TSH category	High 7; Low 4; Normal 4	0.001
Hypocalcemia	FNAC category	MNG 9; Papillary 5; Follicular 1*	0.004
Hypocalcemia	Type of surgery	Subtotal 9; Total 6; Lobectomy 0	<0.001

Discussion

This single-centre study describes the pattern of thyroid surgery and its major postoperative complications in 104 patients. The cohort was predominantly female, with the highest proportion in the 41–50-year age group.

Multinodular goitre was the commonest indication for surgery, while subtotal thyroidectomy was the

most frequently performed procedure. These demographic and disease patterns are broadly consistent with previous reports showing female predominance and a substantial burden of multinodular goitre among surgical thyroid populations.

Postoperative hypocalcemia was the most common complication, occurring in 14.4% of patients. Published series have reported wide variation in

hypocalcemia rates because of differences in the extent of thyroidectomy, biochemical cut-offs, timing of calcium measurement and definitions of transient versus permanent hypoparathyroidism. Pattou et al. demonstrated that post-thyroidectomy hypocalcemia is strongly related to parathyroid injury or impaired function, while other large series have similarly emphasized the relationship between extent of surgery and postoperative calcium disturbance.

RLN palsy occurred in 4.8% of the cohort. This lies within the range reported in several surgical series, although the reported frequency depends heavily on whether routine pre- and postoperative laryngoscopy is performed and on the duration of follow-up. In this study, four of five RLN palsy events followed total thyroidectomy. The association of malignant pathology and more extensive surgery with RLN injury is biologically plausible because malignancy may distort tissue planes and total thyroidectomy requires bilateral dissection close to the RLN.

The analysis also found that postoperative hypocalcemia was associated with surgical indication, TSH category and extent of resection. No hypocalcemia events were recorded after lobectomy, whereas events occurred after both subtotal and total thyroidectomy.

This reinforces the practical importance of parathyroid identification and preservation, careful capsular dissection and postoperative calcium surveillance in patients undergoing bilateral thyroid surgery.

Bleeding/hematoma (3.8%) and wound infection (1.9%) were less common. Although infrequent, postoperative neck hematoma warrants particular attention because of the potential for acute airway compromise. Standardized postoperative monitoring and early recognition remain essential.

Strengths and Limitations:

The study evaluated multiple clinically relevant postoperative outcomes and included serial serum calcium assessment and postoperative laryngoscopic evaluation. However, it was conducted at a single centre with a modest sample size and used convenience sampling. The source dataset contains limited long-term follow-up and does not consistently distinguish transient from permanent hypocalcemia or RLN palsy. In addition, some reporting inconsistencies are present in the thesis, including different p values for the association between surgical indication and hypocalcemia and differing study-period wording in the summary. For this manuscript, the detailed Methods section (August 2020–August 2022) and the tabulated result p values were prioritized; these

should be verified against the original master chart before submission.

Conclusion

Hypocalcemia and recurrent laryngeal nerve palsy were the principal complications following thyroid surgery in this cohort, with incidences of 14.4% and 4.8%, respectively. Malignant thyroid pathology and total thyroidectomy were associated with RLN palsy, while hypocalcemia was associated with more extensive thyroid resection and selected disease/biochemical factors. Meticulous RLN and parathyroid preservation, careful selection of surgical extent and structured postoperative monitoring may help reduce morbidity. Larger prospective studies with standardized outcome definitions and longer follow-up are warranted.

Declarations

Ethics approval and consent to participate:

Institutional ethics approval was obtained and written informed consent was obtained from participants. Insert the exact ethics committee approval number and date before submission.

Consent for publication: Not applicable for de-identified aggregate data; confirm according to the target journal's policy.

Author contributions: To be completed according to the target journal's authorship policy (e.g., conceptualization, data collection, analysis, drafting and critical revision).

Data availability: Data availability statement to be added according to institutional and journal policy.

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