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Original Research Article

Assessment of Post-Operative Complications After Thyroid Surgery: A Cross-Sectional Study

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Abstract:

Aim: To assess the frequency and pattern of early post-operative complications after thyroid surgery and to describe the anesthetic management required for airway and systemic complications in adult patients undergoing elective thyroid procedures.

Materials and Methods: This institutional cross-sectional study was conducted over six months in the Department of Anesthesia, LN Medical College and JK Hospital, Bhopal. Fifty adult patients with benign or malignant thyroid disorders who underwent elective thyroid surgery were enrolled by convenient sampling. Patients with previous thyroid surgery, previous head-and-neck radiotherapy, abnormal thyroid function, or emergency surgery were excluded. Demographic, clinical, operative, anesthetic and post-operative data were recorded using a predesigned proforma. Patients were assessed for airway difficulty, laryngeal oedema, hemorrhage or hematoma, hypocalcemia, tracheomalacia, recurrent laryngeal nerve palsy and thyroid storm.

Results: The mean age was 36.5 ± 10.25 years, and 38 patients (76%) were female. Goiter was the commonest pre-operative diagnosis (18, 36%), followed by chronic thyroiditis (16, 32%). Hemithyroidectomy was the most frequent procedure (18, 36%), followed by total thyroidectomy (15, 30%). Post-operative complications were recorded in 18 patients (36%). Hypocalcemia was the most frequent complication among affected patients (8/18, 44.4%), followed by tracheomalacia (4/18, 22.2%) and laryngeal oedema (3/18, 16.7%). Difficult extubation, reintubation and post-operative intensive-care ventilation were required in 6 (12%), 4 (8%) and 2 (4%) patients, respectively.

Conclusion: Although thyroid surgery is usually safe, clinically important complications may occur, particularly involving calcium homeostasis and the airway. Careful pre-operative assessment, meticulous surgical technique, vigilant extubation and timely anesthetic intervention are essential. The findings support structured post-operative observation, especially after extensive surgery and in patients with large goiters or anticipated airway difficulty.

Keywords: Thyroid Surgery; Post-Operative Complications; Hypocalcemia; Airway Management; Tracheomalacia.

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Introduction

Thyroid surgery is performed for a broad spectrum of benign and malignant disorders, including multinodular goiter, solitary thyroid nodules, chronic autoimmune thyroiditis, toxic disease and differentiated thyroid carcinoma. The extent of surgery ranges from hemithyroidectomy to total thyroidectomy and is determined by the clinical diagnosis, radiological findings, cytological or histopathological assessment, patient preference and the need for oncological control. Although modern thyroidectomy is associated with low mortality and generally favorable outcomes, the operation takes place in a compact anatomical region containing the trachea, esophagus, recurrent laryngeal nerves, external branches of the superior laryngeal nerves, parathyroid glands and major vessels. Consequently,

a seemingly uncomplicated procedure may be followed by airway compromise, voice change, hypocalcemia, bleeding or other systemic complications.

The post-operative period is particularly important because several complications can progress rapidly. Neck hematoma may compress the trachea and cause venous congestion, airway obstruction and cardiovascular instability. Laryngeal oedema, bilateral recurrent laryngeal nerve dysfunction and tracheomalacia can make extubation hazardous, especially in patients with long-standing or large goiters. Hypocalcemia may result from temporary or permanent parathyroid dysfunction, inadvertent removal, devascularization or hungry-bone physiology. Clinical manifestations include perioral tingling, paresthesia, muscle cramps, carpopedal spasm, laryngospasm, seizures and, in severe cases, cardiac rhythm disturbance. Recurrent laryngeal nerve injury may present with hoarseness, weak cough, aspiration or airway obstruction when bilateral.

Anesthetic management is therefore not limited to induction and maintenance of general anesthesia. Pre-operative evaluation should identify difficult airway predictors, compressive symptoms, tracheal deviation or narrowing, retrosternal extension, cardiorespiratory effects and biochemical abnormalities. Intra-operatively, secure airway management, appropriate tube positioning, protection of the recurrent laryngeal nerves and communication with the surgical team are important. At the end of surgery, reversal of neuromuscular blockade, assessment of airway patency, evaluation of cuff leak where appropriate, direct clinical examination and a planned extubation strategy help reduce avoidable morbidity.

Reported complication rates vary because studies differ in definitions, follow-up duration, surgical complexity, institutional expertise and whether transient symptoms are included. Hypocalcemia is often the most frequently reported complication, while bleeding and recurrent laryngeal nerve injury are less common but potentially serious. The incidence may also vary with the extent of thyroid resection and the indication for surgery. Local institutional data are useful because they allow teams to identify patterns, strengthen peri-operative protocols and allocate post-operative monitoring appropriately.

The present study was undertaken in the Department of Anesthesia at LN Medical College and JK Hospital, Bhopal, to assess post-operative complications among adults undergoing elective thyroid surgery. The study also describes the type of operation, the distribution of thyroid pathology, and the anesthetic interventions required for airway-related complications. The findings are intended to support systematic peri-operative assessment and early recognition of complications.

Materials and Methods

Ethical Clearance Ethical clearance was obtained from the Institutional Ethics Committee before commencement of the study. The study was conducted in accordance with institutional requirements for research involving human participants. Eligible patients were informed about the study, and participation was documented according to the institutional consent process. Patient confidentiality was maintained during data collection, analysis and reporting.

Study Design, Setting and Duration This was a hospital-based cross-sectional study conducted in the Department of Anesthesia, LN Medical College and JK Hospital, Bhopal, over a period of six months. The study population comprised adult patients presenting with benign or malignant thyroid disorders and undergoing elective thyroid surgery under general anesthesia.

Sample Size and Sampling A sample of 50 patients was selected by convenient sampling. The sample size was based on the available eligible surgical population during the study period and was not derived from a formal prevalence calculation. Accordingly, the results are primarily descriptive and should be interpreted as institutional observations rather than population-level estimates.

Eligibility Criteria Patients aged 18 years or above with benign or malignant thyroid disorders who underwent elective thyroid surgery were eligible. Patients were excluded if they had a history of previous thyroid surgery, previous radiation to the head or neck region, abnormal thyroid function, or emergency thyroid surgery. Patients with incomplete peri-operative records were also unsuitable for analysis where outcome assessment could not be reliably completed.

Data Collection A predesigned semi-structured proforma was used. Baseline variables included age, sex, presenting diagnosis and relevant clinical findings. Pre-operative assessment included airway examination, thyroid enlargement, compressive symptoms, biochemical thyroid status and relevant investigations. Operative variables included the type of surgery, anesthetic technique, airway-related concerns and the need for intra-operative or post-operative intervention.

Post-operative assessment was undertaken in the recovery area and during the immediate post-operative observation period. Complications assessed included laryngeal oedema, hemorrhage or neck hematoma, hypocalcemia, tracheomalacia, recurrent laryngeal nerve palsy and thyroid storm. Airway management outcomes included difficult

extubation, reintubation and post-operative ventilation in the intensive-care unit. Hypocalcemia was assessed clinically and through documented biochemical testing when available; patients requiring calcium replacement were recorded as having received medical management. The clinical course and interventions were documented until discharge or completion of the planned early post-operative assessment.

Observation Tables

Table 1: Distribution According to Pre-Operative Diagnosis.

Diagnosis	Frequency (n=50)	Percentage
Chronic thyroiditis	16	32%
Cyst	3	6%
Thyroid nodule	5	10%
Goiter	18	36%
Hyperplastic nodules	4	8%
Papillary carcinoma	3	6%
Follicular carcinoma	1	2%
Total	**50**	**100%**

Table 2: Distribution According to Type of Thyroid Surgery.

Procedure	Frequency (n=50)	Percentage
Hemithyroidectomy	18	36%
Subtotal thyroidectomy	7	14%
Near-total thyroidectomy	10	20%
Total thyroidectomy	15	30%
Total	**50**	**100%**

Table 3: Distribution According to Anaesthetic Management Required.

Anesthetic management	Frequency (n=50)	Percentage
Difficult extubation	6	12%
Reintubation	4	8%
Post-operative ventilation in ICU	2	4%
No airway intervention or only medical management	38	76%
Total	**50**	**100%**

Table 4: Distribution According to Post-Operative Complications Among Affected Patients.

Complication	Frequency (n=18)	Percentage among affected patients
Laryngeal oedema	3	16.7%
Haemorrhage/haematoma	1	5.6%
Hypocalcaemia	8	44.4%
Tracheomalacia	4	22.2%
Recurrent laryngeal nerve palsy	1	5.6%
Thyroid storm	1	5.6%
Total	**18**	**100%**

Results

Fifty patients were included in the study. The mean age of the participants was 36.5 ± 10.25 years. Females constituted the majority of the study population, with 38 patients (76%), while males accounted for 12 patients (24%). The observed female predominance is consistent with the common clinical pattern of thyroid disorders presenting for surgical treatment.

Goiter was the commonest pre-operative diagnosis, identified in 18 patients (36%). Chronic thyroiditis was present in 16 patients (32%), thyroid nodules in 5 (10%), hyperplastic nodules in 4 (8%), cysts in 3 (6%), papillary carcinoma in 3 (6%) and follicular carcinoma in 1 (2%). Thus, benign and inflammatory disorders represented most of the operative workload, while malignant diagnoses accounted for a smaller proportion of the cohort. Hemithyroidectomy was the most frequently performed operation, involving 18 patients (36%). Total thyroidectomy was performed in 15 patients (30%), near-total thyroidectomy in 10 (20%) and subtotal thyroidectomy in 7 (14%). The distribution reflects the predominance of unilateral or benign disease while also demonstrating a substantial number of extensive resections.

Post-operative complications were documented in 18 of the 50 patients, giving an overall observed

complication rate of 36%. Among the 18 affected patients, hypocalcemia was the most frequent complication, occurring in 8 patients (44.4%). Tracheomalacia was documented in 4 patients (22.2%), laryngeal oedema in 3 (16.7%), and hemorrhage or hematoma, recurrent laryngeal nerve palsy and thyroid storm in 1 patient each (5.6%). The corresponding proportions in the complete cohort were 16% for hypocalcemia, 8% for tracheomalacia, 6% for laryngeal oedema and 2% each for the remaining three complications.

Regarding anesthetic management, difficult extubation was required in 6 patients (12%), reintubation in 4 (8%) and post-operative ventilation in the intensive-care unit in 2 (4%). The remaining 38 patients (76%) did not require an airway intervention or required only medical management, such as calcium supplementation or supportive treatment. Airway-related interventions were especially relevant in patients with laryngeal oedema and tracheomalacia. The single patient with post-operative hematoma required urgent attention because of the potential for rapid airway compromise.

Statistical Analysis: Data were entered and analyzed using SPSS version 25.0 trial version. Continuous variables were summarized as mean and standard deviation. Categorical variables were presented as frequencies and percentages. Tables were used for descriptive presentation. No inferential comparison or multivariable modelling was planned because the sample was selected by convenient sampling and the study was designed primarily to describe the observed pattern of complications. The level of interpretation was therefore restricted to descriptive findings.

Discussion

The present cross-sectional study describes post-operative complications among 50 adults undergoing thyroid surgery at a tertiary-care hospital in Bhopal. The mean age was 36.5 years, and women comprised 76% of the cohort. This female predominance is clinically plausible because thyroid nodular disease, autoimmune thyroid disorders and several thyroid malignancies are more frequently encountered in women. The age distribution also indicates that thyroid surgery affected a relatively young and economically active adult population in this setting. Thyroid surgery is generally a safe and effective treatment for benign and malignant thyroid disorders, but it can be followed by clinically important post-operative complications. In this six-month cross-sectional study of 50 adult patients, the mean age was 36.5 ± 10.25 years and women represented 76% of participants. Goiter was the most common pre-operative diagnosis, and hemithyroidectomy was the most frequent operation. These findings reflect the broad spectrum of patients managed by the anesthesia department, from individuals with benign unilateral disease to patients requiring extensive thyroid resection.

An overall complication rate of 36% was observed. Hypocalcemia was the leading complication among affected patients, followed by tracheomalacia and laryngeal oedema. Hemorrhage or hematoma, recurrent laryngeal nerve palsy and thyroid storm were each observed in one patient. Although some events were uncommon, their potential severity makes early diagnosis and immediate treatment essential. A low frequency should not lead to reduced vigilance, particularly because airway compromise and neck hematoma may progress rapidly. Hypocalcemia was the most frequent complication among affected patients, representing 44.4% of complications. This finding is consistent with the biological vulnerability of the parathyroid glands during thyroid surgery. Hypocalcemia may be transient, but it requires early recognition because symptoms may progress from perioral paresthesia and cramps to tetany, laryngospasm or cardiac effects. Routine assessment of symptoms, serum calcium where indicated and timely calcium replacement are important components of post-operative care. The observed rate also suggests that institutions should maintain clear protocols for monitoring patients after bilateral thyroid operations.

Tracheomalacia and laryngeal oedema were important airway-related findings. Long-standing thyroid enlargement can compress or weaken the tracheal wall, while surgical manipulation and fluid shifts may contribute to airway swelling. The anesthesiologist must therefore consider the possibility that apparently adequate spontaneous ventilation before surgery will not guarantee uncomplicated extubation. A planned extubation in a controlled environment, with skilled personnel and equipment for reintubation, is essential when airway compromise is anticipated. Difficult extubation was required in 12% of patients, reintubation in 8% and post-operative ICU ventilation in 4%. These interventions illustrate the practical contribution of anesthetic preparedness. Difficult extubation and reintubation may reflect laryngeal oedema, tracheomalacia, residual neuromuscular blockade, vocal-cord dysfunction or a combination of factors. The data also demonstrate that the absence of a major complication does not eliminate the need for structured recovery-room observation.

Post-operative hemorrhage or hematoma occurred in one patient. Although uncommon, neck hematoma is a time-critical emergency. The combination of swelling, venous obstruction and tracheal compression may produce rapid deterioration. Recovery and ward staff should be trained to identify neck swelling, respiratory distress, voice change, stridor, agitation and falling oxygen

saturation. Immediate communication with the surgical and anesthesia teams is required, and airway management should not be delayed when obstruction is developing. Recurrent laryngeal nerve palsy was recorded in one patient. Even a single event has clinical significance because nerve injury may cause hoarseness, ineffective cough and aspiration, while bilateral dysfunction can produce severe airway obstruction. Documentation of pre-operative and post-operative voice status, appropriate surgical identification of the nerve and coordinated follow-up are important. The study did not distinguish transient from permanent nerve palsy, which limits interpretation.

Thyroid storm was also recorded in one patient despite the exclusion of patients with abnormal thyroid function. This finding highlights the importance of reviewing the complete clinical context, medication adherence, biochemical results and peri-operative stress response. Because the study was observational, the recorded event cannot establish causality or determine whether it represented a classical storm or a milder peri-operative thyrotoxic reaction. Prompt recognition, cardiovascular monitoring, beta-blockade where appropriate, cooling and supportive treatment remain important principles. The findings reinforce the need for multidisciplinary planning. Surgeons, anesthesiologists, endocrinologists, recovery-room nurses and intensive-care staff should share information about the size and duration of goiter, tracheal compression, retrosternal extension, surgical extent, anticipated nerve risk and calcium-monitoring plan. Checklists can improve communication at induction, before extubation and during transfer to recovery.

Airway management was an important component of peri-operative care. Difficult extubation was required in 12% of patients, reintubation in 8% and post-operative ventilation in the intensive-care unit in 4%. These findings support the use of an individualized extubation plan based on the size and duration of thyroid enlargement, evidence of tracheal compression, surgical extent, intra-operative airway findings, neuromuscular recovery and the patient's respiratory status. Extubation should be performed in a controlled environment with appropriate monitoring and immediate availability of skilled assistance, difficult-airway equipment and reintubation facilities. The results also emphasize the need for organized post-operative surveillance. Patients should be monitored for respiratory distress, stridor, neck swelling, voice alteration, dysphagia, paresthesia, muscle cramps and other clinical signs of hypocalcemia. Serum calcium assessment and calcium supplementation should be guided by institutional protocols and clinical findings. Clear communication during transfer from the operating room to recovery and from recovery to the ward or intensive-care unit can help prevent missed deterioration.

The anesthesiologist has a central role before, during and after thyroid surgery. Pre-operative evaluation should identify difficult airway features, compressive symptoms, cardiopulmonary effects and biochemical abnormalities. Intra-operative management should include secure airway control, careful positioning, appropriate monitoring and coordination with the surgical team. Post-operatively, the anesthesiologist should remain prepared for delayed airway obstruction, reintubation, ventilation and emergency support. The interpretation of these findings is limited by the small convenient sample, single-centre design, absence of a control group and short follow-up. The study cannot determine independent risk factors or distinguish transient from permanent complications. Nevertheless, it offers useful local evidence for strengthening peri-operative protocols. Future prospective multicenter studies with larger samples should standardize definitions, include serial calcium and voice assessments, document operative and airway variables, and evaluate outcomes beyond hospital discharge.

This study has several limitations. The sample was small and collected from a single institution, which restricts generalizability. Convenient sampling may have introduced selection bias. The study did not include a formal comparison of complication rates by surgical extent, diagnosis, age or airway findings. Follow-up was limited to the early post-operative period, so delayed hypocalcemia, persistent nerve palsy, chronic voice symptoms and long-term quality-of-life effects could not be evaluated. Laboratory values, operative duration and detailed airway measurements were not consistently available for quantitative analysis. Despite these limitations, the study provides a practical description of complications encountered in a real-world anesthesia service. The predominance of hypocalcemia and the need for airway interventions support continued emphasis on calcium surveillance, careful extubation and immediate access to reintubation equipment. Larger prospective multicenter studies should use standardized definitions, report transient and permanent outcomes separately, and evaluate risk factors using appropriate statistical methods.

Conclusion

Goiter was the leading diagnosis, followed by chronic thyroiditis. This pattern differs between institutions because referral pathways, iodine status, access to diagnostic imaging, cytology practice and the case mix of endocrine surgery vary. The presence of papillary and follicular carcinoma in a smaller proportion confirms that the anesthesia service must be prepared for both routine benign

procedures and more extensive oncological operations.

Hemithyroidectomy was the commonest procedure, accounting for 36% of operations. This is compatible with the large proportion of unilateral nodules and benign lesions. However, 30% of patients underwent total thyroidectomy, and an additional 20% underwent near-total thyroidectomy. The substantial proportion of extensive resections is important because bilateral or near-bilateral procedures can increase the risk of hypocalcemia, recurrent laryngeal nerve dysfunction and post-operative airway concerns.

The overall observed complication rate was 36%. This figure should be interpreted cautiously because the sample was small, single-centre and based on convenient sampling. Differences in definitions also influence reported rates: some studies include only complications requiring treatment, whereas others include transient biochemical hypocalcemia or minor voice changes. The present study included clinically documented complications and management-relevant events during the early post-operative period.

In conclusion, structured pre-operative assessment, meticulous surgical and anesthetic practice, vigilant extubation and systematic post-operative monitoring are necessary to minimize morbidity after thyroid surgery. Particular attention should be directed towards hypocalcemia and airway-related complications. A coordinated multidisciplinary approach can improve early recognition, ensure timely intervention and promote safer recovery for patients undergoing thyroid procedures.

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