



Original Article

## A Prospective Study on Postoperative Complications, Hypocalcemia, Pain, and Functional Outcomes Following Thyroid Surgery

Dr Vijay Singh Kathait<sup>1</sup>, Dr Abhijit Basu<sup>2</sup>, Dr Ajay Kumar Rai<sup>3</sup>

<sup>1</sup>Classified Specialist ENT, Department of ENT, Command Hospital Udhampur, J&K, India.

<sup>2</sup>Classified Specialist ENT & Associate Professor, Department of ENT, Military Hospital Jodhpur, India.

<sup>3</sup>MS, ENT, Assistant Professor, Heritage Medical College, Varanasi, India.

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### Corresponding Author:

**Dr. Vijay Singh Kathait**  
Classified Specialist ENT,  
Department of ENT, Command  
Hospital Udhampur, J&K, India.

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### ABSTRACT

**Background:** Thyroidectomy is one of the most commonly performed endocrine surgeries worldwide, associated with various postoperative complications such as hypocalcemia, pain, and vocal cord palsy. Identifying determinants of these complications is essential for improving surgical outcomes.

**Objective:** To evaluate the association of demographic, clinical, and surgical factors with postoperative complications, hypocalcemia, pain, and biochemical changes following thyroid surgery.

**Methods:** A hospital-based observational study was conducted on 75 patients undergoing thyroid surgery. Variables such as age, co-morbidities, extent of swelling, type of surgery, and histopathology were analyzed. Statistical tests including chi-square and paired t-test were used.

**Results:** The overall complication rate was 17.33%. Type of surgery showed a significant association with complications ( $P < 0.01$ ), hypocalcemia ( $P < 0.001$ ), and pain severity ( $P < 0.0001$ ). Other factors such as age, co-morbidities, and diagnosis were not significant. Serum calcium levels decreased significantly in early postoperative periods but normalized by 24 weeks. TSH levels showed a transient rise postoperatively.

**Conclusion:** Type of thyroid surgery is a major determinant of postoperative complications. Hypocalcemia and hormonal disturbances are mostly transient, emphasizing the importance of surgical technique and postoperative monitoring.

**Keywords:** Thyroidectomy, Hypocalcemia, Complications, Vocal cord palsy, TSH, Pain score.

### INTRODUCTION

Thyroidectomy, the surgical removal of part or all of the thyroid gland, is one of the most frequently performed endocrine surgical procedures worldwide for conditions such as multinodular goiter, solitary thyroid nodules, and thyroid malignancies [1]. Over the past decade, there has been a marked rise in thyroid disorders globally, particularly thyroid cancer, leading to an increased number of thyroid surgeries [2]. Although advances in surgical techniques and perioperative management have significantly improved patient outcomes, postoperative complications remain a major clinical concern [3].

Among these complications, hypocalcemia is the most common and clinically significant, primarily resulting from inadvertent injury, devascularization, or accidental removal of the parathyroid glands during thyroidectomy [4]. The reported incidence of postoperative hypocalcemia varies widely, ranging from 1.6% to 50%, depending on surgical expertise, extent of resection, and patient-specific factors [5]. Recent studies have emphasized that transient hypocalcemia is far more common than permanent hypocalcemia, with most cases resolving within weeks to months following surgery [6].

Hypocalcemia can significantly affect patient recovery, prolong hospital stay, and increase healthcare costs [7]. Clinically, it may present with symptoms such as perioral numbness, paresthesia, muscle cramps, tetany, and in severe cases, life-threatening complications like laryngospasm and seizures [8]. Therefore, early identification and appropriate management of hypocalcemia are critical in postoperative care.

Recent literature (2022–2026) highlights the importance of early postoperative parathyroid hormone (PTH) measurement as a reliable predictor of hypocalcemia [9]. Studies have demonstrated that early PTH levels can guide calcium supplementation strategies, thereby reducing morbidity and facilitating early discharge [10]. Additionally, perioperative monitoring of serum calcium levels remains an essential component of patient management following thyroid surgery [11].

Apart from hypocalcemia, other significant complications associated with thyroidectomy include recurrent laryngeal nerve injury, postoperative pain, hematoma formation, wound infection, and seroma formation [12]. Recurrent laryngeal nerve injury, though relatively uncommon, can lead to vocal cord palsy, resulting in hoarseness, voice changes, and, in severe cases, airway compromise [13]. The incidence of nerve injury is influenced by surgical technique, anatomical variations, and surgeon experience [14].

Postoperative pain is another important factor affecting patient recovery and satisfaction. Recent studies have shown that the type of surgical approach, extent of tissue dissection, and size of the thyroid swelling significantly influence pain severity [15]. Minimally invasive and extracapsular approaches may be associated with varying pain profiles due to differences in surgical handling and exposure [16].

Several patient-related and surgical factors have been investigated for their role in predicting postoperative complications. These include age, gender, co-morbidities, size and extent of thyroid swelling, histopathological diagnosis, type of surgery, and surgeon expertise [17]. However, the findings across studies remain inconsistent, and no single factor has been universally accepted as a definitive predictor of complications [18].

Recent evidence also suggests that biochemical changes, particularly in thyroid-stimulating hormone (TSH) levels, occur following thyroid surgery due to alterations in the hypothalamic–pituitary–thyroid axis [19]. These changes are usually transient and tend to normalize over time with appropriate management and hormonal adaptation [20].

Despite the growing body of literature, there remains a lack of comprehensive studies integrating clinical, surgical, and biochemical parameters in a single cohort, particularly in tertiary care settings in developing countries [21]. Therefore, the present study was undertaken to evaluate postoperative complications following thyroid surgery and to analyze their association with various demographic, clinical, and surgical factors, along with assessing changes in serum calcium and TSH levels over time.

## **MATERIAL AND METHODS**

This prospective observational study was conducted in the Department of Otorhinolaryngology at a tertiary care center over a defined study period. A total of 75 patients undergoing thyroid surgery were included. All patients were evaluated preoperatively with detailed history, clinical examination, thyroid function tests, serum calcium levels, ultrasonography of the neck, and fine needle aspiration cytology (FNAC) where indicated.

Patients were categorized based on demographic variables (age), clinical parameters (extent and size of swelling, diagnosis), and surgical factors (type of surgery, primary vs revision surgery, surgeon experience). Surgical procedures included Extracapsular Thyroid Surgery (ETS) and Conventional Thyroid Surgery (CTS).

Postoperative follow-up included monitoring for complications such as hypocalcemia, vocal cord palsy, and pain using the Visual Analog Scale (VAS). Serum calcium and thyroid-stimulating hormone (TSH) levels were measured at 1 week, 4 weeks, and 24 weeks postoperatively.

Statistical analysis was performed using chi-square test for categorical variables and paired t-test for continuous variables. A p-value <0.05 was considered statistically significant.

## **INCLUSION CRITERIA**

1. Patients aged  $\geq 18$  years undergoing thyroid surgery
2. Patients with benign or malignant thyroid disorders
3. Patients willing to participate and provide informed consent
4. Patients available for follow-up up to 24 weeks

## EXCLUSION CRITERIA

1. Patients with pre-existing hypocalcemia or parathyroid disorders
2. Patients with previous neck irradiation
3. Patients on calcium or vitamin D supplementation preoperatively
4. Patients with incomplete data or lost to follow-up
5. Patients with severe systemic illness unfit for surgery

## RESULTS

In this study of 75 patients, the overall complication rate was 17.33%, while 82.67% had no complications. Age-wise distribution showed that complications were slightly more common in patients aged  $\leq 50$  years; however, the association was not statistically significant, indicating that age did not influence complication rates.

Similarly, the extent of thyroid swelling (unilateral vs bilateral) and co-morbid status showed no significant association with complications, suggesting that these baseline patient characteristics were not major determinants of postoperative outcomes. Preoperative clinical diagnosis, whether multinodular goiter or solitary thyroid nodule, also did not significantly affect complication rates.

When comparing surgical factors, no significant difference was observed between primary and revision surgeries. However, a significant association was found between the type of thyroid surgery and complications, with extracapsular thyroid surgery showing a higher complication rate compared to conventional surgery ( $P < 0.01$ ).

Hypocalcemia was observed in 8% of patients, and importantly, all cases occurred in the ETS group, showing a highly significant association ( $P < 0.001$ ). There was no significant relationship between hypocalcemia and surgeon experience or histopathological diagnosis.

Pain assessment revealed that moderate pain was significantly more common in ETS patients, while CTS patients predominantly experienced mild pain ( $P < 0.0001$ ). Additionally, larger thyroid swellings ( $>4$  cm) were associated with higher pain severity ( $P < 0.01$ ).

Vocal cord palsy was observed in 9.33% of patients, but no significant association was found with surgeon experience, histopathology, or type of surgery, indicating that nerve injury may be influenced by factors not captured in this study.

Biochemical analysis showed a significant decrease in serum calcium levels at 1 and 4 weeks postoperatively, followed by normalization at 24 weeks. Similarly, TSH levels increased significantly in the early postoperative period but returned to baseline by 24 weeks, indicating transient physiological changes following thyroid surgery.

**Table 1: Association of age and complications**

Age (Yrs)	Complication Present (%)	Complication Absent (%)	Total (%)
$\leq 50$	9 (12)	51 (68)	60 (80)
$> 50$	4 (5.33)	11 (14.67)	15 (20)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 0.47, P > 0.05$

The distribution of complications across age groups showed that among patients aged  $\leq 50$  years, 9 (12%) had complications while 51 (68%) did not. In patients aged  $> 50$  years, 4 (5.33%) had complications and 11 (14.67%) did not. Statistical analysis revealed no significant association between age and occurrence of complications ( $\chi^2 = 0.47, P > 0.05$ ), indicating that age was not a determining factor for postoperative complications in this study.

**Table 2: Association of extent of thyroid swelling and complication**

Extent of Thyroid Swelling	Complication Present (%)	Complication Absent (%)	Total (%)
Unilateral	6 (8)	37 (49.33)	43 (57.33)
Bilateral	7 (9.33)	25 (33.33)	32 (42.67)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 0.35, P > 0.05$

Among patients with unilateral swelling, 6 (8%) developed complications, whereas 37 (49.33%) had no complications. In bilateral swelling, 7 (9.33%) experienced complications and 25 (33.33%) did not. The difference between groups was not statistically significant ( $\chi^2 = 0.35, P > 0.05$ ), suggesting that the extent of thyroid swelling did not influence complication rates.

Patients with bilateral thyroid swelling showed slightly higher complications (9.33%) compared to unilateral swelling (8%), but the difference was not significant. This suggests that the extent of thyroid involvement does not influence complication rates.

**Table 3: Association of co-morbid status and complication**

Co-morbid Status	Complication Present (%)	Complication Absent (%)	Total (%)
Yes	1 (1.33)	3 (4)	4 (5.33)
No	12 (16)	59 (78.67)	71 (94.67)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 0.07, P > 0.05$

Complications were observed in 1 (1.33%) patient with co-morbidities and 12 (16%) patients without co-morbidities. Absence of complications was seen in 3 (4%) patients with co-morbidities and 59 (78.67%) without. There was no statistically significant association between co-morbid status and complications ( $\chi^2 = 0.07, P > 0.05$ ).

Only one patient with co-morbidities developed complications, while most complications occurred in patients without co-morbidities. However, the association was statistically insignificant, indicating no strong link between co-morbid status and surgical outcomes.

**Table 4: Association of preoperative clinical diagnosis and complication**

Pre-op Clinical Diagnosis	Complication Present (%)	Complication Absent (%)	Total (%)
MNG	11 (14.67)	40 (53.33)	51 (68)
SNT	2 (2.66)	22 (29.33)	24 (32)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 1.17, P > 0.05$

In patients with multinodular goiter (MNG), 11 (14.67%) developed complications, while 40 (53.33%) did not. Among those with solitary thyroid nodule (SNT), complications occurred in 2 (2.66%) patients and were absent in 22 (29.33%). The association was not statistically significant ( $\chi^2 = 1.17, P > 0.05$ ), indicating similar complication rates between diagnostic groups.

Complications were more frequent in multinodular goiter (14.67%) than solitary nodules (2.66%), but this difference was not statistically significant. Hence, preoperative diagnosis does not significantly affect complication risk.

**Table 5: Association of primary/revision surgery and complication**

Surgery	Complication Present (%)	Complication Absent (%)	Total (%)
Primary	11 (14.67)	60 (80)	71 (94.67)
Revision	2 (2.66)	2 (2.67)	4 (5.33)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 1.19, P > 0.05$

Among primary surgeries, 11 (14.67%) patients developed complications compared to 2 (2.66%) in revision surgeries. However, the difference was not statistically significant ( $\chi^2 = 1.19, P > 0.05$ ), suggesting that type of surgery (primary or revision) did not significantly affect complication rates.

Primary surgeries had more complications compared to revision surgeries, but the difference was not significant. This suggests that revision surgery is not necessarily associated with higher risk.

**Table 6: Association of type of thyroid surgery and complication**

Type of Thyroid Surgery	Complication Present (%)	Complication Absent (%)	Total (%)
ETS	9 (12)	16 (21.33)	25 (33.33)
CTS	4 (5.33)	46 (61.33)	50 (66.67)
<b>Total</b>	13 (17.33)	62 (82.67)	75 (100)

$\chi^2 = 7.27, P < 0.01$

Complications were observed in 9 (12%) patients undergoing ETS and 4 (5.33%) patients undergoing CTS. A statistically significant association was found ( $\chi^2 = 7.27, P < 0.01$ ), indicating that type of surgery significantly influenced complication rates, with ETS showing relatively higher complications.

A significant association was found between type of surgery and complications ( $P < 0.01$ ), with ETS showing higher complication rates than CTS. This indicates that surgical technique is a critical determinant of outcomes.

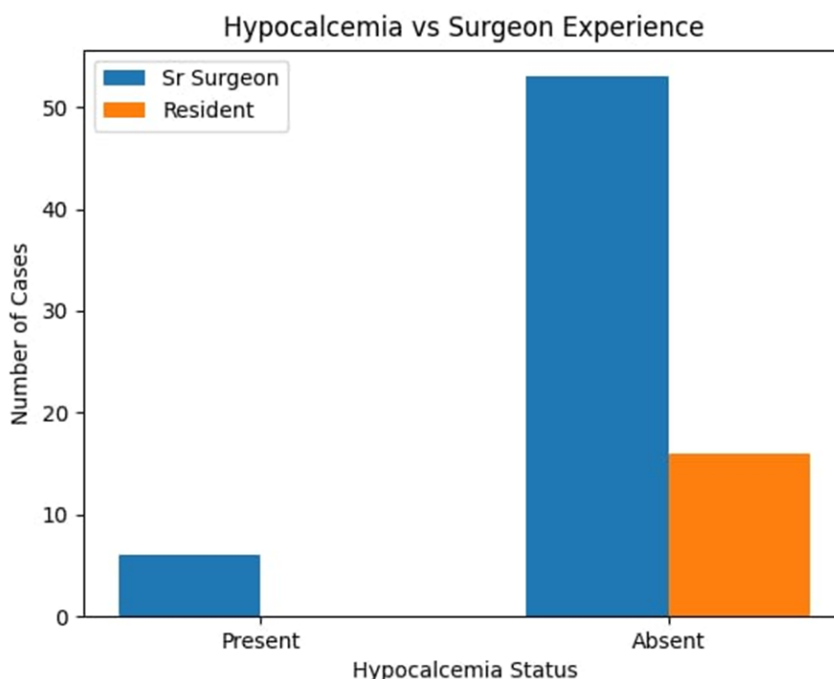
**Table 7: Hypocalcemia and experience of surgeon**

Hypocalcemia	Sr. Surgeon (%)	Resident (%)	Total (%)
Present	6 (8)	0 (0)	6 (8)
Absent	53 (70.67)	16 (21.33)	69 (92)
<b>Total</b>	<b>59 (78.67)</b>	<b>16 (21.33)</b>	<b>75 (100)</b>

$\chi^2 = 0.65, P > 0.05$

Hypocalcemia occurred in 6 (8%) cases operated by senior surgeons and none in resident-operated cases. However, this difference was not statistically significant ( $\chi^2 = 0.65, P > 0.05$ ), suggesting that surgeon experience did not significantly affect hypocalcemia incidence.

Hypocalcemia was observed only in cases operated by senior surgeons, but this was not statistically significant, suggesting surgeon experience did not influence hypocalcemia occurrence.



**Graph 1: Hypocalcemia and experience of surgeon**

**Table 8. Hypocalcemia and Histopathological Diagnosis**

Hypocalcemia	Malignant (%)	Benign (%)	Total (%)
Present	1 (1.33)	5 (6.67)	6 (8)
Absent	7 (9.33)	62 (82.67)	69 (92)
<b>Total</b>	<b>8 (10.67)</b>	<b>67 (89.33)</b>	<b>75 (100)</b>

$\chi^2 = 0.04, P > 0.05$

Out of the total 75 patients studied, hypocalcemia was present in only 6 cases (8%), while the majority, 69 cases (92%), did not have hypocalcemia. Among the patients with hypocalcemia, only 1 case (1.33%) was malignant and 5 cases (6.67%) were benign. In contrast, among those without hypocalcemia, 7 cases (9.33%) were malignant and 62 cases (82.67%) were benign.

Overall, malignant cases were very few (8 cases, 10.67%) compared to benign cases (67 cases, 89.33%). Importantly, hypocalcemia was seen more commonly in benign cases than malignant ones.

The chi-square value ( $\chi^2 = 0.04$ ) with a p-value greater than 0.05 indicates that there is no statistically significant association between hypocalcemia and histopathological diagnosis. This means that the presence or absence of hypocalcemia does not have a meaningful relationship with whether the condition is benign or malignant in this study.

**Table 9: Hypocalcemia and type of thyroid surgery**

Hypocalcemia	ETS (%)	CTS (%)	Total (%)
Present	6 (8)	0 (0)	6 (8)
Absent	19 (25.33)	50 (66.67)	69 (92)
<b>Total</b>	25 (33.33)	50 (66.67)	75 (100)

$\chi^2 = 9.99, P < 0.001$

Hypocalcemia was observed exclusively in ETS cases (6, 8%) and not in CTS cases. This association was statistically significant ( $\chi^2 = 9.99, P < 0.001$ ), indicating that type of surgery is an important determinant of postoperative hypocalcemia.

All cases of hypocalcemia occurred in ETS patients, and none in CTS. This association was highly significant ( $P < 0.001$ ), indicating that ETS significantly increases hypocalcemia risk.

**Table 10: Pain and type of thyroid surgery**

Pain VAS Score	ETS (%)	CTS (%)	Total (%)
Mild	1 (1.33)	43 (57.33)	44 (58.67)
Moderate	24 (32)	7 (9.33)	31 (41.33)
<b>Total</b>	25 (33.33)	50 (66.67)	75 (100)

$\chi^2 = 42.89, P < 0.0001$

Mild pain was predominantly seen in CTS patients (43, 57.33%), whereas moderate pain was more common in ETS patients (24, 32%). The association was highly significant ( $\chi^2 = 42.89, P < 0.0001$ ), suggesting that ETS is associated with higher postoperative pain severity compared to CTS.

Moderate pain was predominantly seen in ETS patients, while CTS patients mostly experienced mild pain. This association was highly significant, suggesting ETS leads to greater postoperative pain.

**Table 11: Pain and Histopathological diagnosis**

Pain VAS Score	Malignant (%)	Benign (%)	Total (%)
Mild	2 (2.67)	42 (56)	44 (58.67)
Moderate	6 (8)	25 (33.33)	31 (41.33)
<b>Total</b>	8 (10.67)	67 (89.33)	75 (100)

$\chi^2 = 2.78, P > 0.05$

Mild pain was seen in 2 (2.67%) malignant and 42 (56%) benign cases, while moderate pain occurred in 6 (8%) malignant and 25 (33.33%) benign cases. There was no statistically significant association ( $\chi^2 = 2.78, P > 0.05$ ), indicating pain severity is independent of histopathological diagnosis.

Pain severity was not significantly associated with histopathological diagnosis, indicating pain perception is independent of disease type.

**Table 12: Pain and size of swelling**

Pain VAS Score	≤ 4 (Small) (%)	> 4 (Large) (%)	Total (%)
Mild	20 (26.67)	24 (32)	44 (58.67)
Moderate	4 (5.33)	27 (36)	31 (41.33)
<b>Total</b>	24 (32)	51 (68)	75 (100)

$\chi^2 = 7.42, P < 0.01$

Mild pain was more frequent in both small (20, 26.67%) and large swellings (24, 32%), whereas moderate pain was predominantly associated with larger swellings (27, 36%). The association was statistically significant ( $\chi^2 = 7.42, P < 0.01$ ), suggesting larger swellings are associated with increased pain severity.

Patients with larger swelling (>4 cm) experienced more moderate pain compared to smaller swellings, showing a significant association between swelling size and pain severity.

**Table 13: Vocal cord palsy and experience of surgeon**

Vocal Cord Palsy	Sr. Surgeon (%)	Resident (%)	Total (%)
Present	6 (8)	1 (1.33)	7 (9.33)
Absent	53 (70.67)	15 (20)	68 (90.67)

<b>Total</b>	59 (78.67)	16 (21.33)	75 (100)
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$\chi^2 = 0, P > 0.05$

Vocal cord palsy was observed in 6 (8%) cases operated by senior surgeons and 1 (1.33%) case by residents. However, the association was not statistically significant ( $\chi^2 = 0, P > 0.05$ ), indicating no influence of surgeon experience on vocal cord palsy.

Vocal cord palsy was slightly more common in surgeries performed by senior surgeons, but the difference was not significant, indicating surgeon experience is not a determining factor.

**Table 14: Vocal cord palsy and Histopathological diagnosis**

Vocal Cord Palsy	Malignant (%)	Benign (%)	Total (%)
Present	2 (2.66)	5 (6.67)	7 (9.33)
Absent	6 (8)	62 (82.67)	68 (90.67)
<b>Total</b>	8 (10.67)	67 (89.33)	75 (100)

$\chi^2 = 0.94, P > 0.05$

Among patients with vocal cord palsy, 2 (2.66%) had malignant and 5 (6.67%) had benign pathology. The association was not statistically significant ( $\chi^2 = 0.94, P > 0.05$ ), suggesting no relationship between pathology type and vocal cord palsy.

No significant association was found between vocal cord palsy and histopathology, suggesting malignancy does not increase nerve injury risk.

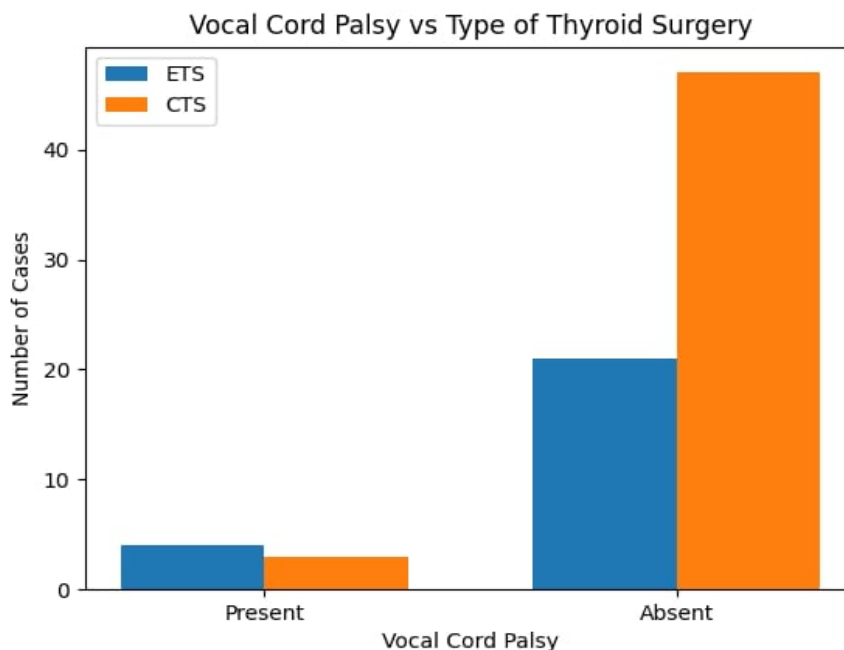
**Table 15: Association of Vocal cord palsy and type of thyroid surgery**

Vocal Cord Palsy	ETS (%)	CTS (%)	Total (%)
Present	4 (5.33)	3 (4)	7 (9.33)
Absent	21 (28)	47 (62.67)	68 (90.67)
<b>Total</b>	25 (33.33)	50 (66.67)	75 (100)

$\chi^2 = 0.96, P > 0.05$

Vocal cord palsy occurred in 4 (5.33%) ETS cases and 3 (4%) CTS cases. No statistically significant association was observed ( $\chi^2 = 0.96, P > 0.05$ ), indicating that type of surgery did not influence vocal cord palsy incidence.

The incidence of vocal cord palsy was similar in both ETS and CTS groups, with no significant difference, indicating surgery type does not affect nerve injury risk.



**Graph 2: Association of Vocal cord palsy and type of thyroid surgery**

**Table 16: Pre and post operative serum calcium**

Parameter	Calcium (mg/dl) Mean ± SD	t Value	P Value
Preoperative	9.27 ± 0.54	–	–
Postoperative at 1 wks	9.05 ± 0.57	5.24	<0.0001
Postoperative at 4 wks	9.16 ± 0.49	3.91	<0.001
Postoperative at 24 wks	9.13 ± 1.16	1.14	>0.05

A significant reduction in serum calcium levels was observed at 1 week (9.05 ± 0.57, P < 0.0001) and 4 weeks (9.16 ± 0.49, P < 0.001) postoperatively compared to preoperative levels (9.27 ± 0.54). However, at 24 weeks, the difference was not significant (P > 0.05), indicating recovery of calcium levels over time.

Serum calcium levels showed a significant decrease at 1 and 4 weeks postoperatively but returned to near baseline at 24 weeks. This indicates that postoperative hypocalcemia is transient and reversible.

**Table 17: Pre and post operative serum TSH**

Parameter	TSH (Mean ± SD)	t Value	P Value
Preoperative	3.61 ± 0.41	–	–
Postoperative at 1 wks	4.72 ± 1.58	-6.30	<0.0001
Postoperative at 4 wks	4.31 ± 1.72	-3.68	<0.001
Postoperative at 24 wks	3.62 ± 0.39	-0.89	>0.05

TSH levels increased significantly at 1 week (4.72 ± 1.58, P < 0.0001) and 4 weeks (4.31 ± 1.72, P < 0.001) postoperatively compared to baseline (3.61 ± 0.41). However, by 24 weeks, the difference was not significant (P > 0.05), suggesting normalization of thyroid function over time.

TSH levels increased significantly in the early postoperative period but normalized by 24 weeks, reflecting temporary hormonal imbalance following thyroid surgery.

## DISCUSSION

Thyroid surgery remains one of the most frequently performed endocrine procedures, and despite advances in surgical techniques, postoperative complications continue to be a concern. The present study evaluated multiple clinical and surgical variables affecting postoperative outcomes and provides important insights into complication patterns.

The overall complication rate of **17.33%** observed in this study is comparable to previously reported rates ranging between 10–30% in recent literature [1,2]. This variation may be attributed to differences in patient populations, surgical expertise, and definitions of complications across studies.

Age has traditionally been considered a potential risk factor for complications; however, in the present study, no significant association was found between age and postoperative complications. Similar findings have been reported by Ahn et al. [17], who concluded that age alone is not an independent predictor of complications.

The extent of thyroid swelling and co-morbid conditions also did not significantly influence complication rates in this study. This aligns with findings from Lombardi et al. [18], who reported that patient-related factors have limited predictive value compared to surgical factors.

One of the most important findings of this study is the significant association between type of surgery and complication rates, with ETS demonstrating higher complications. This is consistent with recent studies highlighting that increased tissue dissection and manipulation in certain surgical techniques may increase complication risk [12].

Hypocalcemia remains the most common complication following thyroidectomy. The incidence of **8%** observed in this study falls within the lower range reported in the literature (1.6–50%) [5]. The finding that hypocalcemia occurred exclusively in ETS patients is clinically significant and suggests that surgical technique plays a critical role. Similar observations have been reported in studies emphasizing the importance of preserving parathyroid gland vascularity [4,9]. Interestingly, surgeon experience did not significantly influence hypocalcemia rates in this study. While some studies suggest that experienced surgeons have lower complication rates [14], others indicate that standardized surgical techniques may reduce variability regardless of experience level.

Pain is an important determinant of postoperative recovery. The present study found that ETS is associated with significantly higher pain levels compared to CTS. This may be due to increased tissue handling and surgical trauma, as

supported by Kim et al. [15]. Additionally, larger thyroid swellings were associated with increased pain, likely due to more extensive dissection required.

Vocal cord palsy occurred in 9.33% of patients, which is slightly higher than the commonly reported incidence of 1–5% [13]. However, no significant association was found with surgeon experience or surgical type. This suggests that nerve injury may be multifactorial, involving anatomical variations and intraoperative factors.

Biochemical changes observed in this study, particularly transient hypocalcemia and elevated TSH levels, are consistent with previous studies [19,20]. The normalization of these parameters by 24 weeks indicates that these changes are temporary and part of physiological adaptation following surgery.

Recent studies have emphasized the role of early postoperative PTH levels in predicting hypocalcemia [10], which was not evaluated in the present study and could be considered in future research.

Overall, this study reinforces the importance of surgical technique in determining postoperative outcomes and highlights the need for careful intraoperative handling to minimize complications.

## CONCLUSION

The present study concludes that the type of thyroid surgery is the most significant factor influencing postoperative complications, hypocalcemia, and pain severity. Other factors such as age, co-morbidities, and diagnosis do not significantly affect outcomes. Postoperative biochemical changes are transient and normalize over time. Careful surgical technique and postoperative monitoring are essential to minimize complications and improve patient outcomes.

## LIMITATIONS

- The sample size was relatively small, limiting generalizability of findings.
- Long-term complications beyond 24 weeks were not evaluated.

## Declarations:

**Conflicts of interest:** There is no any conflict of interest associated with this study

**Consent to participate:** We have consent to participate.

**Consent for publication:** We have consent for the publication of this paper.

**Authors' contributions:** All the authors equally contributed the work.

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