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Original Research Article

Complications of thyroidectomy: Insights from a single-centre study in northeast India

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ABSTRACT

Background: To study and compare the frequency of post-operative complications associated with thyroid surgeries indicated for various benign and malignant pathologies and assess the outcome of management of such complications in a tertiary care hospital in Northeast India.

Materials and Methods: An analytical study was done at a tertiary care hospital in Assam over a period of 1 year from May 2022 to June 2023. Data was collected from 53 patients who underwent surgery at this hospital.

Results: Hemithyroidectomy, subtotal, near-total, and total thyroidectomies were performed in 31 (58.4%), 2 (3.7%), 6 (11.3%) and 14 (26.4%) cases respectively. The overall rate of complications was 39.6%. Permanent hypocalcaemia was observed to be the most common complication, followed by transient hypocalcaemia and transient recurrent laryngeal nerve palsy. The complications were found to be more frequent in surgery for malignant thyroid disease. There was no mortality in our study.

Conclusion: A better understanding of thyroid gland anatomy, meticulous haemostasis and Identification of Recurrent laryngeal nerve and parathyroid glands lead to favourable post-operative outcomes. Appropriate post-operative care with early identification and management of complications plays an essential role in reducing the duration of postoperative hospital stay and limiting patient morbidity.

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1. Introduction

Disorders of the thyroid gland are the second most common endocrine disorders following diabetes mellitus.¹ Thyroid disorders warranting surgical intervention can be benign like colloid cysts, nodules, adenomas; or malignant tumours. Another indication for thyroid surgery is the swelling causing breathing, voice production, and swallowing difficulties. Recently, cosmetic appearance is also a leading reason for surgery.

Thyroid surgery is one of the most common procedures, dating back 1000 years. The earliest recorded surgery was

performed by Abu al Qasim (936-1013 AD).² However, the mortality of thyroidectomy early in the nineteenth century was nearly 40 per cent. General anaesthesia, antisepsis, and haemostasis improvements in the twentieth century significantly reduced mortality and morbidity rates. Theodor Billroth's thyroidectomies reduced the mortality rate to 8 per cent. Theodor Kocher (Billroth's pupil) is regarded as the "father of modern thyroid surgery", with over 5000 thyroidectomies and an associated mortality rate of just 0.5 per cent.

Presently, thyroidectomy is a standard operation with extremely low mortality. The indications include nodular or colloid goitre, solitary thyroid nodule, thyroid swelling with toxic symptoms, thyroid malignancy, and cosmesis.

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The type of thyroidectomy depends on the degree of impairment, nature and size of the lesion.³ The post-operative complications may include minor issues viz flap oedema to life-threatening haemorrhage or respiratory obstruction. Sound knowledge of the thyroid anatomy and surgical nuances of thyroidectomy determine the outcomes and limit the post-operative complications.⁴ Ramirez et al. stated that post-operative complications are directly related to the expanse of thyroidectomy and have an inverse relation with the surgeon's expertise.⁵

Despite the magnitude of the problem in routine clinical practice, the studies investigating the incidences of thyroidectomy complications and their predictive factors in this region of the country are very limited.

This study intends to evaluate the rate of complications of different thyroidectomies in a tertiary care hospital in Assam, assess the outcome and compare it with other published data.

2. Materials and Methods

53 patients were operated on at Tezpur Medical College and Hospital, Assam between May 2022 to June 2023.

This analytical study was done to assess complications after various types of thyroid surgeries indicated for benign and malignant thyroid diseases. A thorough preoperative work-up was done in all cases comprising of complete ear, nose, and throat examination, indirect laryngeal examination, routine blood tests, thyroid profile, neck ultrasound, and fine needle aspiration cytology. Special investigations like computed tomography, or magnetic resonance imaging, were done in those cases where there was suspicious mass, retrosternal extension, and large thyroid masses causing compressive symptoms. The study included age groups from 15 to 80 years. Patients with thyroiditis, history of head and neck radiation and inoperable malignancy were excluded from the study.

All surgeries were performed by ENT surgeons following written informed consent. All patients undergoing surgery were euthyroid.

Kocher's incision was used for all surgeries. Following subplatysmal flap elevation and exposure of the thyroid gland, the Superior pole was identified and ligated close to the gland. Genuine efforts were made in every surgery to identify the Recurrent laryngeal nerve. Similarly, at least 2 parathyroid glands were identified intra-operatively. The types of surgeries done were total thyroidectomy (TT), near-total thyroidectomy (NTT), subtotal thyroidectomy (STT) and hemithyroidectomy (HT). The pathologies observed in this study were colloid goitre, follicular adenoma, papillary, follicular and medullary carcinoma.

Video laryngoscopy was done in patients who developed hoarseness postoperatively. Vocal cord dysfunction existing after 6 months was designated as permanent paralysis.

All patients were treated with antibiotics postoperatively and suction drains were kept in all cases which were usually removed within 48 hours. Routinely, sutures were removed in all cases by the 7th to 10th postoperative day. Serum calcium levels were measured on the next postoperative day in all cases. Temporary hypoparathyroidism was considered when the total serum calcium level was less than 8.5 mg/dL. Hypocalcaemia persisted for more than 6 months despite regular calcium and vitamin D supplementation and was termed permanent hyperparathyroidism. The patients were followed up regularly for at least 6 months. This study was approved by the Ethics in Research Committee of the institute.

3. Results

This study included 53 patients who underwent thyroid surgery at Tezpur medical college and Hospital, under the Department of Otorhinolaryngology and Head and Neck Surgery. The overall incidence of complications for various thyroid surgeries was evaluated. Their incidence associated with each pathological and radiological subtype of thyroid swelling was also examined.

The mean age of the study group was 39.15 years, with the youngest study participant aged 16 years, while the oldest study participant was aged 65 years.

Out of 53 patients, more than four-fifth of the study group was female (n=46).

All patients underwent FNAC and were categorised according to the Bethesda system. The majority of the cases were colloid goitre, followed by Multinodular goitre. 6 cases were diagnosed as malignant on FNAC (11%).

The most common lesion in our study was Colloid goitre (60.3%) as shown on Table 1. Papillary carcinoma was observed to be the most common malignant lesion (18.86%).

Table 1: Distribution of cases according to Histo-pathological examination

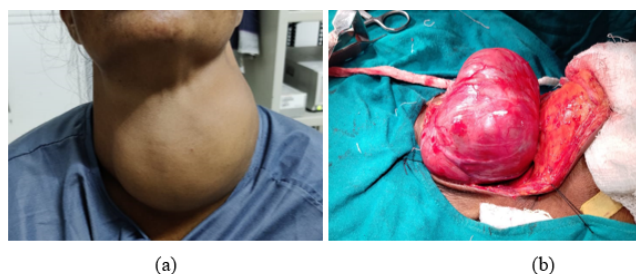
Histopathological examination	Number of cases	Percentage
Colloid goitre	32	60.3%
Follicular adenoma	8	15.09%
Follicular carcinoma	2	3.77%
Papillary carcinoma	10	18.86%
Medullary carcinoma	1	1.88%

The types of surgeries performed were as follows (Table 2). The most common surgery was Hemithyroidectomy (58.4%).

The overall complication rate was 39.6% as shown in Table 3.

Table 2: Distribution of cases according to the type of surgery administered. (N = 53)

Type of surgery administered	Number of cases	Percentage
Hemi-thyroidectomy	31	58.4%
Near-total thyroidectomy	6	11.3%
Subtotal thyroidectomy	2	3.7%
Total thyroidectomy	14	26.4%

**Figure 1:** (a) A 48-year-old female with huge thyroid swelling (b) Intraoperative view of the gland after the elevation of the upper flap.**Table 3:** Distribution of cases according to post-operative complications.

Post-operative complications	Number of cases
Hematoma	2
SLN injury	Transient 1 Permanent 1
RLN injury	Transient 3 Permanent 2
Hypoparathyroidism	Transient 3 Permanent 4
Hypothyroidism	2
Wound infection	1
Stitch granuloma	2

Hypoparathyroidism (13.7%) was found to be the most complication of this study, noted in 7 cases. In TT, NTT, and STT, sincere efforts were made to preserve at least two parathyroid glands. 4 cases were labelled as permanent hypoparathyroidism. All such patients received parenteral calcium gluconate with oral calcium and vitamin D3. Corrected serum calcium was evaluated every 24 hours and was strictly monitored.

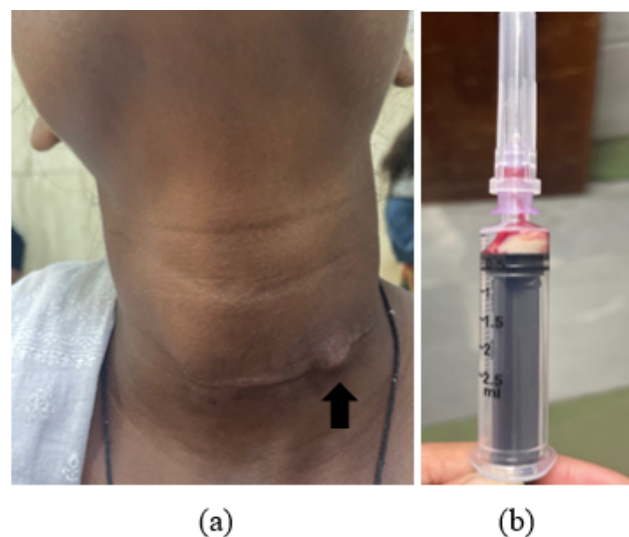
The overall incidence of RLN palsy was observed in 11.32% of the patients. Sub-analysis revealed that two patients suffered RLN injury following hemithyroidectomy, one patient following near total, and two patients following total thyroidectomy. Injectable steroids and injection Methyl cobalamin 1500 micrograms once daily for 5 days was immediately commenced and speech therapy was advised following discharge to all patients with vocal fold palsy.

Three patients suffered from transient, whereas two patients suffered permanent paralysis. Permanent RLN palsy was encountered post total thyroidectomy. In our study, RLN on the right side was more commonly involved than the left. No cases had bilateral involvement.

In this study, EBSLN palsy was encountered in two patients who underwent near-total and total thyroidectomy for large-sized Colloid goitre and Papillary carcinoma, respectively (3.77%).

Post-operative wound hematoma was observed in two patients, each following total and near-total thyroidectomy, which was managed with needle aspiration. Re-exploration for wound hematoma was not indicated in these cases. No patients had postoperative respiratory distress in our study.

Only one patient developed local wound site infection post-surgery, which was managed with oral antibiotics and pus aspiration and stitch granuloma was observed in two cases.

**Figure 2:** (a) and (b) Stitch granuloma**Figure 3:** (a) Infected cyst formation over left lateral aspect of the surgical wound following hemithyroidectomy, (b) Pus aspirated from the swelling

None of the cases in our series was operated for hyperthyroidism. There was no postoperative mortality

Table 4: Distribution of cases according to histological subtype, surgical procedure and complications experienced. (N = 53)

Complications	HPE	HT	NT	TT
Hematoma	Colloid goitre	0	1	0
	Papillary carcinoma	0	-	1
Transient SLN injury	Papillary carcinoma	0	-	1
Permanent SLN injury	Colloid goitre	0	1	0
Transient RLN injury	Colloid goitre	1	1	0
	Follicular carcinoma	1	-	0
Permanent RLN injury	Papillary carcinoma	0	-	1
	Colloid goitre	0	0	1
Transient hypoparathyroidism	Papillary carcinoma	1	-	2
Permanent hypoparathyroidism	Papillary carcinoma	0	-	3
	Colloid goitre	0	0	1
	Papillary carcinoma	0	-	1
Hypothyroidism	Medullary carcinoma	-	-	1
	Colloid Goitre	0	0	1
Stitch granuloma	Papillary carcinoma	-	-	1
	Papillary carcinoma	1	-	0
Wound infection	Papillary carcinoma	1	-	0

observed in our study.

4. Discussion

Fifty-three patients who underwent thyroidectomy using the capsular dissection technique were studied to analyse the occurrence of different post-operative complications from May 2022 to June 2023. The age demographic in our study ranged from 16 years to 65 years with average of 39.15 years with male: female ratio of 1: 6.57.

Of the 53 patients included in our study, 21 experienced postoperative complications, and 61.9% were associated with total thyroidectomy procedures (n=13). In the present study, hemithyroidectomy is a safe operative intervention with minimal complications (n=5, 9.43%). Furthermore, 4.76% of the complications were post near-total thyroidectomy.

However, a greater incidence of post-operative complications is seen after thyroidectomy for malignant than benign disease.

The most common complication encountered post-operatively was hypoparathyroidism, seen in 13.2% of patients. Post operative hypoparathyroidism is a serious complication leading to increased hospital stay. A prospective study done in 2008 concluded post-operative hypocalcemia was the most common following total

thyroidectomy, with an incidence of 1.6 to 50 %.⁶ Six patients who suffered from this complication in our study had low serum calcium pre-operatively (less than 1.9 mmol/ml). All the patients received parenteral calcium gluconate with oral calcium and vitamin D3. Corrected serum calcium was evaluated every 24 hours and was strictly monitored.

With the capsular dissection technique, injury to the parathyroid is avoidable. However, transient hypocalcemia can occur despite meticulous surgical techniques.⁷ Delbridge et al. stated that transient hypoparathyroidism is an acceptable outcome after total thyroidectomy.⁸ The extent of thyroidectomy determines the severity and duration of the hypocalcemia.

The incidence of temporary (< 6 months) and permanent hypoparathyroidism (>6 months) ranges between 8%– 30% and 1.7%– 3.5%, respectively.⁹ Richmond et al. showed that the incidence of permanent and temporary hypocalcemia was 13 and 0.8 per cent, respectively.¹⁰ In the sub-analysis of the extent of thyroidectomy with the incidence of hypocalcemia, Transient hypocalcemia was observed in one patient following hemithyroidectomy. Two and four patients had transient and permanent hypocalcemia, respectively, following total thyroidectomy.

The risk of post-operative hypocalcemia is associated with female sex, malignant pathology, lymph node dissection, type and duration of surgery, re-exploration and low pre-operative hypocalcemia. In our study, five out of 7 patients suffering from this complication were female and 5 cases were following surgery for malignant disease.

Hypothyroidism is not regarded as a complication of thyroid surgery and was considered as an expected outcome in the majority of the studies.⁹ In cases of total or completion thyroidectomy, permanent thyroid insufficiency must be expected. In our series, hypothyroidism was observed only in two cases who underwent TT.

RLN palsy is one of the most debilitating complications of thyroid surgeries.

In this study, the nerves were identified and attempted for preservation in all cases. The overall incidence of RLN palsy was observed in 11.32% of the patients (n=6), which is in accordance with other studies in the literature. Sub-analysis revealed that permanent RLN palsy was encountered post total thyroidectomy.

Nayar et al. studied the incidence of RLN palsy following thyroidectomy for malignant diseases and concluded that aggressive histopathology, stage of the disease, extra thyroid extension and positive central compartment nodes were the responsible factors.¹¹ RLN palsy was found in two cases who underwent thyroidectomy for carcinoma.

The capsular dissection prevents RLN injury. The RLN is encountered as the dissection proceeds towards the ligament of the berry. However, novice surgeons should seek the nerve initially; and during the posterior capsular

ligament dissection. In cases of malignancy, when nerve identification is complex, the RLN should be traced back from the thoracic inlet.¹²

Earlier, the RLN was dissected throughout its length until the cricopharyngeus. However, medial dissection also carries the risk of ischemia to the parathyroid gland. Also, the chances of neuropraxia are higher because of the interruption of the vascular supply to the vasa nervorum. Over the last two decades, total thyroidectomy has been the preferred option over subtotal thyroidectomy for thyroid malignancy and all bilateral goitre, Grave's disease etc.

There has been a paradigm shift from lateral to capsular dissection. This technique is embryo logically based rather than anatomical based. It has ensured complete resection with minimal or nil complications. However, it requires knowledge about the embryology of the gland, including pyramidal remnants, tubercle of Zuckerkandl, and thyro-thymic thyroid rests. Parathyroid dissection has evolved from vascular pedicle isolation to routine parathyroid auto-transplantation. Capsular dissection starts high on the surface of the thyroid gland. It involves the ligation of tertiary branches of the ITA. The dissection proceeds posteriorly towards the berry's suspensory ligament identifying the RLN and preserving the vascular supply to the parathyroid.¹³

In this study, EBSLN palsy was encountered in two patients who underwent near-total and total thyroidectomy for large-sized Colloid goitre and Papillary carcinoma, respectively (3.77%). The injury rate to this nerve can be as high as 58%. However, the incidence is highly variable in the literature.¹⁴ The causative factor may be nerve entrapment while ligating the superior pole vessels, stretching, thermal damage or injury due to shearing forces during retraction. Nerve ischaemia and surgeon experience were also found to influence the incidence of this complication by various studies in the literature.¹⁵

Cervical haematomas developed in 1.4% of thyroid surgeries, with most haematomas developing within 6 hours of surgery. Drains and size of incision did not appear to change the rate of this complication.¹⁶ Usually of venous origin, it appears following waking or bout of cough due to negative pressure on the large vessels of the neck. Hence, haemostasis should be ensured following surgery by checking the surgical field and Valsalva manoeuvre prior to closure. Post-operative wound hematoma was observed in two patients, each following total and near-total thyroidectomy, which was managed with needle aspiration. Re-exploration for wound hematoma was not indicated in these cases. No patients had postoperative respiratory distress in our study.

Infections after thyroidectomies are rare, and incidences have been noticed to be as low as 0.4% in various studies.¹⁷ The risk of infection depended mainly on the quality of pre-operative and post-operative care and whether there was

a break in sterile technique. The use of drains and pre-operative antibiotics did not affect the incidence of SSI.¹⁸ In the present study, only one patient developed local wound site infection post-surgery, which was managed with oral antibiotics and pus aspiration.

Stitch granuloma was observed in two cases. It has an association with the use of non-absorbable sutures during closure.

Other less frequent complications like tracheomalacia, pneumothorax, seroma, flap oedema or hypertrophic scarring were not seen in our study.

Tracheomalacia occurs when previously normal cartilage experiences degeneration due to extrinsic compression by an enlarged thyroid gland (secondary tracheomalacia).¹⁹ Pneumothorax or pneumomediastinum is a very uncommon complication, usually associated with extensive surgery that necessitates mediastinal dissection or retrosternal extension.²⁰ This condition can clinically present with respiratory distress, decreased breath sounds or desaturation; therefore a postoperative chest radiograph is advisable in such events.

Rare complications due to hyper extension of the head during surgery have also been reported leading to vertigo, headache, and nausea. Mispositioning on the operating table may cause Brachial plexus paralysis and paralysis of the ulnar nerve. Claude-Bernard-Horner syndrome and punctiform corneal lesions leading to serious visual damage are reported to be very unusual complications.⁹

5. Conclusion

Most of the complications observed are preventable. The complications assessed were RLN and SLN paralysis, hypoparathyroidism, hypothyroidism, thyrotoxic storm, bleeding, hematoma formation and wound complications. They were frequently encountered following total thyroidectomy and surgery for a malignant lesion. The most common complication was hypoparathyroidism.

Due to a better understanding of thyroid gland anatomy, adequate pre-operative preparation, and improved techniques in haemostasis and RLN identification and monitoring, there has been a steady decline in post-operative complications following thyroidectomy. Proper identification and preservation of parathyroid glands have led to a very favourable outcome without causing hypoparathyroidism. In addition, appropriate post-operative care with early identification of complications and prompt institution of corrective treatment plays an essential role in reducing the duration of post-operative hospital stay and limiting patient morbidity.

6. List of Abbreviations

1. HT: Hemi thyroidectomy
2. NTT: Near total thyroidectomy

3. STT: Subtotal thyroidectomy
4. TT: Total thyroidectomy
5. RLN: Recurrent laryngeal nerve
6. SLN: Superior laryngeal nerve
7. EBSLN: External branch of superior laryngeal nerve
8. ITA: Inferior thyroid artery
9. SSI: Surgical site infection

7. Source of Funding

None.


8. Conflict of Interest

None.

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