Prevalence of Recurrent Laryngeal Nerve Paralysis following Thyroid Surgery: An Observational Study

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ABSTRACT

Introduction: Injury to recurrent laryngeal nerve (RLN) is significant complication after thyroid surgery that leads to voice changes, aspiration, breathing difficulty if both nerves are injured and impairment in quality of life. The aim of this study was to find the prevalence of recurrent laryngeal nerve palsy following thyroid surgery.

Methods: It was an observational study carried out in the Department of ENT-Head and Neck Surgery of a tertiary care center in Nepal. The surgery records between January 2013 and April 2025 were reviewed to document demographic information, type of surgery, paralysis of RLN and its recovery rate at least six months following surgery. The data were recorded in the excel sheet version 16 and percentages, rate, ratio and mean were calculated. The ethical clearance for the study was obtained from institutional review committee (IRC).

Results: A total of 695 patients underwent thyroid surgery. Recurrent laryngeal nerve palsy occurred in 53 (7.62%) patients and in 66 (6.96%) nerves. The incidence was higher in malignant disease and in patients undergoing thyroid surgery with neck dissection. Unilateral palsy was observed in 40 (5.75%) patients and bilateral palsy in 13 (1.87%) patients, with no requirement for airway intervention. On follow-up, recovery was seen in 38 (70.37%) nerves, while 16 (29.63%) nerves developed permanent palsy.

Conclusions: Recurrent laryngeal nerve palsy remains a significant complication of thyroid surgery, particularly in malignant disease and extensive procedures, with most cases showing recovery on follow-up.

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INTRODUCTION

Thyroidectomy is one of the common surgical procedure for otolaryngologists and is performed for malignant conditions of the thyroid, thyroid swelling presenting with compressive symptoms, or for cosmetic reasons. Thyroidectomy may lead to complications like injury to recurrent laryngeal nerve or superior laryngeal nerve, hypocalcaemia, wound hematoma or seroma.[1–3]

The rate of transient recurrent laryngeal nerve (RLN) palsy is 2.8–9.8%, and rate of permanent RLN palsy is 0.3–3%.[1,3–9] The RLN palsy rate is high in elderly patients, retrosternal goitre, bilateral thyroidectomy, malignancy, re-operation and nodal dissection.[3,8,10–12] Most of the RLN palsy are temporary, non-life-threatening and usually recover within 6 months after surgery.[11]

Despite extensive international research, Nepalese studies remain limited to small samples, leaving important gaps in national data on this common complication following thyroid surgery.[13-16] The aim of this study was to find out the prevalence of recurrent laryngeal nerve palsy following thyroid surgery at the tertiary centre.

METHODS

This was an observational study conducted in the Department of ENT-Head and Neck Surgery at Tribhuvan University Teaching Hospital, Kathmandu, Nepal. Retrospective data of patients who underwent thyroid surgery for various indications between January 2013 and April 2025 were reviewed. Data were collected regarding the type of surgery performed and the occurrence of recurrent laryngeal nerve (RLN) palsy as a postoperative complication. Patients of any age and gender were included, provided that documentation of preoperative vocal cord mobility and postoperative complications was available. Cases in which the recurrent laryngeal nerve was deliberately sacrificed due to

tumour involvement and those with preoperative nerve palsy were excluded from the study. The ethical clearance for the study was obtained from the Institutional Review Committee (IRC) of IOM (Ref 538 (6-11) E2/081/082).

All patients scheduled for thyroid surgery underwent preoperative flexible laryngoscopy to assess vocal cord mobility as a protocol in the department. Postoperatively, vocal cord function was usually evaluated on the 3rd or 4th postoperative day with indirect laryngoscopy. Flexible laryngoscopy was performed only in patients who developed voice changes following surgery and was difficult to assess by indirect laryngoscopy. In cases where recurrent laryngeal nerve palsy was identified in the immediate postoperative period, repeat laryngoscopy was performed at-least six months following thyroid surgery. Recovery of vocal cord mobility was classified as transient (temporary) paralysis, whereas persistent immobility was recorded as permanent paralysis. These inclusion criteria were; hemithyroidectomy, completion thyroidectomy and total thyroidectomy with or without neck dissection. Incomplete data were excluded.

Proforma was prepared that included recording of patient's particulars like age, gender, diagnosis before surgery, mobility of vocal cord before and after surgery and type of surgery performed. Data were entered into Microsoft Excel version 16 and analysed using descriptive statistics. Rates, ratios, and percentages were calculated, and measures of central tendency such as mean and range were determined.

RESULTS

A total of 695 patients met the inclusion criteria for this study. Of these, 442 (63.60%) patients underwent hemithyroidectomy or completion thyroidectomy, accounting for 442 recurrent laryngeal nerves at risk. The remaining 253 (36.40%) patients underwent subtotal, near-total, or total thyroidectomy with or without neck dissection, placing 506 (72.81%) recurrent laryngeal nerves at risk. The mean age of the patients included in our study was 39.92±12.81 years with age ranging from 11 to 79 years. Among the patients there were 569 (81.87%) femalesand 126 (18.12%) male.

Thyroid surgerries were performed for both neoplastic and non-neoplastic lesions, where 319 (45.89%) cases were non-neoplastic and remaining 376 (54.10%) were neoplastic. Non-neoplastic condition like colloid goitre was found in 247 (35.53%), multinodular goitre was present in 70 (10.07%) and toxic nodular goiter in 2 (0.28%). Malignant type of neoplasm was present in 285 (41.00%), out of which papillary carcinoma was 269 (38.71%), medullary carcinoma was 11 (1.58%) and follicular carcinoma was 5 (0.71%). Intermediate type was present in 86 (12.37%) and benign type was present in 5 (0.71%) patients. Additionally, 86 (12.37%) patients with a preoperative diagnosis of follicular neoplasm underwent hemithyroidectomy; however, their final histopathology reports were not available. Recurrent laryngeal nerve (RLN) palsy was observed in 53 (7.62%) patients. Among those affected, 40 (5.75%) patients developed unilateral RLN palsy, while 13 (1.87%) experienced bilateral paresis. (Table 1).

Table 1. Recurrent laryngeal nerve palsy in patient undergoing thyroid surgery (n=695).

Diagnosis	n(%)	Nerve palsy n*(%)
Non-neoplastic	319(45.89)	15(4.70)
Neoplastic- Benign	5(0.71)	0(0)
Neoplastic- Indeterminate	86(12.37)	2(2.30)
Neoplastic- Malignant	285(41.00)	36(12.63)

n=out of total 695; n*=out of total non-nepplastic, neoplastic-benign, neoplastic-intermediate and neoplastic-maliganant

Hemithyroidectomy was performed in 406 (58.42%) patients, completion thyroidectomy in 24 (3.45%) patients, total thyroidectomy in 69 (9.93%) patients, near-total thyroidectomy in 2 (0.29%) patients, subtotal thyroidectomy in 27 (3.88%) patients, total thyroidectomy with neck dissection in 155 (22.30%) patients, and completion thyroidectomy with neck dissection in 12 (1.73%) patients. The total nerve at risk was 948 and the overall rate of RLN palsy calculate against the total number of nerve at risk was 66 (6.96%), (Table 2).

Table 2. Types of thyroid surgery performed, total nerves at risk and the immediate postoperative recurrent laryngeal nerve palsy (n=695).

Type of surgery	No of patients n(%)	Nerves at risk	RLN palsy n*(%)
Unilateral Thyroid Surgery	430(61.87)	430	20(4.60)
Bilateral Thyroid Surgery	98(14.10)	196	3(1.50)
Thyroid Surgery with Neck Dissection	167(24.03)	322	43(13.30)

n=out of total 695; n*=out of nerve at risk; RLN=Recurrent Laryngeal Nerve

None of the patients with bilateral involvement required tracheostomy or re-intubation, as the vocal cords were positioned laterally. These patients presented with breathy voice and aspiration, both of which gradually improved over time.

To assess the long-term outcome of RLN paralysis, patients were followed up at least six months postoperatively using flexible endoscopy. Of the 53 patients with 66 nerve palsies, 12 (1.72%) patients with unilateral palsy either did not attend follow-up or did not undergo endoscopic evaluation; their nerve status was recorded as unknown (Table 3). Consequently, 41 patients with 54 nerve palsies were evaluated for long-term recovery. Among these, 38 (70.37%) nerve recovered to normal function, 16 (29.63%) nerve developed permanent palsy.

DISCUSSION

Thyroid surgery is performed for both non-neoplastic and neoplastic conditions. In recent years, there has been a marked increase in the incidence of papillary thyroid carcinoma, which

may reflect either a true rise in cases or improved detection through routine neck imaging and screening. Some tumours are incidentally discovered during imaging performed for unrelated head and neck pathologies. Potential complications following surgery of thyroid glands are hypocalcaemia due to parathyroid injury, hematoma, seroma, and injury to the recurrent or superior laryngeal nerves.[1–3] Among these, recurrent laryngeal nerve (RLN) palsy can significantly impact voice, breathing, swallowing, and overall quality of life.[7,9] Bilateral vocal cord injury may lead to airway compromise, occasionally necessitating tracheostomy.

The mean age of patients in our study was 39.9 years, which is comparable to previous reports.[2,13–15] In contrast, Tulachan et al.[16] reported a younger study population, while a large series by Gunn et al.[11] showed a higher median age than our cohort. Some studies have identified advanced age, particularly over 65 years, as a risk factor for recurrent laryngeal nerve (RLN) palsy.[11] Female patients predominated in our study, comprising 569 (81.87%) of the cohort, resulting in a male-to-female ratio of 1:4.5, consistent with findings from other studies in the literature.[2,11,13–15]

The overall recurrent laryngeal nerve (RLN) palsy rate in our study was 66 (6.96%) of total nerves at risk, which is comparable to previously published reports. In studies with large sample sizes, the reported rates range from 1.1% to 6.5%.[2,8–11,17,18] Data from Nepal show a wider variability, with rates ranging from 1.9% to 13%.[13–16,19] Most studies report RLN palsy in the immediate postoperative period, while only a few describe long-term outcomes. Nerve palsy persisting beyond six months is considered permanent, whereas recovery within six months is classified as temporary. Temporary palsy rates in previous studies ranged from 64.6% to 87.5%, and permanent palsy rates ranged from 12.5% to 44.4%.[8,9,14,15,19] In our cohort, the distribution of temporary and permanent RLN palsy was similar.

The rate of recurrent laryngeal nerve (RLN) palsy was higher in surgeries performed for malignant thyroid disease, particularly those involving neck node dissection. Similar findings have been reported in previous studies, showing an increased risk of RLN injury in malignancy compared to benign lesions.[1,8,11] Tumour proximity to the nerve or direct invasion of the nerve capsule are potential mechanisms for nerve paralysis.[20] Higher rates of RLN palsy have also been associated with total thyroidectomy, neck dissection, and revision surgery.[1,2,8] However, in a large study of 11,370 patients, Gunn et al. reported no significant difference in RLN injury between surgeries with or without central neck dissection.[11] Surgeon experience also plays a role, with high-volume thyroidectomy surgeons demonstrating lower rates of nerve injury.[1,3] In our study, cases included were either primary or completion thyroidectomies; only a few revision cases were excluded from evaluation. RLN palsy risk is known to be higher in revision surgeries due to adhesions, scarring, and loss of normal tissue planes.[20,21]

Proper anatomical knowledge of the recurrent laryngeal nerve (RLN) and its variations, along with surgical expertise, is essential to prevent nerve injury. Visual identification of the nerve, as well as the use of intraoperative nerve monitoring, can further reduce the risk of injury.[22] The RLN can be approached superiorly, laterally, or inferiorly, and familiarity with its course on both sides and its relationship with the inferior thyroid artery is crucial.[23] The nerve lies in close proximity to the tubercle of Zuckerkandl and Berry's ligament before entering the larynx, making this region the most common site of injury.[20,24–26] Historically, surgeons such as Kocher and Billroth intentionally left portions of thyroid tissue near the nerve to minimize the risk of RLN injury.[25]

Even when the recurrent laryngeal nerve (RLN) is visually identified and preserved, palsy may still occur due to factors such as inadequate visualization, anatomical variations, intraoperative bleeding, postoperative oedema, or a combination of these.[25] Additional mechanisms of nerve injury include excessive traction or stretching, contusion, clamping, inadvertent ligation or suturing, thermal injury from cautery, and transection.[20,27]

All surgeries included in our study were performed without the use of intraoperative nerve monitoring (IONM), and the observed RLN palsy rates were comparable to those reported in series using IONM. Currently, many centres utilize IONM, which may reduce the risk of RLN injury.[2,9,11,18] Reported RLN palsy rates in surgeries with IONM range from 5.6% to 5.7%, compared with 6.5% to 6.8% in surgeries without IONM.[2,11] However, some studies have not demonstrated clear superiority or inferiority of IONM compared to visual nerve identification alone with respect to temporary or permanent RLN palsy.[6,28] Therefore, the routine use of IONM remains debatable and may be most beneficial in complex cases, such as difficult thyroid surgery, central compartment neck dissection, or reoperations.[20]

This study has several limitations. Being a retrospective chart review, there is a possibility of missing or incomplete data. Additionally, some asymptomatic recurrent laryngeal nerve (RLN) palsies may have been missed due to the absence of routine postoperative laryngoscopic evaluation. Furthermore, 12 (18.18%) of nerve palsies could not be assessed for long-term outcomes, limiting the ability to calculate the overall rate of permanent RLN paralysis.

CONCLUSIONS

Recurrent laryngeal nerve palsy was an important complication of thyroid surgery in this study. The risk was higher in patients with malignant thyroid disease and in those undergoing more extensive procedures, particularly surgery combined with neck dissection. Most nerve injuries recovered over time, but a proportion resulted in permanent palsy, emphasizing the need for meticulous surgical technique and diligent postoperative follow-up.

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