

Right Non-Recurrent Laryngeal Nerve: Case Report

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Abstract

Background: The non-recurrent laryngeal nerve (NRLN) is a rare anatomical variant, with a prevalence of 0.3–0.8%. Its recognition during thyroid surgery is crucial to avoid nerve injury, which may cause permanent vocal cord paralysis and related complications.

Case Report: A 36-year-old woman presented with a progressively enlarging midline neck swelling for 20 years and recent-onset dysphagia. Clinical and ultrasound examination revealed a large multinodular goitre with tracheal deviation. FNAC confirmed a benign colloid goitre (Bethesda II). During elective total thyroidectomy, capsular dissection revealed an anomalous nerve arising directly from the right vagus and entering the larynx transversely—diagnosed intraoperatively as a right non-recurrent laryngeal nerve (Type 2A). Meticulous dissection preserved the nerve, and both superior and inferior pedicles were managed carefully to avoid neural injury. Postoperative recovery was uneventful, with normal vocal cord mobility.

Histopathology confirmed multinodular colloid goitre without malignancy. This rare intraoperative finding was managed successfully due to careful surgical technique and anatomical awareness.

Conclusion: Right NRLN, though rare, poses a significant risk for thyroidectomy. Detailed preoperative imaging, careful dissection, and intraoperative vigilance are essential to prevent iatrogenic injury, ensuring optimal surgical outcomes and preserving laryngeal nerve function.

Keywords: Non-recurrent laryngeal nerve, Thyroidectomy, Colloid goitre, Aberrant subclavian artery, Nerve preservation.

Introduction

The recurrent laryngeal nerve (RLN) is a vital branch of the vagus nerve, providing motor and sensory innervation to nearly all the intrinsic muscles of the larynx, except the cricothyroid¹. During its typical course, the right RLN descends into the thorax before looping under the subclavian artery and ascending between the trachea and esophagus to enter the larynx².

However, in rare instances, an anatomical variation known as the non-recurrent laryngeal nerve (NRLN) is observed. In this variant, the nerve takes a direct route to the larynx from the cervical vagus without the characteristic thoracic descent and recurrence³.

The right NRLN is an uncommon anomaly, with a reported prevalence between 0.3% and 0.8% in the general population. Occurrences on the left side are exceedingly rare and almost always linked to major thoracic anomalies, such as situs inversus with a right-sided aortic arch⁴. The right NRLN is strongly associated with vascular developmental anomalies, namely an aberrant right subclavian artery (arteria lusoria), which arises distal to the left subclavian artery and takes a retroesophageal course⁴. This creates a unique embryological context where the nerve does not loop under a normally placed right subclavian artery, resulting in its non-recurrent configuration. While arteria lusoria typically remains asymptomatic, it can occasionally present as dysphagia lusoria due to esophageal compression⁵.

Recognition of this variant is imperative for surgeons, especially those performing thyroid and parathyroid surgeries, as inadvertent injury to the NRLN can result in significant morbidity such as permanent or temporary vocal cord palsy. The risk of nerve injury during thyroidectomy is generally estimated at 1-2%, but this risk significantly increases, up to sixfold, when an undetected non-recurrent course is present⁶. The advent of high-definition imaging modalities, including ultrasound, CT angiography, and the use of intraoperative neuromonitoring, have collectively enhanced the ability to predict, identify, and prevent iatrogenic injuries to this nerve variant⁷. Heightened anatomical awareness and structured dissection remain

the cornerstone strategies to safeguard laryngeal function and patient safety, particularly in regions and populations where the prevalence of the variant may be underestimated⁸.

This case report highlights the importance of recognizing the rare presence of a right NRLN during thyroid surgery. Preoperative anticipation and intraoperative vigilance can prevent devastating complications like vocal cord paralysis. By documenting this case, we aim to increase awareness of this anatomical variation among head and neck surgeons.

Case History

A 36-year-old woman from Ichalkaranji, Kolhapur presented with a long-standing complaint of a midline neck swelling that she had noticed for the past 20 years. Over the last six months, she developed difficulty swallowing (dysphagia), particularly to solids. She did not report any breathing difficulty, noisy respiration, or change in voice. The patient had no history of addictions or comorbidities. Her past surgical history was notable only for a tonsillectomy performed 28 years ago. There was no significant family history of thyroid disease or malignancy.

Her general condition was stable at presentation, and she did not exhibit any signs of systemic illness. She sought medical attention primarily due to the recent progression of symptoms, including discomfort while swallowing and cosmetic concerns due to the visible swelling in the neck.

Clinical Examination

On examination, the patient appeared alert and in no acute distress. Neck examination revealed a single, midline neck swelling measuring approximately 10 × 6 × 5 cm, extending from the right sternocleidomastoid (SCM) to the left SCM. The swelling was firm, non-

tender, and moved with deglutition, indicating thyroid origin. The skin over the swelling was normal in temperature and color. The swelling was not fixed to underlying structures, and the lower border could be palpated in the suprasternal notch, indicating that the goitre was not retrosternal.

There were no palpable cervical lymph nodes, and laryngeal crepitus was preserved. Flexible video laryngoscopy (VLS) showed normal vocal cord mobility bilaterally, with no signs of laryngeal edema or obstruction. No other head and neck masses or abnormalities were detected.

Investigations

Ultrasonography (USG) of the neck revealed a multinodular enlargement of the thyroid gland, predominantly on the right lobe, with multiple colloid-filled cystic nodules. The gland showed heterogeneous echotexture without any suspicious solid hypoechoic lesions or calcifications. No abnormal cervical lymph nodes were identified. Tracheal deviation to the left was noted, consistent with the size of the thyroid mass.



Figure 1: USG shows multinodular enlargement of the right lobe of thyroid gland with colloid-filled nodules.

Fine Needle Aspiration Cytology (FNAC) of the dominant nodule in the right lobe yielded colloid material and benign follicular cells, consistent with a Bethesda Category II (benign) diagnosis, suggestive of

colloid goitre. There was no evidence of atypia, papillary nuclear features, or malignancy.

Final Diagnosis

Based on clinical, ultrasonographic, and cytological findings, the patient was diagnosed with a huge benign multinodular colloid goitre, causing mechanical symptoms such as dysphagia due to tracheoesophageal compression. Given the size of the gland, progressive symptoms, and cosmetic concerns, total thyroidectomy was planned.

Plan of Management

The patient was scheduled for elective total thyroidectomy under general anesthesia. Preoperative evaluation was unremarkable, and informed consent was obtained, including the risks associated with injury to the recurrent laryngeal nerve and hypoparathyroidism.

Steps of Surgery

The patient was placed in supine position with neck extension. A Kocher's incision was made, approximately two fingerbreadths above the sternal notch, following a natural skin crease. The skin and platysma were carefully incised, and subplatysmal flaps were raised—superiorly up to the thyroid cartilage and inferiorly till the sternoclavicular joint. The deep cervical fascia was opened in the midline vertically, and strap muscles were retracted laterally after dividing the midline raphe.

The pretracheal fascia was opened to expose the thyroid gland. The middle thyroid vein was identified and ligated to mobilize the gland. The superior thyroid pedicle was ligated close to the thyroid capsule to prevent injury to the external branch of the superior laryngeal nerve. During dissection of the inferior thyroid pedicle, an abnormally coursing nerve was visualized horizontally, directly entering the larynx from the

vagus—confirming it as a Right Non-Recurrent Laryngeal Nerve (NRLN).

The nerve was meticulously preserved, and the inferior thyroid vessels were ligated away from the nerve. After complete mobilization, the thyroid gland was removed in toto. Hemostasis was achieved. A suction drain was placed in the thyroid bed, and the wound was closed in layers. The intraoperative identification of the NRLN was critical to preventing iatrogenic injury. No complications occurred during the surgery.

Shape of the Incision

A Kocher's transverse incision—a horizontal crease incision—was employed, made approximately 2 fingerbreadths above the sternal notch, extending from one sternocleido-mastoid to the other. This provided excellent cosmetic results and optimal exposure for the thyroidectomy.

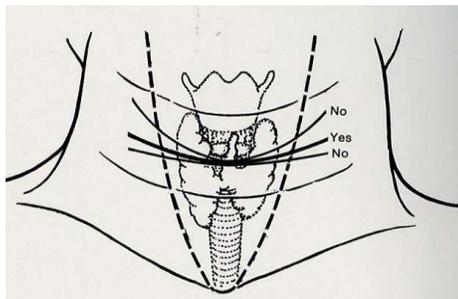


Figure 2: A Kocher's transverse incision—a horizontal crease incision.

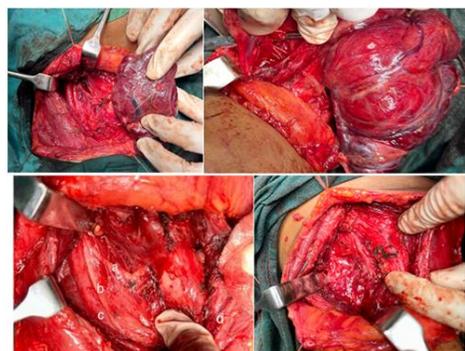


Figure 3: Type 2A NRLN directly arising from Vagus a: Right NRLN, b: Vagus nerve, c: Internal carotid artery, d: Retracted thyroid

HPE Report

Histopathological examination of the excised thyroid gland confirmed a multinodular colloid goitre, with multiple cystically dilated follicles filled with colloid. No evidence of malignancy or lymphocytic thyroiditis was seen. There was no capsular or vascular invasion, confirming the benign nature of the lesion. The final report was consistent with multinodular colloid goitre (benign).

Discussion

In our case of a right non-recurrent laryngeal nerve (NRLN), several notable findings warrant comparison with current published research, particularly regarding prevalence, anatomical associations, clinical risk, and intraoperative management. The identification and preservation of the right NRLN during thyroid surgery in our patient is congruent with most recent literature, although specific percentages and associated clinical risks highlight the critical importance of vigilance and awareness for this rare nerve anomaly.

Prevalence and Embryological Considerations

The identification of a right non-recurrent laryngeal nerve (NRLN) in this case is consistent with the reported prevalence of this anomaly in the literature. Meta-analyses and large case series confirm a prevalence of 0.3% to 0.8% for right NRLN, with Henry et al.¹ documenting a prevalence of 0.7% in over 33,000 cases. Left-sided NRLN is extremely rare, found in less than 0.04% of cases and almost always associated with congenital anomalies such as situs inversus or a right-sided aortic arch. The embryological relationship is well established: the presence of a right NRLN almost invariably coincides with an aberrant right subclavian artery (arteria lusoria). Mahmoulou et al.⁹ found an aberrant right subclavian artery in 97% of cases,

supporting the developmental basis for this nerve variant.

Anatomical and Surgical Findings

Our operative finding—a cervical nerve coursing directly from the vagus to the larynx—reflects the classic anatomical route of NRLN as described in several anatomical and surgical series. Preoperative imaging to exclude retrosternal extension and assess for vascular anomalies proved important in our workup, paralleling contemporary best practices that recommend ultrasound or CT angiography to anticipate NRLN. In our case, careful intraoperative identification allowed preservation of the nerve and safe ligation of the inferior thyroid vessels, techniques emphasized in studies by Toniato et al.⁶ and Bakalinis et al.²

Risk of Iatrogenic Injury

The most significant risk associated with NRLN is iatrogenic injury during thyroid surgery, which may result in temporary or permanent vocal cord palsy. While the standard risk for RLN injury is 1–2%, this risk may rise to as high as 12% for NRLN when the variant is unrecognized intraoperatively. Toniato et al.⁶ specifically identified an injury rate approaching 12% in unanticipated NRLN cases, dropping to below 1% when nerve presence was suspected or confirmed preoperatively or intraoperatively. Our case, with complete anatomical nerve preservation and no postoperative complications, matches the improved outcomes documented when vigilant identification strategies are applied.

The Role of Intraoperative Neuromonitoring

Intraoperative nerve monitoring (IONM) is increasingly acknowledged as an effective adjunct for identifying both recurrent and non-recurrent nerve variations. Bakalinis et al.² and Gurleyik et al.¹⁰ illustrate that

IONM reduces injury rates, with some reports noting drops in NRLN injury from as high as 12.9% to less than 2% after routine application. While IONM was not widely used in our clinical region, its benefits are well supported by multiple recent studies, especially for patients with suspected or known nerve anomalies.

Imaging and Preoperative Assessment

The value of preoperative imaging—particularly CT angiography and high-resolution ultrasound—lies in their ability to detect aberrant arterial patterns, thereby raising suspicion for possible NRLN. Research indicates that up to 85% of right NRLNs may be predicted by identifying an aberrant right subclavian artery on imaging^{11,12}. In our practice, a detailed neck assessment was performed, a protocol that can differ between centers depending on resources and technology.

Conclusion

This case highlights the rare anatomical variant of a right non-recurrent laryngeal nerve (NRLN), identified intraoperatively during total thyroidectomy for a benign multinodular colloid goitre. The case fulfills its aim by emphasizing the critical need for anatomical awareness and careful surgical dissection to prevent nerve injury. Preoperative imaging and intraoperative vigilance enabled successful identification and preservation of the NRLN, resulting in no postoperative complications. This reinforces literature findings that early recognition significantly reduces the risk of iatrogenic vocal cord palsy.

Such case documentation adds to surgical knowledge and encourages heightened caution during thyroid procedures, particularly in the presence of suggestive vascular anomalies. Routine use of preoperative imaging and intraoperative neuromonitoring is recommended in thyroid surgeries to anticipate and identify NRLN,

enhancing patient safety and minimizing the risk of nerve injury.

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