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Identifying and Preserving the Left Non-Recurrent Laryngeal Nerve During Thyroid Surgery Rare Anatomical Variant: A case report and literature review

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ABSTRACT

The non-recurrent inferior laryngeal nerve (NRILN) is a rare anatomical variant of the inferior laryngeal nerve (ILN), with left-sided occurrences being exceptionally uncommon. Recognition of this anomaly is critical to prevent iatrogenic nerve injury during thyroid surgery. Right-sided NRILNs are more frequent and are commonly associated with vascular anomalies such as aberrant right subclavian arteries, whereas left-sided NRILNs are exceedingly rare, typically occurring only in the presence of a right-sided aortic arch with an aberrant left subclavian artery. We report the case of a 34-year-old female with a multinodular goiter causing compressive symptoms. Preoperative imaging revealed a right-sided aortic arch with an aberrant left subclavian artery, raising suspicion for a left NRILN. During total thyroidectomy, the left NRILN was identified and preserved. Histopathology confirmed benign multinodular thyroid disease. This case emphasizes the importance of preoperative imaging and intraoperative vigilance in preventing nerve injury when vascular anomalies are present.

KEYWORDS: Non-Recurrent Laryngeal Nerve, Left-Sided Nriln, Thyroid Surgery, Vascular Anomaly, Aberrant Subclavian Artery.

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INTRODUCTION

The inferior laryngeal nerve, a terminal branch of the vagus nerve, typically ascends within the tracheoesophageal groove after looping around the subclavian artery on the right or the aortic arch on the left. In rare instances, the nerve follows a non-recurrent course, arising directly from the cervical vagus nerve without descending into the mediastinum, and is known as a non-recurrent laryngeal nerve (NRLN). This anatomical variant has significant clinical relevance because injury to the nerve can lead to vocal fold paralysis, dysphonia, dysphagia, or airway compromise, particularly during thyroid or parathyroid surgery [1,2].

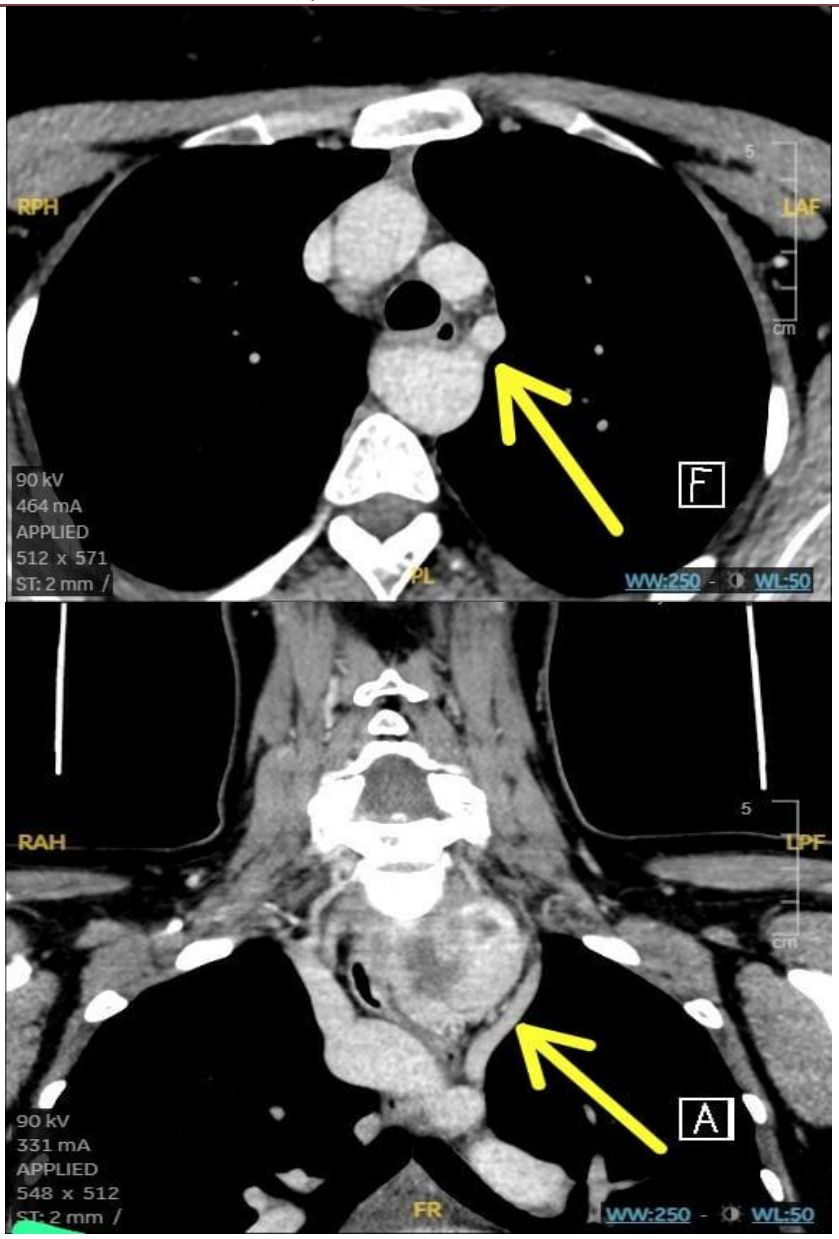
Right-sided NRILNs are reported in approximately 0.7% of patients and are typically associated with aberrant right subclavian arteries [3]. Left-sided NRILNs are extremely rare, with an estimated incidence of 0.04%, and occur exclusively in the context of a right-sided aortic arch with an aberrant left subclavian artery [4–6]. To date, only six cases of left NRILN have been documented in the literature [7–12]. We report the seventh documented case, highlighting the importance of preoperative recognition and intraoperative preservation of this rare nerve variant.

CASE PRESENTATION

A 34-year-old female presented to the emergency department on 4 January 2023 with a known history of hypocalcemia, managed with calcium carbonate 600 mg daily. She reported progressive enlargement of the thyroid with compressive symptoms, including dyspnea and dysphagia. There was no family history of thyroid disease. On clinical examination, the patient was alert, oriented, and hemodynamically stable, with a diffusely enlarged, soft, multinodular thyroid gland; the left lower pole was not palpable. No cervical lymphadenopathy was noted, and systemic examination was unremarkable.

Ultrasound of the neck demonstrated a right lobe nodule measuring 14 × 13 mm, hyperechoic, solid, and oval (TIRADS 3), and a left lobe nodule measuring 60 × 52 mm with mixed solid–cystic components, punctate echogenic foci, and TIRADS 4 features, associated with retrosternal extension. Fine-needle aspiration of the nodules showed benign cystic lesions. Preoperative enhanced CT scan of the neck and chest revealed enlargement of the left thyroid lobe and isthmus with retrosternal extension approximately 2.2 cm below the upper end of the manubrium, displacing the left common carotid artery and an aberrant left subclavian artery. The imaging demonstrated a right-sided aortic arch with an aberrant left subclavian artery and no evidence of a Kommerell diverticulum, raising suspicion for a left NRILN (Figure 1).

The patient underwent total thyroidectomy. Intraoperatively, a left non-recurrent inferior laryngeal nerve was identified and meticulously preserved, preventing inadvertent nerve injury. The thyroid specimen weighed 169 g and contained multiple benign nodules. Histopathological examination revealed variably sized benign follicles with cystic degeneration, hemorrhage, Hürthle cell changes, and lymphocytic infiltration; no malignancy was identified. Postoperatively, the patient developed expected transient hypocalcemia, which was managed appropriately, and she was discharged in stable condition on postoperative day 2.



Preoperative enhanced CT scan of neck and chest demonstrated a right-sided aortic arch with an aberrant left subclavian artery and no evidence of Kommerell diverticulum, raising suspicion for the presence of a left nonrecurrent inferior laryngeal nerve (NRLN).

DISCUSSION

The occurrence of a left NRILN is exceptionally rare and is usually associated with vascular anomalies such as a right-sided aortic arch with an aberrant left subclavian artery [4,5]. Embryologically, the left NRILN arises when the left fourth and sixth aortic arch segments regress, eliminating the loop around which the left recurrent laryngeal nerve typically descends [6].

Recognition of NRILN is critical during thyroid and parathyroid surgery, as inadvertent injury can result in permanent vocal cord paralysis, dysphagia, or airway compromise [2,7]. Preoperative imaging, particularly enhanced CT or duplex ultrasound, plays a pivotal role in detecting aberrant vascular anatomy suggestive of NRILN [1,3,8]. Patients with vascular anomalies may also present with dysphagia lusoria due to esophageal compression by aberrant arteries [9,10].

A review of the literature shows only six previously reported cases of left NRILN (Table 1) [7–12], highlighting the rarity of this anomaly. This case represents the seventh documented occurrence and underscores the importance of maintaining a high index of suspicion when preoperative imaging demonstrates vascular anomalies.

Table 1. Reported Cases of Left Non-Recurrent Inferior Laryngeal Nerve

Author	Year	Associated abnormalities	Cases
Berlin	1935	Right-sided aortic arch; retroesophageal left subclavian artery; persistent ductus arteriosus	1
Henry	1985	Situs inversus; retroesophageal left subclavian artery	1

Author	Year	Associated abnormalities	Cases
Fellmer	2008	Right-sided aortic arch; truncus arteriosus; aberrant left innominate artery	1
Masuoka	2016	Right-sided aortic arch; aberrant left subclavian artery	1
Hua	2018	Right-sided aortic arch; aberrant left subclavian artery	1
Ahumada	2021	Right-sided aortic arch; aberrant left subclavian artery	1
AlBinsaad	2023	Right-sided aortic arch; aberrant left subclavian artery (no Kommerell diverticulum)	1
Total			**7**

CONCLUSION

Left NRILN is an exceptionally rare anatomical variant with significant implications for thyroid and parathyroid surgery. Preoperative recognition of associated vascular anomalies and careful intraoperative identification are essential to avoid iatrogenic nerve injury. Surgeons should remain vigilant for this variant, especially when imaging shows a right-sided aortic arch with an aberrant left subclavian artery.

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