

CASE REPORT

A “Pilot light” of the right non-recurrent laryngeal nerve

Una spia del nervo non-ricorrente destro

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SUMMARY

Total thyroidectomy was performed in a 53-year-old male, with Graves-Basedow's disease. At surgery, the vagus nerve was found to be located medially to the carotid artery associated with a non-recurrent laryngeal nerve arising directly from the cervical vagus: this association has never been described in the literature. These results indicate that a medial location of the vagus nerve may be considered as a “pilot light” of the non-recurrent laryngeal nerve.

KEY WORDS: Thyroidectomy • Recurrent laryngeal nerve • Vagus nerve

RIASSUNTO

Un paziente, maschio di 53 anni, affetto da morbo di Basedow, venne sottoposto a tiroidectomia totale. Durante l'atto operatorio riscontrammo che il nervo vago era situato medialmente alla carotide comune, si constatava inoltre la presenza di un nervo laringeo inferiore a decorso non ricorrente il quale nasceva direttamente dal vago cervicale. Questa particolare associazione non è mai stata descritta in letteratura e si ritiene pertanto che la posizione mediale del vago rispetto alla carotide rappresenti una spia del nervo non ricorrente.

PAROLE CHIAVE: *Tiroidectomia • Nervo ricorrente • Nervo vago*

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Introduction

Despite various techniques to protect the recurrent laryngeal nerve (RLN) during thyroidectomy, post-operative temporary or permanent vocal cord palsy still occurs, due to the variability of its course. The non-recurrent inferior laryngeal nerve is a rare occurrence that should always be taken into consideration in order to avoid accidental injury during thyroid surgery

The case reported here, provides a very interesting opportunity to minimize the RLN damage, in fact, in our opinion, the vagus nerve, located in the neck medially to the common carotid artery, could be considered a “pilot light” of the non RLN (nRLN).

Case report

A 53-year-old male was referred to our Institute for Graves-Basedow's disease. At thyroidectomy, after ligation of the middle thyroid vein, the right lobe was retracted medially and a careful ligation of the superior thyroid pedicle was performed.

Attempts were made to identify the RLN in the tracheo-

oesophageal groove, the classic site of the RLN. The inferior thyroid artery was raised with an elastic loop but the RLN was not identified. The vagal trunk was located in the neck medially to the carotid artery. The vagus nerve was isolated and a nRLN was identified arising directly from the cervical vagus and following a transverse path parallel to the inferior thyroid artery (Figs. 1, 2).

The vagus nerve was gently raised with vessel loops and the nRLN was isolated and followed to the larynx. Total thyroidectomy was performed and the post-operative course was regular. No vocal cord deficit was observed.

Discussion

The association between an anomalous location of the right vagus trunk, sited medially to the common carotid artery, and a nRLN has, to our knowledge, never been described in the literature.

The vagus nerve is the longest of the cranial nerves. The cervical vagus nerve passes vertically down the neck within the carotid sheath, lying between the internal jugular vein and internal carotid artery as far as the upper border

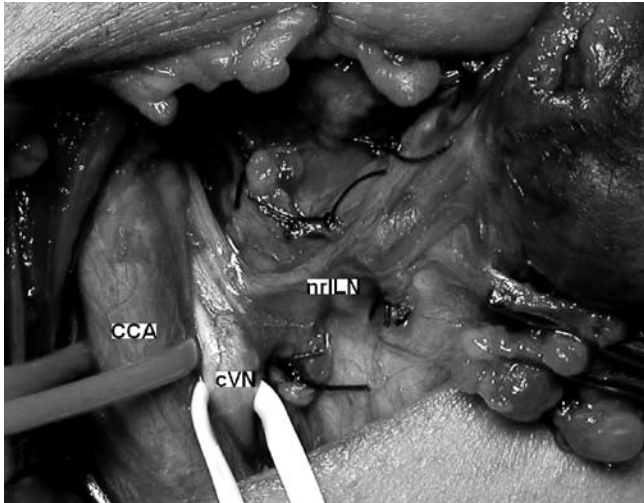


Fig. 1. The CCA and the cVN are gently raised with vessel loops. CCA: common carotid artery; cVN: cervical vagus nerve, nrILN: non-recurrent inferior laryngeal nerve.

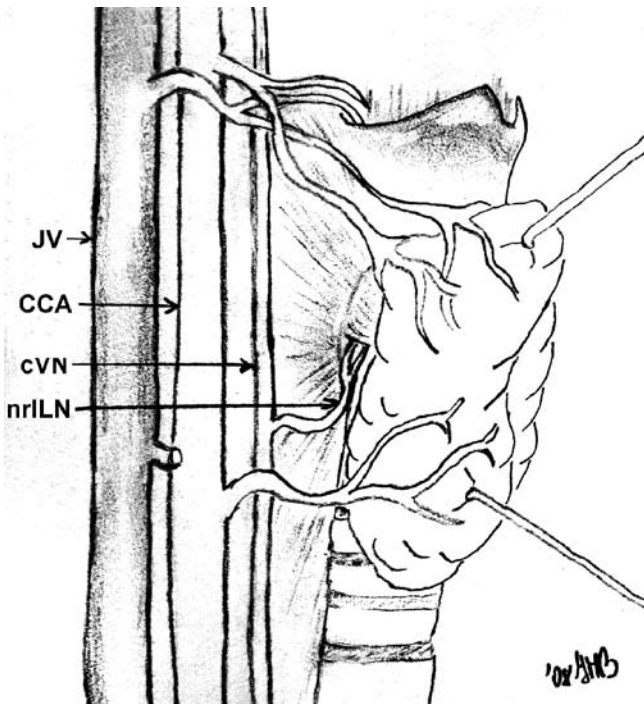


Fig. 2. View of surgical field. JV: jugular vein; CCA: common carotid artery; cVN: cervical vagus nerve; nrILN: non recurrent inferior laryngeal nerve.

of the thyroid cartilage, and then between the same vein and the common carotid artery to the root of the neck. At thyroidectomy, the common carotid artery can be detected but the vagus nerve, which is located laterally to the artery, is not usually visible.

The nRLN is a rare abnormal condition that the endocrine surgeon must recognize in order to avoid severe potential pitfalls during thyroidectomy. The incidence of this anomaly ranges from 0.3% to 1.6% for the right nRLN and it is approximately 0.04% for the left side¹⁻⁶.

The presence of a nRLN, on the right side, is consecutive to an anomaly of the right subclavian artery that arises from the aortic arch. This vascular anomaly was first described in 1789 when D. Bayford reported a case of secondary dysphagia linked to a retro-oesophageal course of the right subclavian artery⁷. He proposed the name “dysphagia lusoria” for this new syndrome. The first description of a nRLN was by G.W. Stedman in 1823⁸ who described, during a necroscopy, a “right inferior laryngeal nerve in a non-recurrent situation” arising from the right vagus nerve and coursing directly into the larynx. This particular case was associated with a right subclavian artery arising from the aortic arch to the left of the left subclavian artery.

Therefore, the absence of the RLN is always the result of an embryologic error; in fact during embryological development the inferior laryngeal nerves (ILN) are derived from the VI branchial arch. These originate from the vagus nerves under the VI aortic arch and have a horizontal course.

Subsequently, the V and the distal portion of the VI aortic arches regress bilaterally and the two laryngeal nerves remain anchored to the structures that develop from the IV arch (the subclavian artery on the right and the aortic arch on the left). During their descent into the thorax, these arteries take with them the nerves, which, therefore, assume a recurrent course⁹. As reported by A. Devèze et al., in 2003¹⁰, on the right side, the ILN moves up to lie beneath the IV arch, which forms the initial portion of the subclavian artery. When this portion of the IV aortic arch is absent, the arterial segment under which the RLN makes its loop is missing. The right ILN is free to migrate upwards and arises directly from the vagus nerve, at a cervical level, and reaches the right thyroid lobe transversely. In this case, the right subclavian artery arises distally to the left subclavian artery, directly from the aortic arch. The subclavian artery crosses the mediastinum behind the oesophagus to reach the right axillary area. This anatomic situation is exceptional on the left side, always associated with a *situs viscerum inversus*¹¹.

In our previous report, 2 types of nRLN were defined: type 1 when the nRLN runs together with the vessels of the superior thyroid peduncle and type 2 when the nRLN follows a transverse path parallel to the inferior thyroid artery (2a over the trunk of the inferior thyroid artery and 2b under the trunk or between the branches of the inferior thyroid artery)⁹.

The pre-operative diagnosis of a nRLN is extremely difficult³⁻¹¹. A left nRLN has been suspected in patients with proved *situs inversus*. The presence of *situs inversus* on a pre-operative chest x-ray should alert the surgeon to the possibility of a left-sided nRLN.

A right-sided nRLN should be suspected pre-operatively in those patients with dysphagia “lusoria” due to an aberrant retro-oesophageal right subclavian artery (*arteria lusoria*), shown at a barium swallow as a distortion

of the oesophagus resulting in a "bayonet" image^{13 10}. In the literature, many landmarks have been reported to identify the RLN¹⁻¹³. The most important is the inferior thyroid artery which some Authors suggest to encircle always RLN with a vessel loop, medially to the carotid artery and by gentle tractioning via the ribbon; in this manner, it is much easier to identify the RLN, as the nerve is strained like a string^{9 11}. Many other tips have been stressed to minimize the risk of the RLN lesion, such as identifying the inferior edge of the thyroid cartilage that helps to trace the course of the nerve, manual palpation that allows the surgeon to feel the RLN like a cord against the trachea in the tracheo-oesophageal groove, and also identifying Zuckerkandl's tuberculum as an "arrow pointing" to the RLN¹¹⁻¹³.

When the nerve is not found in the tracheo-oesophageal

groove arising from the mediastinum, a nRLN should be suspected¹¹. In this case, some Authors suggest that the surgeon should make the dissection in an orderly manner, carefully identifying and mobilizing the vagus nerve before thyroidectomy^{9 13}. The vagus nerve can be gently raised with elastic loops, enabling identification of the nRLN and its course^{9 11-13}.

In our case, we observed the association between a medial location of the vagus nerve in the neck and the nRLN. Medialization of the thyroid lobe associated with traction on the laryngo-tracheal axis lead to medialization of the vagus nerve because the nRLN is shorter than a RLN (Figs. 1, 2). Based on findings in the present case, in our opinion the vagus nerve located in the neck medially to the common carotid artery could be considered a "pilot light" of the nRLN.

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