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clinical practice

Non-recurrent laryngeal nerve coexisting with ipsilateral recurrent nerve: personal experience and literature review

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SUMMARY: **Non-recurrent laryngeal nerve coexisting with ipsilateral recurrent nerve: personal experience and literature review.**

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Introduction. *Non-recurrence and variations in ascending course of the recurrent laryngeal nerve (RLN) represent a risk factor for nerve injuries during thyroid surgery. Non-recurrent laryngeal nerve (NRLN) coexisting to recurrent nerve branch is a rare anatomyc anomaly. It could be a cause of nerve injuries during thyroidectomy. A systematic intraoperative nerve identification may allow an effectiveness prevention of iatrogenic injuries.*

Case report. *We report one case of a young woman underwent to total thyroidectomy (TT) for papillary thyroid carcinoma (PTC) where we found a rare variation of the right inferior laryngeal nerve anatomy. We identified both right laryngeal nerve structures before completing thyroidectomy avoiding possible nerve damage. The postoperative course was without complications.*

Discussion. *Iatrogenic injury of RLN is one of the most serious complication in thyroid surgery. Several risk factors favouring this complication were found as the presence of anatomic variations of the inferior laryngeal nerve. Identification of a normal caliber recurrent nerve can allow the surgeon to complete the thyroid excision; diversely, in case of a smaller caliber nerve in the usual recurrent course, a careful dissection should be continued to demonstrate a possible merger with ipsilateral non-recurrent nerve.*

Conclusions. *The aim of this paper is to report a rare case of NRLN associated to a smaller caliber branch of RNL. We emphasize that careful dissection and intimate knowledge of normal and anomal anatomy allow for avoidance of nerve injury during surgery in the neck.*

RIASSUNTO: **Nervo laringeo inferiore non ricorrente associato a nervo ricorrente omolaterale: esperienza personale e revisione della letteratura.**

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Introduzione. *La "non ricorrenza" e le variazioni del decorso ascendente del nervo laringeo ricorrente (RLN) rappresentano un fattore di rischio per lesioni del nervo in corso di chirurgia tiroidea. Il nervo laringeo non ricorrente (NRLN) che coesiste con il ramo ricorrente è una delle anomalie anatomiche più rare e potrebbe essere causa di danni durante la tiroidectomia. La identificazione intraoperatoria sistematica può consentire una efficace prevenzione del danno iatrogenico.*

Caso clinico. *Riportiamo un caso di una giovane sottoposta a tiroidectomia totale (TT) per carcvinoma papillare (PTC) dove abbiamo appunto riscontrato la rara anomalia di decorso del nervo laringeo inferiore destro. Abbiamo identificato e repertato entrambe le strutture del nervo laringeo durante la tiroidectomia evitandone la possibile lesione. II decorso postoperatorio è stato regolare e privo di complicazione.*

Discussione. *II danno iatrogenico del RLN è una della complicanze più gravi in chirurgia tiroidea. Uno dei fattori di rischio che favorisce questa complicanza è la presenza di variazioni anatomiche del decorso del nervo. L'identificazione di un ramo di calibro normale del nervo ricorrente può permettere al chirurgo di completare in sicurezza la tiroidectomia; diversamente, in caso di nervo nel decorso usuale ma di calibro più piccolo, occorre una dissezione accurata alla ricerca di una possibile fusione con un nervo non ricorrente ipsilaterale.*

Conclusioni. *L'osservazione di un caso raro di NRLN associato ad un ramo di RNL di calibro più piccolo enfatizza la necessità di una dissezione accurata e di un'intima conoscenza dell'anatomia normale e delle sue variazioni per evitare lesioni del ricorrente durante chirurgia del collo.*

KEY WORDS: Non-recurrent nerve - Laryngeal nerve - Thyroid - Surgery.
Nervo non ricorrente - Nervo laringeo - Tiroide - Chirurgia.

Introduction

Iatrogenic injury of RLN is one of the most serious complications in thyroid surgery. A systematic intraoperative nerve identification may allow an effectiveness prevention of iatrogenic injuries. This manoeuvre is man-

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datory in presence of anatomic anomalies as NRLN, although it occurs only in 0.5-1% of cases (1, 2). Rarely, a right-sided NRLN may also be associated to a branch of recurrent nerve (*"accessory recurrent laryngeal nerve"*) and in all cases it is smaller in caliber than the normal nerve (3). This situation induced surgeons to search a NRLN. The missed searching of NRLN, after visualization of the "accessory recurrent laryngeal nerve", could determinate nerve injuries.

We recently observed this anatomic anomaly during a total thyroidectomy (TT) for papillary thyroid carcinoma (PTC) and we have retrospectively review our experience considering the few international literature data.

Case report

From December 1999 to September 2009 we performed 804 total thyroidectomy for benign and malignant thyroid diseases. We always identified bilaterally the inferior laryngeal nerve. The presence of right-side NRLN was observed in 3 cases (0,37 %). Unilateral transitory palsy of vocal cord occurred in 5 cases (0,62 %) and definitive in 3 cases (0,49 %). We resected a RLN during thyroid excision because infiltrated by medullary carcinoma. We did not record cases of bilateral nerve injuries.

A 32 years old woman with multifocal PTC and ipsilateral cervical node metastasis underwent to TT with modified radical neck dissection (MRND). The node dissection was extended from the 2th to the 7th node station agree with the Crile classification (4, 6). During the tracheo-oesophageal groove dissection, a thin RLN on the right-side was identified (25) (0,64 mm in diameter) and this condition induced the surgeon to search the principal nerve trunk. It was identified as a NRLN with a regular diameter, medially to carotid artery, passing directly from the main vagal nerve to the larynx (Fig. 1 a, b). No electrophysiological examination of the nerves fascicle was performed (this method is not routinely available in our Department). The postoperative course was uneventful and the patient was discharged in third postoperative day.

Discussion

Iatrogenic injury of RLN is one of the most serious complication in thyroid surgery. It occurs from 0,2% to 5,77% as transitory palsy and from 0,1% to 3,85% as definitive nerve palsy (1, 7). Paralysis of vocal cords is a common sequence of laryngeal nerve injuries. It represents a dramatic complication inducing serious functional sequnces such as phonatory, respiratory and psychological problems that limit working capacities and social relationships of patients. Several risk factors favouring this complication were found. The three most significant factors leading to nerve damage are: (1) the experience of the operator, (2) reinterventation, and (3) the failure to identity the nerve (7). Injuries may also occur as a result of lack of good haemostasis, mediastinic goiter, and the presence of anatomic variations of the inferior laryngeal nerve known as "not recurrent laryngeal nerve" (7, 9).

Non-recurrence of the RLN has its primary basis in embryologic development (10). The aberration that results in the development of NRLN is attributed to the embryologic development of the aortic arch subclavian artery. As the fifth and sixth aortic arches involutes during embryologic development, the laryngeal nerve comes to lie in relation to the fourth aortic arch. The right fourth aortic arch becomes the subclavian artery. The left aortic arch becomes a part of the *ligamentum arteriosum* as well as the arch of the aorta. The development

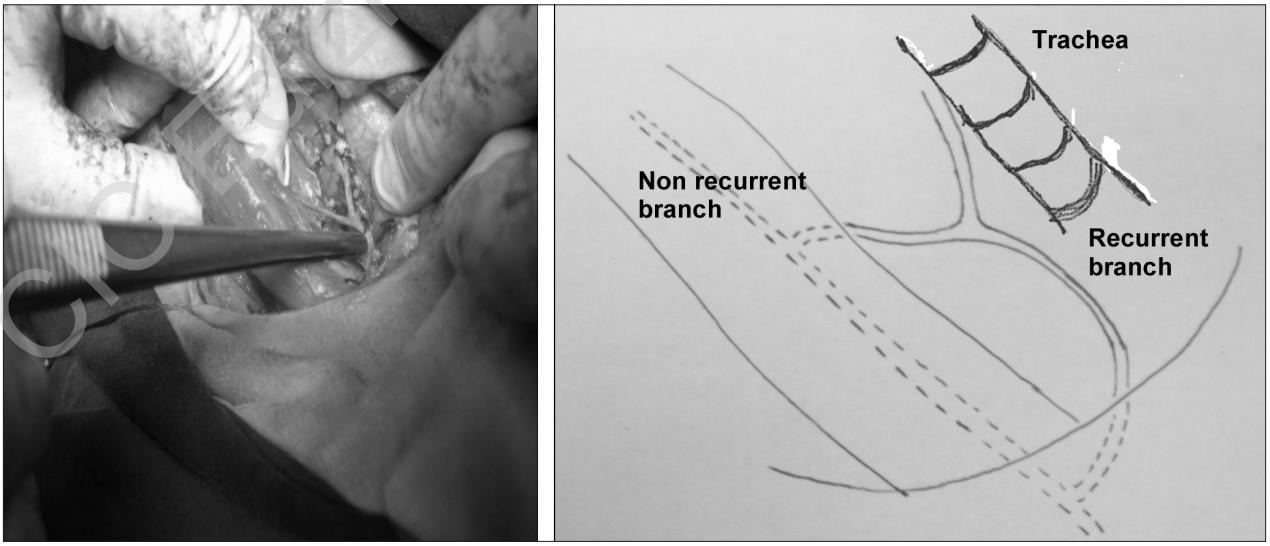

Fig. 1 - NRLN with a regular diameter, medially to carotid artery, passing directly from the main vagal nerve to the larynx coexisting to a normal right inferior laryngeal nerve.

of NRLN is related to an abnormal involution of the fourth aortic arch. The absence of the right subclavian artery in its normal position allows the inferior laryngeal nerve to rise higher in the neck. The nerve then runs a course from the vagus nerve directly to the larynx and is generally found running to the larynx at the level of the upper half of the thyroid lobe on the affected side (2, 10-16). The anomaly of NRLN was first reported by Steadman in 1823 (17). Other early accounts of this anomaly were separate reports by Hart in 1826, Pemberton in 1932 and Hilton in 1837 (12-14). The prevalence of this anomaly is not known but is generally reported from 0.3% to 1% (1, 18). In our experience the incidence rate was 0,49 % according to literature data (7). Rarely, a right-sided NRLN was also associated with a recurrent branch in absence of vascular malformation (19). Sanders et al. in a personal experience of 7 NRLN cases (0.7%) described two cases of coexisting smaller RLN (18) Henry in 1988, Thompson in 1988 and Proye in 1991 recorded respectively two cases for each; 8 cases compressively were described since 1823 (19, 21).

A PubMed research, using as key words (MESH heading) *non-recurrent* and *recurrent*, *laryngeal*, *anatomy* (*variations*), *thyroid*, did not report others cases. A common characteristic in these reports was the presence of a very thin branch in the usual recurrent course ("RLN triangle") and this situation allowed the surgeon to search the principal laryngeal trunk (22). In all the cases it was identified as NRLN. The associated risk of failed identification is a possible nerve damage (11). According to Reeve et al. injury to any one of inferior laryngeal nerve branches may result in cord paralysis (23). Sanders referred that identification of a normal caliber recurrent nerve can allow the surgeon to complete the thyroid excision, diversely, in case of a smaller caliber nerve in the usual recurrent course a careful dissection should be continued to demonstrate a possible merger of ipsilateral non-recurrent nerve to avoid a nerve injuries (18). According to Cannon, surgeons should be aware of the possibility of an NRLN in the following five situations: (1) a right-sided thyroid mass; (2) a right-sided thyroid mass and symptoms of dysphagia (*dysphagia lusoria*); (3) an abnormal chest x-ray with a central shadow or widened superior mediastinum, which may indicate anomalous vasculature and associated anomalous RLN; (4) a history of right-sided thyroid surgery and an unlocated RLN at the time of surgery; (5) when the surgeon identifies an empty RLN triangle or a smaller caliber nerve in the usual recurrent course (11).

Conclusions

In this paper we reported a rare association of NRLN with a thin caliber branch of RNL in the usual course of the nerve to remind this "anatomic pitfall". The surgical importance of an NRLN is its vulnerability during thyroidectomy. We emphasize that careful dissection and intimate knowledge of normal and aberrant anatomy allow for avoidance of nerve injury during surgery in the neck. Only with skilled and careful surgery, the thyroidectomy, to put it the way Halstead did, "typifies, perhaps, better than any operation the supreme triumph of the surgeon's art" (cited in 24).

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