

# Identification of the recurrent laryngeal nerve during thyroidectomy can affect the complication rate



Ann Ital Chir, 2021 92, 3: 217-226

pii: S0003469X21029912

Online ahead of print 2021 - Feb. 25

free reading: www.annitalchir.com

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## Identification of the recurrent laryngeal nerve during thyroidectomy can affect the complication rate

**AIM:** Identification of recurrent laryngeal nerve (RLN), performed via different techniques, decreases nerve injury during thyroidectomy. We aimed to evaluate the effect of different anatomic levels at which RLN was identified on postoperative complications.

**MATERIAL AND METHODS:** The patients underwent total thyroidectomy or lobectomy without lymph node dissection were included. Two different surgical methods were performed: thyroidectomy identifying RLN at level of inferior thyroid artery (ITA) (Group 1); at level of Berry's ligament (Group 2). Patients were evaluated with indirect laryngoscopy on 3rd postoperative day, if nerve damage was determined, at each six months. Nerve damage and postop hypocalcemia were accepted transient up to 6th month, permanent after 6th month. Total serum calcium levels were postoperatively measured on 24th and 48th hours, and then monthly.

**RESULTS:** Unilateral and bilateral RLN damage were detected as 4.4% and 2.2% in Group 1; and 8% and 2.67% in Group 2, respectively. The frequency of RLN damage was similar ( $p=0.62$ ). Postoperative hypocalcemia was significantly higher in Group 1 ( $p=0.04$ ); hypocalcemia was similar ( $p=0.149$ ). One patient in Group 1, and 2 patients in Group 2 had f superior laryngeal nerve (SLN) injury. Three patients from each group showed permanent hypocalcemia. One patient in Group 1, and two in Group 2 developed permanent hoarseness.

**DISCUSSION:** RLN injury was similar in both groups, however, temporary hypocalcemia was more frequent in patients undergone thyroidectomy with RLN identification at ITA level.

**CONCLUSIONS:** Devascularization of parathyroid glands may be accused. Future studies are needed.

**KEY WORDS:** Recurrent laryngeal nerve, Thyroidectomy.

### Introduction

A number of thyroid disorders can be treated with thyroidectomy. Recently, new surgical techniques have been used in thyroidectomy, such as robot-assisted methods, transaxillary approach or neuromonitoring. Thyroid surgery has been evolved from lateral to capsular <sup>1</sup>.

Morbidity and mortality also decreased to favorable results and complication rates. Several complications such as seroma, hypoparathyroidism, recurrent laryngeal nerve (RLN) injury may be encountered after thyroidectomy with a total rate of 13% <sup>2</sup>. The complication rate is mainly affected by annual volume of surgeon and health center, and also by surgical technique used.

RLN can be identified at different levels during thyroidectomy: inferior thyroid artery (ITA), tracheoesophageal groove, and Berry ligament. Some authors proposed that if RLNs could not be identified at the crossing point of ITA, they should be identified at tracheoesophageal groove <sup>3,4</sup>. Berry's ligament is an also important border which RLN inserts into the cricopharyngeus muscle. Therefore, Berry's ligament is known to be the most common site of injury for RLN. It should

Pervenuto in Redazione Novembre 2018. Accettato per la pubblicazione Febbraio 2019

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be kept in mind that the course of RLN may be altered by anatomic variations, location of lymph nodes, and presence of goiter.

Although meticulous surgery, transient and permanent RLN injuries may occur up to 7% and 11%, respectively. Transient and permanent hypoparathyroidisms may ensue postoperatively up to 49% and 13%, respectively<sup>5-9</sup>. In one study, the frequency of superior laryngeal nerve (SLN) injury was 4%<sup>10</sup>.

Surgical approach has evolved from avoidance of RLN to the direct visualization technique and capsular dissection<sup>1</sup>. Numerous reports indicate that identifying RLN could decrease the rates of RLN palsy. However, literature effect of various methods used to identify RLN during surgery on postoperative complications are limited. Herein, it is aimed to investigate whether identification level of RLN would have an effect on the rates of hypocalcemia, RLN or SLN injury.

## Materials and Methods

The patients whose total thyroidectomy or lobectomy without lymph node dissection was performed in Ankara State Numune Hospital between January 2005 and January 2011 were involved consecutively in the present study. The study included a total of 241 patients, aged between 17 and 75, that underwent total thyroidectomy or hemithyroidectomy with diagnoses of toxic multinodular goiter, toxic nodular goiter, nodular goiter, cystic nodular goiter, nontoxic multinodular goiter, recurrent multinodular goiter, Graves disease, and other entities. The patients were divided into two groups according to two surgical methods applied: the first surgeon performed total thyroidectomy with identifying and preserving RLN at the point of crossing ITA (Group 1); the second performed total thyroidectomy with identifying and preserving RLN at the level of Berry's ligament (Group 2). The study was designed as prospective study. Patients who underwent total thyroidectomy or hemithyroidectomy and were regularly postop followed up, were enrolled in the study. Total thyroidectomy was defined as the removal of both lobes totally with isthmus, and hemithyroidectomy was defined as total removal of one thyroid lobe with isthmus and pyramidal lobe<sup>11-14</sup>. In the present study, thyroidectomy was performed under Sevoflurane general anesthesia. At postoperative follow-up, all patients were evaluated with indirect laryngoscopy for vocal cord functions on postop 3<sup>rd</sup> day. If any nerve injury was diagnosed, the patients were followed up regularly at each six months with indirect laryngoscopy. Nerve injury was accepted as transient up to postop 6<sup>th</sup> month; nerve injury persistence after 6<sup>th</sup> month was accepted permanent nerve injury. On postop 24<sup>th</sup> and 48<sup>th</sup> hours, total serum calcium levels were recorded. Patients with hypocalcemia were regu-

larly followed up, and total serum calcium levels were monitored monthly. Up to postop 6<sup>th</sup> month, hypocalcemia was accepted transient; low levels exceeding six months were accepted permanent hypocalcemia (hypoparathyroidism). Any hypocalcemic symptoms were defined as clinical hypocalcemia; state with no symptoms was accepted asymptomatic biochemical hypocalcemia. Patients with lymph node dissection, any other surgical methods were performed, and could not be followed-up regularly, were excluded.

SLN injury was diagnosed via indirect laryngoscopy and along with clinical findings. Rigid or flexible videostroboscopy or laryngeal electromyography were unavailable.

Prospective collected data were evaluated via SPSS® 22.0 (IBM Corporation, Armonk, New York, U.S.). Shapiro-Wilk test was used for normal distribution. Independent two groups were compared via Mann-Whitney U test. In comparison of categorical variables, Pearson Chi-Square, Fisher Exact and Fisher-Freeman-Holton tests were given with Monte Carlo and Exact results. Quantitative variables were shown as median range (maximum-minimum), categorical variables as n (%) in tables. Variables were analyzed in 95% confidence level, and a *P* value of <0.05 level was accepted significant.

## Results

A total of 241 patients were included in the study, and groups 1 and 2 consisted of 91 and 150 patients, respectively. Median age of the patients were similar in two groups ( $p=0.067$ ). Gender distribution between groups was similar ( $p=0.194$ ). Distribution of preoperative diagnoses of the patients and surgical operations was demonstrated in Table 1. Duration of surgery was between 60 and 120 minutes in 70, 13% and 71, 83% of the patients in groups 1 and 2, and in 71, 23% of all patients. No significant differences were detected between groups concerning to duration of surgery. Unilateral RLN injury was detected 4.4% and 8% in groups 1 and 2, respectively. Bilateral RLN injury was detected 2.2% and 2.67% in groups 1 and 2, respectively. The frequency of RLN injury was similar in both ( $p=0.62$ ). The rate of postop biochemical hypocalcemia was significantly higher in group 1 ( $p=0.04$ ) (Fig. 1); however, clinically manifested hypocalcemia was not different in both groups ( $p=0.149$ ). One patient in group 1, and two in group 2 had injury of SLN. The results of pathological analysis were demonstrated in Table I. Three patients in each group suffered from postop permanent hypocalcemia. One patient in group 1, and two in the other developed permanent unilateral RLN injury leading to permanent hoarseness. Demographic, clinical and laboratory features of the patients were demonstrated in Table I.

TABLE 1 - Demographic, clinical and laboratory features of the patients.

	Group 1 Median (Min./Max.) n (%)	Group 2 Median (Min./Max.) n (%)	Total Median (Min./Max.) N (%)	P Value
Age	49 (20 / 75)	44 (17 / 74)	46,50 (17 / 75)	0,067
Gender				
Female	76 (83,52)	113 (75,84)	189 (78,75)	0,194
Male	15 (16,48)	36 (24,16)	51 (21,25)	
Diagnosis				
Toxic Multinodular Goiter	40 (43,96)	49 (32,67)	89 (36,93)	N/A
Graves disease	3 (3,30)	6 (4,00)	9 (3,73)	
Toxic Nodular Goiter	6 (6,59)	4 (2,67)	10 (4,15)	
Nodular Goiter	11 (12,09)	22 (14,67)	33 (13,69)	
Cystic Nodular Goiter	3 (3,30)	1 (0,67)	4 (1,66)	
Nontoxic Multinodular Goiter	28 (30,77)	66 (44,00)	94 (39,00)	
Recurrent Multinodular Goiter	0 (0,00)	1 (0,67)	1 (0,41)	
Other	0 (0,00)	1 (0,67)	1 (0,41)	
Surgery				
Total Thyroidectomy	85 (93,41)	139 (92,67)	224 (92,95)	N/A
Right Total Thyroidectomy	3 (3,30)	7 (4,67)	10 (4,15)	
Left Total Thyroidectomy	3 (3,30)	1 (0,67)	4 (1,66)	
Not performed	0 (0,00)	3 (2,00)	3 (1,24)	
Duration of surgery				
<60 min	16 (20,78)	17 (11,97)	33 (15,07)	0,114
60-120 min	54 (70,13)	102 (71,83)	156 (71,23)	
>120 min	7 (9,09)	23 (16,20)	30 (13,70)	
RLN injury				
No	85 (93,41)	134 (89,33)	219 (90,87)	0,620
Unilateral	4 (4,40)	12 (8,00)	16 (6,64)	
Bilateral	2 (2,20)	4 (2,67)	6 (2,49)	
SLN injury				
No	90 (98,90)	148 (98,67)	238 (98,76)	N/A
Yes	1 (1,10)	2 (1,33)	3 (1,24)	
Clinical Hypocalcemia				
Overt Hypocalcemia	19 (20,88)	20 (13,33)	39 (16,18)	0,149
No	72 (79,12)	130 (86,67)	202 (83,82)	
Postoperative Ca level				
Normal	63 (69,23)	122 (81,33)	185 (76,76)	0,040
Low	28 (30,77)	28 (18,67)	56 (23,24)	
Pathological diagnosis				
Multinodular Goiter	36 (39,56)	41 (27,33)	77 (31,95)	N/A
Nodular Goiter	33 (36,26)	75 (50,00)	108 (44,81)	
Cystic Nodular Goiter	7 (7,69)	2 (1,33)	9 (3,73)	
Diffuse Hyperplasia	3 (3,30)	5 (3,33)	8 (3,32)	
Hashimoto's thyroiditis	1 (1,10)	2 (1,33)	3 (1,24)	
Follicular Adenoma	5 (5,49)	10 (6,67)	15 (6,22)	
Hashimoto's Thyroiditis+Nodular hyperplasia	2 (2,20)	1 (0,67)	3 (1,24)	
Hurtle cell Adenoma	0 (0,00)	1 (0,67)	1 (0,41)	
Lymphocytic thyroiditis	1 (1,10)	2 (1,33)	3 (1,24)	
Papillary carcinoma	2 (2,20)	9 (6,00)	11 (4,56)	
Follicular carcinoma	1 (1,10)	2 (1,33)	3 (1,24)	
Late complications				
Permanent hypocalcemia	3 (3,30)	3 (2,00)	6 (2,49)	N/A
Permanent hoarseness	1 (1,10)	2 (1,33)	3 (1,24)	
No	87 (95,60)	145 (96,67)	232 (96,27)	

Mann Whitney U Test (Monte Carlo) - Fisher Freeman Halton (Monte Carlo) - Fisher Exact Test (Exact) - Pearson Chi Square Test(Exact/Monte Carlo). N/A: not applicable.

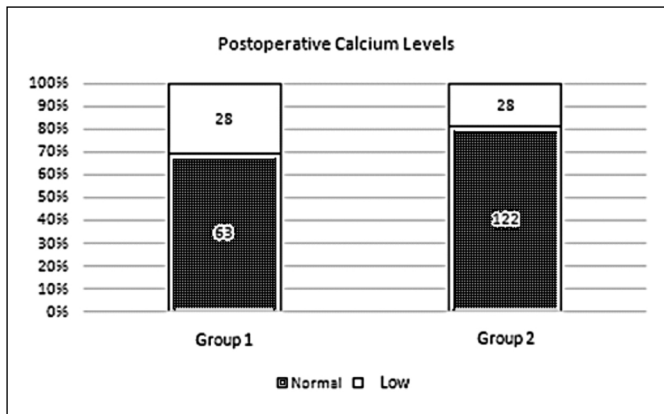


Fig. 1: Comparison of postoperative biochemical hypocalcemia between groups.

## Discussion

No significant differences were detected between groups in terms of duration of surgery. Unilateral and bilateral RLN injuries were 4.4% and 2.2% in Group 1; and 8% and 2.67% in Group 2, respectively. The frequency of RLN injury was similar in both groups. The rate of postop biochemical hypocalcemia was significantly higher in Group 1, however, the rate of clinical hypocalcemia was similar. One patient in Group 1, and two patients in the other developed injury of SLN.

One of devastating complications of thyroidectomy is RLN injury which possibly results due to clamping or stretching of the nerve, complete or partial transection of the nerve, extralaryngeal extension of the nerve or nonrecurrent nerve, misplaced ligature, electrothermal injury, traction, handling or ischemia of the nerve<sup>15-21</sup>. Several risk factors have been revealed for increased risk of RLN injury including reoperation, thyroidectomy for cancer, patients with retrosternal goiter, and extended resections injury<sup>22-33</sup>. The higher experience, the lower complication rates<sup>27,34</sup>. To decrease the RLN injury, routine intraoperative identification of RLN has been suggested in several studies<sup>1,35,36</sup>. Some reports showed great reduction in the injury frequency in thyroid resections with identification of RLN<sup>37,38</sup>. In particular, extensive dissection helps identify the extralaryngeal branches and control the nerve totally, as well. Therefore, extensive dissection seems to be superior to restricted exposure of the nerve<sup>38</sup>. In report of a large multicentre study examining RLN injury after thyroid surgery, visual identification and dissection of RLN was gold standard in prevention of RLN injury, in comparison to no identification, only visual identification or intraoperative nerve monitoring (IONM) in addition to visual identification<sup>27</sup>. Canbaz et al. investigated 134 patients underwent total thyroidectomy or lobectomy<sup>39</sup>. They divided the patients into two groups: Group A, RLN exposed

and followed completely during surgery; Group B, no RLN identification. Group A showed no RLN injury, however, 7.9% of group B developed injury ( $p=0.016$ ). Zakaria et al. investigated 326 patients underwent thyroidectomy, and found a great reduction in RLN injury in group with RLN identification<sup>29</sup>. In a study, 1023 nerves at risk were investigated via palpatory method in preventing RLN injury<sup>40</sup>. Palpatory method was helpful in 81.4% of the patients; however, palpation alone could not exceed the success of the visualization and dissection of the RLN in this study. Chiang et al. investigated 506 nerves at risk, of which 101 underwent extensive dissection<sup>41</sup>. They found no significant differences between extensive dissection and nonextensive dissection groups concerning to RLN injury evaluated with electromyographic signals. Especially in recurrent operations, careful dissection of the nerve was found to carry no extra risk of injury of nerve. Some studies showed that there was no difference between patients underwent subtotal lobectomy whom RLN was identified or not<sup>42,43</sup>. However, Wahl et al. reported that the identification of RLN decreased the rate of RLN palsy in the patients who underwent subtotal resection<sup>44</sup>.

In general, numerous studies shows the benefits of identification of RLN during surgery. However, the literature is limited in investigating the beneficial effects of identification of RLN at different levels in reducing the injury. Veyseller et al. investigated 195 patients with thyroidectomy and divided the patients into two groups according to the identification method of RLN<sup>45</sup>. RLN was identified at the level which nerve enters to larynx in 67 patients, and in tracheoesophageal groove in 128 patients. According to the rate of RLN injury, no significant difference was found between the groups.

In the present study, similar rates of RLN injury were found in both groups with identification of RLN where it crosses the ITA or at the level of Berry's ligament. Actually, if RLN is identified at the level of ITA, more extensive dissection may be required. Due to the more extensive dissection, it could be expected that increased rate of nerve injury was observed if RLN was identified at the level of ITA. However, in harmony with the literature, we did not find any differences in the rate of RLN injury in procedures using different identification levels. Elseikh et al. examined 64 patients underwent thyroidectomy with a method of late identification of RLN<sup>46</sup>. In this study, thyroidectomy was performed downward, and RLN was identified and preserved in all cases. RLN identification was done at late of the procedure. The nerve was identified at the level of midpolar level in lateral approach, and then Berry's ligament was freed. Voice assessment was done preop and postop at 1<sup>st</sup> weeks, 3<sup>rd</sup> and 6<sup>th</sup> months. No significant differences were seen between the patients and the control according to the assessment scores of postop dysphonia. The anatomical level at which the identification of RLN was done could be changed according to the surgeon's pref-

erences, the extent of surgery, or the approach of the department. However, some authors suggested that minimal dissection of the distal part of RLN around Berry's ligament might minimize the nerve injury. The rationale for this approach was determination of RLN injury mostly around the ligament. This approach might also decrease the risk of deterioration of blood flow of the nerve, and entire identification of the nerve could not be possible in subtotal thyroidectomy, was also suggested<sup>47-50</sup>. With this method, Gough and Khadra found permanent RLN injury 0.7% and 0.4%, respectively<sup>49-51</sup>. However, some authors recommended the identification of RLN from ITA along the entire course of the nerve<sup>52-57</sup>. Decreased rates of RLN injury (0.4%) was shown via this method<sup>52,54</sup>. Hermann et al. compared three different methods of RLN identification: nerve exploration at only one point, partial nerve exploration, and exploration along the entire nerve<sup>58</sup>. Permanent nerve injury rates were found 0.9, 0.3, 0.1%, respectively. This finding suggested that complete exploration was superior in reducing the nerve injury.

To date, intraop nerve monitoring devices (IONM) have been used to decrease the frequency of RLN injury. Several various devices have common properties of detecting vocal cord movement in response to the stimulation of RLN<sup>59</sup>. Some beneficial effects of IONM were reported in several studies<sup>23,27,38</sup>. In a study, there was no significant difference between two groups of visual identification alone or identification plus IONM concerning to RLN injury<sup>60</sup>. Some studies showed reduction in RLN injury with IONM especially in surgery of the patients with malignant thyroid disorders, Hashimoto's thyroiditis, Graves disease, or in reoperations<sup>26,27,31,61-65</sup>. However, in several studies, there was no statistical significant difference when comparing identification plus IONM with only visual identification concerning to reduction in the rate of RLN injury<sup>63,66</sup>. Therefore, it can be stated that IONM may help in identification of nerve, but may not decrease the rates of nerve injury.

Parathyroid glands are located on the posterolateral surface of the lateral thyroid lobe. Lower parathyroid glands are located on anteromedial side of RLN, upper ones on the posteromedial<sup>2</sup>. Due to close proximity of the glands to the anatomical landmarks in thyroid surgery, there is a potential risk of injury to these glands. Therefore, parathyroid glands are of particular importance, and should be preserved. Thyroid dissection should be done closely to the capsule as possible to avoid damaging parathyroid glands. Parathyroid glands should be protected in their own vascular beds. Additionally, ITA should be ligated as close to the thyroid capsule as possible to protect the blood supply of parathyroid glands. There are limited data according to the effect of different techniques of identification of RLN on the development of hypoparathyroidism. In one study investigating 195 patients underwent thyroidectomy, the patients

were assessed in two groups according to the identification method of RLN<sup>45</sup>. In this study, hypoparathyroidism was found to be lower in thyroidectomy group with RLN identification at the level of Berry's ligament, comparing to the other thyroidectomy group with RLN identification in tracheoesophageal groove. This study suggested that superior-inferior approach was safer than inferior-superior approach during thyroidectomy. Canbaz et al. investigated 116 patients underwent total thyroidectomy and assessed in two groups: 58 patients whom RLN was totally exposed and followed; 58 patients whom no identification of the nerve was done<sup>39</sup>. The frequencies of permanent hypocalcemia were similar in both groups; however, temporary hypocalcemia was found as significantly higher in RLN exposure group. Hence, they observed that total exposure of the nerve increased the risk of temporary hypoparathyroidism. Similarly, in some series, dissection of RLN was found to increase the frequency of hypoparathyroidism<sup>67</sup>. Total exposure or dissection of the nerve was thought to lead deterioration of blood flow of parathyroid glands. The different effects of different techniques on this devascularization remain to be elucidated. In the present study, we found increased rate of postop biochemical hypocalcemia in Group 1 with RLN identification at ITA level. Most of blood supply of parathyroid glands comes from ITA<sup>2</sup>. Therefore, identification of RLN at the level of crossing ITA may corrupt the vascularization of parathyroid glands. Page et al. determined no hypoparathyroidism, by capsular dissection and first identification and complete dissection of inferior laryngeal nerve at the upper part of thyroid, after thyroidectomy of 25 patients with cervicothoracic goiter<sup>68</sup>. This study, somewhat, suggested our findings in the context of decreased risk of devascularization in parathyroid glands in dissections distant from ITA. Although some authors argue that autotransplantation of parathyroid glands decreases permanent hypocalcemia, autotransplantation may increase temporary hypoparathyroidism<sup>69,70</sup>. SLN injury was detected in a total of three patients in the present study, and the difference between groups was not significant. Therefore, the changes in SLN function in general are less frequently examined than RLN. Generally, to avoid the nerve injury, surgeons avoid and do not dissect the nerve. However, avoiding total ligation of superior thyroid vessels may prevent SLN lesions<sup>71,72</sup>.

We included a total of 241 patients; future studies with larger cohorts are necessary. In some studies, preop laryngological examination and audiological assessment were performed. We did not perform laryngological examination preoperatively. Preop examination may clearly provide postop alterations in function of vocal cords. We assessed vocal cord functions postoperatively with indirect laryngoscopy. Though fibroscopy was not performed, it might help in this evaluation. We did not differentiate the site of injured nerve in the patients with uni-

lateral RLN injury. We did not evaluate preop status of calcium homeostasis, e.g., serum calcium or 25(OH)D3 levels.

## Conclusion

RLN injury may be affected by the method used. In the present study, identification of the nerve at different levels did not alter the rate of RLN injury. Contrary to this finding, transient hypocalcemia was affected by the surgical method since the identification level could change the distance from vascularization of parathyroid glands. However, in respect to clinical/overt hypocalcemia, no significant difference was found between two methods. Since limited number of patients suffered from permanent hypocalcemia in both groups, we could not prospect whether the method used had an effect on the occurrence of postop permanent hypocalcemia. Further studies including larger sample size would probably clarify these issues.

## Riassunto

L'identificazione del nervo laringeo ricorrente (RLN), realizzata con metodologie diverse riduce il rischio di un suo danneggiamento. A tale scopo abbiamo valutato la differenza di complicanze postoperatorie in relazione ai diversi livelli anatomici della sua identificazione.

Sono stati inclusi nello studio i pazienti sottoposti a tiroidectomia totale o lobectomia senza dissezione linfonodale, e sono stati adottati due diversi metodi chirurgici: tiroidectomia con identificazione del RLN a livello dell'arteria tiroidea inferiore (ITA) (Gruppo 1) e quelli a livello del legamento di Berry (Gruppo 2). I pazienti sono stati valutati con laringoscopia indiretta il 3° giorno postoperatorio in caso di danno, e poi ogni sei mesi. Il danno nervoso e l'ipocalcemia postoperatoria sono stati definiti come transitori entro il sesto mese e permanenti dopo il 6° mese. I livelli totali di calcio nel siero sono stati misurati dopo l'intervento 24 e 48 ore e poi mensilmente.

Il danno RLN unilaterale e bilaterale sono stati rispettivamente del 4,4% e del 2,2% nel gruppo 1; del 8% e del 2,67% nel gruppo 2. La frequenza del danno RLN è risultata statisticamente simile ( $p = 0,62$ ). L'ipocalcemia postoperatoria è risultata significativamente più grave nel gruppo 1 ( $p = 0,04$ ), analogamente è risultata clinicamente ( $p = 0,149$ ). Un paziente del gruppo 1 e 2 pazienti del gruppo 2 hanno presentato una lesione del nervo laringeo (SLN) superiore. Tre pazienti di ciascun gruppo presentavano ipocalcemia permanente. Un paziente del gruppo 1 e due del gruppo 2 hanno sviluppato una raucedine permanente.

In pratica la lesione RLN è risultata simile in entrambi i gruppi, tuttavia, l'ipocalcemia temporanea era più fre-

quente nei pazienti sottoposti a tiroidectomia con identificazione RLN a livello ITA. In tal caso può essere chiamata in causa una devascularizzazione delle ghiandole paratiroidee. Sono necessari ulteriori studi.

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## Commento e Commentary

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*I considered with great interest the article by Vural V. and colleagues and I am pleased to discuss their surgical experience. The A.A. have focused their study on intraoperative identification and dissection of the recurrent laryngeal nerve (RLN) to reduce the injury to the nerve, have analysed data regarding the incidence of recurrent laryngeal palsy (RLNP) and hypocalcemia, performing thyroid surgery with identification of the nerve at different levels, and have debated the role of intraoperative neuro monitoring (IONM).*

*RLNP is a long recognized complication of thyroid surgery and over the years, surgical strategy has advanced from non-visualization and avoidance of the nerve to the modern surgical technique of capsular dissection and direct visualization of the nerve. To date, the literature confirms that intraoperative identification and dissection of the nerve for the entire course remain the gold standard for RLN protection during thyroid surgery and the routine exposure and preservation of this important structure should become a recommended procedure during thyroidectomy for reducing RLNP risk<sup>1-3</sup>. According to this technical and anatomic rationale, a safe thyroid surgery requires a specific surgeon experienced thorough training in and understanding of neck anatomy and pathology with an accurate knowledge of the recurrent nerve anatomy and its anatomical abnormalities or variations<sup>4-7</sup>. There are two main methods of initial identification of the nerve. These are the infero-lateral approach, where the nerve is found at the thyroid midpole level and the landmark is the point it crosses the inferior thyroid artery (ITA) and the retrograde approach, in the area of Berry ligament, in close proximity to the superior parathyroid gland, near the cricothyroid point, where the nerve enters the larynx<sup>8,9</sup>. The debate on the challenging approach arises from the most common sites of injury to the nerve which are the area of Berry ligament and the crossing point with the ITA. The intraoperative understanding of the regional neuro vascular anatomy along with assessment of the thyroid pathology, could be important factors for the surgeon to consider the appropriate approach to better identify the nerve. The identification of a recurrent nerve trunk does not represent the nerve in its entirety, and, once, the nerve has been found, whatever approach has been planned, it is mandatory to follow the nerve, recognized or as unique trunk or as bifurcated, with all the identified branches, in its entire cervical course, prior to completing thyroidectomy, upward until it enters the larynx and downward until it approaches the mediastinal inlet.*

*According to others series, the A.A. have documented no significant difference in the rate of RLN injury in two thyroidectomy groups with nerve identification or at cricoid point or at crossing point, respectively, but have observed a higher rate of temporary ipoparathyroidism in thyroidectomy group with RLN identification at the crossing point, related to disruption of the blood supply to the inferior parathyroid gland, as postulated by Shindo<sup>8</sup>. This hypothesis, in our opinion, deserves more consideration in justifying the higher rate of temporary ipoparathyroidism in thyroidectomy plus neck dissection compared with thyroidectomy plus central neck dissection<sup>10</sup>, than in performing thyroidectomy by approaching the nerve at the level of the ITA. Capsular dissection and preservation of blood supply to inferior parathyroid gland by ligating individual tertiary branches of the ITA, should minimize the risk of such a complication<sup>11</sup>.*

*To conclude, in agreement with A. A. data, the recent literature has confirmed no significant difference in RLNP rates when comparing thyroid surgery with the use of IONM versus without IONM<sup>2,12,13</sup>. Visual RLN identification remains the gold standard for nerve protection and It is up to each surgeon to use nerve monitoring as routine aid for identification of the nerve during every procedure or to reserve it for high risk cases including malignancy and re-operative surgery.*

\* \* \*

Ho considerato con molto interesse l'articolo di Vural V. e colleghi e sono lieto di discutere la loro esperienza chirurgica. Gli A.A. hanno focalizzato il loro studio sull'identificazione intraoperatoria e sulla dissezione del nervo laringeo ricorrente (RLN) per ridurre la lesione al nervo, hanno analizzato i dati riguardanti l'incidenza di paralisi laringea ricorrente (RLNP) e ipocalcemia, effettuando un intervento chirurgico alla tiroide con identificazione del nervo a diversi livelli e hanno discusso il ruolo del monitoraggio neuro intraoperatorio (IONM).

L'RLNP è una complicanza riconosciuta della chirurgia della tiroide e nel corso degli anni la strategia chirurgica è passata dall'evitare il nervo senza visualizzarlo alla moderna tecnica di dissezione capsulare e visualizzazione diretta del nervo. Ad oggi, la letteratura conferma che l'identificazione intraoperatoria e la dissezione del nervo per l'intero corso rimangono il gold standard per la protezione del RLN negli interventi sulla tiroide e l'esposizione di routine e la conservazione di questa importante struttura dovrebbe diventare una procedura raccomandata durante la tiroidectomia per ridurre il rischio di RLNP<sup>1-3</sup>. Secondo questa tecnica logica perché anatomica, una chirurgia sicura della tiroide richiede il chirurgo abbia compiuto un approfondito addestramento, con conoscenza dell'anatomia e della

patologia del collo, con accurata conoscenza dell'anatomia topografica del nervo ricorrente e delle sue anomalie o variazioni anatomiche <sup>4-7</sup>.

Esistono due metodi principali per l'identificazione del nervo: l'approccio infero-laterale, dove il nervo si trova a livello medio del lobo tiroideo e il punto di riferimento è dove esso attraversa l'arteria tiroidea inferiore (ITA), e l'approccio retrogrado, nell'area del legamento di Berry, nelle immediate vicinanze della ghiandola paratiroidea superiore, vicino al punto cricotiroideo, dove il nervo entra nella laringe <sup>8,9</sup>.

Il dibattito sull'approccio deriva dai siti più comuni di lesione del nervo che sono l'area del legamento di Berry e il punto di incrocio con l'ITA. La comprensione intraoperatoria dell'anatomia neuro vascolare regionale insieme alla valutazione della patologia tiroidea, potrebbe essere un fattore importante per il chirurgo per considerare l'approccio appropriato per identificare meglio il nervo.

L'identificazione di un tronco nervoso ricorrente non rappresenta con certezza il nervo nella sua interezza e, una volta individuato il nervo, qualunque sia stato l'approccio, prima di completare la tiroidectomia è obbligatorio seguire il tronco nervoso, riconoscerlo come unico o biforcuto, con l'identificazione di tutte le sue eventuali branche nell'intero suo decorso cervicale verso l'alto fino a quando non entra nella laringe e verso il basso fino a quando non si avvicina all'emergenza dal mediastino.

Secondo altri dati della letteratura gli A.A. non hanno documentato alcuna differenza significativa nella percentuale di lesioni RLN in due gruppi di tiroidectomia con identificazione del nervo rispettivamente o al punto cricoide o al punto di incrocio, ma hanno osservato un più alto tasso di ipoparatiroidismo temporaneo nel gruppo delle tiroidectomie con identificazione RLN al punto di incrocio, in relazione alla interruzione dell'afflusso arterioso alla ghiandola paratiroidea inferiore, come postulato da Shindo <sup>8</sup>. Questa ipotesi, a nostro avviso, merita maggiore considerazione nel giustificare il più alto tasso di ipoparatiroidismo temporaneo nella tiroidectomia associata alla dissezione del collo rispetto alla tiroidectomia associata alla sola dissezione centrale del collo <sup>10</sup> piuttosto che nell'esecuzione della tiroidectomia con approccio al nervo a livello dell'ITA. La dissezione capsulare e la conservazione del rifornimento di sangue alla ghiandola paratiroidea inferiore legando i singoli rami terziari dell'ITA, dovrebbero ridurre al minimo il rischio di tale complicazione <sup>11</sup>.

Per concludere, in accordo con i dati di A. A., la letteratura recente non ha confermato alcuna differenza significativa nei tassi di RLNP quando si confronta la chirurgia tiroidea con l'uso di IONM rispetto a IONM <sup>2,12,13</sup>. L'identificazione visiva RLN rimane il gold standard per la protezione dei nervi e spetta a ciascun chirurgo utilizzare il monitoraggio nervoso come aiuto di routine per l'identificazione del nervo durante ogni procedura o per riservarlo a casi ad alto rischio, tra cui la malignità e la chirurgia re-operatoria.

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