

Original Research Article

Tracheoesophageal groove: a reliable landmark

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ABSTRACT

Background: Galen first described the recurrent laryngeal nerve (RLN) as a nerve that descended from the brain to the heart, then reversed the course and ascended to the larynx and caused the vocal cords to move. Tracheoesophageal groove is useful for identifying the RLN. In the present study we studied the course of RLN in tracheoesophageal groove and its anatomical position, in patients undergoing thyroid surgery.

Methods: The study was conducted in the Department of ENT and Head and Neck Surgery, SMGS Hospital, for a period of two years, on the patients who underwent thyroid surgeries. Tracheoesophageal groove was considered first landmark to identify RLN position and only after meticulous dissection in the groove, the nerve could be identified. The nerve was carefully dissected and its position evaluated in relation with trachea and esophagus.

Results: Trajectory of the nerves studied in the patients was mostly in the tracheoesophageal groove (TEG), seen in 113 (69.75%) nerves. 16.05% of the nerves were seen in the posterior half of the trachea while 4.94% of the nerves were seen to travel from TEG to anterior half of trachea and 1.85% from TEG to posterior half of trachea. 6.17% of nerves travelled from oesophagus to the TEG.

Conclusions: A uniform dissection procedure should be followed and the recurrent laryngeal nerve must be first looked for in the TEG, which serves as important landmark and later any deviation must be considered.

Keywords: RLN, Tracheoesophageal, Groove, Thyroid

INTRODUCTION

Galen first described the RLN as: “a nerve that descended from the brain to the heart, then reversed the course and ascended to the larynx and caused the vocal cords to move”.¹ While Vesalio described the anatomy of the larynx and of the RLN in detail.²

The usual course of the RLN differs on the two sides of the neck. Both the nerves arise from the vagus in the superior part of the thorax, the left RLN ascends towards and lies in the tracheoesophageal groove from the posterior aspect of the arch of aorta whereas the right

RLN usually does not lie in the tracheoesophageal groove, except for its distal part.^{3,4} As the RLN leaves the vagus, it gives rise to two cardiac branches and a number of oesophageal and tracheal branches along its ascending course towards the larynx. The RLN enters the larynx posterior to the cricothyroid joint and inferior to the inferior constrictor muscle.³ Tracheoesophageal groove is the sulcus formed because of the abutment of the trachea anteriorly and esophagus posteriorly and is useful for identifying the RLN.

The first surgeon who advocated routine exposure of the nerve was August Bier followed by Lahey of Boston. Lahey emphasized the importance of identification and

routine display of recurrent laryngeal nerve (RLN) while performing thyroid surgeries.⁵ Prevalence of temporary and permanent paralysis of RLN after thyroid surgery has been reported to be as high as 7.1% and 11% respectively.⁶ Judicious search and identification of the RLN decreases the risk of nerve damage significantly.

Even though various anatomic studies and surgical studies have been performed, in the present study we will study the course of RLN in tracheoesophageal groove and its anatomical position, in patients undergoing thyroid surgery. This information can help thyroid surgeons to decrease the possible risk of injury to the RLN.

METHODS

The study was conducted in the Department of ENT and Head and Neck Surgery, SMGS Hospital, for a period of two years from July 2013 to June 2015, after seeking proper permission and authority from the patients who underwent thyroid surgeries [hemithyroidectomy and total thyroidectomy]. We included patients undergoing thyroid surgeries for the first time for both benign and malignant pathologies (e.g. colloid goiter, multinodular goiter, papillary carcinoma and medullary carcinoma) while revision or completion thyroid surgery cases for malignancies like follicular malignancy and anaplastic carcinoma were excluded from the present study.

Tracheoesophageal groove was considered first landmark to identify recurrent laryngeal nerve position and only after meticulous dissection in the groove, the nerve could be identified. The nerve was carefully dissected in relation with trachea and esophagus. The nerve position

was evaluated as in tracheoesophageal groove, in the anterior half of groove, in posterior half of groove, nerve position from anterior to posterior half of groove and from esophagus to tracheoesophageal groove. All the dissected nerves positions were finally tabulated. Statistical analysis was done using Microsoft excel.

RESULTS

The present enrolled a total of 140 patients with the mean age being 40.84±10.74 years. Out of these, there were 121 female patients and 19 male patients. 114 of these patients underwent hemithyroidectomy while 24 underwent total thyroidectomy. Thus, a total of 162 nerves were dissected.

Table 1: Male and female distribution in the study.

	Males	Females	Total
Patients	19	121	140

Trajectory of the nerves studied in the patients was mostly in the tracheoesophageal groove (TEG). On the right side 98 nerves were dissected, the trajectory of RLN from tracheoesophageal (TO) groove to trachea posterior half was seen in 3% and in posterior half of trachea in 24.49%. RLN was seen in TO groove in 57.14%. Trajectory of the nerve from TO groove to trachea posterior half to trachea anterior half was not seen in any of the cases. Trajectory of RLN from TO groove to anterior half of trachea was seen in 5.10% and from oesophagus to TO groove was seen in 8.16%. Nerve was seen anterior to trachea in 2.04%. Non-recurrent nerve was not seen in our cases.

Table 2: Showing recurrent laryngeal nerves in relation to TEG.

Side	Type of trajectory						Total
	TEG	Anterior half trachea	Posterior half trachea	TEG- anterior half trachea	TEG- posterior half trachea	Oesophagus- TEG	
Right	56 (57.14%)	2 (2.04%)	24 (24.49%)	5 (5.10%)	3 (3.06%)	8 (8.16%)	98
Left	57 (89.6%)	0	2 (3.13%)	3 (4.68%)	0	2 (3.13%)	64
Total	113	2	26	8	3	10	162

On the left side, out of the 64 nerves dissected, the trajectory of the nerve was seen in posterior half of trachea in 3.13%. RLN was seen in TO groove in 89.6% while from TO groove to anterior half of trachea in 4.68% and from oesophagus to TO groove in 3.13%. Trajectory from TO to trachea posterior half, nerve in anterior half of trachea and from TO groove to trachea posterior half to trachea anterior half was not seen in any of the cases.

Trajectory of the nerves studied in the patients was mostly in the TEG, seen in 113 (69.75%) nerves. 16.05% of the nerves were seen in the posterior half of the trachea. In two cases, nerve was seen in the anterior half

of the trachea. 4.94% of the nerves were seen to travel from TEG to anterior half of trachea and 1.85% from TEG to posterior half of trachea. 6.17% of nerves travelled from oesophagus to the TEG.

DISCUSSION

In the present study, 162 recurrent laryngeal nerves (RLN) were dissected and the trajectory of the nerve was noted in relation to trachea and oesophagus.

Trajectory of the nerves studied in the patients was mostly in the tracheoesophageal groove {113 (69.75%) nerves}, 16.05% of the nerves were seen in the posterior

half of the trachea and in two cases, nerve was seen in the anterior half of the trachea. 4.94% of the nerves were seen to travel from TEG to anterior half of trachea and 1.85% from TEG to posterior half of trachea. 6.17% of nerves travelled from oesophagus to the TEG.

In a cadaveric study done by Henry et al, 36 formalin-fixed cadavers were dissected and RLN was identified bilaterally in all the cadavers, making a total of 72 nerves.⁷ The RLN was located within the groove in 49 (68.1%) and outside it in 23 (31.9%) cases. The relationship of RLN was symmetrical in 22 (61.1%) of the 36 cadavers. When the RLN was located outside the groove, it was most commonly found lateral to the TEG (17 nerves, 73.9%). In the same study a meta-analysis of 23 studies was also done and it was found that (=5,970 nerves), the nerve was located inside the groove in 63.7% (95% CI: 55.3–77.7) of sides and outside it in 36.3% (95% CI: 28.3–44.7) (=97.4%; 95% CI: 96.8–97.9). In subgroup analysis by type of study, side, or geography, or in the sensitivity analysis, no statistically significant difference was found. In meta-analysis of ten studies (=1,268 nerves), including the study by Henry et al, data on the position of the RLN in relation to the TEG when the nerve was located outside the groove was evaluated. It was located anterior to the TEG in 45.7% (95% CI: 1.1–81.1) of cases and lateral to it in 37.4% (95% CI: 0–72.1).

Sunanda et al studied 46 RLNs and reported the trajectory of the nerve from the inferior thyroid artery level to the ligament of berry.⁸ On the right side trajectory of the nerve from TO groove to trachea posterior half was seen in 37.5%, in posterior half of trachea in 33.3% and from TO groove to posterior half of trachea to anterior half of trachea was seen in 12.5%. Nerve in TO groove was seen in 8.3% and from TO groove to anterior half of trachea was seen in 2.2%. Trajectory of nerve from oesophagus to TO groove and anterior to trachea was not seen. Non recurrent nerve was seen in 2.2% on right side. On the left side trajectory of the nerve from TO groove to trachea posterior half was seen in 68.2%, in posterior half of trachea in 13.6% and in TO groove was seen in 4.6%. Trajectory of the nerve from TO groove to posterior half of trachea to anterior half of trachea was seen in 4.6%, from oesophagus to TO groove in 2.2% and nerve anterior to trachea was seen in 2.2%. Thus RLN was in the TO groove in 70% instances. Trajectory of nerve from TO groove to anterior half of trachea was not seen.

The findings of the study were consistent with that of Hunt et al who studied 151 nerves and reported that on the right side the RLN is located in the tracheoesophageal groove in 65% cases, whereas on the left it is there in 77% of the cases.⁹ The nerve was located lateral to trachea in 33% on the right and 22% on the left.

Consistent with the present study, the usual position of the nerve in the trachea-esophageal groove was also reported in a study by Al Salihi et al.¹⁰ They studied the

anatomy of the recurrent laryngeal nerve on 106 post-mortem cases and fixed dissecting-room cadavers dissecting 212 nerves.

While, Meffert et al studied 23 postmortem en block specimens and reported that RLN passed upward within the lateral peritracheal and less frequently perioesophageal loose connective tissue.¹¹ The left RLN being closer to tracheoesophageal groove than the right, as seen in the present study.

Our findings are also consistent with findings of study by Hisham et al done on 325 patients undergoing thyroid surgeries.¹² The total number of RLN dissections was 502. A total of 231 RLNs (60.8%) were seen in the tracheoesophageal groove, 18 (4.9%) nerves were observed to be lateral to the trachea, and 109 (28.3%), were posterior in location.

Similar results were also reported by Ardito et al in their study on 2626 nerves, wherein 581 right nerves (61.4%) were located in the tracheoesophageal groove, 358 right nerves (37.8%) were located lateral to the trachea, 6 nerves (0.6%) on the right side were located anterolateral to the trachea; 614 left nerves (67.3%) were located in the tracheoesophageal groove, 282 left nerves (31%) were located lateral to the trachea and 15 nerves (1.6%) on the left side were located anterolateral to the trachea.¹³

The TEG is an important landmark for identifying the RLN. Simple palpation of groove can provide valuable information about the presence of the RLN.¹⁴ TEG has been proved to be useful in endoscopic thyroidectomies and other procedures where the RLN is required to be identified.¹⁵ In a study done by Chang, the RLN was identified in all the endoscopic thyroid procedures using the TEG.¹⁵ We suggest that an attempt should first be made to identify the RLN in the TEG, and then the course of the nerve should be traced upwards to the BL to confirm the position and structure.

CONCLUSION

Recurrent laryngeal nerve detailed anatomy should be carefully studied before the nerve is dissected in all cases of thyroidectomies to minimize the chances of nerve palsy. A uniform dissection procedure should be followed and the nerve must be first looked for in the groove and later any deviation must be considered.

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