

Original Research Article

Identification of recurrent laryngeal nerve: a dilemma in thyroid surgery

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ABSTRACT

Background: Surgery of the thyroid gland is one of the most common surgical procedures performed. Recurrent laryngeal nerve injury is the most dreaded complication of thyroid surgery. Hence reducing intraoperative injury is of utmost importance. Routine dissection and identification of the recurrent nerve remain controversial.

Methods: This study consists of 70 patients who underwent thyroid surgery. This study was conducted at our institute during the period of 2 years (2018-2020). Patients were evaluated and operated. Patients with thyroid diseases and normal vocal cords were allocated to two groups randomly; in group A the nerve was identified and in group B the nerve was not identified.

Results: Most of the patients participating in the study were in the age group of 33-42 years. Male to female disease ratio was 0.13:1. In our study out of 70 patients who underwent thyroid surgery, 18 (25.71%) patients suffered from recurrent laryngeal nerve palsy. Amongst those 18 patients, 2 palsies (5.71%) were in Group A and 16 palsies (45.71%) were in Group B. Recurrent laryngeal nerve most commonly lied posterior to the inferior thyroid artery on both right (65.38%) as well as left side (45.45%). Most commonly injured recurrent laryngeal nerve was the right sided recurrent laryngeal nerve (77.77%).

Conclusions: Careful dissection of nerve during thyroid surgery eliminates the risk of recurrent laryngeal nerve injury. A thorough knowledge of thyroid gland, recurrent laryngeal nerve and its anatomical relations and variations is of utmost importance in preserving the recurrent laryngeal nerve in thyroid surgery.

Keywords: Recurrent laryngeal nerve, Thyroidectomy, Vocal cord palsy

INTRODUCTION

Surgery of the thyroid is one of the most common surgical procedures. Although the recurrent laryngeal and external branch of the superior laryngeal nerves do not actually supply the thyroid gland, their close proximity to the gland render them an extremely important consideration during the assessment of thyroid conditions and in thyroid and parathyroid surgery.¹ The reported rates of recurrent nerve injury range from 0 to 6 per cent, or even more frequently in some studies.²⁻⁴ Recurrent laryngeal nerve injury is the most dreadful complication of thyroid surgery. In unilateral recurrent laryngeal nerve injury, patient will

have hoarseness of voice. In a significant percentage of patients, dysphagia for liquids and aspiration are also present.⁵⁻⁷ But in bilateral recurrent laryngeal nerve injury, the patient will have normal voice but will have dyspnoea and sometimes life-threatening stridor.³ Hence reducing injury intra-operatively is of utmost importance. An old dictum of ligating the inferior thyroid artery away from the inferior pole and superior thyroid artery as near to the superior pole exists since centuries for preserving the recurrent laryngeal nerve and superior laryngeal nerve without dissection. This dictum is still followed to this date by a substantial number of surgeons as they believe dissecting the nerve itself causes recurrent laryngeal nerve

injury. Hence it remains controversial as to whether dissecting the recurrent laryngeal nerve is beneficial taking into consideration various individual patient and disease factors and intra-operative variations including anatomical variations of the recurrent laryngeal nerve as this often lacks fool proof surgical landmarks. So, this study is being carried out to compare the status of recurrent laryngeal nerve injury with respect to dissecting and non-dissecting groups and also to study the various anatomical landmarks used for identification of the nerve as well as its own anatomical variations.

METHODS

This study is a prospective cross-sectional observational study of patients undergoing thyroid surgery in the Department of Otorhinolaryngology of Dr Shankarrao Chavan Government Medical College, Nanded between January 2018 to June 2020. Institutional Ethics Committee approval for the study was obtained. All patients with thyroid masses and a euthyroid state were included in the study. Patients with preoperative vocal cord palsy were excluded from the study. The patients were divided randomly into Group A and group B. In group A thyroidectomy was done with the identification and tracing the course of recurrent laryngeal nerve. In group B thyroidectomy was done without routine identification of the nerve and the inferior thyroid artery was ligated away from the gland and superior thyroid artery near to the gland. All patients presenting to the ENT outpatient department with thyroid masses were subjected to a detailed history taking and general as well as local examination. They were further subjected to ultrasonography of neck, FNAC of the thyroid swelling, thyroid function test and video laryngoscopy to rule out preoperative vocal cord palsy. After establishing a diagnosis and confirming patient's euthyroid state, all routine investigations followed by preanesthetic evaluation was conducted. After which patients were subjected to thyroidectomy under GA with orotracheal intubation. Dissection in Group A patients for identification of recurrent laryngeal nerve was done by lateral approach, superior approach and inferior approach according to the operating surgeon's preference as well as intraoperative finding. Immediate post-operative direct laryngoscopy was performed by a surgeon with the help of an anaesthesiologist for the assessment of vocal cords. A post-operative day 1 indirect laryngoscopy (IDL) was performed. Patient was discharge on post-operative day 4 and was asked to follow up 7 days after discharge. An indirect laryngoscopy or video laryngoscopy was performed at follow up. Following the above procedures, the findings were recorded in the proforma (case record form). These findings were entered in Microsoft excel 2010. Statistical analysis was carried out with the help of Statistical package for social sciences (SPSS) (version 20) for Windows package (SPSS Science, Chicago, IL, USA). The results were compiled by using suitable tables and graphs wherever necessary. The variations were analysed as a percentage of the total and reported. Quantitative data

is presented with the help of mean, standard deviation qualitative data is presented with frequency and percentage tables. Charts and diagrams were drawn wherever necessary.

RESULTS

Most of the patients participating in the study were in the age group of 33-42 years, followed by patients from age group 43-52 and 53-62 years (Table 1).

Table 1: Age wise distribution of patients (N=70).

Age groups (years)	No. of patients	Percentage
23-32	05	7.14
33-42	20	28.57
43-52	17	24.28
53-62	17	24.28
≥ 63	11	15.72
Total	70	99.99

Table 2: Gender wise distribution of patients (N=70).

Gender	No. of patients	Percentage
Males	08	11.42
Females	62	88.57
Total	70	99.99

Table 3: Distribution of patients according to diagnosis by FNAC (N=70).

Diagnosis (FNAC)	No. of patients	Percentage
Goiter	34	48.57
Thyroid neoplasm	15	21.42
Thyroid cyst	09	12.85
Thyroiditis	08	11.42
Cellular Follicular Lesion	04	5.71
Total	70	99.99

Thyroid diseases were far more commonly seen in females. Male to female disease ratio was 0.13: 1 (Table 2). The most common thyroid condition according to FNAC in our study is goitre (48.57%) followed by thyroid tumours (21.42%). Among goitres the most common type as per FNAC is colloid goitre (73.52%) followed by cystic colloid goitre (14.70%). The most common malignancy according to FNAC in our study was follicular neoplasm (73.33%). The most common thyroiditis on FNAC in our study is Hashimoto's thyroiditis (37.4%) (Table 3 and 4). In our study, out of 70 patients with thyroid diseases 8 patients were male and 62 patients were female. 2 male patients had malignant thyroid conditions as per the

histopathology report i.e., 25% and 6 male patients (75%) had benign thyroid conditions.

Table 4: Distribution of patients by different types of benign lesions of thyroid (goiter) diagnosed by the FNAC (n=34).

Types of goiter diagnosed (FNAC)	No. of patients	Percentage
Colloid Goiter	25	73.52
Cystic Colloid Goiter	05	14.70
Adenomatous Goiter	02	5.88
Multi-nodular Goiter	02	5.88
Total	34	99.99

Table 5: Distribution of thyroid diseases as per their histopathology report according to the gender of the patient.

Gender of the patient	Benign	Malignant
Male (n=8)	6 (75%)	2 (25%)
Female (n=62)	60 (96.7%)	2 (3.3%)
Total (n=70)	66 (94.28%)	4 (5.72%)

Table 6: Distribution of patients according to surgical procedure performed on them (N=70).

Surgical procedures	No. of patients	Percentage
Total thyroidectomy	24	34.28
Right hemithyroidectomy	29	41.42
Left hemithyroidectomy	17	24.28
Near total thyroidectomy	0	00
Subtotal thyroidectomy	0	00
Total	70	99.99

Table 7: Distribution of patients in Dissecting group according to approach of identification of recurrent laryngeal nerve (RLN) during surgical procedure (n=35).

Approach of identification RLN	No. of patients	Percentage
Lateral approach	21	60
Inferior approach	12	34.28
Superior approach	02	5.71
Total	35	99.99

Amongst the female patients 96.7% patients had benign thyroid diseases and 3.3% had malignant thyroid diseases (Table 5). The most common thyroid surgery performed in our study is right hemithyroidectomy (41.42%) followed by left hemithyroidectomy (24.28%) and total

thyroidectomy (34.28%) was the least commonly performed thyroid surgery (Table 6). The most common approach used to identify recurrent laryngeal nerve in our study is the lateral approach (60%) followed by inferior approach (34.28%). The least commonly used approach is superior approach (5.71%) (Table 7).

Table 8: Distribution of patients in Dissecting group according to relation of Recurrent Laryngeal Nerve (RLN) to Inferior Thyroid Artery (ITA) during surgical procedure (n1: right RLN=26 and n2: left RLN= 22).

Relation of RLN with ITA	Right RLN No. of patients (%)	Left RLN No. of patients (%)
Posterior to ITA	17 (65.38%)	10 (45.45%)
Anterior to ITA	06 (23.07%)	10 (45.45%)
Between the branches of ITA	03 (11.53%)	02 (9.09%)
Total	26 (99.99%)	22 (99.99%)

Table 9: Distribution of patients according to side of occurrence of vocal cord palsy after surgical procedure (n= 18).

Side of occurrence of Vocal Cord Palsy	No. of patients	Percentage
Right sided	14	77.77
Left sided	04	22.22
Total	18	99.99

Table 10: Distribution of patients according to different types of histopathological conditions and occurrence of vocal cord palsy after surgical procedure (n=18).

Histopathology and occurrence of vocal cord palsy	No. of patients	Percentage
Goiter	14	77.77
Follicular Adenoma	03	16.66
Hashimoto's Thyroiditis	01	5.55
Total	18	99.99

In our study out of 70 patients who underwent thyroid surgery, 18 (25.71%) patients suffered from recurrent laryngeal nerve palsy. In dissecting group, vocal cord palsy was occurred in 5.71% patients whereas in non-dissecting group 45.71%. This difference in both groups is statistically significant (p<0.05) (Table 8). We also studied the anatomical relation between the recurrent laryngeal nerve and inferior thyroid artery. The most common relation was the recurrent laryngeal nerve lying posterior to the inferior thyroid artery on both right (65.38%) as well as left side (45.45%). The least common anatomical relation was that it lied between the branches of inferior thyroid artery on both right (11.53%) as well as left side

(9.09%) (Table 9). Most commonly injured recurrent laryngeal nerve was the right sided recurrent laryngeal nerve (77.77%). There were no instances of bilateral nerve injuries in our study. Vocal cord palsy was most commonly seen with patients having goitre (77.77%) followed by follicular adenoma (16.66%) in our study (Table 10).

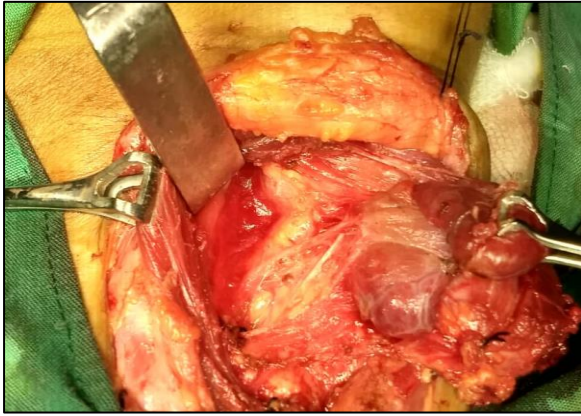


Figure 1: Presence of recurrent laryngeal nerve between the branches of inferior thyroid artery on the right side.

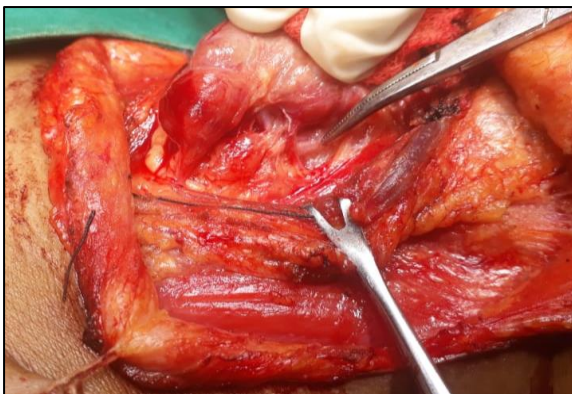


Figure 2: Identification of recurrent laryngeal nerve posterior to the inferior thyroid artery.

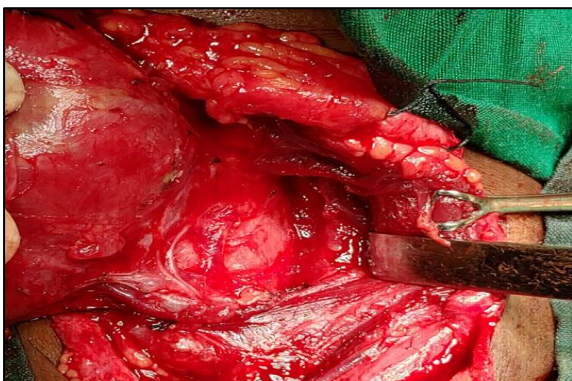


Figure 3: Presence of extralaryngeal branching of recurrent laryngeal nerve seen on the left side of the thyroid gland.

DISCUSSION

Recurrent laryngeal nerve injury remains a devastating complication of thyroid surgery. After thorough evaluation of 70 patients most of the patients i.e., 20 (28.57%) participating in the study were in the age group of 33-42 years, followed by 17 (24.28%) from age group 43-52 and 53-62 years. The mean age in our study was 48.81 ± 12.32 years. This data was quite similar to a study by Kumar⁸ et al and Shao et al wherein the mean age of presentation were 45.8 years and 45 years respectively.⁹ In our study a greater number of patients were females (88.57%) as compared to males (11.43%). In the study conducted by Nyeki et al similar results were concluded wherein 92.86% cases were females and 7.14% were males.¹⁰ In the study done by Saldanha et al, out of 91 cases 80 (87.91%) cases were of benign thyroid diseases and 11 (12.02%) cases were of malignant thyroid conditions.¹¹ In this study the most common benign thyroid condition was colloid goitre (65%). These findings were similar to our study wherein out of 70 patients, 58 (82.8%) cases were benign thyroid diseases while 12 (17.2%) cases were of malignant thyroid conditions. Most common benign thyroid condition in our study was colloid goitre (35.71%). The anatomical relation of recurrent laryngeal nerve (RLN) was compared to inferior thyroid artery (ITA) on right and left side in our study. We found that RLN most commonly lied posterior to inferior thyroid artery on right (65.38%) as well as left side (45.45%), similar results were found in a study by Nyeki¹⁰ et al out of total 62 recurrent laryngeal nerves that were identified the most common anatomical relation between the RLN and ITA was that RLN was posterior to ITA on right (53.12%) as well as left side (76.66%). In a study by Kumar⁸ et al wherein the most common surgery was hemithyroidectomy (70%) followed by total thyroidectomy (26.6%). In this study right hemithyroidectomy (40.80%) was more common than left hemithyroidectomy (29.16%) while in our study the most common thyroid procedure performed was hemithyroidectomy (65.71%) as well. Right hemithyroidectomy (41.42%) was performed more commonly than left hemithyroidectomy (24.28%) in our study. The most common approach used for identification of recurrent laryngeal nerve in our study was the lateral approach (60%). Similarly, in a study conducted by Nyeki et al the most common approach used was the lateral approach (59.7%) as well.¹⁰ In our study, 35 nerves were identified by tracing dissection out of which 2 nerves (5.71%) were injured causing unilateral vocal cord palsy. Recurrent laryngeal nerves were not traced and identified in the remaining 35 patients out of which 16 nerves (45.71%) were injured causing unilateral vocal cord palsy. This difference was found to be statistically significant ($p < 0.01$). Similarly in the study conducted by Yagnik et al 25 recurrent laryngeal nerves were dissected and identified and 25 nerves were not dissected and left nonidentified.¹² in the dissecting group no recurrent laryngeal nerve injury was found. There were 4 RLN injuries (16%) in the non-dissection group in this study. This difference was also statistically significant. A study conducted by Shen et al in

which 5,344 patients undergoing thyroidectomy.¹³ Among these cases, 548 underwent dissection of the recurrent laryngeal nerve, while 4,796 did not. There were 12 RLN injuries (2.2%) out of the 548 nerves that were dissected and identified. Similarly, there was injury of 512 (10.7%) nerves in the no dissection group, making this result statistically significant.

In our study vocal cord palsy was most commonly associated with goitre (77.77%) followed by follicular adenoma (16.66%). It was least commonly associated with Hashimoto's thyroiditis (5.55%).

Consistent results were seen in a study conducted by Shen¹³ et al in this study vocal cord palsies were most commonly associated with goitre (7.3%) followed by follicular adenoma (7.1%). However, no vocal cord palsy was observed in Hashimoto's thyroiditis.

CONCLUSION

Identification and preservation of RLN is vital in thyroid surgeries. Careful dissection essentially eliminates the chances of recurrent laryngeal nerve injury. A thorough knowledge of thyroid gland, recurrent laryngeal nerve and its relation to its surrounding structures as well as its anatomical variations is of utmost importance in preserving the recurrent laryngeal nerve in thyroid surgery. Young surgeons need to acquire sufficient surgical skills and knowledge of anatomy of thyroid gland and recurrent laryngeal nerve for performing a successful thyroid surgery. We highly recommend identification of recurrent laryngeal nerve to avoid recurrent laryngeal nerve injury during thyroid surgery.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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