

# Stages of Identifying and Preserving Recurrent Laryngeal Nerve during Thyroid Surgery

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## ABSTRACT

**Background:** Thyroid surgery is becoming more common in affluent nations, due in part to a higher recognition of nodular thyroid disease. Thyroid problems are widespread around the world, and thyroid gland surgery is a regular procedure. To evaluate the stages of identifying and preserving recurrent laryngeal nerve during thyroid surgery.

**Materials and methods:** This was a prospective, observational study conducted in the Department of ENT and Head & Neck Surgery, Ad-din Medical College Hospital, Dhaka for a period of 2 years from 1st January, 2018 to 30<sup>th</sup> December, 2019. Patients underwent thyroid surgery for both benign and malignant disease were included in the study. Patients who had pre-operative RLN (Recurrent Laryngeal Nerve) palsy were excluded from the study. Total 100 patients were admitted and thorough clinical, biochemical and histopathological evaluations were done.

**Results:** On the right side of patients, 80 nerves were evaluated, and the recurrent laryngeal nerve or its branches were anterior to the artery or its branches in (23.8%) instances, posterior to the artery in (65.0%) cases, and in between in (11.3%) cases. On the left side 68 nerve were evaluated the RLN or its branches were not seen prior to the ITA or its branches, but were seen posterior to the ITA (Inferior thyroid Artery) or its branches in 51 (75.0%) instances and in between the artery branches in 17 (25.0%) cases. Overall, 19 nerves or branches were anterior to the artery or its branches in patients, whereas 103 nerves or branches were posterior to the artery or its branches.

**Conclusion:** The majority of patients had hemithyroidectomy during surgery, with surgical injury of RLN developing (2.0%) in hemithyroidectomy.

## KEY WORD

Hemithyroidectomy; ITA; RLN.

## INTRODUCTION

Thyroid surgery is performed increasingly in developed countries, in part owing to a greater identification of nodular thyroid disease.<sup>1</sup> Thyroid diseases are common worldwide and the surgery of thyroid gland is one of the

frequent operation. Total thyroidectomy or thyroid lobectomy has been accepted as current surgical therapy for benign and malignant thyroid disorders but extensive resection might increase the risk of postoperative complications.<sup>2</sup> Identification of Recurrent Laryngeal Nerve (RLN) in both sides and save the nerve while performing thyroid surgeries is a good practice. Prevalence of temporary and permanent paralysis of RLN after thyroid surgery has been reported to be as high as 7.1%-11%.<sup>3</sup> Complications such as bleeding, hypoparathyroidism and Recurrent Laryngeal Nerve Injury (RLNI) represent nearly half of all the complications of thyroid surgery.<sup>4</sup> However, different complication rates are reported in literature. Complications after total thyroidectomy, although they happen infrequently, can affect the quality of life. The recurrent laryngeal nerve was first identified and named by Galen in the second century.<sup>5</sup> The right sided nerve is at higher risk of injury due to its wide anatomical variation compared to the left side. In addition to the hoarseness that occurs with unilateral RLNI, bilateral RLNI leads to dyspnea and often life-threatening glottal obstruction.<sup>6</sup> The surgical technique is one of the important factors affecting the outcome of thyroidectomy.<sup>7</sup> In the past, most surgeons avoided

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dissections in close proximity to the RLN to prevent its injury.<sup>8</sup> Endocrine surgeons consider this totally unacceptable. The identification and preservation of the RLN are essential to avoid its injury.<sup>9</sup> The aim of the study to evaluate the stages of identifying and preserving recurrent laryngeal nerve during thyroid surgery.

### MATERIALS AND METHODS

This was a prospective, observational study conducted in the Department of ENT and Head & Neck Surgery, Ad-din Medical College Hospital, Dhaka for a period of 2 years from 1st January, 2018 to 30<sup>th</sup> December, 2019. Necessary permission was obtained from the proper authorities before commence the study. Patients underwent thyroid surgery for both benign and malignant disease were included in the study. Patients who had pre-operative RLN palsy were excluded from the study. Total 100 patients were admitted and thorough clinical, biochemical and histopathological evaluations were done. Indirect laryngoscopy was done in each patient to assess the status of vocal cords pre-operatively. Patients were prepared for surgery and all necessary routine investigations were carried out. Attempts were made to identify and preserve RLN in all cases. Function of the vocal cords was checked by the surgeon at the end of the operation. Postoperatively, FOL was done on the first and day of discharge of the patient. Postoperative vocal cord palsy assessed by immobile Vocal Cord (VC) or sluggish movement of VC during phonation. Patient with paralyzed vocal cord were advised to follow-up twice in a month in the first three months and then on a monthly interval for at least 6-9 months. Clinical evaluation of these patients was done by any improvement in voice quality or vocal cord function. A questionnaire and a consent form were prepared, sample was selected on the basis of inclusion and exclusion criteria, questionnaire was filled with informed written consent, relevant investigations were done. After collection of data, data were edited by meticulous checking and rechecking. Continuous scale data were presented as mean standard deviation and categorical data will be presented as number percentage. The summarize data were present in the table.

**Inclusion criteria:** Patients underwent thyroid surgery for both benign and malignant disease were included in the study.

**Exclusion criteria:** Patients who had pre-operative RLN palsy were excluded from the study.

### RESULTS

Out of 100 patients, mean age was found 38.6±4.1 years with range from 22 to 59 years. Majority (91.0%)

patients were female and 9(9.0%) were male (Table-I). 83.0% of patients had euthyroid followed by 12.0% of patients who had hypothyroid and some had hyperthyroid (Table-II). In FNAC findings, 64(64.0%) patients were found colloid goitre, 18(18.0%) was multinodular goitre, 9(9.0%) was papillary carcinoma, 5(5.0%) was follicular neoplasm, 3(3.0%) was cystic nodule and 1(1.0%) was medullary carcinoma (Table-III). In surgical injury, 74 patients underwent hemithyroidectomy, 16 underwent total thyroidectomy, 7 underwent near total thyroidectomy, 2 underwent completion thyroidectomy and 1 lobectomy (Table-IV). Surgical injury develops 2(2.0%) in hemithyroidectomy (Table-V). In patients, on the right side 80 nerves were studied and out of these, recurrent laryngeal nerve or its branches were anterior to the artery or its branches in 19(23.8%) cases while it was posterior to the artery in 52(65.0%) cases and was in between in 9(11.3%) patients. On the left side out of the 68 nerves studied, the RLN or its branches were not seen anterior to the ITA or its branches, but were posterior to ITA or its branches in 51(75.0%) cases and was in between the branches of the artery in 17(25.0%) cases. Overall in patients, 19 nerves or its branches were anterior to the artery or its branches, 103 nerves or its branches were posterior to the artery or its branches and 26 nerves or its branches were in between the branches of the artery (Table-VI).

**Table 1** Demographic characteristics of the study population (n=100)

| Age in year      | Number of patient | Percentage (%) |
|------------------|-------------------|----------------|
| ≤30              | 38                | 38.0           |
| 31-40            | 32                | 32.0           |
| 41-50            | 19                | 19.0           |
| >50              | 11                | 11.0           |
| Mean age (years) |                   | 38.6±4.1       |
| Range (min-max)  |                   | 22-59          |
| Sex              |                   |                |
| Male             | 9                 | 9.0            |
| Female           | 91                | 91.0           |

**Table II** Thyroid hormone status pre-operatively of the study population (n=100)

| Thyroid hormone status | Number of patient | Percentage (%) |
|------------------------|-------------------|----------------|
| Euthyroid              | 83                | 83.0           |
| Hypothyroid            | 12                | 12.0           |
| Hyperthyroid           | 5                 | 5.0            |

**Table III** Indication for thyroid surgery (n=100)

| Indication          | Number of patient | Percentage (%) |
|---------------------|-------------------|----------------|
| Colloid goitre      | 64                | 64.0           |
| Multinodular goitre | 18                | 18.0           |
| Papillary carcinoma | 9                 | 9.0            |
| Follicular neoplasm | 5                 | 5.0            |
| Cystic nodule       | 3                 | 3.0            |
| Medullary carcinoma | 1                 | 1.0            |

**Table IV** Surgical procedure (n=100)

| Surgical procedure       | Number of patient | Percentage (%) |
|--------------------------|-------------------|----------------|
| Hemithyroidectomy        | 74                | 74.0           |
| Total thyroidectomy      | 16                | 16.0           |
| Near total thyroidectomy | 7                 | 7.0            |
| Completion thyroidectomy | 2                 | 2.0            |
| Lobectomy                | 1                 | 1.0            |

**Table V** Surgical injury develop in RLN injury (n=100)

|                          | Number of patient | Percentage (%) |
|--------------------------|-------------------|----------------|
| Hemithyroidectomy        | 2                 | 2.0            |
| total thyroidectomy      | 0                 | 0.0            |
| Near total thyroidectomy | 0                 | 0.0            |
| Completion thyroidectomy | 0                 | 0.0            |
| Lobectomy                | 0                 | 0.0            |

**Table VI** Frequency of position of RLN during thyroid surgery (n=100)

| Side  | Total | Type of position |            |            |
|-------|-------|------------------|------------|------------|
|       |       | Anterior         | Posterior  | In between |
| Right | 80    | 19 (23.8%)       | 52 (65.0%) | 9 (11.3%)  |
| Left  | 68    | 0 (0.0%)         | 51 (75.0%) | 17 (25.0%) |
| Total | 148   | 19               | 103        | 26         |

## DISCUSSION

In this study observed that mean age was found  $38.6 \pm 4.1$  years with range from 22 to 59 years. Most of the participants of this study were female with only 9% of the participants being male. Iqbal et al reported the mean of age was  $38.5 \pm 10.9$  years.<sup>2</sup> 30(40%) patients were between 31-40 years in group A and 32(42.7%) in group B. 28(37.3%) were male in group A and 25(33.3%) in group. This is in accordance with the studies carried out earlier.<sup>7,10</sup> Kanotra et al observed 43 female patients and 7 male patients with the mean age being  $39.3 \pm 9.76$  years.<sup>3</sup> Sarma et al reported majority of patients were females 90%. maximum number of patients 38% presented in the age group of 31-40 years.<sup>6</sup>

Present study showed that majority (83.0%) patients had euthyroid followed by 12(12.0%) had hypothyroid

and 5(5.0%) had hyperthyroid. Iqbal et al reported the incidence of RLN paralysis may be as high as 13% to 30% in patients with thyroid cancer and secondary thyroidectomy in recurrent disease respectively.<sup>2</sup> Sarma et al observed 81.2% cases were in euthyroid status preoperatively followed by 12.2% cases in hypothyroid and 6.4% cases in hyperthyroid status.<sup>6</sup> Recurrent laryngeal nerve injury and parathyroid gland injury is a serious concern in thyroid and parathyroid surgery. Therefore, methods that can reduce the incidence of this complication are of great interest.<sup>11</sup> Careful identification and meticulous thyroid dissection is essential to prevent RLN injury. Some surgeons are of the opinion that it is not possible to identify the recurrent laryngeal nerve in every case. In these circumstances, technique of staying close to the thyroid capsule and division of terminal branches at capsular level is recommended.<sup>12</sup>

Current study observed in FNAC findings, 64(64.0%) patients was found colloid goitre, 18(18.0%) was multinodular goitre, 9(9.0%) was papillary carcinoma, 5(5.0%) was follicular neoplasm, 3(3.0%) was cystic nodule and 1(1.0%) was medullary carcinoma. In comparison with Iqbal et al study, they showed in group A, 38(50.7%) patients were of MNG, 10 (13.3%) diffuse goiter, 7(9.3) solitary nodules, 13 (17.3%) suspicion of malignancy & 7(9.3%) malignancy.<sup>2</sup> In group B, 33(44%) patients were having MNG, 15(20%) diffuse goiter, 10(13.3%) solitary nodule, 6(8%) suspicion of malignancy and 11(14.7%) malignant disease. Sarma et al reported the most common pathology observed in the thyroid gland for which surgery was indicated, according to preoperative FNAC report, was colloid goitre (61.4%) followed by multinodular goitre, papillary carcinoma thyroid, follicular neoplasm, cystic nodule, medullary carcinoma thyroid.<sup>6</sup> Smith et al study reported the most common indication for surgery was suspected malignancy (57%), with surgery for compressive goitre being second most common (24%).<sup>1</sup>

In surgical injury, 74 patients underwent hemithyroidectomy, 16 underwent total thyroidectomy, 7 underwent near total thyroidectomy, 2 underwent completion thyroidectomy and 1 lobectomy. Iqbal et al reported in group A 39(52%) patients underwent STT, 20(26.7%) NTT, 10(13.3%) TT and 6(8%) hemithyroidectomy.<sup>2</sup> In group B 35(46.7%) patients underwent STT, 21(28%) NTT, 12(16%) TT and 7 (9.3%) hemi-thyroidectomy. Kanotra et al.<sup>3</sup> reported out of the 50 patients undergoing thyroidectomies, 22 patients underwent hemithyroidectomy (12 patients underwent right hemithyroidectomy and 10 left

hemithyroidectomy) 11 patients underwent subtotal thyroidectomy, 8 underwent near total thyroidectomy while 9 underwent total thyroidectomy. Sarma et al reported commonest surgical procedure performed was Hemi thyroidectomy (73.6%) followed by total thyroidectomy, near total thyroidectomy, completion thyroidectomy, lobectomy.<sup>6</sup>

This study showed surgical procedure develop 2(2.0%) in hemithyroidectomy. Iqbal et al. observed in group A, 3 (4%) patients developed transient paralysis and 1(1.3%) permanent paralysis of RLN. In group B, 9.3% patients developed partial paralysis while 3 patients were found to develop permanent paralysis of recurrent laryngeal nerve.<sup>2</sup> Sarma et al reported to identify recurrent laryngeal nerve as a routine procedure were done in all cases by meticulous dissection.<sup>6</sup> RLN injury was observed in 3 cases (1.75%) in our study which occurred post hemi thyroidectomy. Hayward et al reported that permanent RLNP occurs in 0.3-3% of cases, with transient palsies in 5-8%, Chaing has reported figures of 5.1% and 0.9% for transient and permanent RLN injury. Xu et al have reported 0.2% incidence of permanent RLN injury in their study in China.<sup>7,12,13</sup> Schulte and Roher reported prevalence of RLN palsy in the range of 0.5%-2.5%, from Australia.<sup>14</sup> In Pakistan, an incidence of 4.7%, both for transient and permanent RLN palsy has been reported in a study by Arif and Ahmed.<sup>15</sup> On the other hand, Shah and Khan have reported it to be 13.5%.<sup>16</sup>

This study showed in patients, on the right side less than 100 nerves were carefully studied and out of these, RLN and other branches were anterior to the artery or its branches in 19(23.8%) cases while it was posterior to the artery in 52(65.0%) cases and was in between in 9(11.3%) patients. On the left side out of the 68 nerves studied, the RLN or its branches were not seen anterior to the ITA or its branches, but were posterior to ITA or its branches in 51(75.0%) cases and was in between the branches of the artery in 17(25.0%) cases. Overall in patients, 19 nerves or its branches were anterior to the artery or its branches, 103 nerves or its branches were posterior to the artery or its branches and 26 nerves or its branches were in between the branches of the artery. Kanotra et al reported on the right side the recurrent laryngeal nerve or its branches were posterior to the artery in 57(57%) cases, anterior in 32(32%) cases and in between in 11 (11%) cases.<sup>3</sup> RLN that were dissected in the study were mainly posterior to the inferior thyroid artery i.e. 125 (66%) of nerves. 45(23.20%) nerves or their branches were anterior to the artery or its branches and 25 nerves (12.89%) or the branches were in between the branches of the artery. Matubis et al observed that 29.6% in anterior, 59.25% in posterior and 11.15% in between groups.<sup>17</sup>

Chandrakala et al reported that 51.22% in anterior, 27.66% in posterior and 21.12% in between groups.<sup>18</sup> Another study Ozguner and Sulak reported that 31.5% in anterior, 35.75% in posterior and 2.25% in between groups.<sup>19</sup>

#### LIMITATION

Sample size was small due to time strains, result would be better if time and size of sample is higher amount.

#### CONCLUSION

The majority of patients had hemithyroidectomy during surgery, with surgical injury developing (2.0%) in hemithyroidectomy. Patients' right sides were assessed, with the majority of instances being posterior to the artery. On the left side, the RLN or its branches were not seen previous to the ITA or its branches, but were seen in the majority of cases posterior to the ITA or its branches.

#### RECOMMENDATION

Every patient needed a proper clinical history associate with histopathological evaluations to diagnose the disease properly.

#### DISCLOSURE

All the authors declared no competing interest.

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