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Distance of Recurrent Laryngeal Nerve in Relation to Superior Parathyroid Gland During Thyroid Surgery

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ABSTRACT

Background: In thyroid surgery, it is essential to identify and preserve recurrent laryngeal nerve to avoid injury to the nerve which will lead to nerve paralysis or paresis. The meticulous dissection of recurrent laryngeal nerve is important for careful identification and preservation of the nerve to prevent post operative vocal cord paresis and hoarseness.

Methods: A single centre prospective, cross sectional study was conducted from May 2019 to January 2021 in Department of ENT and Head and Neck surgery in Kathmandu Medical College Teaching Hospital. The data on distance between recurrent laryngeal nerve and superior parathyroid gland during thyroidectomy were collected.

Results: The mean distance of recurrent laryngeal nerve in relation to superior parathyroid gland during thyroid surgery was 5.03±1.79 millimeters. The recurrent laryngeal nerve lies within 5mm of superior parathyroid gland in 83.05% cases and between 6 and 10mm in 15.25 % of cases.

Conclusions: The recurrent laryngeal nerve is found in the close proximity to the superior parathyroid gland. The visual method of identification of recurrent laryngeal nerve can be widely adopted in thyroid surgery to prevent recurrent laryngeal nerve injury.

Keywords: Anatomical location; recurrent laryngeal nerve; thyroid surgery

INTRODUCTION

The identification of recurrent laryngeal nerve is important during thyroid surgery in order to prevent recurrent laryngeal nerve injury. The relationship of recurrent laryngeal nerve to superior parathyroid gland during thyroidectomy has been assessed in American population. [1]

There are reports of permanent injury to recurrent laryngeal nerve in up to 1.4% and temporary paralysis of recurrent laryngeal nerve in up to 5.4% of thyroidectomy surgery.[2] The careful dissection with meticulous technique for proper identification of recurrent laryngeal nerve will reduce the rate of recurrent laryngeal nerve injury during thyroid surgery.[3] The aim of this study is to determine the anatomical location of recurrent laryngeal nerve in relation to superior parathyroid gland during thyroid surgery.

METHODS

This is a single centre prospective, cross sectional study conducted from May 2019 to January 2021 in Department of ENT and Head and neck surgery in Kathmandu Medical College Teaching Hospital. The study population were the patients admitted in Department of ENT and Head and neck surgery in Kathmandu Medical College Teaching Hospital for thyroid disease. The Ethical Approval was taken from Kathmandu Medical College Teaching Hospital Ethical Committee.

The study unit was patients undergoing thyroid surgery in Department of ENT and Head and neck surgery in Kathmandu Medical College Teaching Hospital. The convenience sampling method was used to conduct the study and the sample size was 59. The Inclusion criteria were age group 20-70 years, benign or malignant thyroid pathology, patients undergoing thyroid surgeries and written informed consent. The exclusion criteria was anatomical variation of recurrent laryngeal nerve. The data on patient demographics, age, sex, thyroid pathology, distance between recurrent laryngeal nerve and superior parathyroid gland were collected. The data was collected during preoperative, intra-operative and post operative period from cases undergoing thyroid surgery. In order to correct the operator bias, the uniform standardized technique was followed for

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recurrent laryngeal nerve dissection.

The patients were informed about the procedure and written informed consent was taken. Preoperatively, the data was collected on patient demographics, type of thyroid surgery and thyroid pathology. Intraoperatively, the data was collected on distance between recurrent laryngeal nerve and superior parathyroid gland.

During the surgery, when one structure will be identified, meticulous dissection was done to identify the other structures and the anatomical relationship and distance between the structures were noted. The identification of recurrent laryngeal nerve was done by utilizing various methods. In case the recurrent laryngeal nerve was identified prior to the superior parathyroid gland, it was subsequently dissected to determine the nerve's closest relationship to superior parathyroid gland. In case the superior parathyroid gland was identified first, careful attempts were made to expose the nerve in its vicinity. When the RLN was identified, dissection was halted and care was taken to preserve the natural distance between the RLN and superior parathyroid gland. The distance from superior thyroid gland to recurrent laryngeal nerve was measured in millimeters using sterile measuring scale (ruler) and recorded. Any aberration or anatomical variation was recorded. The data from right and left thyroid lobes were separately recorded.

The recorded distance between the RLN and superior parathyroid gland was put into one of three categories: 0–5 mm (group A), 6–10 mm (group B) and equal to or over 11 mm (group C).In case the recurrent laryngeal nerve was not identified, it was assumed to be greater than 11 mm from the superior parathyroid gland and included in group C. The post operative hoarseness (which was a measure for ipsilateral vocal cord paresis) and stridor was noted to see for recurrent laryngeal nerve palsy.

The data entry was done in MS Excel and the data analysis was done using SPSS software.

RESULTS

There were 59 cases of thyroidectomy included in the study and 3 were excluded – one each of extralaryngeal bracnch, non recurrent laryngeal nerve and interwining between recurrent laryngeal nerve and inferior thyroid artery. The age of study participants was 41.8±7.9 years. There were 3 males (5%) and 56 females (95%).

Table 1. Types of thyroid pathology in cases undergoing thyroidectomy.

Thyroid pathology		n	
Benign	Colloid goitre	36	61%
	Multinodular goitre	4	6.7%
	Adenoma	4	6.7%
Malignant	Papillary carcinoma	10	16%
	Follicular carcinoma	1	1.6%
	Hurthle cell carcinoma	1	1.6%
	Medullary carcinoma	2	3.3%
	Lymphoma	1	1.6%
	Total	59	

Out of 59 cases undergoing thyroidectomy surgery, 49 (83.0 %) cases were hemithyroidectomy and 10 (16.9 %) cases were total thyroidectomy. During thyroidectomy, lateral approach was adopted in 50 (84.7%) cases , inferior approach in 8(13.5%) cases and superior approach in 1(1.6%) case. The recurrent laryngeal nerve was identified first in 83% and superior parathyroid gland was identified first in 16.9% during thyroidectomy surgery. 2 (3.3%) patients had vocal cord palsy and 1(1.6%) patient had hypocalcemia following thyroidectomy.

The mean distance of recurrent laryngeal nerve in relation to superior parathyroid gland during thyroid surgery was 5.03±1.79 millimeters.

Table 2. Categories of the distance between recurrent laryngeal nerve and superior parathyroid gland

Category	Number	
A (0-5mm)	49	83.05%
B(6-10mm)	9	15.25%
C(>=11mm)	1	1.69%

mm – distance in millimeters

DISCUSSION

The injury to recurrent laryngeal nerve is a serious complication after thyroid surgery. The visual identification of recurrent laryngeal nerve during thyroid surgery will decrease the inadvertent injury to recurrent laryngeal nerve.[4] There are many methods of identifying the recurrent laryngeal nerve during thyroid surgery, but Richer and Randolf have described the three main methods of identification of recurrent laryngeal nerve- lateral, inferior and superior approach.

It has been found that a consistent relationship exists between the recurrent laryngeal nerve and the superior parathyroid gland. This study has shown that the recurrent laryngeal nerve can be identified in majority of thyroidectomy cases (83%) with lateral approach. However, the superior- inferior was identified as safer technique to avoid complications.[5] There are debate as to whether the recurrent laryngeal nerve identification decreases the risk of recurrent laryngeal nerve palsy. The recurrent laryngeal nerve was identified visually or functionally in 98.2% of nerves at risk.[6] RLN injury during thyroidectomy occurs intraoperatively significantly more often to a visually intact RLN than to a transected nerve.[6] The recurrent nerve palsy is less when the recurrent laryngeal nerve is identified during surgery.[7] In our study, the vocal cord palsy was seen in 3.3% . The proportion of vocal cord palsy is less as compared to reported 5.4%.[2] This variation can be due to visual identification of recurrent laryngeal nerve during thyroid surgery.

In addition there will be anatomical variations of recurrent laryngeal nerve which cannot be predicted preoperatively. This increases the inadvertent injury to recurrent laryngeal nerve during thyroid surgery. . There are studies reporting the anatomical variations of the recurrent laryngeal nerve [8-12] such as extralaryngeal branches, distorted recurrent laryngeal nerve, interwining between recurrent laryngeal nerve braches and inferior thyroid artery, and non-recurrent laryngeal nerve. This can have a major role in recurrent laryngeal nerve injury due to visual misidentification. The routine recurrent laryngeal nerve identification is recommended as a basic procedure in thyroid surgery.[4] In our study, there were one case each of extralaryngeal bracnch, non recurrent laryngeal nerve and interwining between recurrent laryngeal nerve and inferior thyroid artery. This study showed that the recurrent laryngeal nerve lies within 5mm of superior parathyroid gland in 83.05% cases, between 6 and 10mm in 15.25 % of cases and >11mm in 1.69% cases. In the US study, the recurrent laryngeal nerve was identified within 5 mm of the superior parathyroid gland in 88.9% and found between 6 and 10 mm from the superior parathyroid gland in 8.1 % of cases [1].The patient population in our part of the world have a different body habitus as compared to Western patient population. The identification of superior parathyroid gland will help to localize recurrent laryngeal nerve during thyroid surgery when recurrent laryngeal nerve cannot be identified initially. In our study, the superior thyroid gland was identified first in 16.9%. The results from this study and the study from the US showed that the recurrent laryngeal nerve was located within 5mm from the superior parathyroid gland in the majority of patients undergoing thyroid surgery (83.0% and 88.9 %).

CONCLUSIONS

The location of recurrent laryngeal nerve lies within 5mm distance laterally from superior parathyroid gland in majority of our population.

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