

Research Article

Recurrent laryngeal nerve injury (RLNI) in thyroid surgery and its prevention

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ABSTRACT

Background: Vocal cord paresis or paralysis due to iatrogenic injury of the recurrent laryngeal nerve (RLNI) is one of the main problems in thyroid surgery. Although many procedures have been introduced to prevent the nerve injury, still the incidence of recurrent laryngeal nerve palsy varies between 1.5-14%. The aim of the present study is to assess the risk factors of recurrent laryngeal nerve injury during thyroid surgery.

Methods: This was a prospective, observational study conducted in the Department of ENT and Head & Neck Surgery, Gauhati Medical College & Hospital, Guwahati for a period of 3 years from 1st October, 2010 to 30th September, 2013. Factors predisposing to recurrent laryngeal nerve injury were evaluated such as pathology of the lesions and the type of operations and identification of recurrent laryngeal nerve intra-operatively. Preoperative and postoperative indirect laryngoscopic examinations were performed for all patients.

Results: A total of 171 cases of thyroid surgery were performed during the study period. Majority of patients were females. The most common pathology observed in the thyroid gland for which surgery was indicated, according to preoperative FNAC report, was colloid goitre. RLN injury was observed in 3 cases (1.75%) in our study which occurred post hemi thyroidectomy. All these cases had unilateral vocal cord palsy.

Conclusion: RLN palsy is one of the common complications after thyroid surgery. Most of the palsy is transient. Meticulous thyroid dissection and identification of RLN during surgery can reduce the rate of RLN palsy.

Keywords: Recurrent laryngeal nerve, Thyroid gland, Palsy

INTRODUCTION

Thyroid surgery is one of the common surgeries performed in head and neck region. Complications such as bleeding, hypoparathyroidism and Recurrent Laryngeal Nerve Injury (RLNI) represent nearly half of all the complications of thyroid surgery.¹ However, different complication rates are reported in literature. The latter complication after thyroidectomy, although infrequently encountered, can jeopardize the quality of life.² The recurrent laryngeal nerve was first identified and named by Galen in the second century.³ 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.

The incidence of RLNI has been found to be higher during re-explorations and thyroid carcinoma procedures.⁴ Therefore, methods that can reduce the incidence of this complication are of great interest.⁵ The most important aspect of effective and safe surgical approach is an adequate knowledge of surgical anatomy and pathophysiology in combination with meticulous handling and dissection of tissue in the correct surgical plane. RLN

is located anterior to the tracheoesophageal sulcus (41.6%), posterior to the inferior thyroid artery (35.8%), lateral to Berry's ligament (88.1%), below the inferior rim of the inferior constrictor muscle (90.4%), and entering the larynx before its terminal division (54.6%).⁶ An almost certain way to ensure the integrity of the RLN is to always identify the nerve during all surgical procedure on thyroid and parathyroid glands.⁷ Anatomy of laryngeal nerve is shown in Figure 1.

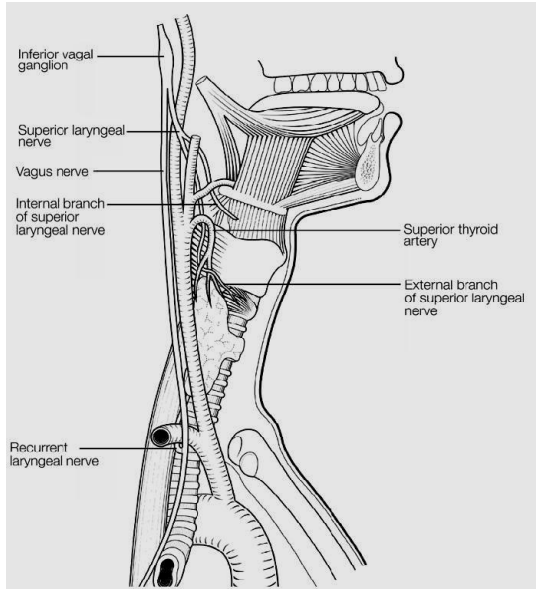


Figure 1: Anatomy of laryngeal nerve.

Aims and Objectives

The aim of the present study is to

- Assess the RLN status during intraoperative and post-operative period.
- To determine the factors influencing the risk of RLN injury during thyroid surgery.

METHODS

This was a prospective, observational study conducted in the Dept. of ENT and Head & Neck Surgery, Gauhati Medical College & Hospital, Guwahati for a period of 3 years from 1st October, 2010 to 30th September, 2013.

Patients undergoing 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.

All 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.

Vocal cords mobility was checked by the operating surgeon at the time of extubation. Postoperatively, indirect laryngoscopy was done on the second and fifteenth post operative day. Postoperative vocal palsy was defined as the presence of immobile vocal cord or decreased movement of vocal cord during phonation. The patients who developed vocal cord paralysis were planned to be followed up on fortnightly basis in the first three months and then at monthly intervals for at least six months. Clinical evaluation of these patients was done regarding any improvement in voice quality or vocal cord function. Post hemithyroidectomy showing RLN in Figure 2.

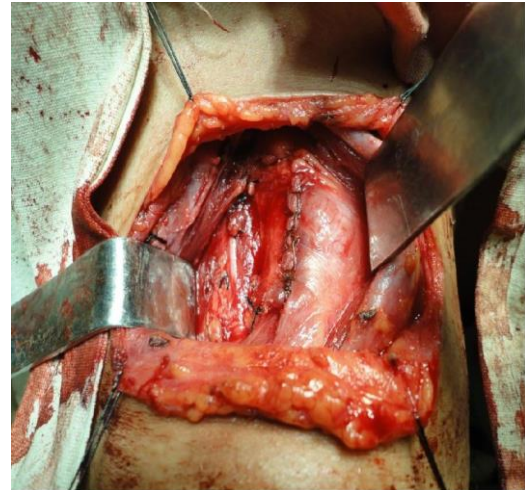


Figure 2: Post hemithyroidectomy showing RLN.

RESULTS AND OBSERVATIONS

A total of 171 cases of thyroid surgery were performed during the study period. Majority of patients were females 90% (154/171). The commonest age group of patients to be operated in this study group was 31-40 yrs. On preoperative evaluation, all cases had normal vocal cords. Figure 3 shows pie diagram of gender distribution. Age distribution of 171 cases are shown in Table 1 and maximum number of patients 38% (65/171) presented in the age group of 31-40 years. Around 81.2% cases (139/171) were in euthyroid status preoperatively, followed by 12.2% cases (21/171) in hypothyroid and 6.4% cases (11/171) in hyperthyroid status. Figure 4 shows pie diagram of thyroid hormone status pre-operatively. 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 multi nodular goitre, papillary carcinoma thyroid, follicular neoplasm, cystic nodule, medullary carcinoma thyroid. Table 2 shows indication for thyroid surgery. Commonest surgical procedure performed was Hemi thyroidectomy (73.6%) followed by total thyroidectomy, near total thyroidectomy, completion thyroidectomy, lobectomy. Table 3 shows surgeries performed. Attempts to identify recurrent laryngeal nerve as a routine procedure were done in all cases by meticulous dissection. RLN injury was observed in 3

cases (1.75%) in our study which occurred post hemi thyroidectomy. All these cases had unilateral vocal cord palsy. These cases were put on speech therapy and were regularly followed up till 6 months. All the cases had temporary palsy and recovered with speech therapy alone. Table 4 shows type of surgery and frequency distribution of RLN injury.

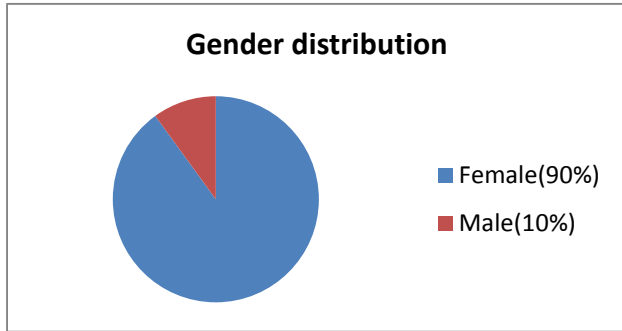


Figure 3: pie diagram showing gender distribution.

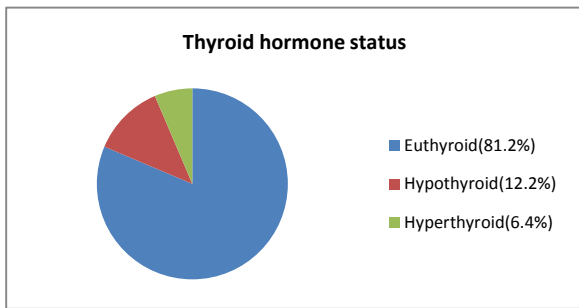


Figure 4: pie diagram showing thyroid hormone status pre-operatively.

Table 1: Age distribution of 171 cases.

Age distribution	No. of cases	Percentage (%)
< 20 yrs	12	7.01
21-30 yrs	38	22.22
31-40 yrs	65	38.01
41-50 yrs	32	18.71
51-60 yrs	19	11.11
>60 yrs	05	2.92
Total	171	100

Table 2: Indication for thyroid surgery.

Indication for surgery (as per pre-op FNAC report)	No. of cases	Percentage (%)
Colloid Goitre	105	61.4
Multinodular goitre	31	18.12
Papillary carcinoma	14	8.18
Follicular neoplasm	11	6.43
Cystic nodule	08	4.67
Medullary carcinoma	02	1.16
Total	171	100

Table 3: Surgeries performed.

Surgery performed	No. of cases	Percentage (%)
Hemithyroidectomy	126	73.6
Total thyroidectomy	25	14.61
Near total thyroidectomy	13	7.6
Completion thyroidectomy	05	2.92
Lobectomy	02	1.16
Total	171	100

Table 4: Type of surgery and frequency distribution of RLN injury.

Operative procedure	No. of cases developing RLN injury	Percentage (%)
Hemithyroidectomy	03	1.75
Total thyroidectomy	--	--
Near total thyroidectomy	--	--
Completion thyroidectomy	--	--
Lobectomy	--	--
Total	03	1.75

DISCUSSION

Recurrent Laryngeal Nerve Injury (RLNI) is a disabling complication of thyroid surgery. Because of the close anatomical relation between thyroid gland and laryngeal nerves, impairment of laryngeal function is a well known possible complication of thyroid surgery. RLNI can lead to temporary or permanent paralysis.

Mechanism of injury to the nerve includes complete or partial dissection, traction, contusion, crushing injury, thermal damage, misplaced ligature or compromised blood supply. Anything that increases local scar formation e.g. thyroiditis, previous surgery and radiation, increases the chances of RLN injury.⁸

The consequence of RLN injury is the true vocal fold paresis or paralysis with varying degrees of symptoms and signs depending upon the severity and side of involvement. Unilateral RLN injury causes the ipsilateral vocal cord to remain in the median or paramedian position. The voice may be hoarse. The patient's cough is weak, and aspiration may occur. Presentation is often sub acute. Definite voice changes may not manifest for days or weeks. The paralyzed vocal fold undergoes atrophy, causing voice to worsen. Dysphagia and aspiration are other potential sequelae of unilateral vocal fold paralysis.⁹

Bilateral RLN paralysis may manifest immediately after extubation and patient exhibit signs of airway obstruction in the immediate postoperative period. Bilateral RLN injury is a severe, life threatening complication that

results in airway obstruction and aspiration and requires immediate attention. In this condition, both vocal cords remain in a median or paramedian position. As a result, the patient exhibits inspiratory stridor, dyspnoea, tachypnoea, and nasal flaring, although the voice is near normal.^{9,10}

RLN injury is an annoying but avoidable complication which results from severing, clamping or stretching of the nerve during surgery and may result in severe untoward sequelae for the patient.⁸ Routine exposure of RLN throughout its course has been shown to reduce the rate of nerve injury.¹¹ By adopting this principle, nerve injury rate of zero has been reported in the literature even after total thyroidectomy for thyroid cancer.¹² Conversely, when nerve is not clearly identified, the reported injury rate is three to four times higher.⁸

RLN injury is a major concern in thyroid and parathyroid surgery. Therefore, methods that can reduce the incidence of this complication are of great interest.¹³ 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.¹⁴ Proper assessment of vocal cord functions by indirect and direct laryngoscopy, pre and post operatively, is necessary to rule out injuries to these nerves during surgery.⁵

Review of literature revealed that the prevalence of RLN palsy varies from centre to centre depending upon the level of experience in thyroid surgery and the nature of surgery. Aytac and colleagues¹⁵ reported 3.5% and 1.2% incidence of transient and permanent RLN injury, respectively and Hayward *et al.*,⁷ reported that permanent RLNP occurs in 0.3-3% of cases, with transient palsies in 5-8%, Chaing¹⁴ has reported figures of 5.1% and 0.9% for transient and permanent RLN injury. Xu and colleagues¹⁶ have reported 0.2% incidence of permanent RLN injury in their study in China. Schulte has reported prevalence of RLN palsy in the range of 0.5% - 2.5%, from Australia.¹⁷ In Pakistan, an incidence of 4.7%, both for transient and permanent RLN palsy has been reported in a study by Arif and his colleagues.¹⁸ On the other hand, Shah and his colleagues¹⁹ have reported it to be 13.5%. Incidence of RLNI is about 6.9% in video assisted thyroid surgery.¹¹

Proper exposure of the nerve and careful dissection especially in the region of the ligament of Berry is the key to functional and structural preservation of the nerve. Intra operative nerve monitoring significantly reduces the incidence of RLN palsy with better clearance of thyroid as evidenced by post-operative radio iodine scan.²⁰ However, there is no significant difference in incidence of nerve injury between intra operative nerve identification and visualisation of the nerve alone.²¹

The potential for recovery is generally proportional to the degree of injury, although clinical factors such as unrecognized severity of injury and delay in the diagnosis have precluded establishing an exact relation. This principle underlies the policy of watchful waiting in certain surgical etiologies, where nerve is known or even suspected to be intact.⁸ Any corrective procedure is not recommended for unilateral vocal cord paralysis until at least six months because a reversible injury may improve by that time.¹⁸ Corrective procedures include thyroplasty procedures and reinnervation using the Ansa.²² Compared to conventional surgery, robotic thyroid surgery is associated with significantly higher chance of temporary RLN palsy.²³

In our study, all the cases were evaluated both pre-operatively and post-operatively for vocal cord paralysis. We tried to identify RLN in every case and preserve it. We reported 3 cases (1.75%) of RLN palsy in our series which occurred following hemithyroidectomy. They were temporary palsy and all the cases recovered within three months of speech therapy.

CONCLUSION

Recurrent laryngeal nerve palsy is one of the common complications after thyroid surgery which can be avoided by meticulous thyroid dissection and identification of RLN during surgery. Majority of nerve lesions are transient which shows recovery within six months of surgery. Adequate identification and monitoring is the key to functional preservation of the nerve. Definitive procedures for corrective treatment of RLN injury should not be considered for at least six months after surgery.

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