



Tubercle of Zuckerkandl as a Landmark for Identification of Recurrent Laryngeal Nerve Enabling Safe Thyroid Surgery- A Prospective Comparitive Study

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Abstract

Introduction: During thyroid surgery identification of Recurrent laryngeal nerve (RLN) is an essential step, as any injury to it will lead to hoarseness or loss of voice. Tubercle of zuckerkandl (TZ), a projection from the postero-lateral aspect of throid lobe, is a useful landmark in the identification of RLN which usually runs in its vicinity.

Aim & Objective: The aim of this study is to demonstrate the effectiveness of RLN identification using the ZT as an anatomical landmark in comparison with the usual infer superior dissection of the tracheoesophageal groove.

Study Design: A prospective comparitive study was carried on two groups of patients who underwent total thyroidectomy for multinodular goitre at general surgery department, narayana medical college, nellore. In one group RLN was identified by taking TZ as landmark and in other group RLN was identified with inferosuperior dissection of tracheoesophageal groove during thyroidectomy. Post operatively RLN integrity was recorded by vocal cord examination and both groups compared.

Results: A total of 70 patients underwent total thyroidectomy, 21 females and 49 males. 38 underwent RLN identification using TZ as landmark (group A) and 32 underwent RLN identification by trcheoesophageal groove dissection (group B). The mean age of patients in both groups was equal. the incidence of RLN injury in group B was higher than in group A with statistically significant numbers.

Conclusion: The findings of our study confirm that using TZ as landmark for identification of RLN is associated with low risk of injury to the latter thus enabling safe thyroid surgery.

Keywords: Total Thyroidectomy, Tubercle of Zuckerkandl, Recurrent laryngeal nerve.

Introduction

Among the complications associated with thyroid surgery, recurrent laryngeal nerve injury is a common and severe one which results in hoarseness and loss of voice. A detailed knowledge of the anatomical relations, variations and course of RLN is essential for safe thyroid surgery. RLN injury can result from clamping, stretching, transection, electro thermal injury, ligature entrapment, or ischemia.

Visualization of the RLN during thyroid surgery is absolutely vital for good surgical outcome because many studies report decreased incidence of vocal cord injury with visualization.

Different surgical landmarks have been proposed for locating the RLN, but none of them are universally accepted. These include Simone's triangle, relation with the inferior thyroid artery, relation with the inferior pole of the thyroid gland etc. Alternatively some centres follow intraoperative electrophysiological monitoring for RLN identification.

The tubercle of Zuckerkandl (TZ) is an important anatomic landmark that can be used for the identification of the RLN intraoperatively. It is located between the superior and inferior poles, pointing toward the tracheoesophageal groove. The TZ is a lateral or posterior projection from the lateral thyroid lobe, which indicates the point of embryologic fusion of the ultimobranchial body and principal median thyroid process⁽¹⁾.

TZ was first described by the Viennese anatomist, Emil Zuckerkandl, in 1902. RLN during its course in tracheoesophageal groove runs medial to TZ in majority of cases. In few patients it runs lateral to TZ. This landmark has been frequently overlooked in surgical textbooks.

Methods

This was a prospective comparative study done on 70 consecutive patients, attending general surgery OPD Narayana Medical College Nellore, who came for total thyroidectomy during the period January 2014 to January 2015. Written informed consent was taken from all patients. Ethics committee

approval was taken with no conflict of interest or financial or professional issues.

Inclusion criteria were all cases undergoing total thyroidectomy for benign disease⁽²⁾. Indirect laryngoscopy was done on all patients 3 days prior to surgery and integrity of vocal cords established. Patients with malignant thyroid disease, recurrent thyroid lesions and preoperative vocal cord weakness were excluded from the study.

Patients were randomized into two independent groups-group A and group B, according to the technique of RLN identification that would be used. Surgery was performed by two surgeons, who have at least 5 years of experience in thyroid surgery, with each surgeon performing one technique.

Group A included 38 patients. Identification of RLN was achieved by initially dissecting TZ and using it as landmark⁽³⁾. Group B included 32 patients. Identification of the RLN was achieved by carrying out infer superior dissection in the tracheoesophageal groove.

Total Thyroidectomy was done by a standard method. After taking a transverse skin crease incision, flaps raised, investing layer of deep fascia and strap muscles opened in the midline, thyroid gland retracted medially thus opening the tracheoesophageal groove. In group A patients, tubercle of Zuckerkandl is identified first which usually lies midway between upper pole and lower pole pointing towards tracheoesophageal groove. By retracting and lifting TZ, close to it RLN is identified in a tunnel which is then traced to its entry into larynx and thus preserved⁽⁴⁾. In group B patients just blunt dissection is carried along tracheoesophageal groove from inferior to superior and in the process RLN is identified, traced and preserved. In both the groups after RLN is traced, upper pole and lower pole clamped and divided and thus thyroidectomy completed⁽⁵⁾.

Vocal cords of all the patients were examined during extubation and their status documented. Later all the patients were subjected to indirect laryngoscopy after 48 hours and again the status of vocal cords documented. A well preserved voice, normal position and normal movement of

vocal cords was considered as no injury to RLN. the converse of above findings was considered as injury to RLN ⁽¹⁰⁾. Thereafter, all the patients were followed up twice weekly for 6 months to look for any signs of delayed presentation of RLN injury and improvement in already injured cases. after 6 months of followup cases were finally tagged as having nerve injury or not ⁽¹¹⁾.

Statistical Methods

Descriptive statistical analysis has been carried out in the present study. SPSS 15.0 Statistical software was used for the analysis of the data and Microsoft word and Excel have been used to generate tables etc. Results were presented as Mean±SD. Unpaired t test, ANOVA and Chi-square test were used to test significance between two groups. P value is considered to be significant when it is less than 0.05 ($P < 0.05$).

Results

In this comparative study involving 70 patients two groups were formed. 38 people belonging to group A underwent total thyroidectomy by the procedure where RLN identified by using TZ as landmark. 32 people assigned in group B underwent total thyroidectomy by procedure where RLN identified by inferosuperior dissection in tracheoesophageal groove. 53.8% patients had multinodular goitre in group A and 51% in group B, and 46.2% had colloid goiter in group A and 49% in group B. The mean ± SD age (years) was 40.5±8.59 group A and 40.5±9.5 in group B, but Samples are age matched with $P=1.00$. In group B 62.5% were males and 37.5% were females. And in group A 76.3% were males and 23.7% were females. The incidence of RLN injury was compared in between the two groups. In group A one case of RLN injury was documented (2.63%) whereas in group B 5 cases of RLN injury were noticed (15.62%) thus exhibiting a statistically significant difference with a p value less than 0.05

Clinical parameters	Group A		Group B	
	number	percentage	number	percentage
Age in years				
21-30	2	5.2	2	6.25
31-40	20	52.7	18	56.25
41-50	12	31.6	8	25
51-60	3	7.9	2	6.25
>60	1	2.6	2	6.25
total	38	100	32	100
Gender	number	percentage	number	percentage
Male	29	76.3	20	62.5
Female	9	23.7	12	37.5
Total	38	100	32	100

COMPLICATIONS		
	RLN injury-no of cases	RLN injury-percentage
Group A	1 in 38 cases	2.63%
Group B	5 in 32 cases	15.62%

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Discussion

TZ being located lateral to the RLN in most of the cases because of its embryological development, it can be considered as a useful landmark for the formers identification during thyroid surgery⁽⁶⁾. The TZ is a very useful landmark for identification of the RLN, as it is nearly always lateral to the nerve, based on its embryological development. previously, it was the usual practice of most surgeons to identify the RLN low in the tracheo-oesophageal groove early during the course of thyroidectomy. This technique makes the surgeon to extensively follow the RLN along its cervical course, which may increase the risk of nerve injury and increase the risk of compromising blood supply to the parathyroid glands. From our study we have found that TZ is very useful in aiding RLN identification, as the nerve is nearly always just medial, and readily apparent once the TZ is freed and reflected medially⁽⁷⁾.

For decades there were two schools of thought regarding RLN dissection during thyroid surgery, one version saying that trying to dissect RLN leads to more chances of nerve injury and hence its better not to see nerve at all. another school of thought says that its better to dissect RLN to prevent its injury. However it has been repeatedly shown that in experienced hands identification of the nerve is not accompanied by an increased rate of nerve palsy. Several prospective multicentric studies have confirmed this⁽⁸⁾.

Among several studies on TZ, Sheahan and Murphy's study endorsed the use of TZ as landmark for safe thyroid surgery whereas studies done by asgharpour et al denied it.

We do believe that a correct technique of thyroidectomy requires routine direct visualization and identification of the RLN, especially in huge thyroids and in those with retrosternal extension for which safe tracheoesophageal groove dissection for RLN identification is rather difficult. Only careful dissection of the RLN allows its subsequent protection, with less nerve damage. Finally, we have been considering the ZT

as a useful anatomical landmark for tracing the RLN during thyroid surgery. We consider this to be an improvement in thyroidectomy because of the almost constant relationship of the tubercle to the nerve at the level where there is a great risk of injury, although it does not guarantee the postoperative outcome of vocal fold palsy⁽⁹⁾.

The usual method of tracing the RLN by dissecting along the entire cervical RLN may result in palsy because of excessive exposure of the nerve. However, the technique of RLN identification using the ZT, thus avoiding the dissection of the actual nerve, might even reduce the incidence of temporary palsy of the RLN, especially in cases of huge goiters⁽¹²⁾.

Conclusion

Tubercle of Zuckerkandl is a very useful landmark in identification of Recurrent laryngeal nerve during thyroidectomy thus enabling safe thyroid surgery with low risk of nerve injury.

Disclosure Statement

None of the authors have any conflicts of interest to declare.

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