ORIGINAL ARTICLE

Zuckerkandl Tubercle: An Important Landmark in Thyroid Surgery

Zahid Mehmood, Usman Khan, Iram Bokhari, Adeel Hussain, Anis Subhan and Mehvish Nazeer

Abstract

Objective: To find out the frequency of Zuckerkandl Tubercle (ZT) and the position of recurrent laryngeal nerve with reference to ZK.

Study Design: Cross-sectional observational study.

Place and Duration of Study: Surgical Ward-3, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from June 2010 to August 2011.

Methodology: Patients having goiter, aged between 12 - 60 years were admitted through OPD and operated after informed written consent. After admission, they underwent surgery. ZT and recurrent laryngeal nerve position i.e. whether medial, lateral or posterior to ZT was identified during surgery. Data was collected on pre-designed proforma and analysed on SPSS version 15 for descriptive statistics.

Results: Out of the 84 patients ZT was found in 52 (61.90%) patients. Nineteen patients had grade-I (less than 0.5 cm), 22 (42.3%) had grade-II (0.5 - 1 cm) and 11 (21.1%) had grade-III (more than 1 cm) ZT. During surgery, 33 (63.4%) patients had recurrent laryngeal nerve medial to ZT, 15 (28.8%) patients had lateral and in 4 (7.6%) patients recurrent laryngeal nerve was engraved posteriorly.

Conclusion: Zuckerkandl tubercle was found in about 62% cases; recurrent laryngeal nerve was located pre-dominantly medial to ZT.

Key Words: *Zuckerkandl tubercle. Recurrent laryngeal nerve. Thyroidectomy.*

INTRODUCTION

Thyroid gland develops as the midline descent of the thyroid tissue from the foramen caecum to the level of the larynx along the thyroglossal tract. It descends anterior to the pharyngeal gut, as a bilobed diverticulum and remains connected to the tongue by the thyroglossal duct, which disappears later.[1] At this stage, the thyroid tissue develops into right and left lobes of thyroid gland. There is also a lateral thyroid gland component which arises from the 4th branchial cleft and ultimobranchial body which fuses with the median components of the Thyroid gland to form a tubercle known as Zuckerkandl tubercle. This tubercle is the most posterior pyramidal extension of pure thyroid tissues of the lateral lobes of the thyroid gland in the area of the ligament of Berry.[2] Superior parathyroid gland is also derived from the 4th brachial cleft so is commonly found in close association with that tubercle, usually cephalad to that tubercle.

This tubercle is usually found in the cleft between trachea and oesophagus which is a common pathway of recurrent laryngeal nerve. It may be mistaken for a thyroid nodule or mass or lymph node. It is a projection of normal thyroid tissue from the posterior or lateral lobes of the thyroid gland. It has been used as an anatomical landmark for location of the inferior laryngeal nerve.[3] Early elevation of this tubercle usually allows the identification of recurrent laryngeal nerve,[4] which can be easily and safely encountered even though it is not initially visible. It is classified into three grades according to size: (I) < 0.5 cm, (II) 0.5 to 1 cm, (III) > 1 cm.[5] Sometimes a large tubercle is associated with significant pressure symptoms in otherwise small-sized goitres. An understanding of the consistent anatomical relationship between the ZT and recurrent laryngeal nerve and superior parathyroid gland is crucial for safe thyroidectomy.[6,7]

This study aimed to determine the common location of this tubercle so that it can be used as an important landmark for preservation of recurrent laryngeal nerve during thyroid surgery.

METHODOLOGY

This cross-sectional study was conducted at Surgical Ward 3, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from June 2009 to January 2011. Patients were included in this study by non-probability purposive sampling. All patients of either gender having goitre, aged 12 - 60 years, were included in this study. Patients who were operated previously for thyroid diseases, with huge multinodular goitre and having thyroid malignancy were excluded from this study. All patients admitted through OPD after initial workup of history, examination and investigations including thyroid harmone profile,

Department of Surgery, Ward 3, Jinnah Postgraduate Medical Centre, Karachi.

Correspondence: Dr. Iram Bokhari, 62/II B, Street No. 5, Off Khayaban-e- Momin, Phase V, DHA, Karachi. E-mail: i_bokhari@hotmail.com

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ultrasound, Fine Needle Aspiration Cytology (FNAC) and other baseline examination. After complete initial workup and informed consent patients were enrolled in this study. The size of ZT in cm and the position of recurrent laryngeal nerve to ZT i.e. whether medial, lateral or posterior to ZK was identified during surgery. Thereafter, identification was made under the supervision of a consultant surgeon.

The data was collected in a proforma and analyzed on SPSS version 15. Frequencies and percentages were determined for categorical variables while mean and standard deviation values were determined for numerical variables.

RESULTS

Eighty four patients were included in this study. The female to male ratio was 6.6:1 (73 females and 11 males). Mean age of the patient in this study was 35 ± 7 years. Twenty four (28.5%) patients underwent right lobectomy, 27 (32.1%) patients left lobectomy, 25 (29.7%) patients underwent subtotal thyroidectomy and 8 (9.5%) patients underwent total thyroidectomy. ZT was found in 52 (61.90%) patients. Nineteen patients had grade-I (less than 0.5 cm), 22 (42.3%) had grade-II (0.5 to 1 cm) and 11 (21.1%) had grade-III (> 1 cm) ZT (Table I). During surgery, 33 (63.4%) patients had recurrent laryngeal nerve located medial to ZT, 15 (28.8%) patients had lateral and in 4 (7.6%) patients, recurrent laryngeal nerve was engraved posterior.

Table I: ZT grades in this study (n=52).

ZT grade	Number of patients
Grade-I (< 0.5)	19 (36.53%)
Grad-II (0.5 - 1 cm)	22 (42.3%)
Grade-III (> 1 cm)	11 (21.1%)

DISCUSSION

Thyroid surgery is frequently performed worldwide with various known complications like hematoma, respiratory difficulty, Recurrent Laryngeal Nerve (RLN) injury, hypothyroidism, hypoparathyroidism, wound infection, stitch granuloma and keloid formation. Thus, the safety of thyroid operations mainly depends on complete knowledge of the embryology, anatomy, and topography of the thyroid gland and related vascular, nervous structures and parathyroid glands including all potential variations.[8] Therefore, a thyroid surgeon must have intimate knowledge of all the structural and anatomic variants and relations of the gland. Regarding all these complications recurrent laryngeal nerve preservation is of utmost importance during surgery. Its localization and the identification of its course is of great importance during thyroid surgery.

Emil Zuckerkandl (1849 - 1910), described a lateral projection of the thyroid gland, as the tubercle of Zuckerkandl, extending off posterior and lateral to the thyroid lobes.[9,10] It has a relationship with the RLN at its distal part documented in many patients.[11] Ultrasound of large multinodular goitres as well as anatomical landmarks are important in patients with large multinodular goitres.[8] Even an enlarged ZT (grade-III) displacing RLN may increase injury risk to the nerve during total thyroidectomy.

ZT is generally found in 63 - 80% of patients undergoing thyroidectomy and is located between the superior and inferior lobes and points toward the trachea-esophageal groove.[12] This study showed that this tubercle was found in 61.90% of the patients. Gauger *et al*. concluded that ZT was present in 63% patients.[6] Gurleyik and Gurleyik found it in 66% of the cases.[13] Kaisha *et al*. found ZT in 59%,[14] Hisham and Lukman in 55%[11] and Yalçin *et al*. found it in 55.2% patients.[2] It were identified in most patients by Yun *et al*. (right 89.3%, left 85.6%).[15] On the other hand, Page *et al*. identified ZT only in 7% of their patients.[16] The most common range of finding tubercle in thyroid swelling is from 55% to 70% and the present results also followed in this range.

This posterior thyroid tubercle is an important surgical landmark due to its close proximity to the recurrent laryngeal nerve.[17] The ZTs were graded according to Pelizzo as grade-0, unrecognizable; grade-I, only a thickening of the lateral lobe; grade-II, smaller than 1 cm; or grade-III, larger than 1 cm.[20] The ZT was found situated at the middle third of lateral lobe of thyroid gland in 48 sides (82.7% of 58 sides). Yalçin *et al*. reported an incidence of grade-II and III tubercles as 64% and 65% in lateral lobes.[2] Yun *et al*. found grade-II and III ZT in 68% (right side 72% and left side 64%) of lateral lobes.[15] Bilateral occurrence of ZT is a less common observation as reported in 25% of patient included in series of total thyroidectomy cases in the study done by Gurleyik.[13] Gauger *et al*. reported (bilateral) ZT in 15% of their patients.[6] Grade-I ZT was found in 36.5% patients in this study which is higher than Cannizzaro[18] who found grade-I ZT in only 5% thyroids. Grade-II ZT was found in 42.3% patients in this study which is almost near to Cannizzaro's reported who found grade-II ZT in only 50% thyroids. In this study, grade-III ZT was found in 21.1% which is less than that reported by Gauger,[6] Gravante[12] and Cannizzaro (45%).[18] Thus, a high incidence of presence of this tubercle indicated it as an important landmark for preservation and identification of vital structures thereby minimizing complications associated with thyroid surgery.

Injury to the recurrent laryngeal nerve may result in profound life-long consequences for the patient.[19] In addition to serving as a useful landmark, awareness of the ZT is important to ensure complete removal of all thyroid tissue during total thyroidectomy, as failure to remove the entire ZT may be a source of persistent radioiodine uptake in thyroid cancer cases, or even of recurrent thyroid mass in cases of multinodular goiter, as may be seen after subtotal thyroidectomies. The ZT is a very useful landmark for identification of the recurrent

laryngeal nerve,[20] as it is nearly always lateral to the nerve, based on its embryological development. In the past, it was the usual practice of most surgeons to identify the recurrent laryngeal nerve low in the tracheo-oesophageal groove during thyroidectomy. This allowed for safe early identification of the RLN; however, it obliges the surgeon to extensively follow the recurrent laryngeal nerve, which may increase the risk of compromising parathyroid glands blood supply. This is obviated by identifying the nerve only at its termination, around Berry's ligament. However, the nerve can be difficult to find in this location, and may be confused with terminal branches of the inferior thyroid artery.

The most common relation of recurrent laryngeal nerve to Zuckerkandl tubercle was medial to it, (33 out of 52 patients, 63.4%) slightly more than Yalçin *et al*.[2] who found the nerve medial to tubercle in 55.2% patients. However, other studies also described the medial position to be the most common site for presence of recurrent laryngeal nerve in relation to ZT.[13,15] In this series second most common relationship of finding the recurrent laryngeal nerve was lateral to ZT in 15 out of 52 patients (28.8%) and in a few patients it was also found engraving through the posterior part of the Zuckerkandl tubercle. In one study,[6] nerve was commonly found engraving posterior through the tubercle. However, they did not specifically mention the number of patients included in study and what exactly was the position of the nerve. Thus, variable results have been observed in this regard and in most cases nerve was found medial to tubercle. It is also described as an arrow pointing towards an enlarged nerve.[20,21] Therefore, the surgeon must be aware of the tubercle, and must locate the ZT with care.[22] Identification of the ZT, exposing the recurrent laryngeal nerve during operation seems to decrease permanent recurrent laryngeal nerve injury.[23] Thus, an understanding of the relationship between the ZT and RLN, and isolation of the nerve before dissection of ZT are essential for performing safer thyroidectomy, a common procedure which is performed worldwide.[24]

CONCLUSION

ZT present in the majority of cases serves as an important landmark in thyroid surgery to save the recurrent laryngeal nerve which is often located medial to it.

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