Annals of Medicine and Surgery 7 (2016) 92–96

Contents lists available at ScienceDirect

Annals of Medicine and Surgery

journal homepage: www.annalsjournal.com

Zuckerkandl tubercle in thyroid surgery: Is it a reality or a myth?

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HIGHLIGHTS

- Zuckerkandl tubercle (ZT) is a lateral projection from the lateral thyroid lobe.
- Even today, ZT and its relationship with recurrent laryngeal nerve (RLN) is not well known by all surgeons.
- If it is present, ZT is a real constant landmark pointing to the RLN.
- In order to find and protect RLN during thyroid surgery, a careful dissection should be carried out around the ZT.

ARTICLE INFO

Article history:
Received 27 February 2016
Received in revised form
24 March 2016
Accepted 24 March 2016

Keywords:
Zuckerkandl
Thyroid
Landmark
Laryngeal nerve

ABSTRACT

Background: Zuckerkandl tubercle (ZT) is a lateral projection from the lateral thyroid lobe which is a constant landmark for finding the recurrent laryngeal nerve during thyroid surgery. It is the condensed thyroid parenchyma located in the cricothyroid junction. Even today, ZT and its relationship with recurrent laryngeal nerve (RLN) is not well known by all surgeons. The objectives of the present study were to find out the incidence of ZT in our thyroidectomies and to investigate whether the ZT has a relationship with RLN. We also discussed how to prevent RLN injury during thyroidectomy.

Materials and methods: One hundred operations were performed by the same surgeon included in this study. All operations performed with intraoperative neuromonitorization (IONM) for proving the visualization of RLN. In each patient, particularly the ZT and its relationship with RLN searched and recorded. We also analyzed the patients in terms of sex, age, clinical diagnosis, and types of performed operations.

Results: In 100 operations, 173 thyroid lobectomies were considered. 87 of these lobectomies were in right side and 86 in left side. The ZT was determined in 127 of 173 (73.41%) lobectomies. ZT was detected in 68 (78.16%) of right thyroid lobes whereas in 59 (68.60%) of left thyroid lobes. We observed that the ZT was detected more frequently in the right side. In 115 (90.55%) of these occasions, the recurrent nerve was directed upwards covered by the ZT.

Conclusions: If it is present, ZT is a real constant landmark pointing to the RLN. In order to find and protect RLN during thyroid surgery, a careful, bloodless, and meticulous dissection should be carried out around the ZT. Although our results are encouraging, further researches are still needed on this topic.

1. Introduction

The recurrent laryngeal nerve (RLN) is very important for airway and voice quality. Unilateral injury of the RLN during thyroid surgery can cause hoarseness of voice and dysphagia. The consequences are more severe and life-threatening in bilateral injuries, which may compromise the airway and necessitate immediate tracheostomy. Rates of RLN injury are reported to be as high as 10%. The RLN identification and protection during thyroid surgery is essential for avoiding intraoperative RLN injury [1–9].

In 1902, Emil Zuckerkandl (1849–1910), an Austrian anatomist described a protuberance which arises from the posterior border of thyroid lobes [1]. He named this protubarance as processus posterior glandulae thyroidea [2]. It is commonly seen as a thickening or a nodule in the posterior aspect of the gland. Today it is called Zuckerkandl tubercle (ZT) [3,4]. Thirty-six years later, Gilmour described a possible relationship between ZT and the recurrent nerve, he also mentioned its proximity to the upper parathyroid glands. However, this anatomical relationship, did not attract the attention of surgeons during the subsequent half century. Today it is accepted by some authors that this structure is usually present as

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http://dx.doi.org/10.1016/j.amsu.2016.03.030

a lateral projection from the lateral thyroid lobe with a close relationship to the extralaryngeal termination of the recurrent laryngeal nerve [1–6]. They suggested that, it may be a useful landmark to find and protect the RLN during thyroid surgery but others do not agree [7]. Additionally, some authors were reported that leaving ZT in the operation field may cause an insufficient surgery [3–6].

The primary objective of the present study was to find out the incidence of ZT in our thyroidectomies and our secondary objective was to investigate whether the ZT has a relationship with RLN. We also discussed how to prevent RLN injury during thyroidectomy.

2. Materials and methods

2.1. Study design and the extent of surgery

This study was approved by the ethics committee of the Adana Numune Research and Training Hospital. The present study was designed as a descriptive study and carried out on patients who underwent thyroid surgery from 1st January 2013 to 31st December 2015. 113 operations performed under IONM of RLN in our hospital. 13 of these operations were complementary surgery which were referred from other hospitals did not included in this study. The inclusion criteria were all cases of primary total thyroidectomy or lobectomy, with or without central neck dissection. Revision surgical cases and operations performed without IONM were excluded. 100 operations included in this study. Operations were performed by the same medium volume surgeon (50–70 thyroidectomies/year) (Oİ). The IONM was strictly used in all cases in order to prove the dissection and visualization of RLN. The mean age of the patients was 47 years, ranging between 18 and 82 (M/F was 15/85). There were 73/100 total thyroidectomies (73%), and 27/100 hemithyroidectomies (27%). Of the hemithyroidectomies, 14/27 were right and 13/27 were left. So we were able to analyse 173 thyroid lobe (87 right and 86 left) (Table 1). We also analyzed the structure in terms of sex, age, clinical diagnosis, and types of operations. The datas were recorded according to observation sheets and operation datas.

2.2. Surgical technique

All operations were performed on patients under general anaesthesia by one experienced surgeon (Oİ). A similar thyroidectomy technique was choosed to perform which is also used with Pelizzo et al. [8] who were described ZT classification [8]. In this technique, an approach to the RLN from Zuckerkandl tubercle was preferred instead of classically using inferior thyroid artery as an anatomic landmark. The phases of operation is almost all the same as in the current standard procedure [8,9]. Firstly, the middle thyroid vein sectioned in order to achive a good thyroid mobilization and making visible the cricothyroid space. Secondly, the superior pole vessels are ligated and divided carefully with protecting the external branch of the superior laryngeal nerve after that the inferior thyroid veins are subsequently divided also [8–10]. Thirdly, after the thyroid lobe is gently retracted to medial, it released from the surrounding thin areolar tissue by bloodless blunt dissection. The extra capsular plane was followed for dissection [10]. Fourthly, we begin the RLN dissection with delicate workmanship by looking specifically for Zuckerkandl tubercle. It is easy to identify, if it is well-developed. As it is described by Pezillo [8], when it is encountered, the tuberculum looks like an arrow pointing toward the nerve. Frequently the nerve runs in a tunnel deep behind the tubercule. Additionally, the nerve may lies in front when the tuberculum is a very small lateral projection or only a thickening of the lateral edge of thyroid lobes [8–14]. In each patient, the ZT searched. If present, its relationship with RLN investigated and then recorded. To avoid a RLN injury, the dissection should be done very carefully. The crucial aspect of RLN dissection in this region is to dissect beyond the lateral border of the tubercle and lift it up to ensure that the RLN is not damaged. We do not carry out subtotal thyroidectomies.

All operations performed with intraoperative neuromonitorization (IONM) for proving the visualization of RLN. We facilitated the visual identification of the RLN via the IONM system, with the nerve mapping technique. Once, we carefully identified the RLN, repeated stimulations with the monopolar probe of the IONM system served to trace the nerve path in the operative field. We always tested its functional integrity during dissection and before finishing the operation.

Table 1
Indications of patients for thyroid surgery.

Operation indication	n
Multinodular goitre	28
Malignancy or suspicion of malignancy in FNAC	22
Graves-Basedow disease	6
Follicular neoplasia	6
Hurtle cell neoplasia	2
Toxic multinodular goitre	8
Toxic nodulary goitre	6
Nodulary goitre	22
Total	100

2.3. Characteristics of patients

The preoperative clinical indications for thyroid surgery as follows: Multinodular goitre in 28 patients, malignancy or suspicion of malignancy in FNAC in 22 patients, Graves-Basedow disease in 6 patients, follicular neoplasia in 6 patients, hurtle cell neoplasia 2 patients, toxic multinodular goitre in 8 patients, toxic nodular goitre in 6 patients, and nodular goitre in 22 patients. The characteristics of the patients are presented in (Table 1). In the excluded patients, operation indications were for recurrent multinodular goitre (4 patients) and malignancy (9 patients).

2.4. ZT classification

We studied the percentage of cases in which the ZT was certainly detected and when it appeared in the right lobe and when in the left lobe. Size of the tubercle was measured intraoperatively by using a sterilized needle with calibrations in millimeters. We modified the classification system described by Pelizzo et al. [8] because according to that grading system, grades 0 (unrecognizable) and 1 (only a thickening of the lateral lobe) tubercles may not help surgeon to indicate the location of the nerve and can not be applied from a surgical perspective. Therefore, we revised the grading system as grade 0/1: when the ZT was not recognised; grade 2: the ZT is less than 10 mm; grade 3: the ZT is more than 10 mm.

3. Results

There was no RLN injury in this study. Of the 173 thyroid lobectomies considered. 87 of 173 lobectomies were performed in the right side whereas 86 were in the left side. we located the ZT in 127 of 173 (73.41%) lobectomies. In the RL, ZT detected in 68 of 87 (78.16%) lobectomies whereas it is existed in 59 of 86 (68.60%) left lobectomies. We observed that the ZT was detected more frequently in the right side. The ZT was not detected in 46/173 thyroid lobectomies (26.58%).