


Can the Zuckerkandl tubercle assist in the location of the inferior laryngeal nerve during thyroidectomies?

O tubérculo de Zuckerkandl pode auxiliar na localização do nervo laríngeo inferior durante tireoidectomias?

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ABSTRACT

Objective: to evaluate whether the lateral projection of the thyroid gland, called Zuckerkandl's tubercle (ZT), can assist the surgeon in identifying the inferior laryngeal nerve during conventional open thyroidectomy. **Methods:** we conducted a prospective study with 51 patients submitted to thyroidectomy, with a total of 100 resected thyroid lobes, and observed the presence or absence of ZT in sufficient dimensions to be identified without image magnification, its base and height, its location in the gland, and its anatomical relationship with the inferior laryngeal nerve. **Results:** ZT was present in 68 of the 100 thyroid lobes analyzed (68%). The mean base was 6.7mm on the right side and 7.1mm on the left side, and the average height was 5.7mm on the right side and 6.1mm on the left side. In most of the lobes studied, the tubercle had a minimum height of 5mm (55.9%), with no significant difference between the right and left lobes of the thyroid gland. During surgery, 100% of the identified ZTs were anterior to the inferior laryngeal nerve, just below the nerve entry in the larynx. **Conclusion:** the ZT is a quite frequent entity and large enough to serve as an intraoperative anatomical reference for the inferior laryngeal nerve, next to its entry in the larynx, along with other anatomical references.

Keywords: Thyroidectomy. Thyroid Gland. Laryngeal Nerves.

INTRODUCTION

The Zuckerkandl's tubercle (ZT), described in 1867 by Madelung¹ and popularized in 1902 by the Austrian anatomist Emil Zuckerkandl (1849-1910)², is a posterolateral projection of the thyroid lobes, formed during the gland's embryogenesis, indicating the point of fusion between the last branchial body and the main median thyroid process^{3,4}.

The inferior laryngeal nerve (ILN) is the terminal branch of the recurrent nerve, which in turn is a branch of the vagus nerve. The ILN follows a different path in each side. On the right, it runs beneath the right subclavian artery on the upper chest, and on the left, it contours the aortic arch, having a much longer course within the mediastinum. Both run through the tracheo-esophageal groove, pass between the thyroid, the trachea and the esophagus, and enter the larynx⁵.

ILN injury can lead to dyspnea, breathing difficulties and consequent worsening in quality of life, as well as psychological and social problems resulting from these changes⁶. The appropriate way to avoid ILN injuries during thyroidectomy is its careful identification and dissection until its entry into the larynx⁷, and a good knowledge of its anatomical relationship with the ZT may contribute to this identification⁸.

There are several anatomical references used to ILN localization, such as the tracheo-esophageal groove and inferior thyroid artery and its branches. The palpation of the tracheoesophageal groove against the trachea can also assist in locating the ILN⁵. The literature is divergent regarding the percentage of ZT occurrence, the incidence even being different when the study is performed in cadavers or during surgery, when its identification is higher⁴. The presence of nodules in the posterolateral region of the thyroid may make it difficult to identify the ZT⁹.

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The aim of this study was to identify the presence and dimensions of the ZT in a series of patients undergoing thyroidectomy and its anatomical relationship with the inferior laryngeal nerve during conventional thyroidectomy.

METHODS

We conducted a prospective study of 51 consecutive patients submitted to conventional open thyroidectomy, with a total of 100 resected thyroid lobes, and observation of the presence or absence of ZT in sufficient dimensions to be identified without image magnification. We recorded its base and height, its location in the gland and its anatomical relationship with the inferior laryngeal nerve. Of the 51 thyroidectomies, 49 were total and two partial. Surgical indications were the presence of nodular goiter with suspected malignant neoplasia or with compressive effects. The analyzed group contained 43 women and eight men, aged 22 to 79 years. We excluded from the sample patients with large goiters or with nodular involvement of the tubercle region. All patients underwent the surgical procedure in a traditional, open way, and by the same surgical team.

After identification of the trunk and branches of the inferior laryngeal nerve below the inferior thyroid artery, we followed its course toward its entry into the larynx, performing ligatures of the artery branches next to the thyroid gland, preserving the parathyroid glands and observing the presence or absence of ZT, its shape, base and height, and its anatomical relationship with the ILN.

The study was submitted to and approved by the Human Research Ethics Committee of the Federal University of Mato Grosso do Sul (protocol n# 29/05), and those patients who agreed and signed the informed consent form participated in the research.

RESULTS

We identified the ZT in 68 operated sides, from a total of 100 (68%), not being able to identify it in 32 of them (32%). There was no prevalence of one side of the thyroid gland.

When present, we studied the ZT by measuring its largest diameters, base and height. The bases ranged between 2mm and 12mm, with an average 6.7mm on the right and 7.1mm on the left, and the height ranged between 2mm and 19mm, with 5.7mm average of the right and 6.1mm on the left. In one patient, we observed a narrow base and long height, appendicular-shaped ZT of 3mm x 19mm. In the others, the base was equal or greater than the height.

In over half the cases, the ZT was more than 5mm high (55.9%), the remaining between 2mm and 5mm. In all patients in whom we identified the ZT, its relationship with the ILN was constant (Figure 1). In all of these, the ILN followed a course posteromedial to the ZT, being positioned between the tubercle and the trachea (Figure 2). Additionally, the ZT was in a position immediately below the ILN entry in the larynx, and its elevation exposed the ILN and the upper parathyroid (Figure 3).

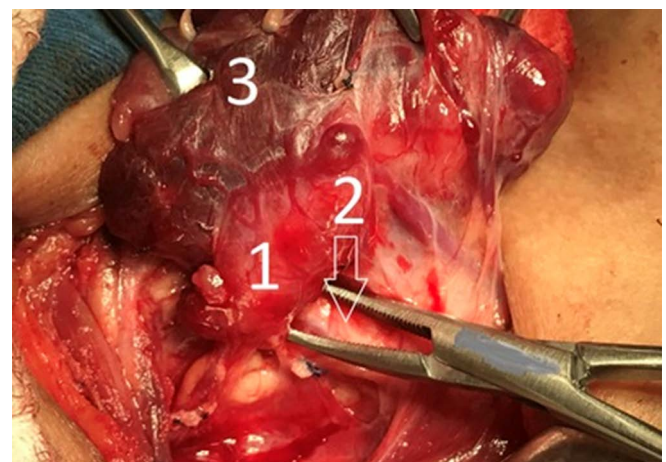


Figure 1. Right thyroid lobe with the presence of a Zuckerkandl's tubercle in its posteromedial location over the inferior laryngeal nerve near its entry into the larynx - 1) Zuckerkandl's tubercle; 2) inferior laryngeal nerve; 3) right lobe of the thyroid gland.

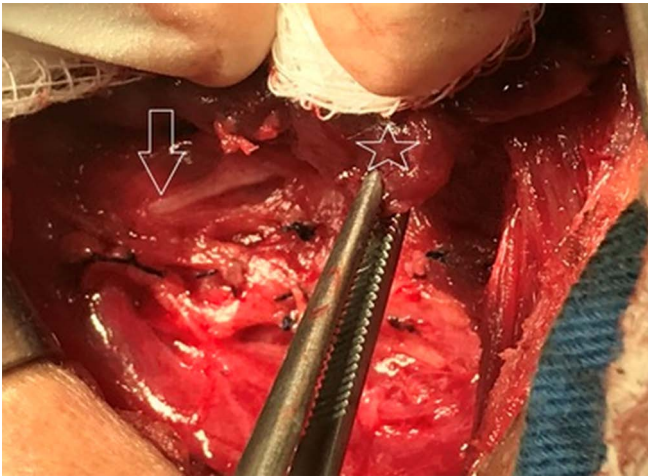


Figure 2. Left lobe of the thyroid gland with the Zuckerkandl's tubercle covering the lower laryngeal nerve near its entry into the larynx - arrow: left inferior laryngeal nerve; star: left Zuckerkandl's tubercle.

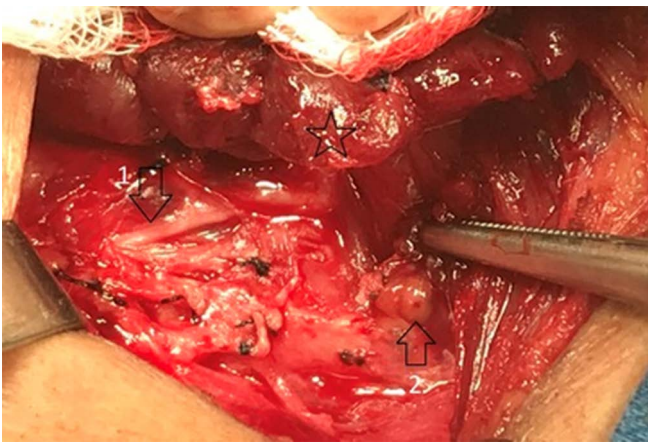


Figure 3. Left thyroid lobe after ligation of blood vessels and mobilization of the lobe, showing the inferior laryngeal nerve below the Zuckerkandl's tubercle, over the trachea, and the left superior parathyroid - arrow 1: left inferior laryngeal nerve; arrow 2: upper left parathyroid; star: left Zuckerkandl's tubercle.

We observed no complications related to the ILN in the studied patients.

DISCUSSION

The Zuckerkandl's tubercle was described over a century ago. Despite this, it is little used as a reference in the location of the inferior laryngeal nerve. Previous studies have reported its incidence in most people (87% to 95%)¹⁰⁻¹³.

Many of these studies used the 1998 Pelizzo classification, which classify it in degrees from 0 to 3: grade 0 - absent ZT; grade 1 - thickening at the ZT site; grade 2 - ZT less than 1cm; and grade 3 - ZT greater than 1cm¹⁴.

Our series reveals that in most of the patients analyzed (68%) it was possible to identify the ZT during conventional open thyroidectomy, without any image magnification feature. This index was lower than that found in previous studies¹⁰⁻¹³. However, it is worth remembering that we reported only those ZT that we could identify during conventional thyroidectomy, and that, consequently, could guide the surgeon during dissection of the ILN. We considered in this study, therefore, only Pelizzo grades 2 and 3¹⁴. Other studies have also observed lower ZT identification rates, such as the ones from Gauger *et al.*¹⁵ (63%) and from Pelizzo himself (76.7%), which are similar to the results found in our study.

When present, the ZT displayed a constant anatomic relationship with the ILN. In this situation, the ZT can contribute to the identification and preservation of the ILN, especially in conjunction with other references, such as the tracheoesophageal groove and the inferior thyroid artery, and digital palpation. Moreover, this relationship between ZT and ILN occurs near the entry point of the ILN into the larynx, ie, where the nerve is very close to the thyroid gland, and at greater risk of injury⁸.

Some studies that considered ZT with very small sizes also found a small proportion of nerves lateral to the ZT, always in less than 10% of cases^{8,10}. When the ZT is larger in size, it is expected to be over the nerve, and also to have a close proximity to the upper parathyroid.

The ILN position, posteromedial to the ZT, has been detected in other studies. Rajapaksha *et al.*¹² and Irawati *et al.*¹³ observed that in all individuals with ZT, the ILN followed a pathway posteromedial to the tubercle, that is, between it and the trachea. In this position, the ZT surely contributes to the intraoperative localization of the ILN¹⁶. According to Singh *et al.*¹¹, the elevation of the ZT allows the recurrent nerve to be easily and safely identified.

We conclude that ZT is present in most patients submitted to thyroidectomy in sufficient

dimensions to contribute to the identification and preservation of the inferior laryngeal nerve during open conventional thyroidectomies, given the constant anatomical relationship between them. One should continue to use other anatomical references, such as the inferior thyroid artery and its branches, the tracheoesophageal groove, and digital palpation against the trachea. Associated with them, the Zuckerkandl's tubercle, when present, is useful in identifying the inferior laryngeal nerve at its closest point to the gland, near its entry into the larynx.

R E S U M O

Objetivo: avaliar se a projeção lateral da glândula tireoide, chamada tubérculo de Zuckerkandl (TZ), pode auxiliar o cirurgião na identificação do nervo laríngeo inferior durante a tireoidectomia convencional aberta. **Métodos:** estudo prospectivo de 51 pacientes submetidos à tireoidectomia, com um total de 100 lobos tireoidianos ressecados, e observação da presença ou não do TZ em dimensões suficientes para ser identificado sem magnificação de imagem, suas dimensões de base e altura, sua localização na glândula e sua relação anatômica com o nervo laríngeo inferior. **Resultados:** o TZ estava presente em 68 dos 100 lobos de tireoide analisados (68%). A dimensão média da base foi 6,7mm no lado direito e 7,1mm no lado esquerdo, e a altura média foi 5,7mm no lado direito e 6,1mm no lado esquerdo. Na maioria dos lobos estudados, o tubérculo tinha altura mínima de 5mm (55,9%) sem diferença significativa entre o lobo direito e esquerdo da glândula tireoide. Durante a cirurgia, 100% dos TZ identificados estavam anteriores ao nervo laríngeo inferior, imediatamente abaixo da entrada do nervo na laringe. **Conclusão:** o TZ é bastante frequente e em dimensões suficientes para ser usado como referência anatômica na localização intraoperatória do nervo laríngeo inferior, próximo à sua entrada na laringe, junto com as demais referências anatômicas.

Descritores: Tireoidectomia. Glândula Tireoide. Nervos Laríngeos.

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