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Original Research Paper

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# TUBERCLE OF ZUCKERKANDL : THE NORTHERN STAR FOR A THYROID SURGEON ?

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**ABSTRACT**

**Aims :** The aim of the study was to appreciate the incidence of the tubercle of Zuckerkandl , its relationship with some important structures (Recurrent Laryngeal Nerve ,Parathyroid gland), which need to be preserved during thyroid surgery and whether it has any right/left lobe preponderance.

**Methods :** This study included 92 patients, 73 female and 19 male, who underwent thyroid surgery in our institution between 2016 and 2018 carried out by the same surgical team. Out of the 92 thyroid surgeries, 18 were total thyroidectomies, 41 were right-sided hemithyroidectomies and 33 were left-sided hemithyroidectomies.

**Results :** The tubercle of Zuckerkandl could be identified in 64.13% patients, 57.27% excised thyroid lobes, 59.32% excised right lobes, 54.9% excised left lobes and bilaterally seen in 22.22% of the cases where both lobes were excised. Recurrent laryngeal nerve was found to lie medial to the tubercle in 92.06% cases, while in all cases superior parathyroid gland was cephalad to the tubercle.

**Conclusion:** A purely gross anatomical approach to a thyroid surgery is not as useful as an embryological approach.

**KEYWORDS :** Tubercle of Zuckerkandl , tubercle, thyroid tubercle, Zuckerkandl

## INTRODUCTION

The Tubercle of Zuckerkandl (TZ) is a nodular thickening of the lateral edge of the thyroid lobe, which is present in most patients [1]. It was described for the first time in 1867 by Otto Madelung (posterior horn of thyroid) [2] and in 1902 by Emil Zuckerkandl (Processus posterior glandulae thyroidae) [3].

The TZ is formed by the fusion of a lateral thyroid gland component (arising from 4th branchial cleft and ultimobranchial body) with the median parts of the thyroid gland [5]. The TZ is commonly found in the cleft between the trachea and the oesophagus. The TZ usually enlarges lateral to the RLN, with the nerve appearing to pass into a cleft medial to it. Early elevation and medial displacement of the TZ usually allows the identification of the RLN close to its entrance into the larynx. It is for this reason that the TZ has been described as an "arrow pointed towards the nerve". On the other hand, in some cases, the RLN runs lateral to the TZ, which has been enlarging medially. In these cases, the RLN is at high risk, if it is identified lower than this level.

The Superior Parathyroid glands, derived from the 4th branchial pouch, are commonly found in close association and cephalad to TZ. It can be graded on the basis of size as follows [4,5]:

The importance of TZ is owing to its close relationship with the Recurrent Laryngeal Nerve (RLN) and Superior Parathyroid gland (SPG). It should never be left behind while performing total thyroidectomy, especially for cancer, as it contains thyroid tissue. Appreciation, dissection and subsequent excision of the tubercle of Zuckerkandl are essential for an adequate total thyroidectomy. An argument can very well be made that it is the removal of the tubercle of Zuckerkandl, which distinguishes a true total thyroidectomy from what may, in fact, be a near-total thyroidectomy.

However, the tubercle of Zuckerkandl is scarcely mentioned in textbooks and papers on thyroid surgery. This contrast is particularly stark when placed in the context of the sheer volume of literature on the various types of thyroid surgery and the measures thyroid surgeons should take to prevent post-operative complications.

## METHODS

This was a prospective study. It included 92 patients, who underwent thyroid surgery in our institution. The time period of this study was from 1st January, 2016 to 31st December, 2018. Patients undergoing thyroid surgery carried out by the same surgical team were included in this study, to rule out observer bias. Patients undergoing revision surgery on the same side of the thyroid gland, which was previously operated on, were excluded from this study. 18 of the 92 patients included in this study underwent total thyroidectomy, 41 of the 92 patients included in this study underwent right-sided hemithyroidectomy and 33 of the 92 patients included in this study underwent left-sided hemithyroidectomy. Thus, this study included 59 right lobes and 51 left lobes of the thyroid gland.

| GRADE | CORRESPONDING SIZE (in cm) |
|---|---|
| 0 | unrecognisable |
| 1 | <0.5 |
| 2 | 0.5-1 |
| 3 | >1 |

## RESULTS

73 of the 92 patients (79.35%) included in this study were female (Figure 1).

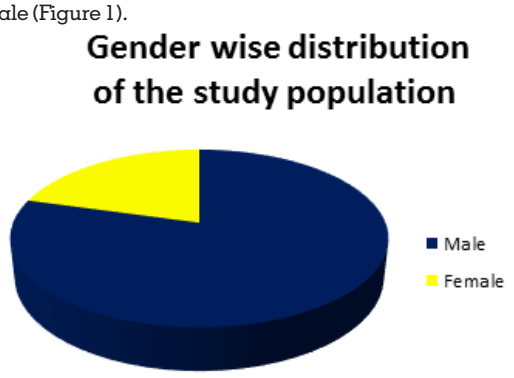


**Figure 1**

The tubercle of Zuckerkandl was identified in 63 excised lobes (Table 1).

**Table 1**

| Parameters | Number In Which TZ Could Be Identified | Total Number | Percentage (%) |
|---|---|---|---|
| Excised lobes | 63 | 110 | 57.27 |
| Excised right lobe | 35 | 59 | 59.32 |
| Excised left lobe | 28 | 51 | 54.90 |
| Excised both lobes | 4 | 18 | 22.22 |

In 58 out of the 63 lobes (92.06%) where TZ could be identified, the recurrent laryngeal nerve (RLN) was found to lie medial to it (Figure 2).

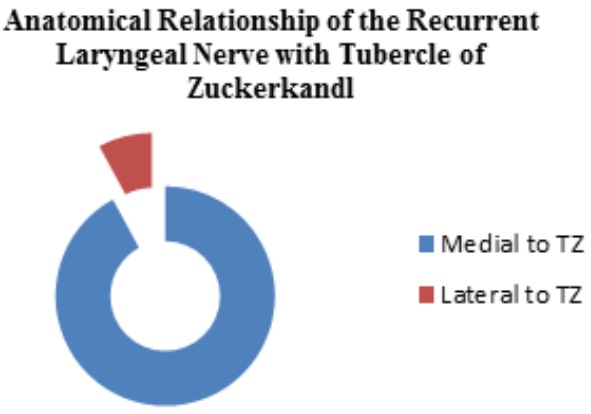


**Figure 2**

In All Of The 63 Lobes Where The Tubercle Of Zuckerkandl Could Be Identified, Superior Parathyroid Was Seen To Be Lying Cephalad To It.

## DISCUSSION

The tubercle of Zuckerkandl is not a rare anatomical variant. In this study, tubercle of Zuckerkandl could be identified in 64.13% of the patients, who underwent thyroid surgery carried out by the same surgical team over a period of two years. This is consistent with the frequency with which it was identified in some previous studies [6,7,8]. Chintamani et al., however, conducted a study where the tubercle of Zuckerkandl was identified only in 35% cases [9]. In most cases, it was unilateral with a slight preponderance for the right lobe of the thyroid gland [6,9,10]. The valuable insight gleaned from this study, however, is not only how commonly we encounter this anatomical variant but also how reliable it is for purposes of identifying vital structures, which need to be preserved while performing thyroid surgery, thereby providing a thyroid surgeon with a feasible alternative technique for carrying out a safe and adequate thyroid surgery. This study illustrates that structures like recurrent laryngeal nerve and superior parathyroid gland have a fairly constant anatomical relationship with the tubercle of Zuckerkandl. In this study, we found that the recurrent laryngeal nerve lies medial to the tubercle of Zuckerkandl in 92.06% [5], while superior parathyroid gland lies cephalad [5,11] and in all of the lobes where tubercle of Zuckerkandl could be successfully identified. It is also worth noting that the tubercle of Zuckerkandl contains thyroid tissue and failing to surgically excise it while performing thyroid surgery, especially in cases where malignancy is suspected, would constitute inadequate or suboptimal surgery [5,9]. It must also be emphasised that if the surgeon is inexperienced and the tubercle is large, chances of suboptimal surgery and complications increase. Thus, this study, like some previous studies, highlights the importance of the tubercle of Zuckerkandl to a thyroid surgeon in order to perform a safe and adequate thyroid surgery [5, 6, 7, 8, 9,12].

## CONCLUSION

This study highlights that the tubercle of Zuckerkandl is a reliable anatomical landmark, which helps in the identification of the recurrent laryngeal nerve and superior parathyroid glands. It can be considered as friendly to a thyroid surgeon as the Northern star is to a sailor lost at sea. However, when the tubercle is large or the surgeon lacks experience, chances of suboptimal surgery and/or complications may increase.

This study, thus suggests, that a purely gross anatomical approach to a thyroid surgery is not as optimum as one, which also appreciates the embryology of the thyroid gland and the presence of anatomical variants like the tubercle of Zuckerkandl.

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