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Original Research Article

Incidence of tubercle of Zuckerkandl of the thyroid and it's surgical relation with recurrent laryngeal nerve and the superior parathyroid gland

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ABSTRACT

Background: This study was carried out with the objective to identify the tubercle of Zuckerkandl in patients undergoing thyroidectomy and to establish the relationship of TZN with the recurrent laryngeal nerve and superior parathyroid gland.
Methods: 100 patients posted for thyroidectomy for various causes in Government medical college, Kozhikode for a period of 1 year between March 2014 and March 2015. 92 patients underwent total thyroidectomy, 4 patients underwent left hemithyroidectomy and 4 patients underwent right hemithyroidectomy. A total of 192 lobes i.e. 96 right lobes and 96 left lobes were studied.
Results: Of the 100 patients studied TZN was identified in 63 (63%) patients. Of the 192 lobes studied, TZN was identified in 100 lobes (52.08%). This was 59 of 96 (61.40%) lobes on the right side and 41 of 96 (42.70%) lobes on the left side. Of the 92 Total Thyroidectomies, TZN was found bilaterally in 36 (39.10%) cases. RLN was identified 'posteromedial' in relation in 99 of the 100 (99%) TZNs studied and not visualized in relation to TZN in 1 (1%) case. The Superior Parathyroid was identified 'superolateral' in relation in 93 (93%), 'lateral' in 6 (6%) and 'inferolateral' in 1 (1%) of 100 TZNs studied.
Conclusions: Zuckerkandl's tubercle is a posterior extension of lateral lobes of the thyroid gland, maintains a constant relationship with the RLN and the superior parathyroid gland. It can be used as an anatomical landmark to assist in preservation of the RLN and the superior parathyroid gland during thyroid surgery.

Keywords: Zuckerkandl, Recurrent laryngeal nerve, Superior parathyroid

INTRODUCTION

The Tubercle of Zuckerkandl (TZN) is a posterolateral extension of the thyroid gland. It takes its name after Emil Zuckerkandl an Austrian Anatomist who discovered it in 1902. Although it is named after Emil Zuckerkandl, it was first described by the Otto Wilhelm Madelung in 1867 as the posterior horn of the thyroid.[1-4] The embryological development of TZN is from the ultimobranchial body of the 4th branchial cleft. During embryological development, the thyroid descends along the thyroglossal tract from the foramen caecum to the level of the thyroid cartilage, when the right and left lobes develop. In addition to this there is a lateral component which arises from the ultimobranchial body which fuses with the median component at approximately the 5th week of gestation to complete the formation of the thyroid gland. The remnants of the ultimobranchial body ultimately persist as the TZN.[2,3,11-14] A grading system based on the size of the tubercle was proposed by Pelizzo et al.[5] Grade 0- unrecognizable; grade 1- only a

thickening of the lateral edge of the thyroid lobe; grade 2-smaller than 1 cm and grade 3- larger than 1 cm.

Multiple variations can be observed when we consider the relation between the nerve and TZN, but most commonly, the recurrent laryngeal nerve lies between the tubercle and the trachea. The nerve is almost always seen underneath the TZN in most of the cases. The superior parathyroid has a much more constant location when compared to the inferior parathyroid gland and it is also seen right behind the TZN at the intersection between the superior thyroid artery and the nerve. It is of paramount importance that while doing a thyroidectomy, dissection should be carried along the lateral aspect of the tubercle to identify the nerve and also preserve it. TZN can act as a pointer there helping in identifying the RLN and the superior parathyroid gland during surgery thereby preventing its damage.[6] Multiple studies are present in literature demonstrating the relationship of the tubercle with the recurrent laryngeal nerve and superior parathyroid gland separately.[1,3,6-10] However this study combines both these aspects in all patients i.e., relation of the tubercle with the recurrent laryngeal nerve as well as the superior parathyroid gland thereby aiding in preservation and prevention of both these important structures during thyroidectomy.

METHODS

The study conducted was an institution based prospective study of 100 consecutive patients undergoing total and hemithyroidectomies for any cause in the department of general surgery, Government medical college, Kozhikode.

Inclusion and exclusion criterion

Patients with proven case of disease of the thyroid gland (carcinoma, multinodular goitre etc) requiring surgery were include. Patients with reoperative surgery required for recurrent goitre and patients with distorted thyroid anatomy due to large neck masses or ectatic vessels were excluded.

Study duration

The study was conducted for a period of 1 year, between March 2014 and March 2015. Informed consent was taken for all patients.

Study factors

Brief history regarding the patient's illness was taken and the final diagnosis noted. The type of surgery carried out for the respective cause was duly noted. The patient was followed up in the operation theatre during surgery and photographs of dissection of TZN and the RLN with Superior Parathyroid was taken. An assessment regarding the ease of identifying RLN and the superior parathyroid following identification of TZN was done from the operating surgeon.

Statistical analysis

The data was presented in tabular form using tables, pie and bar diagrams for descriptive statistics. Categorical variable was analysed using Fisher's Exact test and Chi-square test.

RESULTS

Gender distribution

A total of 100 patients posted for thyroid surgery for various causes were studied. Out of which 93 were females and 7 were males.

Table 1: Gender distribution.

Gender	N
Males	7
Females	93
Total	100

Type of thyroidectomy

92 patients underwent total thyroidectomy, 4 patients underwent left hemithyroidectomy and 4 patients underwent right hemithyroidectomy.

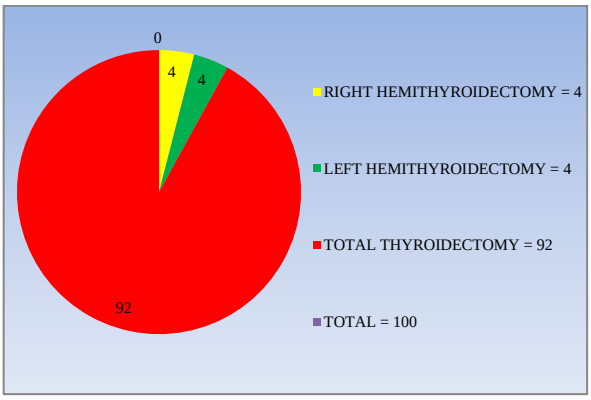

Figure 1: Type of thyroidectom.

Total number of lobes

A total of 192 lobes were studied i.e. 96 Right and 96 Left lobes among the 100 patients (92 total thyroidectomy+4 left hemithyroidectomy+4 right hemithyroidectomy).

Presence of TZN in the patients studied

Out of the 100 patients studied TZN was identified in 63 (63%) patients.

Table 2: Total number of lobes.

Parameters	N
Right lobe	96
Left lobe	96
Total number of lobes	192

Distribution of TZN

Of the 192 lobes studied, TZN was identified in 100 lobes (52.08%). This was 59 of 96 (61.40%) lobes on the right side and 41 of 96 (42.70%) lobes on the left side. Of the 92 total thyroidectomies, TZN was found bilaterally in 36 (39.10%) cases.

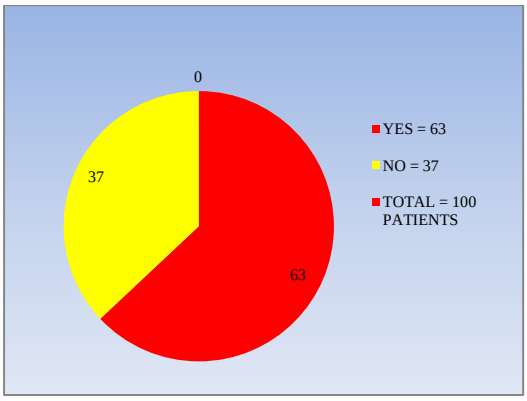

Figure 2: Presence of TZN in the patients studied.

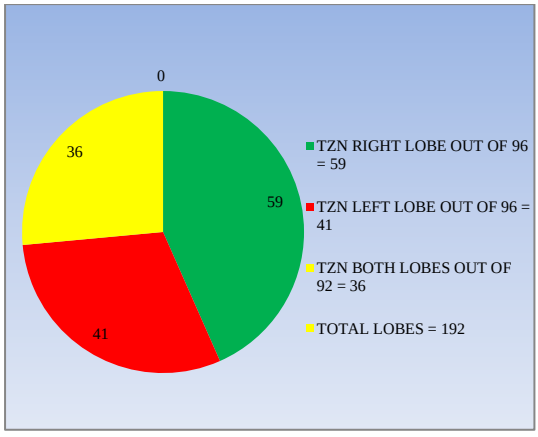

Figure 3: Distribution of TZN.

Relationship of TZN to recurrent laryngeal nerve

RLN was identified 'posteromedial' in relation in 99 of the 100 (99%) TZNs studied and not visualized in relation to TZN in 1 (1%) case.

Location of superior parathyroid gland in relation to TZN

The superior parathyroid was identified 'superolateral' in relation in 93 (93%), 'lateral' in 6(6%) and 'inferolateral' in 1 (1%) of the 100 TZNs studied.

DISCUSSION

The incidence of TZN among the 100 patients studied was found to be 63%. The general consensus among various studies indicates that the incidence of TZN among subjects is between 63% and 80%. Page et al have identified TZN only in 7% of their patients.[7] The incidence of TZN in the lobes studied was found to be 52% (100/192).

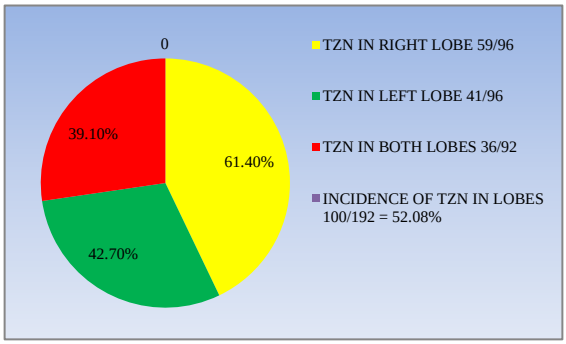

Figure 4: Percentage of distribution of TZN.

Table 3: Relationship of TZN to recurrent laryngeal nerve.

Relationship of TZN to RLN	N	%
Posteromedial	99	99
RLN not seen	1	1
Total	100	100

Table 4: Location of superior parathyroid gland in relation to TZN.

Location of superior parathyroid gland in relation to TZN	N	%
Superolateral	93	93
Lateral	6	6
Inferolateral	1	1
Total	100	100

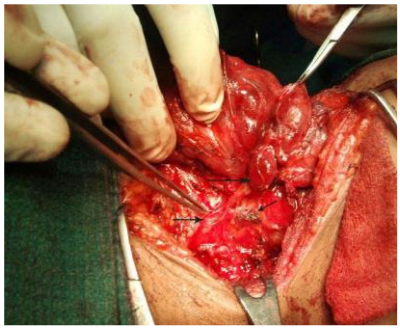

Figure 5: TZN (large arrow) with its relation to RLN and superior parathyroid.

The present study shows an incidence of 61.4% (59/96) of TZN in the right lobe and 42.7% (41/96) in the left lobe. Identification of the TZ was 72.6% right side and

53.9% left side in a study conducted by Mehanna et al.[8] The relationship of TZN with the RLN is relatively constant. In 99% (99/100), the RLN was found posteromedial to the TZN.

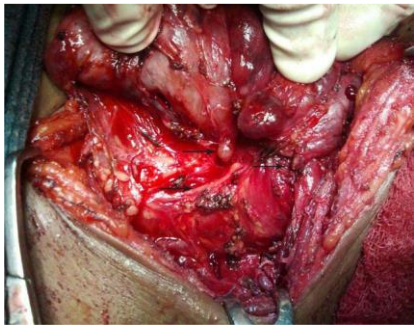

Figure 6: TZN (large arrow) with its relation to RLN and superior parathyroid.

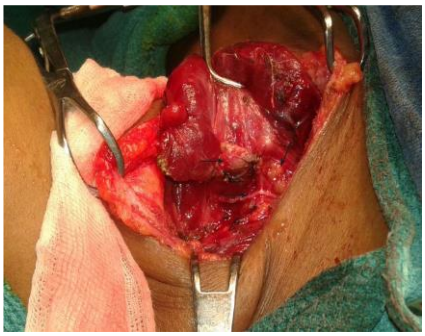

Figure 7: TZN (Large arrow) with its relation to RLN and superior parathyroid.

The relationship of TZN with the Superior parathyroid gland is fairly constant. In the study by Gurleyik et al, RLN was posterior (medial) to TZN in 94% occurrences and RLN was on the anterior surface of TZN only in 6% instances. In 93% (93/100), the Superior Parathyroid gland was found superolateral to the TZN.[1] In the study by Yun et al there is a 96.1% relation in the left and 95.2% relation in the left.[9] Surgical importance of the TZN arises from its relations with RLN and the superior parathyroid gland. The resection of enlarged tubercle at posterior site of the thyroid requires delicate and careful dissection adjacent to the nerve. RLN injury may be prevented by its full isolation based on intimate knowledge of the anatomy including all its variations. Some anatomical landmarks like the TZN help surgeons in identifying RLN. TZN appears as a marker in identifying the RLN. Superior parathyroid gland also originates from the 4th branchial cleft adjacent to the ultimobranchial body thereby having a constant relationship with TZN. So TZN can be used as a guide during surgery to identify the RLN and the Superior Parathyroid gland, thereby preventing any injuries. The identification of the TZN also depends on the expertise of the surgeon performing the operation. Adequate knowledge of the anatomy of the region which proper surgical techniques in dissecting the TZN may be essential to identify the structures. The TZN should also be removed during thyroidectomies as they themselves have a chance of turning into a nodule or developing a malignant change

Limitations

The study considered 100 consecutive patients who underwent thyroidectomy in our institute irrespective of cause, however the thyroidectomies were conducted by different surgeons with different surgical techniques which was the major limitation. So we would like to mention the fact that the individual surgeon's technique also matters in dissecting and identifying the TZN.

CONCLUSION

Multiple studies have already demonstrated the importance of Zuckerkandl's tubercle and its relation with the recurrent laryngeal nerve. This study in addition to that also adds on to the tubercle's relation with the Superior Parathyroid gland. Adequate dissection of the TZN during surgery can serve as an anatomical landmark to assist in preservation of the RLN and the superior parathyroid gland during thyroid surgery thereby preventing damage to these two very important structures.

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