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# The Morphological Study and Variations of Thyroid Gland in Human Cadavers

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**Abstract:**

- ***Introduction***

**The thyroid gland is the largest endocrine gland. It is a highly vascular gland located in the lower half of the front of neck at a level of 5th cervical to 1st thoracic vertebrae. The gland has 2 lateral lobes connected by isthmus. The thyroid lobes are connected by an isthmus, mostly positioned anterior to the 2nd–4th tracheal rings.**

- ***Aim***

**To study the morphology and variations of thyroid gland.**

- ***Materials & Methods***

**The current study was conducted on 20 human cadavers of both sex in the Department of Anatomy, KAHER's Jawaharlal Nehru Medical College, Belagavi over a period of 1 year. The cadavers were preserved in 10% formalin.**

- ***Result***

**The isthmus was absent in 10% of cases. In 30% cases it was related to the 2nd to 3rd tracheal rings. In 20% cases it was related to 1st to 2nd tracheal rings. In 5% case it was related to 1st to 4th tracheal rings. In 15% cases it was related 1st to 3rd tracheal rings. In 15% cases it was related to 2nd to 4th tracheal rings. The pyramidal lobe was present in 5% of cadavers arising from the left lobe.**

- ***Conclusion***

**The present study showed that the mean length of the right lobe is more than the left lobe. Estimation of size of thyroid gland is clinically relevant in evaluation of any thyroid disorder. The variations in the thyroid gland along with the thorough information related to the anomalies can be of great importance to the surgeons so that there is better, planned & effective surgery.**

***Keywords:*** *Thyroid Gland, Pyramidal Lobe, Tracheal Rings.*

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## I. INTRODUCTION

The thyroid gland is the largest endocrine gland of the body (1,2). It is a highly vascular, butterfly-shaped structure situated in the lower part of the anterior neck, extending from the level of the 5th cervical vertebra to the 1st thoracic vertebra (2). Each lateral lobe is conical, with an apex reaching the oblique line of the thyroid cartilage and a base lying over the 5th or 6th tracheal ring (2). The two lobes are connected by an isthmus, which most commonly overlies the 2nd to 4th tracheal rings (2,3). In some individuals, a pyramidal lobe may extend upwards from the isthmus or a lobe and may continue as a fibrous or muscular band to the hyoid bone (4,5).

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The thyroid gland is enclosed by an inner true capsule and an external false capsule derived from the pretracheal layer of deep cervical fascia (2). This fascia forms the suspensory ligament of Berry, anchoring the gland to the cricoid cartilage and causing the gland to move with deglutition (2). The gland has a rich arterial supply from the superior and inferior thyroid arteries, with occasional contribution from the thyroidea ima artery (2,3). Venous drainage occurs through the superior, middle and inferior thyroid veins (2), while lymphatic drainage is directed to the prelaryngeal, pretracheal and deep cervical lymph nodes (2).

The gland has important anatomical relations: anteriorly by the infrahyoid muscles; anterolaterally by sternohyoid and sternothyroid; and posteromedially by the trachea, oesophagus, recurrent laryngeal nerve and parathyroid glands (2,3). Of particular surgical importance is the close relationship of the recurrent laryngeal nerve to the inferior thyroid artery and the external laryngeal nerve to the superior thyroid artery (3,5).

Accurate estimation of thyroid size is clinically significant in diagnosing and managing thyroid disorders (3,6,9). A clear understanding of the normal anatomy, relations, variations and anomalies of the gland is essential for surgeons in planning safe and effective operative procedures (4,5,8,9). Variations in the thyroid gland may occur with age, gender, race, physiological status and geographical region (6,8,9). Proper anatomical knowledge helps prevent complications such as recurrent laryngeal nerve injury, hypocalcaemia or postoperative airway compromise (4,5,9).

Hence, understanding morphological and anatomical variations of the thyroid gland is crucial, especially in regions with a high prevalence of thyroid disorders (2,8,9).

## II. MATERIALS AND METHOD

This anatomical study was conducted on 20 formalin-preserved human cadavers of both sexes at the Department of Anatomy, KAHER's Jawaharlal Nehru Medical College, Belagavi. Over a 1-year period, the cadavers, fixed in 10% formalin, were examined to investigate specific anatomical features, contributing to the understanding of human morphology and clinical relevance.

## III. RESULTS

The two tables (Table 1 & 2) describe the distribution of thyroid glands isthmus position, relative to tracheal rings, and the mean dimensions of the thyroid lobes and isthmus in the study sample.

Table 1: Position of Isthmus, Relative to Tracheal Rings

| Isthmus Position | Percentage |
|---|---|
| Isthmus absent | 10% |
| Isthmus at 2nd–3rd tracheal rings | 30% |
| Isthmus at 1st–2nd tracheal rings | 20% |
| Isthmus at 1st–4th tracheal rings | 5% |
| Isthmus at 1st–3rd tracheal rings | 15% |
| Isthmus at 2nd–4th tracheal rings | 15% |

In this series, the isthmus of the thyroid gland was absent in 10% of specimens. When present, the isthmus lay anterior to different levels of the trachea: in 30% of specimens, it extended from the second to the third tracheal rings, in 20% from the first to the second tracheal rings, in 5% from the first to the fourth tracheal rings, in 15% from the first to the third tracheal rings, and in 15% from the second to the fourth tracheal rings.

Table 2: Morphometry of Thyroid Lobes and Isthmus

| Mean Length of Right Lobe (in cm) | Mean Length of Left Lobe (in cm) | Width of Isthmus |
|---|---|---|
| 3.49 | 3.47 | 1.74 |

Morphometry of thyroid lobes and isthmus is as follows, mean length of the right lobe of the thyroid glands present was 3.49 cm, while the mean length of the left lobe was 3.47 cm. The mean width of the thyroid isthmus was 1.74 cm. (Figure 1 & 2)

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Fig 1: Measuring the Length of the Right Lobe

Fig 2: Measuring the Width of the Isthmus

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In the present study a thyroid gland with pyramidal lobe was also observed. (Figure 3).


Fig 3: Pyramidal Lobe of the Thyroid Gland

## IV. DISCUSSION

The present study demonstrates notable variations in the position and morphometry of the thyroid gland, particularly the thyroid isthmus. Such variations are of clinical importance due to the close anatomical relationship of the thyroid gland with vital neck structures and its relevance in surgical and diagnostic procedures.

In the present study, absence of the thyroid isthmus was observed in 10% of specimens. This finding is comparable to previous cadaveric studies that have reported absence of the isthmus in a small proportion of individuals (1,2). The absence of the isthmus is considered a developmental variation and should be recognized as a normal anatomical finding. From a clinical perspective, this variation may alter expected surgical landmarks during thyroidectomy or tracheostomy, emphasizing the need for careful preoperative assessment. Among specimens in which the isthmus was present, its most common position was anterior to the second and third tracheal rings (30%), followed by the first and second tracheal rings (20%). Classical anatomical descriptions state that the isthmus usually overlies the second to fourth tracheal rings (2,3), and the findings of the present study largely support this. However, variations were noted, with the isthmus extending between the first to fourth tracheal rings in some cases. Similar variability has been reported in earlier cadaveric and radiological studies (3). These positional differences are clinically significant, particularly during emergency airway procedures, where an unexpectedly placed isthmus may increase the risk of bleeding.

Morphometric analysis showed that the mean length of the right and left thyroid lobes was nearly equal, measuring 3.49 cm and 3.47 cm respectively. These findings are consistent with earlier studies reporting minimal asymmetry between the thyroid lobes (1,6). The mean width of the thyroid isthmus was 1.74 cm, which falls within the range documented in previous anatomical and ultrasonographic studies (3,6). Variations in thyroid dimensions have been attributed to factors such as age, sex, body build, and geographical differences (6,8,9).

The results of this study reinforce the importance of understanding anatomical variations of the thyroid gland. Such knowledge is essential for surgeons to minimize complications including recurrent laryngeal nerve injury, hypocalcaemia, and excessive bleeding during thyroid surgeries. Additionally, awareness of normal variations aids clinicians and radiologists in accurate diagnosis and interpretation of imaging findings.

## V. CONCLUSION

Variations in the position of the thyroid isthmus and the dimensions of the thyroid lobes are common and should be regarded as normal anatomical findings. Recognition of these variations is crucial for safe surgical practice and effective clinical management of thyroid disorders.

## REFERENCES

[1]. Harjeet A, Sahni D, Jit I, Aggarwal AK. Shape, measurements and weight of the thyroid gland in Northwest Indians. Surg Radiol Anat. 2004;26(2):91-95.

[2]. Joshi SD, Satoskar M, Joshi SS, Ghosh SK. The thyroid gland and its variations: a cadaveric study. Folia Morphol (Warsz). 2010;69(1):52-56.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25dec838

[3]. Cengiz A, Bozdağ G, Ulaşoğlu C, Güney E, Bulus H. Surgical anatomy of the thyroid isthmus and its variations: a radiological study. Surg Radiol Anat. 2021;43(5):677-83.
[4]. Braun EM, Windisch G, Wolf G, Hausner T, Anderhuber F. The pyramidal lobe: frequency, morphology and its clinical significance. Clin Anat. 2013;26(7):893-902.
[5]. Ballal S, Raghavendra B, Yadav R, Somayaji SN. Prevalence of pyramidal lobe and its clinical relevance in thyroid surgery. Gland Surg. 2015;4(6):698-703.
[6]. Kim E, Park CS, Lee HS, Park JS, Kim BW. Ultrasonographic measurement of thyroid volume and its relationship with body parameters. Clin Endocrinol (Oxf). 2017;87(1):79-86.
[7]. Saknure MB, Waghmare CSH. Morphological variation of thyroid gland in cadavers. MedPulse Int J Anat. 2017;3(1):1-4.
[8]. Muhammad G, Yusof MF, Abdullah N, Idris FM. Anatomical variations of the thyroid gland in Southeast Asian population: a cadaveric study. Anat Sci Int. 2020;95(3):368-75
[9]. De Moraes DC, Nascimento LFL, Freitas RM, Costa FL, de Sá FC. Thyroid gland volume and its relation to anthropometric characteristics in adults. Clin Anat. 2014;27(4):570-76.