

**Agensis of Thyroid Isthmus in Adult Human Cadavers.”**Nishigandha Sadamate<sup>1</sup>, Ravindra Vedpathak<sup>1</sup>, Ranjit S. Ambad<sup>2</sup>, Swati Belsare<sup>3</sup><sup>1</sup>Assistant Professor, Department of Anatomy, Dr. Rajendra Gode Medical College, Amravati.<sup>2</sup>Professor, Department of Biochemistry, Dr. Rajendra Gode Medical College, Amravati.<sup>3</sup>Professor, Department of Anatomy, MIMER Medical College, Talegaon

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**Abstract****Introduction :** The thyroid gland is the most common endocrine organ which gets operated throughout the globe. It is ensheathed by the pre-tracheal layer of deep cervical fascia.

The two lobes are connected by a narrow median isthmus. In our study, on the morphometric features of the thyroid gland it was found that, 4 out of 25 thyroid glands that were dissected, showed an absence of the isthmus. The respective lateral lobes were positioned independently on either side of the trachea. The incidence of agensis of isthmus, along with the developmental and clinical significance are discussed.

**Aim and Objective :** To study the morphometric features of the thyroid gland with its neurovascular relations.**Materials and Methods :** The Morphometric study carried on 25 human adult cadavers aged between 40 to 70 years, out of which 19 were male and 6 were female cadaver. Various morphometric parameters like length of lobes, width of lobes, height of isthmus, levator thyroideae glandulae and pyramidal lobe were recorded.**Observation :** Absence of isthmus is rare in humans, In this morphometric study out of 25 thyroid glands only two glands with agensis of thyroid isthmus.**Conclusion :** On the partial thyroidectomy, the surgeon should aware of the absence of the isthmus which may be associated with absence of whole or part of the lobes. He should assess whether the remaining portion of thyroid gland is present and functioning otherwise patient may be inadvertently rendered hypothyroid.**Keywords :** Thyroid gland, isthmus, thyroidectomy.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The thyroid gland is a highly vascular, palpable and ductless endocrine gland situated in the anterior/front portion of the neck. its position extends from the fifth cervical to the first thoracic vertebrae. It roughly resembles the shape of a butterfly. It is also one of the largest endocrine glands, weighing an average of 25 – 30 g. This gland has two lobes on either side of the trachea, with each lobe measuring 4 – 6 cm in length and 1.3 – 1.8 cm in width.

The primary function of the thyroid gland is to secrete two hormones, namely, Triiodothyronine (T3) hormone and the Thyroxine hormone (T4). Both T3 and T4 hormones play a very important role and affect almost every tissue in the body. which primarily influence the Metabolic Rate and protein synthesis. Alterations in the production of hormones can result in hypothyroidism or hyperthyroidism. The thyroid gland is involved in inflammatory processes (e.g., thyroiditis), autoimmune processes (e.g., Graves disease), and cancers (e.g., papillary thyroid carcinoma, medullary thyroid carcinoma, and follicular carcinoma). the thyroid gland considering its role in metabolism, growth, regulation of certain

electrolytes, and its involvement in many disease processes, the thyroid gland deserves consideration for its anatomical location and its close relationship to important structures, including the parathyroid glands, recurrent laryngeal nerves, and certain vasculature.

The thyroid attaches to the trachea via a consolidation of connective tissue, referred to as the lateral suspensory ligament or Berry's ligament. This ligament connects each of the thyroid lobes to the trachea. The "normal" thyroid gland has lateral lobes that are symmetrical with a well-marked centrally located isthmus. The thyroid gland typically contains a pyramidal extension on the posterior-most aspect of each lobe, referred to as the tubercle of Zuckerkandl. Despite these general characteristics, the thyroid gland is known to have many morphologic variations. The position of the thyroid gland and its close relationship with various structures brings about several surgical considerations with clinical relevance.

**Embryology of Thyroid Gland:** The parenchyma of the thyroid gland is derived from endoderm. The

thyroid gland originates from the foramen cecum, which is a pit positioned at the posterior one-third of the tongue. Early in gestation, the thyroid gland begins its descent anterior to the pharynx as a bilobed diverticulum. The thyroid gland then continues to descend anterior of the hyoid bone and the cartilages of the larynx. By the seventh week, the thyroid gland reaches its destination midline and anterior to the upper trachea. The thyroglossal duct maintains the connection of the thyroid gland to the base of the tongue until the involution and disappearance of the duct. The ultimobranchial body, derived from the ventral region of the fourth pharyngeal pouch, then becomes incorporated into the dorsal aspect of the thyroid gland. The ultimobranchial body gives rise to the parafollicular cells or C cells of the thyroid gland.

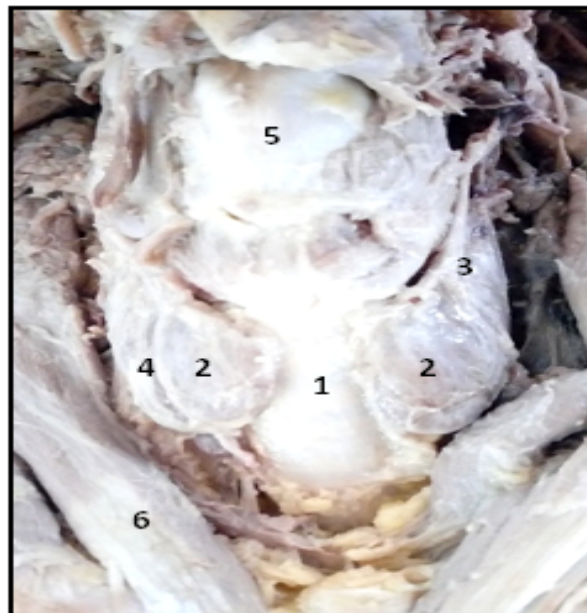
The thyroid gland has two lateral lobes connected by a narrow median isthmus, giving an 'H' Shaped appearance. The normal size of each lobe of the thyroid gland has been described to be 5 cm long, its greatest transverse and anteroposterior extent being 3 cm and 2 cm respectively. The isthmus measures about 1.25 cm transversely as well as vertically and is usually placed anterior to the second and third tracheal cartilages. [1] The developmental anomalies of the thyroid gland may change the morphology of the gland, and may cause clinical functional disorders and various thyroid illnesses. [2] Incidence of agenesis of the thyroid isthmus has been reported to vary from 5% to 10% by Pastor et al and from 8% to 10% by Marshall, [3,4] Ranade et al in their study on anatomical variations of the thyroid gland reported a 33% incidence of agenesis of the isthmus.[5]

Daksha Dixit et al reported the incidence was 14.6% with a male to female ratio of 5:1 [6]. The knowledge of various developmental anomalies of the gland and variations in neurovascular relations will help the surgeon in better planning of a safe and effective surgery.

**Aims and Objectives:** To study the morphometric features of the thyroid gland with its neurovascular relations.

**Materials and Methods:** The Morphometric study carried on 25 human adult cadavers aged between 40 to 70 years, out of which 19 were male and 6 were female cadaver. Various morphometric parameters like length of lobes, width of lobes, height of isthmus, levator thyroideae glandulae and pyramidal lobe were recorded.

**Observations:** The average length of the right lobe of thyroid gland was 5.17 cm and that of the left lobe was 4.83 cm. The average height of the isthmus was 2.31 cm. The thyroideae ima artery was present in 1 cadaver. During midline dissection of the neck 2 out of the 25 cadavers dissected showed no glandular tissue in the region of the isthmus of thyroid gland. Grossly, only the pre-tracheal fascia connecting the right and left lobes of the thyroid gland was observed. The average lengths of the right and left lobes in these 2 cadavers were 4.81 cm and 4.78 cm respectively. The male to female ratio of incidence of agenesis of thyroid isthmus was 2:0 in our study. There were no significant variations in neurovascular relations and no ectopic thyroid tissues were found.



**Photo 1 :- Agenesis of thyroid isthmus**

1. Absences of Isthmus 2. Thyroid Lobes 3. Sup. Thyroid A.  
4. Ant. Br. of Sup. Thyroid A. 5. Thyroid cartilage 6. Sternocleidomastoid M

**Discussion:**

Pastor et al defined the Agenesis of the thyroid isthmus as complete and congenital absence of the thyroid isthmus. [3]. In their study, they had reported agenesi s of isthmus of thyroid gland with enlarged lobes in a Caucasian cadaver. According to Gruber (quoted by Testus and Latarjet) the incidence of agenesi s of isthmus is about 5%. [8]. Marshall documented the variations in the gross structure of the thyroid gland in 60 children, varying in age from a few weeks to 10 years and the absence of the isthmus was reported to be 10% in this group. [(4). Ranade et al reported absence of isthmus in 35 out of 105 cases (33%), of which 8 were female cadavers. [5]. Daksha Dixit et al reported the incidence was 14.6% with a male to female ratio of 5:1[6]. According to the study by Braun et al, the isthmus was missing in 4 cases of the 58 cadavers they studied. [9]. Won and Chung have reported that in 3% of the cases studied, the isthmus was absent and the lateral lobes of the thyroid were separated. [10]. The incidence in Northwest Indians is reported to be 7.9% in gross specimens. [11]. In our study the incidence of agenesi s of thyroid isthmus at 8%.

**Result :** Agenesis of thyroid isthmus is rare in humans, the incidence varying from 5% to 10%. In our study the incidence was 8%.

**Conclusion :** Agenesis of thyroid can be explained as an anomaly of embryological development i.e. a high division of the thyroglossal duct giving rise to two independent thyroid lobes with absence of isthmus.

Agenesis of isthmus can be associated with other types of dysorganogenesis, such as the absence of a lobe or the presence of ectopic thyroid tissue and hence in clinical practice when such a condition is diagnosed, it is necessary to perform a differential diagnosis against other pathologies such as autonomous thyroid nodule, thyroiditis, etc.

Before thyroidectomy, surgeon must be prepared to find variations like ectopic thyroid nodules around the normally-located thyroid gland. Hence a thorough knowledge of the thyroid anatomy and its associated anatomical variations is very much essential, so that these anomalies are not overlooked in the differential diagnosis.

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