

# Implications of Anatomical and Morphological Variations of Thyroid Gland: A Case Report

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## ABSTRACT

Because of extreme variations in gross Anatomy of Thyroid Gland, Marshal stated that it was a difficult work to speak about normal thyroid gland [1]. Description of incidence of Pyramidal lobe, an embryological remnant of thyroglossal duct differ from 15 to 75% in Anatomical text books and data concerning its size are lacking [2,3]. During the routine undergraduate dissection of Thyroid gland for 1st year MBBS in the Department of Anatomy, Govt. Medical college, Amritsar, India, in an elderly Male cadaver various morphological anomalies of Thyroid gland were encountered. These were in the form of presence of pyramidal lobe on left side, tip of which was attached to hyoid bone through Levator glandulae thyroideae and absence of superior thyroid artery on right side. The knowledge of various Anatomical & Morphological variation will help surgeons in forming a cornerstone to safe and effective surgeries.

Keywords: Pyramidal lobe (PL), Superior Thyroid artery (STA), Levator glandulae thyroideae (LGT), Thyroid

Amongst the endocrine glands, thyroid gland is well known for its disturbed organogenesis leading to wide range of morphological variations which may be from common to rare one. The anomalies of the development of the Thyroid gland distort the morphology of gland and may cause clinical functional disorders and

various thyroid illnesses [4]. The Thyroid Gland lies deep to sternothyroid and sternohyoid muscle, located anteriorly in the neck at the level of the C5-T1 vertebrae [5]. It consists of two lateral lobes which are connected by isthmus. Isthmus measures 1.25 cm transversally as well as vertically [6]. In some cases an additional lobe is present, which is known as Pyramidal Lobe (PL) is attached to the superior border of Isthmus, usually at its junction with the left lobe. Apex of lobe is attached to the Hyoid bone by a fibrous band known as Levator Glandulae Thyroideae (LGT).

**Embryological Basis:** It is the first endocrine gland to appear and begin to function by the end of 3<sup>rd</sup> month, the time at which the first follicle containing colloid become visible [7]. The embryonic Thyroid tissue

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first appears about 24 day after fertilization on the border between 1<sup>st</sup> and 2<sup>nd</sup> Branchial Arches. It starts as endodermal thickening in the floor of pharynx forming a Thyroid Diverticulum. The thyroid diverticulum is first hollowed but soon become solid and divide in to right and left lobe connected to each other by isthmus that lies anterior to the 2<sup>nd</sup> and 3<sup>rd</sup> tracheal rings. By 7<sup>th</sup> wk the thyroid gland has usually reached its final site in the neck. By this time the thyroglossal duct has normally degenerated and disappeared [8]. The organogenesis of thyroid gland in human is often disturbed, leading to a variety of morphological variations of thyroid gland such as hypoplasia, ectopy, hemigenesis and agenesis [9]. The pyramidal lobe and the Levator Glandulae Thyroidae (LGT) develop from the remnant of the epithelium and connective tissue of thyroglossal duct [8]. As morphological variations are usually diagnosed incidentally during examination for thyroid gland diseases, the true incidence is therefore uncertain [9].

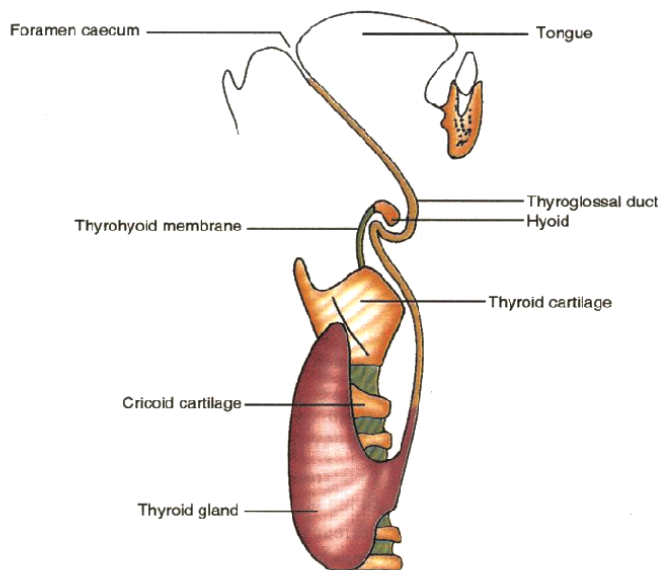


Fig. Showing the development of thyroid gland.

**Case Report:** During the routine undergraduate prosection hours of 1<sup>st</sup> year MBBS in the Department of Anatomy, Govt. Medical college, Amritsar, India, an elderly male cadaver revealed the following anomalies.

- Absence of superior thyroid artery on right side.
- Presence of the pyramidal lobe towards left side.

- Presence of levator glandulae thyroidae on the left side

Absence of the superior thyroid artery on right side and the right lobe of gland being supplied solely by the right inferior thyroid artery. The left superior thyroid artery was normal and came out to be a branch of external carotid.

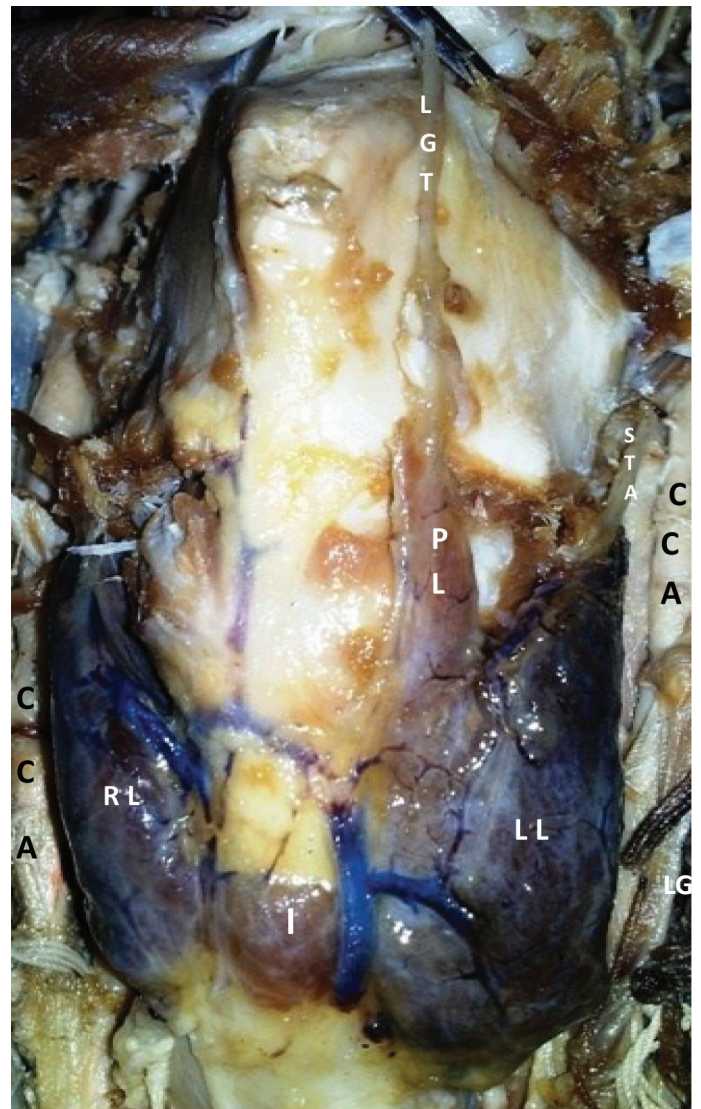


Fig. 1: Anterior view of neck dissection showing the anomalies in the morphology and blood supply of thyroid gland.

(CCA: common carotid artery, STA: superior thyroid artery, RL: right lobe, LL: left lobe, I: isthmus, PL: pyramidal lobe, LGT: levator glandulae thyroidae).

The right and the left lobes were lying on either side of the trachea. The right lobe measured 3.7cms along its medial border and 2.5cms transversely, its apex being at the level of the lower border of the thyroid cartilage and its base being at the level of the third tracheal ring. The left lobe measured 4.0cms along its medial border and 3.1cms transversely, its apex being at the level of the lower border of the thyroid cartilage and its base being at the level of the fourth tracheal ring.

The pyramidal lobe was coming from the medial border of left lateral lobe of gland. It measures 2.6cms long and 1.5cms wide. The length and breadth of the levator glandulae thyroideae were 3.8cms and 0.4cms respectively. It extended from the apex of pyramidal lobe to the hyoid bone. Isthmus of the gland measured 1.3cms transversely and 2.0cms vertically. The inferior thyroid arteries which came out as the branches of the thyrocervical trunk on both the sides supplied the respective lobes of the thyroid gland. There was no scar on the neck which suggested that the subject had not undergone any surgery. There was no ectopic thyroid tissue seen in cervical region along the course of thyroglossal duct from the root of the tongue to the gland's position and its neighbouring vicinity.

**Table-1:** Incidence of occurrence of pyramidal lobe & levator glandulae thyroideae originating from pyramidal lobe

S. No	Year	Author	% of incidence of pyramidal lobe	% of incidence of LGT associated with pyramidal lobe
1	1996	Enayetullah. [10]	50%	32%
2	2004	Begum. [11]	26.7%	15%
3	2008	Ranade <i>et al.</i> [9]	58%	49.5%
4	2008, 2009	Sultana <i>et al.</i> [12 13]	50%	37%
5	2010	Joshi <i>et al.</i> [14]	37.7%	27%

## DISCUSSION

Most of variations of Thyroid Gland is due to a partial persistence of median or thyroglossal duct [15]. Failure of development of entire gland or part of gland results in agenesis or hemiagenesi, which could be unilateral or isthemic [16, 17].

Braun *et al.* [18] commented that pyramidal lobe was found to be present in 55% (32/58) of cadavers. The frequency of presence of pyramidal lobe could be a source of pitfalls in thyroidectomy during preoperative diagnosis on scintigraphical images.

In a study performed by Won *et al.* [19] in Koreans to clarify the morphological characteristics of thyroid gland, the frequency of existence of pyramidal lobe was 76.8%.

Sultana *et al.* [12] observed that 50% of cases (30 out of 60 cases) had pyramidal lobe. In another study by sultana *et al.* [13] found that Levator Glandulae thyroideae was evident in 43.33% cases (26 cases out of 60 cases). Out of 26 cases studied by Sultana *et al.* 22 were associated with pyramidal lobe and Levator Glandulae thyroideae was extending from apex of pyramidal lobe to Hyoid bone as in present case. In remaining 4 cases the origin of Levator Glandulae Thyroideae was from Isthmus, of which 2 were attached to hyoid bone and 2 with the corresponding line of thyroid cartilage above.

In a study conducted by Wahl *et al.* [20] pyramidal lobe was observed to have left lobe origin at 53% as in present case, right lobe origin at 39% and isthmus at 8%.

In literature, there is data on the location of pyramidal lobe [18,20]. This may be due to the fact that the thyroglossal duct is generally developed in the left caudal direction. In line with the literature in our case study pyramidal lobe was present on the left side.

The levator glandulae thyroideae was encountered in 49.5% of the dissections which were performed by Ranade *et al.*, [9]. According to Gregory and Guse [21], Soemmerring's levatorglandulae thyroideae is an accessory muscle which runs from the hyoid bone to insert partly on the thyroid cartilage and partly on the isthmus of the thyroid gland. Merkel [22] thought that the levator glandulae was constant and glandular, though it was usually surrounded by muscle fibres. Huschke [23] spoke of the structure only as glandular, while he mentioned nothing about the muscle. Bourgerie [24] described and illustrated a muscle which he called as "hyo-thyroïdien", which occupied the place of pyramidal lobe.

Saadeh *et al.* [26] reported that an unusual Levator Glandulae Thyroidae (LTG) on the left side of neck in female cadaver. It arose from mastoid process, extend superficially to the superior belly of omohyoid muscle and inserted in to the connective tissue of the left lobe of thyroid gland.

**Clinical Significance:** Through training and understanding of thyroid anatomy and its associated anatomical variations are very much essential for surgeons, physicians and to radiologist as well. In the present era of biotechnology various non invasive radiological investigations such as ultrasonography (USG), computerised tomography (CT) and magnetic resonance imaging (MRI) can bring in to light otherwise clinically silent variations. The anterior cervical region has to be investigated very carefully during an operation, in order not to leave behind residual thyroid tissue during total thyroidectomy. Knowledge of vascular aberrations is essential in routine surgical procedure. When it is suspected the subject should be motivated for the compulsory screening of deferential diagnosis from simple to complicated one like Thyroiditis, Autonomus thyroid nodule, Thyroid carcinoma etc.

## CONCLUSION

Imaging of pyramidal lobe preoperatively especially in patients requiring total thyroidectomy would felicitate the treatment and monitoring of patient by decreasing relapses that may occur at later time. Thyroid scintigraphy can easily image the pyramidal lobe and should be conducted in every patient before the operation, and if pyramidal lobe is visualised then its location should be reported. The study of thyroid anatomy along with its associated frequently to rarely occurring variations will definitely helpful for clinician in planning and executing surgical and radiological interventions and also will be of great academic interest to all medical personnel.

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