

Case Report

# A Morphological Variation in Thyroid Gland- A Case Report

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## ABSTRACT

There are many variants in the size and shape of the thyroid gland, and the position of the embedded parathyroid glands. It is the largest endocrine gland located in the anterior neck, on the trachea just inferior to the larynx. The two right and left lobes are connected each other in the mid of the trachea by isthmus. Besides these two lateral lobes, sometimes an accessory thyroid lobe termed as Pyramidal Lobe, develops from isthmus or lateral lobes as a result of embryological remnant of the thyroglossal duct. Approximately 50% of thyroid glands may have pyramidal lobe. In rare cases, the Pyramidal Lobe may be the site of primary thyroid disease such as follicular carcinoma. The presence of the Pyramidal Lobe may be misinterpreted during a preoperative diagnosis on ultra-sonographic images. This case highlights about Pyramidal lobe with its position, extent, relationship to neighbouring structures and size. The knowledge of such morphological variation is important to perform safe and effective thyroid surgeries.

**Keywords:** Thyroid gland, Thyroglossal duct, Pyramidal lobe, Variation

## INTRODUCTION

Thyroid gland is an endocrine gland, located just inferior to the larynx at the level of fifth cervical to first thoracic vertebrae (C5-T1). It consists of right and left lobes placed one on either side of the trachea and are connected with a narrow median mass of tissue called Isthmus. A small, finger like projection of thyroid tissue frequently arises from the upper border of the isthmus or the adjacent part of the either lobe; more often the left lobe. This conical projection termed as pyramidal lobe, often ascends towards the hyoid bone. Sometimes, this lobe may be connected with the body of the hyoid bone through a descending fibrous or fibromuscular band called Musculus levator glandulae thyroideae. [1,2] The lobe appears related to an embryological remnant of the

thyroglossal duct, which develops along the migratory path of the thyroid gland and usually disappears later in development. [3] It was estimated that 50%-70% of people may have pyramidal lobe [4] and considered as the morphological variation of the thyroid gland [5] or normal component of the thyroid gland. [1] The presence of the Pyramidal Lobe may be misinterpreted during diagnosis and is important in total thyroidectomy surgery to prevent recurrent thyroid diseases. For a successful postoperative radiation therapy in patients with thyroid carcinoma, the identification and removal of pyramidal lobe has great importance. [3]

The aim of this case report is to determine the pyramidal lobe with its position, extent, relationship to

neighbouring structures and size. Knowledge of such information is necessary to perform safer and more effective thyroid surgery.

### CASE REPORT

We describe a pyramidal lobe observed in a 70 years old female cadaver during routine dissection in the Department of Anatomy at Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. This Cadaver belongs to South India, Karnataka region obtained through voluntary body donation programme and was formalin fixed for routine dissection for teaching. While doing dissection of anterior aspect of neck, as the thyroid gland and related structures were exposed, the Pyramidal Lobe was found arising from the Junction of the right lobe with the isthmus. Anteriorly, the base of the pyramidal lobe was covered by the sternohyoid muscle and separated from its pre-tracheal layer of the deep cervical fascia. After removal of the sternohyoid and

omohyoid muscles, we found that the base of the pyramidal lobe was located directly below the level of the arch of the Cricoid cartilage and inferomedial to the oblique line of the thyroid cartilage. The posterior aspect of the base of the pyramidal lobe showed a direct relationship with the cricothyroid muscle. The apex of the pyramidal lobe (superior and narrower portion) was found below the level of the superior border of the thyroid cartilage and related medially to sternohyoid muscle.

Measurement of the pyramidal lobe was performed directly and the three linear parameters of the pyramidal lobe were measured: the length (from the base to the apex) is 2.16 cm long, the width (transverse diameter of the base) is 1.12 cm wide and thickness (anteroposterior diameter of the base) is measured about 2.6 mm. sometimes, pyramidal lobe may also be associated with the muscle levator glandulae, but in this case it was absent. No other remarkable abnormalities noted.

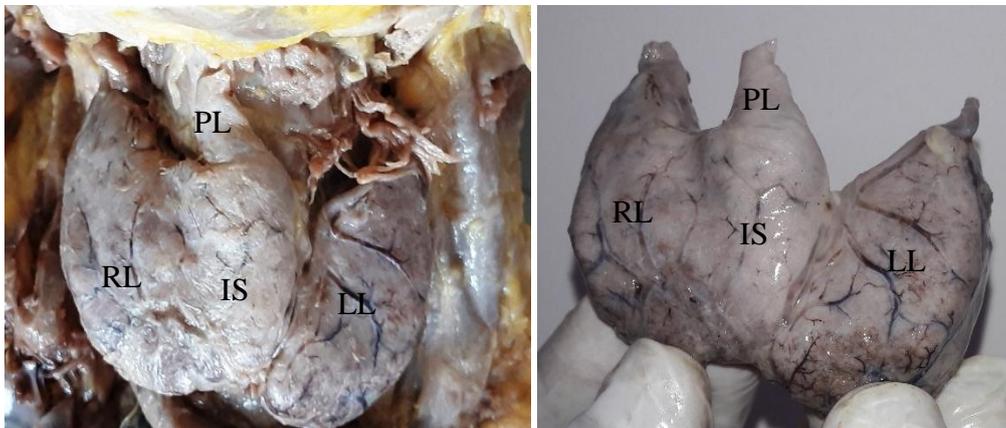


Figure 1: Pyramidal lobe (PL) of the human thyroid gland arising from Junction of the right lobe with the isthmus. RL – Right thyroid lobe; LL – Left thyroid lobe; IS – Thyroid isthmus

### DISCUSSION

Gland is a highly vascular endocrine gland, situated anteriorly in the lower part of the neck against fifth cervical to first thoracic vertebrae. It regulates the basal metabolic rate, stimulates somatic and psychic growth, and plays an important role in calcium metabolism. Sometimes, a third pyramidal lobe may arise from the isthmus or from one of the lobes. [6] Based on the studies using a limited number of cadavers,

differing values for the prevalence of the pyramidal lobe have been reported ranging from 15% to 75%. A multi-centre randomized study in large population of patients was reported focusing on the frequency of the pyramidal lobe, as determined by computed tomography (CT), demonstrated that this variant was present in 44.6% (968/2200) of patients [693 women and 288 men] with higher incidence in women. [4] Zivic R et al.(2011) also

expressed same about gender incidence and also reported presence of the pyramidal lobe incidence more in multi nodular goitre. [1]

The Thyroid gland consists of two lobes connected by a narrow median isthmus. The average weight of thyroid gland is 25gm and length of each lobe is 4-5cm but varies being slightly heavier in female and enlarging during menstruation and pregnancy. The estimation of the size of thyroid gland is clinically important in the evaluation and management of the thyroid disorders. The lobes of thyroid gland have two parts called apex and base. The Apex is diverging laterally to the level of the oblique lines on the lamina of the thyroid cartilages. It lies opposite to 5<sup>th</sup> cervical vertebra. The base is present at the level of 5<sup>th</sup> or 6<sup>th</sup> tracheal ring which corresponds to 1<sup>st</sup> thoracic vertebrae. This level is variable due to thyroid enlarge, usually extend downwards. Each lobe has three surfaces and two borders. The lateral surface is directed forwards and laterally covered by sternothyroid, anteriorly sternohyoid and superior belly of omohyoid, inferiorly by anterior border of sternocleidomastoid. The medial surface lies over the thyroid and cricoid cartilages of the larynx, upper most parts of trachea and oesophagus, deep to this inferior constrictor of pharynx and cricothyroid muscles are present. The external laryngeal nerve on its way to cricothyroid, located medially to the gland. The recurrent laryngeal nerve as it ascends in the groove lies posterior to this surface. The posterior part of the lobe is directed posterolaterally, next to carotid sheath and its contents. The lateral and medial surfaces are separated by the sharp anterior border. A branch of the superior thyroid artery descends along this border. The rounded posterior border separates posterior and medial surfaces, on its right side related to inferior thyroid artery and parathyroid gland, on the left is related to thoracic duct. The Lower part of each lobe is connected by isthmus, which usually lies anterior to 2<sup>nd</sup>-3<sup>rd</sup> cartilages, though often higher or sometimes lowers. It is covered in front by

skin and fascia; and by the sternothyroid, sternohyoid muscles and by the anterior jugular veins. It measures about 1.25cm both transversely and vertically. The superior thyroid arteries anastomosis along its upper border and inferior thyroid veins leave the gland in inferior border. The pyramidal lobe is a finger like projection of thyroid tissue which frequently arises from the upper border of isthmus or the adjacent part of the either lobe; more often the left lobe. Occasionally, it is detached or more parts. A fibrous or muscular band is sometimes found attached from thyroid isthmus or its pyramidal lobe to the body of the hyoid bone, when muscular termed as the levator muscle of thyroid gland. Sometimes small detached masses of thyroid tissue may occur above the lobe as accessory thyroid gland. [2]

#### **Development of the thyroid gland**

Thyroid gland arises as a median outgrowth of pharynx. When the pharyngeal arches and pouches are formed, a median diverticulum was developed from the floor of the primitive pharynx between the anterior and posterior rudiments of tongue. This diverticulum grows into the adjacent mesoderm and elongates further. Subsequently, the developing gland relocates from the tongue into the neck as a bilobed diverticulum. During this migration, the thyroid gland is attached to the foramen caecum by the thyroglossal and lies in the midline of the rows downward ventral to the hyoid, thyroid and cricoid cartilages and trachea. On reaching the level of the upper trachea, the tip of the diverticulum divides into two parts which spread out on the sides of the developing trachea and form the lobes of the thyroid gland (one lobe on either side). Due to rotational and regressional changes which happen during development, the thyroglossal duct passes ventral to the hyoid, winds around the bone's inferior border, goes up the posterior aspect and then descends ventral to the laryngeal cartilages. In adult life, the site of origin of the diverticulum is indicated by the foramen

caecum. The Thyroglossal duct normally disappears after migration, but remnants of epithelium and connective tissue of the duct may form pyramidal lobe and indicates the original dichotomous branching of the distal end of the diverticulum. [2,7]

Depending on origin and location of the base of Pyramidal lobe, B. Milojevic et al.[2013] classified it into five types. The first type (PL originating from the central part of the isthmus) and the second type (PL originating from the junction of the right lobe with the isthmus) were more frequent than the very rare fifth type (PL originating from the right lobe). These are summarized in table no.1

**Table 01. Types of the Pyramidal lobe according to the origin and location of its base**

Type	Origin and location of the base from
Type I	Central part of the isthmus
Type II	Junction of the right lobe with the isthmus
Type III	Junction of the left lobe with the isthmus
Type IV	Left lobe
Type V	Right lobe

An interesting thing of B. Milojevic et al. (2013) Study showed that the size of the Pyramidal lobe was highly significantly influenced by the presence of the Fibromuscular Band (FMB). It was four times longer and its base two and a half times wider and three times thicker when associated with the FMB. The presence of the Pyramidal Lobe may be misinterpreted during diagnosis. It is important in total thyroidectomy surgery to prevent the presence of residual thyroid tissue. The identification and removal of the Pyramidal lobe has also of great importance for successful postoperative radiation therapy in patients with thyroid carcinoma. [3] In rare cases, the lobe may be the site of primary thyroid disease. Ogawa C et al. (2009) reported a case of a minimally invasive follicular carcinoma arising from the apex of the pyramidal lobe. [5] Zivic R et al. (2011) also mentioned two cases of multiple papillary carcinoma, present in pyramidal lobe. [1] A study by Nina Irawati et al.(2016), in cancer patients reported that

pyramidal lobe contains deposits of papillary carcinoma of thyroid. [8]

## CONCLUSION

Pyramidal lobe is a normal component of the thyroid gland. The Morphological variation was manifested by differences in its presence, position, extent and size. This case highlights about type II Pyramidal lobe and its relation to adjacent structures, which was arisen from the junction of the right lobe with the isthmus. The presence of the Pyramidal Lobe may be misinterpreted during a preoperative diagnosis on ultra-sonographic or CT images. The identification and removal of the PL has also of great importance for successful postoperative radiation therapy in patients with thyroid carcinoma. This type of morphological variations is important in pre-operative diagnosis for radiologist and surgeons to perform safe and effective thyroid surgery.

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