

## A STUDY OF THE VARIATIONS IN THE MORPHOLOGY OF THE THYROID GLAND AND ITS SURGICAL CORRELATIONS

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### ABSTRACT

**Introduction:** Being a highly vascular and one of the essential endocrine glands, the knowledge of the variations in the morphology of the thyroid gland stands an important role with respect to their identification, isolation or preservation, and prevention of any untoward complication during the surgeries around the neck region, thus increasing the chances of favourable surgical outcome.

**Aim:** The aim of the present study was to identify the frequent variants in the structure of the thyroid gland, and to compare the same with the work of other authors.

**Materials and Methods:** The present study was conducted on total 86 thyroid glands with morphological variations, out of which 42 were of males and 44 were of females. These were obtained during routine dissection of the neck in the adult human cadavers aged above 50 years.

**Results:** The most common variation in the present study was the presence of pyramidal lobe (50% in males and 65.9% in females), followed by the levator glandulae thyroideae (45.2% in males and 52.3% in females), absence of the isthmus (7.1% in males and 20.5% in females), accessory thyroid tissue (2.4% in males and 2.8% in females), and the least common was presence of groove in the thyroid tissue (0% in males and 2.8% in females). There were also combination of variants in some thyroids.

**Conclusion:** The study emphasizes on the common anatomical variations in the thyroid gland morphology and their surgical correlations.

**KEY WORDS:** Variations, Morphology, Thyroid gland, Pyramidal lobe, Levator glandulae thyroideae, Isthmus.

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### INTRODUCTION

The thyroid gland is situated low down at the front of the neck. It consists of two symmetrical lobes united by an isthmus that lies in front of

the second, third and fourth tracheal rings. The isthmus joins the anterior parts of the lobes, towards their lower poles. A small portion of gland substance often projects upwards from the isthmus, generally to the left of the midline, as

the pyramidal lobe and represents a development of glandular tissue from the caudal end of the thyroglossal duct. It may be attached to the inferior border of the hyoid bone by fibrous tissue; muscle fibres sometimes present in it are named levator glandulae thyroideae [1].

Most of the variations in the morphology of the thyroid gland are related to its development. This may lead to various thyroid disorders, some of which may require surgical correction. Thus a knowledge of these variations is essential during different types of thyroidectomies and surgeries in the neck region [2].

**Aims:** The aims of the present study were to identify and tabulate the frequency of incidence of the various morphological variations in the thyroid gland, and to compare the results with those of previous studies.

## MATERIALS AND METHODS

The present observational study was conducted on total 86 thyroid glands, out of which 42 were of males and 44 were of females. These were obtained during routine dissection of the neck in the adult human cadavers aged above 50 years, during period from October 2015 to September 2018 at Parul University, Vadodara, Gujarat, India.

The variants studied were – presence of pyramidal lobe; its attachment to either lobes/ isthmus, presence of levator glandulae thyroideae; its attachment to hyoid bone/lobes or isthmus, absence of isthmus, presence of accessory thyroid tissues and presence of grooves on the surface of thyroid tissue.

The study was ethically approved by the ethical committee of the Parul Institute of Medical Sciences & Research, Parul University.

**Table 1:** Different morphological variations observed in male and female thyroid glands.

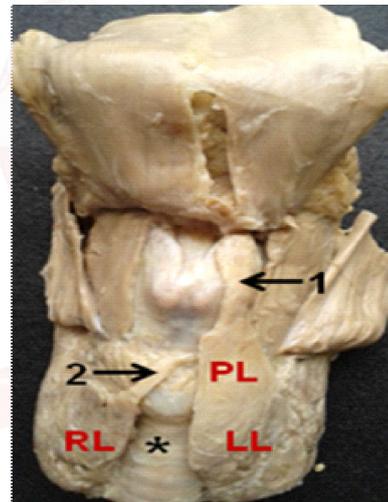
Morphological Variation	Male (n)	Male (%)	Female (n)	Female (%)
Pyramidal lobe	21	50	29	65.9
Levator glandulae thyroideae	19	45.2	23	52.3
Absence of isthmus	3	7.1	9	20.5
Groove in thyroid tissue	0	0	1	2.8
Accessory thyroid tissue	1	2.4	1	2.8

Out of the 86 thyroid glands that were collected having some or other morphological variation, from 42 male and 44 female cadavers, the

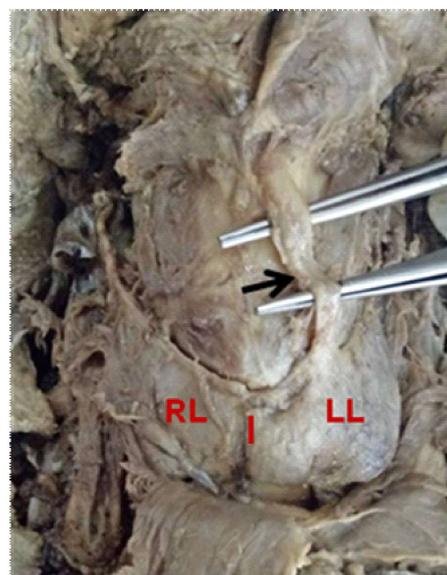
pyramidal lobe was reported in 50% male and 65.9% female specimens [Fig.1]. Levator glandulae thyroideae was seen in 45.2% male and 52.3% female specimens [Fig.1,2 and 3], absence of isthmus in 7.1% male and 20.5% female specimens [Fig.1 and 3], accessory thyroid tissue in 2.4% male and 2.8% female specimens [Fig.3] and the presence of groove in the thyroid tissue in 1 female specimen [Fig.3].

More than one variation (combination of two or more) in a thyroid gland was reported in 16.7% male and 25% female specimens.

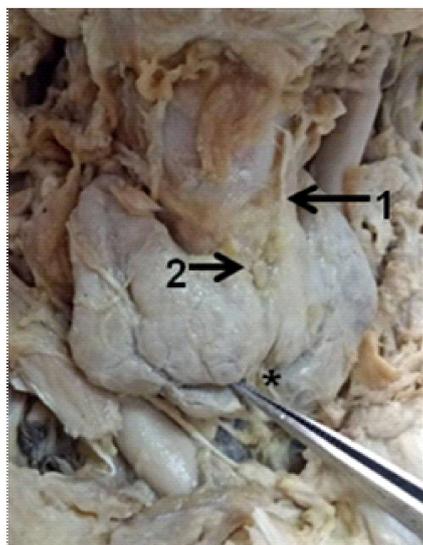
**Fig. 1:** Showing RL=Right lobe; LL=Left lobe; PL=Pyramidal lobe; Arrow 1= Levator glandulae thyroideae attached to pyramidal lobe (arising from left lobe) and hyoid bone; Arrow 2= Levator glandulae thyroideae arising directly from right lobe, and attached to thyroid cartilage; \*= Absence of isthmus.



**Fig. 2:** Showing RL=Right lobe; LL=Left lobe; I=Isthmus; Arrow= Levator glandulae thyroideae arising directly from left lobe, with some fibres attached to thyroid cartilage.



**Fig. 3:** Showing arrow 1= Levator glandulae thyroideae arising from upper border of left side of isthmus, and attached to thyroid cartilage; Arrow 2= Accessory thyroid tissue; \*= Agenesis of lower part of isthmus; Forceps pointing to the presence of groove in the thyroid lobe.



## DISCUSSION

The various variations in the morphology of the thyroid gland reported in the present study were compared with those of the previous studies. [Table 2]

**Table 2:** Comparison of 3 frequent variants observed in the present study with the previous studies.

Author	Year of study	Sample size	% presence of pyramidal lobe	% presence of levator glandulae thyroideae	% absence of isthmus
Ranade A V et al [3]	2008	105	58	49.5	33
Sultana S Z et al [4]	2009	60	84.65	43.33	-
Dixit D et al [5]	2009	41	7.31	7.31	14.6
Joshi S D et al [6]	2010	90	37.77	30	16.66
Zivic R et al [7]	2011	100	61	-	-
Prakash et al [8]	2012	70	38.57	32.86	8.57
Kulkarni V et al [9]	2012	20	-	30	10
Milojevic B et al [10]	2013	58	55.2	-	-
Veerahanumaiah S et al [11]	2015	89	46	41	9
Hussain Kafeel A et al [12]	2015	32	40.6	25	6.2
Rathod M S et al [13]	2015	76	58	-	13
Rajkonwar A J et al [14]	2016	80	38.75	18.75	21.25
Gaikwad S et al [15]	2016	100	26.59	30.85	29.78
Das S R et al [16]	2018	32	12.5	17.5	12.5
Movya Venkata Vinaya Kumar et al [17]	2018	60	13.3	5	8.3
Surya Venkata Narayana P. et al [18]	2018	25	8	12	4
Present study	2018	86	58.1	48.8	13.9

in first, there was absence of isthmus, presence of the accessory thyroid lobe in between two lateral lobes, presence of left pyramidal lobe and presence of levator glandulae thyroideae on left side; in the second, there was presence of

The most common morphological variation in the thyroid gland reported in the previous studies was the presence of pyramidal lobe, followed by the presence of levator glandulae thyroideae, and absence of the isthmus. Out of these, most of the thyroids had combination of two or more variants in one specimen, the commonest being the presence of pyramidal lobe and levator glandulae thyroideae. Accessory thyroid tissue was also reported by Ranade A V et al (0.95% specimens), Veerahanumaiah S et al (2.24% specimens) and Gaikwad S et al (1.6% specimens).

In addition to above studies, some authors also published such variations in the cadavers as case reports. Praveen Kumar G. Et al reported agenesia of isthmus of the thyroid gland with pyramidal lobe and levator glandulae thyroideae arising from the right lobe [19]. Chaudhary P et al reported a rare case of levator glandulae thyroideae arising from the upper border of the left side of isthmus (pyramidal lobe being absent) and attaching to the hyoid bone above [20]. Nikumbh R D et al reported two cases;

narrow isthmus related to first tracheal ring and presence of levator glandulae thyroideae arising from the left lobe of thyroid gland [21].

In the present study, we also observed accessory thyroid tissue (2.4% in male and 2.8% in

female specimens), and the presence of groove in the thyroid tissue (0% in male and 2.8% in female specimens).

The common variants like the pyramidal lobe, levator glandulae thyroideae and the absence of isthmus are mainly due to anomalies during the development of the thyroid gland. The thyroid gland appears as an epithelial proliferation in the floor of the pharynx from the foramen caecum in the form of bilobed diverticulum, called the thyroglossal duct. The lower part of the duct develops into median isthmus and two lateral lobes. The upper connection of the duct with the floor of pharynx later disappears. A high division of the thyroglossal duct can result in two independent thyroid lobes and no isthmus [22]. During the development of thyroid gland, positional variation and the ultimate position of the thyroid gland depends on extent of elongation of thyroglossal duct [23]. According to Moore and Persaud, pyramidal lobe is seen in 50% of population and the muscular band may be made up of smooth muscle fibres and that the pyramidal lobe and the associated smooth muscle represent the persistent part of distal end of thyroglossal duct [24].

The surgeon should keep the morphological variations in mind during different types of thyroidectomies [25,26]. The knowledge of such variations would increase the chances of favourable surgical outcome.

## CONCLUSION

The present study emphasizes on the common anatomical variations in the thyroid gland morphology, an accurate knowledge of which is important for the surgeons to perform safe and effective surgery.

**Conflicts of Interests: None**

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