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## Morphometric features of thyroid gland: A detailed cadaveric study

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### Abstract

**Background:** Thyroid gland is a very important endocrine gland. Thyroid gland surgery is one of the more common surgical interventions in the head and neck region.

**Aim:** Accurate knowledge of morphometry of the gland and its variations is important during tracheostomy and thyroidectomy. Various thyroid diseases like goitre, thyrotoxicosis, adenoma, carcinoma etc are usually associated with enlargement and require surgical intervention.

**Materials and Methods:** The study was done at the Department of Anatomy, Sri Ramachandra Medical College and Research Institute. 50 thyroid glands dissected out from adult cadavers and also specimens utilised for teaching were used. Specimens with signs of thyroid diseases were excluded from the study.

**Observation:** For the 50 specimens the maximum length of the right and left lobe was 6.34cm, 5.29cm, the minimum length of the right and left lobe was 2.80cm, 2.95cm, the maximum breadth of the right and left lobe was 3.55cm, 3cm, the minimum breadth of right and left lobe was 1.24cm, 1.03cm. the maximum thickness of right and left lobes was 2.40cm, 0.89cm, the minimum thickness of right and left lobes was 2.01cm, 0.72cm, the maximum weight was 55gms, the minimum weight was 6gms, the maximum volume was 70ml, the minimum volume was 5ml.

**Conclusion:** Hence this study on morphometry of the gland will hopefully help to minimise the complications during surgeries.

**Keywords:** Thyroid gland, tracheostomy, thyroidectomy, adenoma, carcinoma

### 1. Introduction

Thyroid gland derives its name from its resemblance to a shield (greek: thyreos-shield; eidos-form) [Hoyes AD, Kershaw DR 1985]<sup>[8]</sup>. The gland is located low down in front of neck. It consists of two symmetrical lobes united by an isthmus. [Veena kulkarni *et al.* 2012]<sup>[32]</sup>. The gland is covered by a fibrous true capsule and false capsule. A small portion of the gland substance often projects upwards from the isthmus, generally to the left of the midline as the Pyramidal lobe [Veena kulkarni *et al.* 2012]<sup>[32]</sup>. Glandular or fibrous or fibromuscular band the Levator glandulae thyroideae sometimes descends from the hyoid body to the isthmus or apex of pyramidal lobe, innervated by branch of external laryngeal nerve. [Nurunnabi *et al.* 2009]<sup>[1]</sup>. Superior thyroid artery is the main arterial supply to the gland. Cadavers are still the best means to study all the domains of anatomy. Hence this study will hopefully help the surgeons.

### 2. Materials and methods

The study was done at the Department of Anatomy, Sri Ramachandra Medical College and Research Institute, by conventional dissection of embalmed and formalin fixed adult cadavers age limit of 40-60yrs both sexes and also in specimens utilised for teaching. Specimens with signs of thyroid diseases were excluded from the study.

**2.1 Materials used for the study:** Digital vernier calliper, scalpel, forceps, scissors, digital weighing machine, glass beaker, gauze, cotton, blotting paper, tray

**2.2 Method:** The gland was dissected out from its attachments and taken along with pyramidal lobe and LGT. It was then placed on a tray and dried using a blotting paper and gauze piece. The greatest vertical length of each lobe was measured using a vernier caliper from apex to the base of the lobes as shown in figure 1, was noted down as the length of each lobe in centimetre. The greatest transverse extent of each lobe was measured using vernier caliper, from the posterior border to the beginning of isthmus as shown in figure 2, was noted down as the breadth of the lobes in centimetre. For the thickness, the lobes were incised vertically using a scalpel and 3 measurements were taken from apex to base (i.e antero posterior extent) average of all 3 readings was noted down as the thickness of the lobes in centimetre.

The gland was placed in a digital balance and the weight was noted down in grams.

The volume of the gland was measured by fluid displacement method, in which a tall glass beaker was filled with water, level of water column was first marked, then the gland was dropped in the beaker, allowed to submerge down and the volume of fluid column displaced above was noted. The difference between the two gives the volume of the gland in millilitres.



**Fig 1:** shows measurement of length.



**Fig 2:** shows measurement of breadth.

**3. Observation and results:** In 50 thyroid specimens which included cadavers and glands dissected from head and neck specimens the data collected were statistically analysed and results were tabulated as follows:

**Table1:** Length of the lobes

Parameters	Length of Right Lobe (Cm)	Length of Left Lobe (Cm)
Mean	4.05	3.79
Std. Deviation	0.708	0.608
Minimum	2.80	2.95
Maximum	6.34	5.29

**Table 2:** Breadth of the lobes

Parameters	Breadth of Right Lobe (Cm)	Breadth of Left Lobe (Cm)
Mean	2.10	2.04
Std. deviation	0.604	0.523
Minimum	1.24	1.03
Maximum	3.55	3.00

**Table 3:** Thickness of the lobes

Parameters	Thickness of Right Lobe (Cm)	Thickness of Left Lobe (Cm)
Mean	1.41	1.25
Std. Deviation	0.359	0.238
Minimum	0.89	0.72
Maximum	2.40	2.01

**Table 4:** Weight and volume of the lobes

Parameters	Wt (Gm)	Vol (ML)
Mean	13.98	11.72
Std. Deviation	7.633	9.594
Minimum	6	5
Maximum	55	70

**4. Discussion**

Variations in the descent of the thyroid gland during fetal life and regression of the thyroglossal duct is associated with many variations in the form of the mature gland.

**4.1 Length of the lobes:** In our study the length of right lobe was  $4.05 \pm 0.70$  cm, length of left lobe was  $3.79 \pm 0.60$  cm, this value coincided with most of the authors like Harjeet *et al.*, [2004] [6] length of right lobe  $40.49 \pm 6.78$  mm, left lobe  $38.29 \pm 7.94$  mm, Joshi SD *et al.*, [2010] [10] the mean length of right lobe 4.32cm, length of left lobe 4.22cm, Prakash *et al.*, [2011] [23] the average length of right lobe was 4.43cm, left lobe was 4.21cm, Hasan *et al.*, [2011] [7] the average length of the right lobe was 4.11cm, the left lobe was 4.02cm.

Compared to our study higher values were reported by Daksha dixit *et al.*, [2009] [3], Zuhail Ozgur *et al.*, [2011] [33], Tanriover *et al.*, [2011] [31], which may be due to study in other races, ours is a study in south Indian population.

Lesser values compared to our study was reported by Sami I. Abdullah *et al.*, [2010] [28], Rimpi gupta, Rajan Kumar Singla [2011] in a case, Phukon MJ *et al.*, [2012] [21] in a case, Eti sthapak *et al.*, [2012] [4] in a case, Har simarjit kaur *et al.*, [2013] in a case, the reason may be lesser number of specimens compared to our study.

**4.2 Breadth of the lobes:** In the present study breadth of the right lobe was  $2.10 \pm 0.60$  cm, breadth of left lobe was  $2.04 \pm 0.52$  cm, these values coincide with the previous authors like Harjeet A *et al.*, [2004] [6], Zuhail Ozgur *et al.*, [2011] [33], Prakash *et al.*, [2011] [23], Tanriover *et al.*, [2011] [31], Rimpi gupta, Rajan Kumar Singla [2011], Phukon MJ *et al.*, [2012] [21].

Hasan *et al.*, [2011] [7] found that for the right lobe the average width was 1.25cm, for the left lobe the average width was 1.13cm which was lesser than our value.

Har simarjit kaur *et al.*, [2013] reported in a case that for right lobe the breadth was 3.8cm, for left lobe the breadth was 3.6cm this value was higher than ours.

**4.3 Thickness of the lobes:** In the present study the thickness of the right lobe was  $1.41 \pm 0.35$  cm, thickness of left lobe was  $1.25 \pm 0.23$  cm. our values coincide with most of the authors like Harjeet A *et al.*, [2004] [6], Joshi SD *et al.*, [2010] [10], Prakash *et al.*, [2011] [23], Hasan *et al.*, [2011] [7], Phukon M J *et al.*, [2012] [21]. Tanriover *et al.*, [2011] [31] reported the thickness of left lobe was  $2.33 \pm 0.55$ cm, for right lobe the thickness was  $2.39 \pm 0.54$ cm., this value was higher than us, as their study was on Turkish population.

**4.4 Weight of the gland:** In the present study weight of the gland was 13.98  $\pm$  7.633 gms. These values coincide with the study of Arthur Harland W [1964] [2], Fakhrul *et al.*, [2010] [5]. Sami I. Abdullah *et al.*, [2010] [28] reported the weight of the gland 40- 49 yrs was  $21.81 \pm 2.48$ gm, 50- 60yrs was  $19.62 \pm 1.19$ gm, 60- 70 yrs was  $18.01 \pm 1.50$ gm. Tanriover *et al.*, [2011] [31] reported that the mean thyroid weight was  $26.11 \pm 8.14$ g, higher values reported by these authors are due to racial difference.

**4.5 Volume of the gland:** In the present study the volume was 11.72 ml  $\pm$  9.59 ml, this value was more or less equal to Hegedus L *et al.*, [1983] [12], Schiettecatte *et al.*, [2006] [29], Fakhrul *et al.*, [2010] [5]. Mohammed Yousef *et al.*, [2011] [15] reported the overall mean volume for both lobes was  $6.44 \pm 2.44$ ml. In the present study volume was calculated by fluid displacement method hence little difference was noted compared to the above authors.

**5. Conclusion:** To summarise, the study was done in 50 specimens and morphometry was noted in terms of length, breadth, thickness, weight and volume. All the measurements coincided with most of the authors. Hence this study will be a powerful tool for surgeons.

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