

Observation of pyramidal lobe and levator glandulae thyroideae and their macroscopic relation with whole thyroid gland: A postmortem study.

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Abstract:

Context: The thyroid is a brownish red, highly vascular earliest endocrine glandular structure appears in mammal. The size of thyroid gland varies considerably with age, sex, physiologic state, race and geographical location. It is larger and heavier in mature females than in males, and it hypertrophies during menstruation and pregnancy. Diseases of thyroid may need surgical intervention. During thyroid surgery, there is every possibility of occurrence of haemorrhage and recurrent laryngeal nerve injury. So this study is to carry out the macroscopic and microscopic architecture of thyroid gland of different age and sex groups in Bangladeshi people to establish a normal standard. This study will also help in minimizing complications of thyroid surgery and tracheostomy.

Study design: Mainly descriptive cross-sectional study with an analytic component.

Place and period of study: Department of Anatomy, Sylhet M. A. G. Osmani Medical College, Sylhet, from 1st July 2006 to 30th June 2007.

Materials: The study was carried out on 54 autopsied human thyroid glands aged 5 to 65 years. Thyroid glands were collected from unclaimed dead bodies autopsied in morgue of Sylhet M. A. G. Osmani Medical College, Sylhet.

Methods: The collected specimens were divided into age group A (10 years and below), group B (11 to 20 years), group C (21 to 30 years), group D (31 to 40 years), group E (41 to 50 years) and group F (51 years and above). All specimens were examined morphologically by fine dissection method.

Result: Pyramidal lobe and levator glandulae thyroideae

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were present in 37.04% and 59.26% cases respectively and were situated to the left side of midline in most of the cases. In most of the cases levator glandulae thyroideae had association with apex of pyramidal lobe to the body of the hyoid bone.

Conclusion: From observation and results it reached conclusion that the present study will help to increase the information pool on the anatomy of thyroid gland of Bangladeshi people. To establish a normal standard for Bangladeshi people, further studies with large samples from different zones including goitre endemic zones of the country are suggested.

Keywords: Observation, pyramidal lobe, levator glandulae thyroideae, macroscopic relation, thyroid gland, postmortem.

Introduction:

The thyroid gland is the largest endocrine gland in the body, and is unpaired¹. It is a horseshoe-shaped mass clasping the upper part of the trachea². The thyroid gland consists of two symmetrical lobes united by an isthmus, lies in front of the second, third and fourth tracheal ring^{3,4}. A pyramidal lobe, of frequent occurrence but variable size, extends upward from the isthmus or from the junction of the isthmus and one of the lateral lobes, usually the left⁵ and connected to the thyroid cartilage and hyoid bone⁶. There may be in addition to the pyramidal lobe, a fibromuscular band known as the levator glandulae thyroideae which usually replace the upper part of the pyramidal lobe⁷.

The size of thyroid gland varies considerably with age, sex, physiologic state, race and geographical location. It is larger and heavier in mature females than in males, and it hypertrophies during menstruation and pregnancy⁸. Any abnormal enlargement of the thyroid gland is called goitre. Major enlargements may be associated with either excessive or deficient production of thyroid hormones⁹.

The common diseases of thyroid gland are hypothyroidism (cretinism in children and myxedema in adult), hyperthyroidism, autoimmune thyroiditis, Graves' disease. Among these, hypothyroidism due to iodine deficiency is commonest. 5% of the populations are affected from various thyroid disorders. Over 90% patients with hyperthyroidism are due to Graves's disease, multinodular goitre and

autonomously functioning thyroid nodule (toxic adenoma). During thyroid surgery, there is every possibility of occurrence of haemorrhage and recurrent laryngeal nerve injury.

The thyroid is the earliest of the pharyngeal derivatives to make its appearance¹⁰. It begins to develop by about 24 day (in week 4) after fertilization from a median endodermal thickening in the floor of the primitive pharynx^{11,12} between the tuberculum impar and the copula at a point later indicated by the foramen cecum¹³. As the embryo elongates and undergoes differential growth, the thyroid diverticulum migrates anteriorly and inferiorly to the hyoid bone and laryngeal cartilages tethered by a slender thyroglossal duct¹⁴. Almost from its initial appearance this thyroid primordium (thyroglossal duct) is bilobed¹⁰. Subsequently the thyroid descends in front of the pharyngeal gut as a bilobed diverticulum¹³. At first the thyroid diverticulum is hollow but it soon becomes solid and divides into right and left lobes, which are connected by the isthmus of the thyroid gland. By seventh weeks the thyroid gland has assumed its definitive shape and has usually reached its final site in the neck. By this time the thyroglossal duct has normally degenerated and disappeared¹².

A pyramidal lobe, extending from the isthmus, is seen in about 50% of thyroid glands and is derived from the thyroglossal duct¹¹. The pyramidal lobe may be attached to the hyoid bone by fibrous and / or some smooth muscle – the levator glandulae thyroideae, which represent a persistent part of thyroglossal duct¹².

Materials:

This study was done on fifty-four (54) human thyroid glands of all ages and both sexes. These entire samples were collected from unclaimed autopsied bodies in the morgue of the department of Forensic Medicine of Sylhet M.A.G. Osmani Medical College after requisite legal formalities. As autopsy is not performed routinely in our country for natural deaths, the samples were collected from medicolegal cases within twenty-four (24) hours after death before appearance of signs of putrefaction. The human thyroid gland with related structures was collected enmass from November 2006 to April 2007.

The collected samples were washed gently with tap water. Blood and blood clots were removed. Each sample was tagged with a piece of waxed cloth which bear an identification number along with the age and sex of the victim. Then the sample was fixed and preserved in 10% formal saline solution.

Methods:

Place and duration of study:

This study was carried out in the Department of Anatomy, Sylhet M.A.G. Osmani Medical College (SOMC) from July 2006 to June 2007. Age and sex of cadaver were collected

from Department of Forensic Medicine, SOMC, recorded in the register book against respective number of the sample.

Grouping of the samples:

Grouping of the samples was done according to age into 6 groups (Table- I) and according to sex into 2 groups (Male, n=43 & Female, n=11).

Table – I. Age distribution in different age groups of present study.

Age range (years)	Group	Number of Cadavers/ Thyroid glands	Percentage
10 years and below	A	6 (Male 5 & female 1)	11.11
11 years to 20 years	B	8 (Male 6 & female 2)	14.81
21 years to 30 years	C	14 (Male 12 & female 2)	25.93
31 years to 40 years	D	11 (Male 9 & female 2)	20.37
41 years to 50 years	E	9 (Male 8 & female 1)	16.67
51 years and above	F	6 (Male 3 & female 3)	11.11

The parameters studied:

1. Observation (presence/ absence) of pyramidal lobe.
2. Observation (presence/ absence) of levator glandulae thyroideae and its relation with the pyramidal lobe.

Observation and measurement procedure of pyramidal lobe and levator glandulae thyroideae:

The anterior aspect of the sample block consisting of tongue, pharynx, oesophagus, larynx, trachea, thyroid and parathyroid glands, major vessels of the neck etc. were dissected and the topographical relations of the thyroid glands were observed. During dissection, observation notes were kept about the existence of the pyramidal lobe. If present, its position was noted and its length from base to apex, the breadth at the base and thickness was measured in cm.

Levator glandulae thyroideae muscle was searched. When present, its craniocaudal extension was noted and the relation with pyramidal lobe was also observed.

Observation And Results:

Pyramidal lobe (table – II, Fig. 1)

It was found that 20 (37.04%) out of 54 thyroid gland has pyramidal lobe. The incidence was being 16 (37.21%) in male and 4 (36.36%) in female. In each case the pyramidal lobe was single. It was also found from observations that

this lobe was situated more on the left side than on the right. Its base was mostly attached to the left half of upper border of the isthmus with or without encroachment on the adjacent part of the left lobe. In 3 samples its base was attached directly to the left lobe and in 2 samples to the right lobe. In one sample its apex has no association with levator glandulae thyroideae. The length (base to apex) and the breadth and anteroposterior thickness at the base of this lobe varied from 0.4 to 3.7 cm, 0.6 to 1.6 cm and 0.2 to 0.6 cm respectively. The mean length, breadth and anteroposterior thickness of this lobe were 1.87 ± 1.04 , 1.13 ± 0.33 and 0.43 ± 0.12 cm respectively.

Levator glandulae thyroideae (table –III, Fig. 2)

In this study, out of 54 sample levator glandulae thyroideae (LGT) was found in 32 (59.26%) samples of which 27 (62.79%) male and 5 (45.45%) female. In the male 15 samples of it, the lower end was associated the apex of pyramidal and 12 samples had no association with the lobe. In the female 4 samples of it, the lower end was associated the apex of pyramidal and 1 sample had no association with the pyramidal lobe. In samples where the pyramidal lobe was absent, the lower attachment was with isthmus of thyroid gland in 9 cases, both right and left lobe in 2 cases and left lobe in 3 case. In 4 (12.5%) samples upper end attached to the thyroid cartilage and the others to the body of hyoid bone. In 3 samples both lobes of thyroid gland were separated i.e. isthmus was absent and in 2 cases the lower end of levator glandulae thyroideae was bifurcated and attached to each lobe of the thyroid gland. In one sample there was 2 levator glandulae thyroideae. The length of levator glandulae thyroideae varied from 0.4 to 5.4 cm. Mean length of levator glandulae thyroideae was 2.48 ± 1.15 cm.

Discussion:

The incidence of pyramidal lobe mentioned in the textbooks varied widely. Dozois (1977), Moore and Dalley (1999), Hansen (1997), Pansky (1982), described pyramidal lobe present in about 50% cases^{11,14,15,16}. Marshall (1895) observed and April (1997) described a pyramidal lobe occasionally (43%) found extends superiorly from the middle of the isthmus which is a remnant of thyroglossal duct^{17, 18}. Hamilton (1976) described pyramidal lobe present in about 40% individual and arises more commonly from left of the midline¹⁹. Present study confirmed it. DeGroot (2001) described pyramidal lobe present in about 15% population which was lower than present study²⁰.

Harjeet et al. (2004) found pyramidal lobe in 28.9% of specimen and Izenstark et al. (1969) found in 35% cases, which was below present study^{21, 22}. Enayetullah (1996) found pyramidal lobe in 25 (50%) cases and single in every case, which was above present study²³. The incidence was being equal in male and female. He also observed that this lobe was situated more on the left than on the right. Begum (2004) observed pyramidal lobe in 26.7% cases, which was

below present study²⁴. She also observed this lobe was situated more on the left than right.

Harjeet et al. (2004) found LGT in 19.5% thyroid glands. In glands with LGT, it extended caudally from the body of the hyoid bone in 53.2% specimens²¹. In 10.8% instances, it arose from the median thyrohyoid ligament. Lehr (1979) found LGT in one case only (0.49%)²⁵. Enayetullah (1996) studied and found LGT in 32% cases and its association with pyramidal lobe in 22% cases²³. In most cases LGT were associated with pyramidal lobe and most of the pyramidal lobes were situated on the left side. Begum (2004) found LGT in 15% cases and all of them extended from apex of the pyramidal lobe to the body of the hyoid bone²⁴. The incidence of LGT in present study was higher than studies of above mentioned authors. But the association with pyramidal lobe and attachment to hyoid bone was nearly similar.

Table – II. Incidence of pyramidal lobe with its origin and its relation to isthmus.

Group	Sex	Number of specimen (n)	Attachment of pyramidal lobe with					Total number of thyroid with pyramidal lobe
			Left side of isthmus	Middle of isthmus	Right side of isthmus	Left lobe	Right lobe	
A	Male	5	0	0	0	1	1	2
	Female	1	0	0	0	0	0	
B	Male	6	1	0	1	0	0	3
	Female	2	0	1	0	0	0	
C	Male	12	0	2	1	2	0	5
	Female	2	0	0	0	0	0	
D	Male	9	3	1	0	0	0	5
	Female	2	1	0	0	0	0	
E	Male	8	0	1	0	0	1	3
	Female	1	1	0	0	0	0	
F	Male	3	1	0	0	0	0	2
	Female	3	0	0	1	0	0	
Total (%)		54 (100%)	7 (35%)	5 (25%)	3 (15%)	3 (15%)	2 (10%)	20 (37.04%)

Table – III. Incidence of levator glandulae thyroideae and its association with pyramidal lobe.

Group	Sex	Number of specimen (n)	Presence of levator glandulae thyroideae	Association with pyramidal lobe	Left side of isthmus	Right side of isthmus	Middle of isthmus
A	Male	5	5	2	1	0	2
	Female	1	1	0	0	0	1
B	Male	6	2	1	0	0	0
	Female	2	1	1	0	0	0
C	Male	12	8	5	0	1	1
	Female	2	0	0	0	0	0
D	Male	9	6	4	0	0	1
	Female	2	1	1	0	0	0
E	Male	8	4	2	0	1	1
	Female	1	1	1	0	0	0
F	Male	3	2	1	0	0	0
	Female	3	1	1	0	0	0
Total (%)		54 (100%)	32 (59.26%)	19 (59.38%)	1 (3.13%)	2 (6.25%)	6 (18.75%)

Chi-square = 28.125, P value = 0.000 (HHS)

Note: HHS = highly highly significant

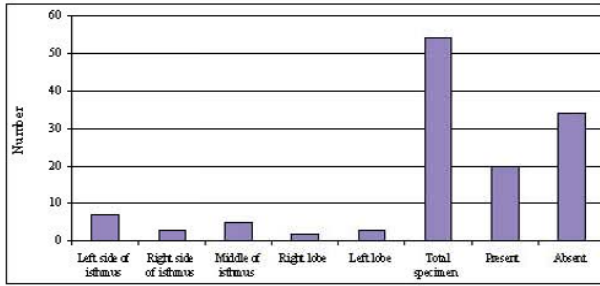


Figure- 1. Bar diagram-showing incidence of pyramidal lobe with its origin and its relation to isthmus.

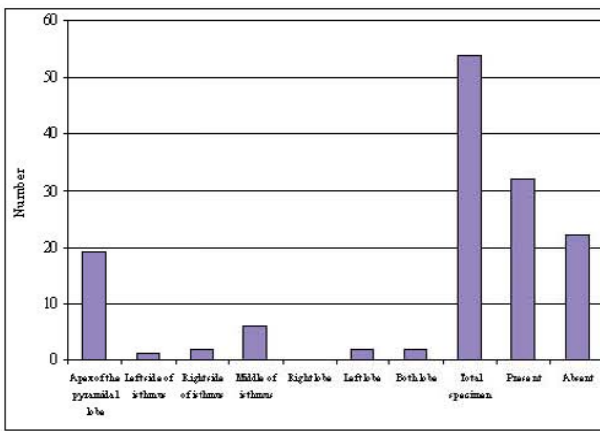


Figure- 2. Bar diagram-showing incidence of levator glandulae thyroideae and its attachment and association with pyramidal lobe.



Fig :- 3. Photograph of thyroid glands showing inferior attachment of pyramidal lobe to right and left lobes and middle, right and left side of isthmus.



Fig :- 4. Photograph of thyroid glands showing inferior attachment of levator glandulae thyroideae to apex of pyramidal lobe, right and left lobes and middle, right and left side of isthmus.



Fig :- 5. Photograph of thyroid gland and great vessels (anterior view), showing levator glandulae thyroideae and pyramidal lobe with their craniocaudal extension and relation.



Fig :- 6. Photograph of thyroid gland and great vessels (anterior view), showing levator glandulae thyroideae, thyroid cartilage, right and left lobe (RL & LL) of thyroid gland, right and left common carotid artery (RCCA, LCCA), arch of aorta (AA).

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