A MORPHOLOGICAL STUDY AND VARIATIONS OF THYROID GLAND

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ABSTRACT

AIMS & OBJECTIVE
To know the morphology & its variation in thyroid gland.

MATERIAL & METHODS
Routine dissection was done on the head and neck region on 24 cadavers in the department of Anatomy at Hassan Institute of Medical Sciences from 2009 to 2015.

RESULTS
On dissection, the thyroid gland lobe was normal in position with pyramidal in shape except in one case there were two lobes on the right side and one lobe on the left side. The length of the right and left lobes ranged from 4.5 to 5.1 cm and the width ranged from 2 to 3.5 cm. The levator glandulae thyroideae was found in two cases in which lower end was attached to lateral lobe in one case and to the pyramidal lobe in another case. The upper end was attached to hyoid bone in both the cases. The pyramidal lobe was present one case which was attached to the right side of the isthmus with length of 0.5 cm and width of 0.7 cm. There was absence of isthmus in one case.

CONCLUSION
The average length of the right lobe is slightly greater than left lobe. The pyramidal lobe was present in 4.1% of cases arising from the right side of the isthmus. Levator glandulae thyroideae was present in 8.3% of cases which is attached isthmus and the left lobe of thyroid gland. The absence of isthmus was 4.1% of the cases.

KEYWORDS
Isthmus, Levator Glandulae Thyroideae, Pyramidal Lobe.


INTRODUCTION
Thyroid gland appears as an epithelial proliferation from the floor of the pharynx between tuberculum impar, later it descends in front of the pharyngeal gut as bilobed diverticulum. During the migration of the thyroid gland is connected to the tongue by a narrow canal called the thyroglossal duct which later disappears. With further development of thyroid gland descends in front of the hyoid and laryngeal cartilage and reaches its final position by 7th week and starts function by 3rd month.

The thyroid gland is brownish red, highly vascular gland placed anteriorly in the lower neck at the level of C3 and T1. Its two lateral lobe connected by isthmus is covered by pretracheal fascia. The apex of the lateral lobe is related to the oblique line of thyroid cartilage and the base to the 4th and 5th tracheal ring. Each lobe 5 cm in length, width is 3 cm and anterior-posterior is 2 cm. The isthmus is connected to the lower part of the two lobes at the level of 2nd and 3rd tracheal ring with measuring of 2.5 cm transversely and 1 cm vertically.

A small portion of gland substance often projects upwards from the isthmus, as a pyramidal lobe which represent the glandular tissue from the caudal end of thyroglossal duct. The thyroglossal duct is attached to the inferior border of the hyoid bone by fibrous tissue or muscle fibres which is named as levator glandulae thyroideae and is innervated by external laryngeal nerve.

MATERIAL AND METHODS
Routine dissection was done on the head and neck region on 24 cadavers in the department of Anatomy at Hassan Institute of Medical Sciences from 2009 to 2015. A midline incision was done in the neck from chin to suprasternal space. The infrahyoid muscle were identified and reflected. The sternocleidomastoid and superior belly of omohyoid were displaced laterally. The fascia was removed from lobes of the thyroid gland. The shape of the gland was observed and photographed. The length and width of the lateral lobe were measured by measuring tape. The presence and absence of pyramidal lobe, levator glandulae thyroideae were noted. The length and width of the isthmus was measured and its relation to the tracheal ring was noted.

RESULTS AND OBSERVATIONS
On dissection, the thyroid gland lobe was normal in position with pyramidal in shape except in one case there were two lobes on the right side and one lobe on the left side. The length of the right and left lobe ranged from 4.5 to 5.1 cm and the width ranged from 2 to 3.5 cm. The levator glandulae thyroideae was found in two cases in which lower end was...
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Table 1

DISCUSSION

Sultana observed that 83.3% of cases in the left lobe, superior limit was below the midpoint of the thyroid cartilage and 56.6% of cases in the right lobe could reach the midpoint. The 53.3% of cases on the right lobe and 55% cases in the left lobe reached the inferior limit at the level of 5th tracheal ring.4

In our study superior and inferior limit of the right and left lobes of the thyroid gland reached superior cornua of the thyroid cartilage and 5th tracheal ring. Cicekibasi et.al examined 60 spontaneously aborted foetus and found variation in position of upper and lower limit of developing thyroid gland.3 The variability regarding the extension of the lobes of the thyroid gland is consistent with the failure of descent or excessive descent with the relationship to the anatomical structure having similar embryonic origin.

According to Braun et. al, the isthmus was absent in four cases out of 58 cases they studied.6 Chung have reported that 3% of cases showed the absence of isthmus and the lateral lobe of thyroid gland was separated.7 Marshall and Gruber have mentioned the incidence of agensis of isthmus is 10% and 5% of cases.8,9 Pastor et.al, 2006 have reported absence of isthmus in 5 to 10% of cases.10

In our study 4.1% of cases showed the absence of isthmus. The absence of isthmus have a differential diagnosis of (a) autonomous thyroid nodule (b) thyroiditis (c) primary carcinoma (d) neoplastic metastasis (e) infiltrative disease. Irregular embryological development can be caused by the fundamental mechanism of agenesis of isthmus. Available knowledge proposes that chromosomes 22 play a vital role in the thyroid development11 The thyroid gland begins to develop as a median thickening on the endodermal floor of the pharynx between the first and second pharyngeal pouches. The median diverticulum occurs as solid cellular cord known as thyroglossal duct, which grow caudally and divide to form thyroid lobe and isthmus. Simultaneous degeneration of the thyroglossal duct at the cephalic end can be observed.12

Pastor et.al, 2006 defined that the agenesis of thyroid isthmus with the incidence of 3% to 33% have been reported.10 An enormous division of the thyroglossal duct can give rise to two independent thyroid lobes, without the development of isthmus.11 A high division of the thyroglossal duct generate two independent thyroid lobes with absence of isthmus.14

About 33% of incidence of agenesis of isthmus of thyroid gland was observed in the study on anatomical variation of thyroid gland by Ranadeet al.15

In our study 79.1% of cases of the isthmus was present between second and third tracheal ring and in 16.6% of cases between second and fourth tracheal ring.

In our study pyramidal lobe was attached slightly towards the right side of the isthmus with the length of 0.5 cm and width of 0.7 cm. S D Joshi et.al presents that the pyramidal lobe was present in 34 cases (37.77%), out of which 16 cases (47.5%) arises from left lobe and 11 (32.55%) cases was attached to right lobe, 7 (20.58%) cases from the isthmus.16 During the development process caudal end of the thyroglossal duct persist as the pyramidal lobe which is attached to the isthmus.17

Marshall8 described the presence of pyramidal lobe in 43% cases. Harjeet et al18 have observed 28.9% of specimens, Levey et al.19 found that pyramidal lobe was arising from the left side of the isthmus in 53% of the cases. Moore and Persaud have
stated that the pyramidal lobe was seen in 50% of population.\textsuperscript{12} Braun et al has presented that the pyramidal lobe was found in 55% cases more frequent in men compared to women. Won H S presents frequency of existence of pyramidal lobe was more in Koreans 76.8.\textsuperscript{7} Dixit et al has presented that the pyramidal lobe was seen in 7.31% cases.\textsuperscript{20}

In our study two cases of Levator glandulae thyroidea were 8.3% was observed with the upper attachment to hyoid bone but lower attachment to the left lobe of thyroid gland in one case and right side of the isthmus in the second case. According to Cunningham Levator glandulae thyroidea is a narrow slip of muscle or fibrous strand remnant of thyroglossal duct, which greater part of thyroid gland is developed.\textsuperscript{21}

According to Gregory and Guse, Sommerring’s Levator glandulae thyroidea is an accessory muscle which is attached from the hyoid bone to the thyroid cartilage partly and to isthmus of thyroid gland.\textsuperscript{22} Merkel thought that Levator glandulae thyroidea was glandular, which is surrounded by muscle fiber.\textsuperscript{23} Rand et al, reported about 49.5% of cases of Levator glandulae thyroidea in his study.

Huschke have mentioned Levator glandulae thyroidea has glandular structure, nothing about the muscle.\textsuperscript{24} Godart reported a case in which the structure was indeed muscular on basis of nitric acid test.\textsuperscript{25} Saadch et al has reported unusual Levator glandulae thyroidea which arises from mastoid process, extend superficially to the superior belly of omohyoid muscle and inserted in to the connective tissue of the left lobe of the thyroid gland in a female cadaver.\textsuperscript{26}

Marshall\textsuperscript{4} has observed that Levator glandulae thyroidea is attached to hyoid bone in 17 (28.3%) cases and in9 cases Levator glandulae thyroidea has merged with fascia covering thyroid cartilage. S D Joshi et al reported that the Levator glandulae thyroidea was present in 27 (30%) cases. Oyasa\textsuperscript{27} has reported that the Levator glandulae thyroidea is attached to pyramidal lobe. The developmental anomalies will not only alter the morphology but also cause various functional disorder.\textsuperscript{28}

CONCLUSION

The thyroid gland was studied in 24 cadavers. The shape and size of the gland with the presence or absence of pyramidal lobe, Levator glandulae thyroidea and isthmus in relation to the tracheal rings was observed.

The average length of the right lobe is slightly greater than left lobe. The pyramidal lobe was present in 4.1% of cases arising from the right side of the isthmus. Levator glandulae thyroidea was present in 8.3% of cases which is attached isthmus and the left lobe of thyroid gland. The absence of isthmus was 4.1% of the cases.

Good knowledge of the variation in the thyroid gland and the pyramidal lobe, position of the isthmus helpful for surgeon in performing tracheostomies and in evaluation scintigraphy.

So that these anomalies are not overlooked in the differential diagnosis of the neck pathologies and helps in better planning for safe and effective surgeries.

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