Case report

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Agenesis of Isthmus of thyroid gland with presence of pyramidal lobe and levator glandulae thyroideae

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Abstract:
A wide range of morphological and developmental variations of thyroid gland like hypoplasia, ectopic thyroid tissue, hemiagenesis or agenesis of thyroid gland has been reported. Out of these agenesis of the thyroid isthmus is a very rare congenital anomaly. Thyroid isthmus agenesis does not manifest clinical symptoms, and it can be confused with other thyroid pathologies. Also the presence of levator glandulae thyroideae and its anatomical variations gain importance in the pathologies which are related to thyroid gland and their treatment modalities. We hereby, report the absence of isthmus and presence of levator glandulae thyroideae and pyramidal lobe in a middle aged male cadaver. The present case report is an attempt to highlight the implications of variation of thyroid gland from diagnostic, phylogenetic and functional perspectives.
Key words: Thyroid gland, Levator glandulae thyroideae, Pyramidal lobe, Thyroglossal duct

Introduction:

The thyroid gland is brownish-red, highly vascular endocrine gland, composed of two lateral lobes connected by a narrow median isthmus. The isthmus unites the anterior part of lobes towards the lower poles. It is ensheathed by pre-tracheal layer of deep cervical fascia and placed anteriorly in the neck. It extends from the fifth cervical to the first thoracic vertebrae. [1,2,3]

Many morphological variations and developmental anomalies of the thyroid gland have been reported in the literature. The common anomalies are persistence of pyramidal lobe and thyroglossal duct cyst. Some rare anomalies are agenesis of thyroid gland, aberrant thyroid gland and agenesis of isthmus. Pyramidal lobe forms a long pyramid which is attached by its base to the superior border of the isthmus, usually at its junction with the left lobe. Its apex is attached to the body of the hyoid bone by a fibrous band, which sometimes contains muscular fibres, known as the Levator Glandulae Thyroideae (LGT). It is seldom midline in position.[4]

Disturbed organogenesis of thyroid gland in humans leads to a variety of morphological variations of gland. The developmental anomalies of the gland may cause clinical, functional disorders and various thyroid illnesses.[2]

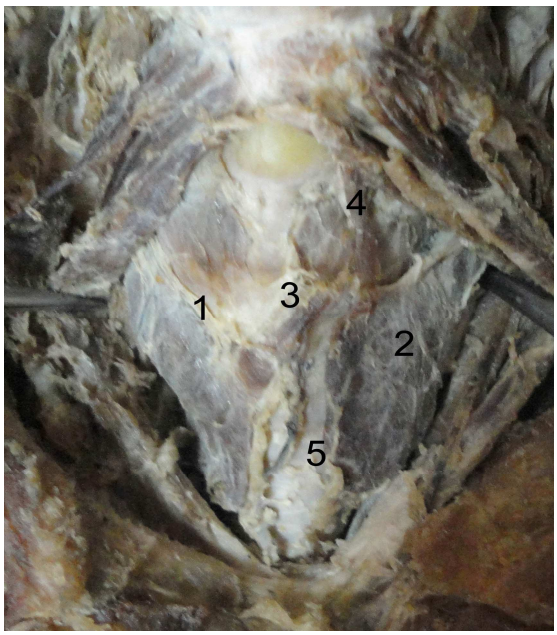
Here, we report a case with absence of isthmus, presence of pyramidal lobe and levator glandulae thyroidea in a middle aged male cadaver. Clinical implications of the variations of thyroid gland are discussed.

Case report

Thyroid gland was explored for any anomalies during routine midline dissection of neck in cadavers for undergraduate students at the Department of Anatomy, Sri Siddhartha Medical College, Tumkur. Agenesis of isthmus of thyroid gland was observed in a middle aged male cadaver. The pyramidal lobe and levator glandulae thyroideae were found to be present. The right and left lateral lobes were separate without any intervening thyroid tissue between them. Levator glandulae thyroideae extended

from hyoid bone to apex of left lateral lobe of the gland. Pyramidal lobe was observed extending from apex of right lobe of thyroid gland to lower margin of thyroid cartilage. Presence of pyramidal lobe and levator glandulae thyroideae arising separately from both lobes of thyroid gland along with agenesis of isthmus is a rare entity(**Figure I**).

Figure I: Thyroid gland with pyramidal lobe, levator glandulae thyroideae and absence of isthmus



1. Right lateral lobe
2. Left lateral lobe
3. Pyramidal lobe
4. Levator glandulae thyroideae
5. Absence of isthmus.

Discussion

Thyroid gland is the first endocrine gland to develop in the embryo on the 24th day of gestation. It develops from the thyroglossal duct, endodermal derivative of primitive pharynx at the level of 2nd and 3rd pharyngeal arch. It descends downwards and its caudal end bifurcates and gives rise to thyroid lobes with isthmus.[5]

Levator glandulae thyroideae is an accessory muscle extending from the hyoid bone to the isthmus or pyramidal lobe. Different studies done by various authors show that it is both glandular and muscular in its structure. According to Standring[6], Hamilton & Mossman[7] and Bergman et al[8], levator glandulae thyroideae is a fibrous or fibromuscular band that stretches from the pyramidal lobe or upper border of isthmus of thyroid gland, usually on the left side, to the body of the hyoid bone above. The muscle fibres are usually derived from the thyrohyoid muscle. But levator glandulae thyroideae which stretches from lobe of thyroid gland to the body of hyoid bone is very rare and reported in the literature. In the present case report, levator glandulae thyroideae was observed on the right side extending from apex of left lobe to hyoid bone.

Sgalitzer[9] stated that the pyramidal process develops out of the lower part of the thyroglossal duct by differentiation of the duct tissue into glandular tissue. The length of the pyramidal process depends on the position at which fragmentation of the thyroglossal duct first occurs. Rarely, a high separation of the thyroglossal duct can generate two independent thyroid lobes and pyramidal lobes with the absence of isthmus.[2] In a study done by Joshi SD et al[10], pyramidal lobe was present in 37.77% and it was attached to isthmus or the lateral lobes. It was observed that the maximum number of pyramidal lobes was attached to the left lobe, then to the right lobe or the isthmus. Marshall[11] described the presence of pyramidal lobe in 43%, Harjeet et al[12] in 28.9% and Levy et al[13] in 63% of cases. In the present case report, pyramidal lobe was seen extending from apex of right lateral lobe of thyroid gland.

The agenesis of isthmus is an anomaly of embryological development. The two types of endocrine cells in adult thyroid gland are follicular and parafollicular cells or 'C' cells, which are derived from two different embryological cell families. The follicular cells are derived from the endodermic cells of the primitive pharynx and the parafollicular cells from the neural

crest. The thyroid gland begins to develop as a median thickening of endoderm on the floor of the pharynx between the first and second pharyngeal pouches. This area later invaginates to form the median diverticulum, which appears in the later half of the fourth week. This thyroid diverticulum grows in allometric proliferation, becoming a solid cellular cord called the thyroglossal duct. The duct grows caudally and bifurcates to give rise to the thyroid lobes and the isthmus. At the same time that its caudal growth is taking place, the cephalic end of the thyroglossal duct degenerates. A high division of the thyroglossal duct can generate two independent thyroid lobes with the absence of isthmus. The absence of the isthmus can be associated with other types of dysorganogenesis, such as the absence of a lobe or the presence of ectopic thyroid tissue.[14]

The isthmus may be missing in amphibians, birds and among mammals - Monotremes, certain Marsupials, Cetaceans, Carnivores and Rodents. In rhesus monkey (Macacus rhesus), the thyroid glands are normal in position but there were no isthmus. In humans usually agenesis of isthmus is identified incidentally when the patient is referred for other thyroid diseases.[2.] In study done by Joshi SD et al[10], the isthmus was absent in16.66% cases. Harjeet et al[12], Marshall[11] and Oya[15] have noted agenesis of isthmus in 7.9%,10% and 4% respectively. Incidence of agenesis of thyroid isthmus has been reported to vary from 5% to 10% by Pastor et al.[16] Ranade et al[17] has reported in 33% of cases. Agenesis of isthmus can be diagnosed by scintigraphy, ultrasonography, CT and MRI. Differential diagnosis can be considered pathologically as autonomous thyroid nodule, thyroiditis, primary carcinoma, neoplastic metastasis and infiltrative diseases such as amyloidosis. Agenesis of isthmus becomes a crucial point for preoperative differentiation of benign and malignant lesions. Therefore, it becomes important to be aware of such variations and not to leave behind any residual thyroid tissues during total thyroidectomy. The knowledge about the fleshy slip of the levator glandulae thyroideae is also very important during neck surgery to avoid the iatrogenic injuries.[2]

Hence, the knowledge of anatomical variations helps surgeons for surgical intervention, and also physicians , and radiologists for further course of diagnosis and therapeutic use.

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