Case Report

Agenesis of isthmus of thyroid gland with bilateral levator glandulae thyroideae

Introduction

Thyroid gland is the first endocrine gland to start developing in the embryo. It is well known for its developmental anomalies ranging from common to rare. Common anomalies include persistence of pyramidal lobe and thyroglossal duct cyst. Rare anomalies are agenesis or hemi-agenesis of thyroid gland, agenesis of isthmus alone or aberrant thyroid glands [1,2].

In all the higher primates and human, the gland is composed of two lateral lobes joined by an isthmus located in the anterior cervical region, at the level of the second to fourth tracheal rings and protected by the infrahyoid muscles.

It is difficult to determine the incidence of agenesis of the thyroid isthmus because it is usually diagnosed in cohort of individuals presenting with other thyroid diseases.

Case Report

During routine dissection in the Department of Anatomy, 48-year-old male cadaver showed agenesis of isthmus of thyroid gland. There were no scars in the cervical region, suggesting that the patient have not undergone any surgery. The thyroid gland had two separate lobes, with complete agenesis of isthmus. Each lateral lobe had a pyramidal lobe of its own which is connected with two levator glandulae thyroideae. There were no ectopic thyroid tissues present between the root of the tongue to the gland’s position. The two lobes were separate without any tissue intervening between them (Figure 1).

The length of the lobes was 5.8 cm at the right and 6.3 cm at the left lobe; widths were 3.2 and 3.8 cm, respectively.

The individual lobes were supplied by branches of superior and inferior thyroid arteries. No accessory thyroid arteries were present. The anterior branch of superior thyroid artery (STA) anastomosed with ascending branch of inferior thyroid artery (ITA) between the pyramidal lobe and lateral lobe on each side. On the posterior border, anastomoses were identified between the posterior and inferior branches of STA & ITA, respectively. But there were no anastomoses between the arteries of right and left side (Figure 2).

Discussion

Agenesis of thyroid isthmus can be explained as an anomaly of embryological development [1,3]. Phylogenetically, the thyroid follicles are structured to acquire a bi-lobe shaped gland. The two lobes were joined together by an isthmus in the upper part of trachea [2,4].

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 [5].

The morphological difference in the evolutionary origin does not result in any changes in thyroid function. Usually agenesis of isthmus is difficult to determine unless the patients refer for other thyroid diseases.

What is the cause of agenesis of isthmus?

Thyroglossal duct (TGD) arises from the endodermic epithelium of primordial pharynx at the level of 2nd & 3rd pharyngeal arch, when it descends downward, its caudal end bifurcates and gives origin to the thyroid lobes and
the isthmus. At the same time the cephalic end of the thyroglossal duct degenerates [6]. This isolates it from the pharyngeal endoderm with the cessation of proliferation of the endodermic cells from which follicular cells of the gland are derived. Rarely, a high separation of thyroglossal duct can engender two independent thyroid lobes and pyramidal lobes with the absence of isthmus [3].

Agenesis of isthmus can be associated with dysorganogenesis related to developmental anomalies of thyroid gland such as absence of either lobe [7] or presence of ectopic thyroid tissue in the nearest cervical region [5].

In our case, the agenesis of thyroid isthmus was not associated with other anomalies of gland, and it may be a congenital anomaly. Interestingly, the glandular branches of STA and ITA did not anastomose in the median plane, which varies from other studies of agenesis of thyroid isthmus. This type of variations should be kept in mind during transthyroid tracheotomy procedures.

Agenesis of isthmus can be diagnosed via scintigraphy, ultrasonography, CT and MRI. When suspected, the individual may be directed for a differential pathological diagnosis such as autonomous thyroid nodule; thyroiditis; primary carcinoma; neoplastic metastases; and infiltrative diseases such as amyloidosis.

References