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Agenesis of Isthmus of Thyroid Gland

Arigela Saikumar[1], Uma shivanal[2], Vidya C.S[3], Joel Isaac paul D[4]

[1]Post graduate, [2]Assistant Professor, [3]Professor and Head, [4]Post graduate
[1,2,3,4]JSS Medical College, JSS AHER Mysuru-15

ABSTRACT

The thyroid gland is an important endocrine gland in the human body, which is bilobed and is connected by a tissue called isthmus. The agenesis of thyroid isthmus is a clinical condition but this condition does not cause any clinical manifestations itself. The lack of isthmus is usually detected when investigations are done for other pathological conditions like autonomous thyroid nodule, thyroiditis, primary carcinoma, neoplastic metastasis and infiltrative diseases such as amyloidosis or during cadaveric dissections. This case purely observational study done in the department of Anatomy JSS Medical college Mysuru during the routine dissection of Head and neck for Under graduate students. Intact to the midline of the neck incision give according to the Cunninghams Manual after reflecting the skin and fascia we noted that the absence of isthmus to thyroid gland 2 out of 10 formalin fixed cadavers. The full outlook awareness of agenesis of the isthmus and its associated thyroid anomalies will significantly contribute to Safety measures to be taken during surgical procedures to avoid surgery related complications and assurance diagnosis and planning.

KEY WORDS:

Absence of Isthmus: Endocrine gland: Thyroid hormones: Iodine homeostasis: Thyroid gland.

1. INTRODUCTION:

The thyroid gland is a brownish-red, highly vascular endocrine gland. It is placed anteriorly in the neck, extending from the fifth cervical to the first thoracic vertebrae. The small median isthmus connects the two lateral lobes that make up the gland. The pre-tracheal layer of the deep cervical fascia envelops it. Each of the thyroid gland lobes is normally 5 cm long, with the largest transverse and anteroposterior measurements being around 3 cm and 2 cm, respectively. The isthmus is typically positioned anterior to the second and third tracheal cartilages and measures around 1.25 cm both vertically and transversely. [1].

Thyroid gland is the first endocrine gland to start developing in embryo. Common anomalies include persistent of pyramidal lobe and thyroglossal duct cyst. Thyroid gland agenesis or hemi agenesis are uncommon abnormalities. It may also present as agenesis of isthmus alone or aberrant thyroid gland [2,3]. Sometimes a fibro-muscular band, the levator glandulae thyroideae descends from the body of hyoid bone to isthmus or pyramidal lobe if present [4].

The agenesis of thyroid isthmus is a clinical condition but this condition does not cause any clinical manifestations itself. The absence of isthmus is usually detected when investigations are done for other thyroid pathological conditions like autonomous thyroid nodule, thyroiditis, primary carcinoma, neoplastic metastasis and infiltrative diseases such as amyloidosis or during cadaveric dissections [5].

2. CASE REPORT:

During the routine dissection of Head and neck region, in the Department of Anatomy JSS Medical College Mysore, it was observed that in two cases, that the thyroid gland had two lobes, but there was no isthmus to unite them. The location, nerve supply and vascular supply were normal.

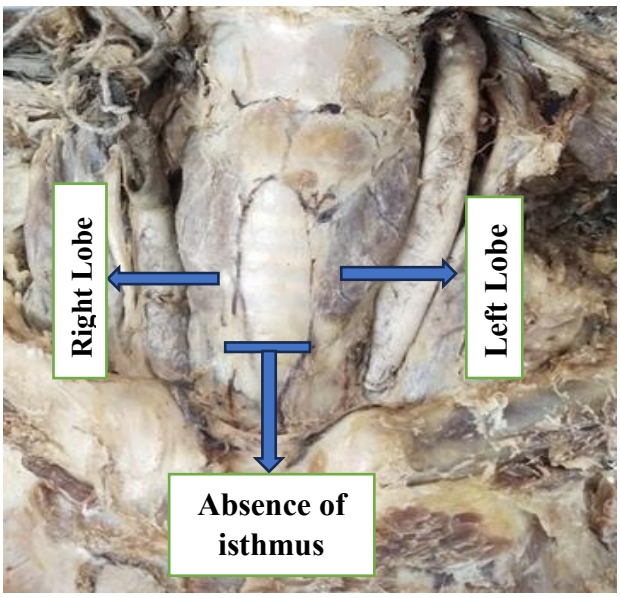
Measurements of thyroid gland lobes;

Fig 1(a & b): Showing two lateral lobes with absence of isthmus**.**

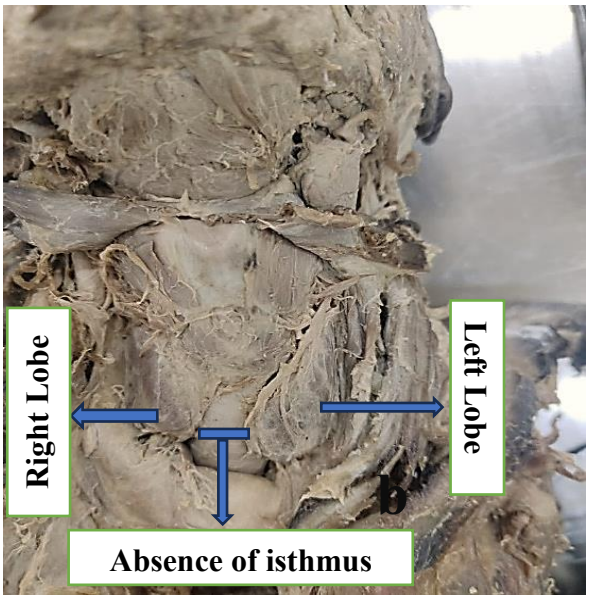
fig-2 (a & b): Showing The length was 38.82mm right and 42.03mm left respectively

fig-3 (a & b): Showing The breadth was 13.84mm in right lobe and 12.94mm in left

Fig 1(a & b): Showing two lateral lobes with absence of isthmus.



Case-1



Case-2

The length was 38.82mm right and 42.03mm left respectively -**fig-2 (a & b)**

Fig 2(a): Showing Length of Right lobe

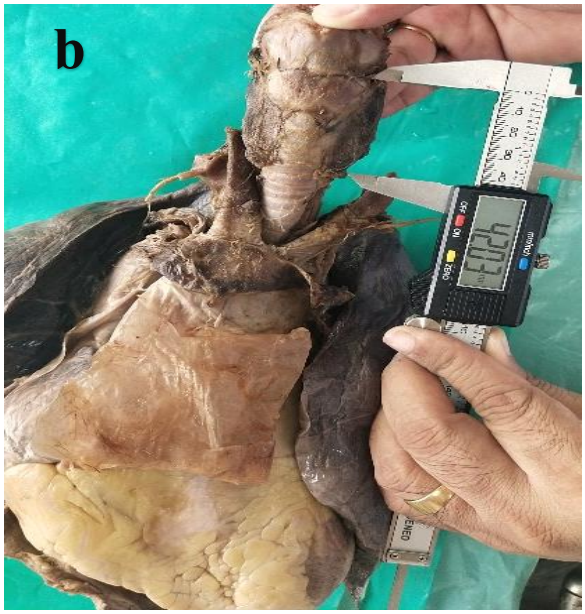


Fig 2(b): Showing Length of Left lobe

The breadth was 13.84mm in right lobe and 12.94mm in left -**fig3(a & b)**

Fig 3(a): Showing breadth of Right lobe

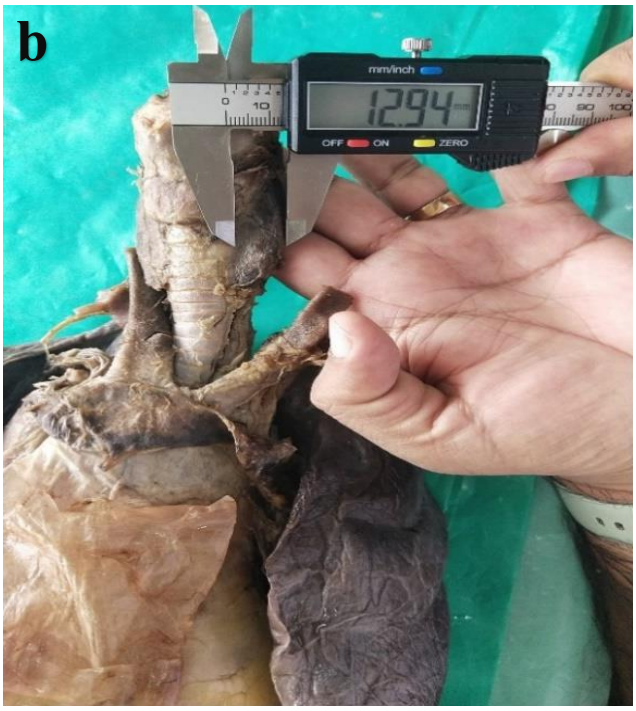


Fig 3(b): Showing the breadth of Left lobe

3. DISCUSSION:

The Thyroid gland arises from the 2nd and 3rd Pharyngeal pouches located close to the tongue's base. Day 20-24 of the 3rd week of pregnancy sees the proliferation of the primitive pharynx's endodermal cells, which leads to the thyroid diverticulum passes anteriorly to the laryngeal cartilage and bone as it migrates along the caudal midline divides, to forming the thyroid lobes and isthmus. occurs in the 5th week of gestation. During migration, the thyroid remains attached to the tongue by the thyroglossal duct. The isthmus, which connects the lower parts of the lobes, typically measures about 1.25 cm both transversely and vertically. It is positioned opposite the second and third tracheal cartilages. A high degree of thyroglossal duct separation may lead to the lack of the isthmus, and the upper end of the duct often degenerates. The absence of the isthmus does not cause clinical symptoms by itself [5,6,7]. Incidence of thyroid isthmus agenesis has been reported to range between 0.5% and 10%, the precise incidence rate is unknown [8,9]. Dixit et al. reported the rate of isthmus agenesis to be 14.6% in a series of 41 cadavers with a male to female ratio of 5:1, whereas Ranade et al. reported a rate of 33% in a series of 105 cadavers [10 11]. Anil Kumar Reddy et al. conducted a study on 29 adult cadavers of both sexes, ranging in age from 35 to 70 years. Among these, only one male cadaver had an absence of isthmus and two normal lateral lobes [12]. Kumar et al. revealed a case of absence of isthmus of thyroid gland with pyramidal lobe and levator glandular arising from right lobe [13]. A previous study in 2021 they reported a rare variant case with absence of isthmus to thyroid gland with a pyramidal lobe arising from left lobe and levator glandulae thyroidae[14].In the present study, it was observed that two cases of the thyroid gland had two lobes with absence of connecting isthmus. The location and vascular supply were normal. The nerve supply of both lobes' nerve supplies was normal, and no extra thyroid tissue was seen. Agenesis of isthmus of the thyroid gland is an uncommon developmental anomaly. Based on the cadaveric studies, isthmus agenesis is seen 5fold more in males. [10]. The reported incidence varies up to 10% in different studies, the true figure is uncertain [15,16,11], may be because the diagnosis of agenesis is done usually when the patient is diagnosed for nodular goiter, thyroiditis, or primary carcinoma and condition itself does not show any clinical manifestations [17,18]. Genetic factors and defects in embryological development seem to play an important role in thyroid isthmus agenesis, mutations in the genes responsible for the development of the thyroid may be linked to isthmus agenesis, particularly chromosome 22 and TITF1-2 genes [9] [10].

De Felice and Di Lauro and Vassart and Dumont reported that mutations in the genes TITF1, PAX8, FOXE1/TITF2 may result in agenesis of thyroid isthmus, especially TITF2, as this gene is necessary for the thyroid gland and palate to grow. Chromosome 22 also plays an important role in the development of the thyroid gland [8,19,20].

If any embryological variations/ developmental anomalies are diagnosed, differential diagnosis of autonomous thyroid nodule, thyroiditis, primary carcinoma, plastic metastasis, amyloidosis are to be ruled out and associated anatomical variations either in vasculature, nerve supply, or regarding the morphology of the lobes are meticulously investigated [21].

4. CONCLUSION:

The thyroid is an endocrine gland composed of two lobes connected by the isthmus tissue. Thyroid isthmus agenesis is a rare condition. When agenesis of the isthmus is found either during cadaveric dissections in teaching hospitals or in surgical procedures, associated thyroid lobe agenesis and the presence of ectopic thyroid tissue must be considered. But in the present case, there was an isolated absence of isthmus with intact normal lobes and its normal blood, nerve supply of the thyroid gland. The comprehensive preoperative awareness of agenesis of the isthmus and its associated thyroid anomalies will significantly contribute to safety measures to be taken during surgical procedures and avoid iatrogenic or surgery-related complications. prevent intraoperative complications and to guarantee appropriate diagnosis and planning.

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