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Case report

Ectopic thyroid tissue in the anterior mediastinum along with a normally located gland ☆

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ABSTRACT

Ectopic thyroid tissue is a rare developmental abnormality arising from an aberration in the normal migration of the thyroid gland, from the floor of the primitive foregut to its final position. It is usually asymptomatic, often being diagnosed as an incidental finding. However, it can present with symptoms of compression such as chest pain, cough, stridor, dysphagia, dyspnea and superior vena cava syndrome. Herein, we present the case of a 42-year-old male patient, presenting with dyspnea, chest pain and fatigue. Laboratory tests showed low serum levels of thyroid-stimulating hormone (TSH) and a thoracic computed tomography revealed a heterogeneous mass in the anterior mediastinum. The patient underwent a full surgical resection. The postoperative histopathological examination of the mass demonstrated the presence of benign ectopic thyroid tissue with no evidence of malignancy. This case report emphasizes the importance of taking Ectopic thyroid tissue into account when considering the differential diagnosis of a mediastinal mass, as other common diagnoses including lymphomas, dermoid cysts and thymic tumors, require an entirely distinct treatment approach.

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Introduction

Ectopic thyroid tissue (ETT) is a rare developmental anomaly that occurs due to the abnormal migration of the thyroid gland from the level of the foramen cecum to its normal pretracheal position (anterior neck region between the second and fifth tracheal rings). Its prevalence is approximately 1 per 100.000-300.000 people, affecting predominantly females, however studies suggest the true prevalence is underestimated [1].

The most common location of this abnormality is the base of the tongue, lingual thyroid, accounting for 90% of cases [2]. Other locations include submandibular, sublingual locations, the mediastinum and the abdomen (adrenal glands, gallbladder, esophagus, duodenum, the reproductive system) [3].

Most patients with ectopic thyroid tissue are asymptomatic. However, it can clinically manifest during periods of physiological stress, in puberty, pregnancy, trauma and infections when levels of TSH increase, subsequently inducing thyroid growth [4]. This thyroid enlargement can cause symptoms of compression. Furthermore, as a result of abnormalities in the normal migration pathway, it can result in insufficient blood supply, precipitating hypothyroidism during these periods of high demand. In 33% of children, the ectopic thyroid presents with clinical hypothyroidism such as failure to thrive and mental retardation [5]. Hyperthyroidism has been reported on very rare occasions.

Less than 1 percent of ectopic thyroid tissue is reported in the mediastinum [6]. In cases of mediastinal ectopic thyroid, the orthotropic thyroid usually coexists and patients are euthyroid. Therefore, patients are typically asymptomatic and ETT may be diagnosed as an incidental finding in a chest x-ray, but may at times present with chest pain, cough, stridor, dysphagia, dyspnea and superior vena cava syndrome [7].

Case presentation

A 42-year-old male patient was admitted to the Internal Medicine ward with dyspnea as his main complaint. The patient also reported chest pain and fatigue. His symptoms had progressively worsened over a period of 2-3 months. He was a heavy smoker, the rest of his past medical history was unremarkable. On examination the patient was alert and well-oriented. His heart rate was 98/min, blood pressure 180/90 mmHg and O2 saturation 98%. The examination of the cardiovascular and respiratory systems was unremarkable.

Initially, routine laboratory tests were ordered. The complete blood count (CBC), renal function tests (RFT), liver function tests (LFT), electrolytes and the lipid panel were all within normal limits.

He had hyperglycemia 182 mg/dl (74-100) and low serum levels of TSH 0.33 mU/L (0.35-4.94). Additionally, tests for tumor markers including CEA, AFP, CA 19-9, Ferritin, free beta-hCG, as well as total PSA, all came back normal.

ACT scan of the chest was ordered. It showed a 9 × 6 cm heterogeneous mass in the anterior mediastinum that was enhanced after intravenous contrast. At first, it was suspected to be an enlarged lymph node. It also revealed a 5 × 3 cm mass, at the right adrenal gland, that was further evaluated with an abdominal MRI. A 9 mm nodule was evident in the inferior part of the left thyroid lobe, as well as a stage II, fatty liver.

Subsequently, the patient underwent a scintigraphic examination of the thyroid gland, using Tec-99m pertechnetate with 2.2 mCL dose. The examination revealed a normal position of both thyroid lobes. They were both slightly enlarged with reduced fixation. Cold nodules were present in both thyroid lobes. The isthmus was normal. The percentage uptake of Tc-99m pertechnetate after 20 minutes was 0.2% (0.35-3.65). The result was suspected to be due to post thyroiditis changes. The low serum TSH values, as well as the low Tc-99m pertechnetate uptake suggested a recent asymptomatic thyroiditis.

The patient was suspected to have a teratoma in the anterior mediastinum. A few days later, he underwent a complete surgical resection of the mass and was transferred to the surgical ward for follow up. The histological examination of the biopsied tissue showed benign ectopic thyroid tissue without evidence of malignancy. Post-operatively, the patient made a complete recovery.

The lesion healed well after the surgery with no evidence of the mass in the postoperative chest CT scan. Laboratory values of the thyroid including TSH and T3, T4 were normal 4 weeks after the surgery.

Discussion

Ectopic thyroid tissue (ETT) is a rare developmental abnormality defined as a failure of the normal migration of the thyroid anlage, from the floor of the primitive foregut to its final position, anterolateral to the superior part of the trachea. Location of ETT varies, it usually can be found in the midline, along the line of the obliterated thyroglossal duct [8]. Most commonly, it is situated at the base of the tongue, a variant known as lingual thyroid, encountered in 90% of the cases [9]. Other possible locations include the head and neck, the axilla, the thymus, the adrenals, in organs of the gastrointestinal and reproductive systems, as well as the mediastinum, as was the case with our patient.

Genetic research has found a number of transcription factors that appear to be determining in the normal morphogenesis of the thyroid gland. NKX2-1(TITF-1), PAX8, HHEX and FOXE1(TITF-2) [10]. These transcription factors seem to be expressed both in precursor and functioning thyroid cells and play a crucial role in the early organogenesis and development of the thyroid gland.

NKX2-1 and PAX-8 are involved in cellular survival of precursor thyroid cells during early stages of organogenesis, functional differentiation and gene expression in thyroid follicular cells (TFC) in adult life. Heterozygous mutations of PAX-8 have been linked to thyroid hemiagenesis [11]. The role of HHEX is not fully understood, but it is believed to assist in maintaining the expression of the other transcription factors in thyroid cells. As for FOXE1, studies show it is involved in thyroid migration. Homozygous mutations affecting FOXE1 have been shown to cause sublingual thyroid in mice, how-

ever, these mutations have not been detected in humans so far [1].

The thyroid gland, in humans, starts developing during the third week of gestation, around day 20-24, when endodermal cells in the midline of the primitive pharynx start to proliferate and differentiate, giving rise to the thyroid diverticulum [12]. This diverticulum, originating at the foramen caecum at the junction of the anterior two-thirds and the posterior two-thirds of the tongue, is originally a spherical shaped structure that eventually becomes lobulated, from which the thyroid gland derives. During the fifth week of gestation, the diverticulum starts penetrating the underlying mesodermal tissue, migrating caudally and descending along the midline, anterior to the hyoid bone and laryngeal cartilage to reach its final pretracheal position, by the seventh week of gestation [13]. Throughout its migration, the primitive thyroid is attached to the foramen caecum by an embryological structure called the thyroglossal duct, that normally undergoes atrophy by the tenth week of gestation.

The pathogenesis of ETT is yet to be fully elucidated. However, aberrations or an arrest of the normal migration of the thyroid diverticulum is believed to account for most cases of ETT. Anomalies during the early embryogenesis of the thyroid gland and heterotopic differentiation of uncommitted endodermal cells have been proposed as possible hypotheses to explain atypical, distant locations of ETT outside the normal migration route of the thyroid.

Some authors suggest that the embryogenesis of the thyroid involves a median and two lateral thyroid anlagen that fuse together to give rise to thyroid follicular cells (TFC). Anomalies during this migration and incorporation process of one of the lateral anlage, may be responsible for ectopic locations in the submandibular and lateral regions of the neck.

Metastatic papillary thyroid cancer should always be excluded when considering a diagnosis of ectopic thyroid tissue. Other conditions to consider include surgical complications such as seeding of thyroid tissue, teratomas containing thyroid cells and local metaplasia. Differential diagnosis also varies depending on the location of the ETT. Lingual and sublingual ETT should be distinguished from cysts in the midline including thyroglossal duct cysts, branchial cysts, dermoid cysts, epidermal and sebaceous cysts, as well as benign adenomas such as lipomas, fibromas, angiomas, and lymphangiomas. Other conditions causing swelling at the base of the tongue including hypertrophic lingual tonsil, vallecular cysts and mucous retention cysts should be considered in the differential diagnosis. ETT located in the lateral cervical region should be differentiated from cervical lymphadenopathy and salivary gland tumors. When considering a diagnosis of mediastinal ETT, lymphomas, thymic tumors, germ cell tumors, neurogenic and mesenchymal tumors must be ruled out [14,15]. Abdominal ETT is typically diagnosed as an incidental finding. Usually, malignant transformation in ETT is very rare, still surgical removal of the mass is mandatory, considering the risks of enlargement, hemorrhage and malignant transformation and compression of other mediastinal organs [16].

Thyroid functioning tests (levels of T3, T4, TSH, thyroglobulin) are usually ordered to evaluate the functional status of the ectopic thyroid tissue. A number of different imaging modalities are used to establish the diagnosis. Ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) are all excellent, non-invasive methods used to determine the location and the extent of the ectopic tissue, asses the vascularization pattern, as well as assist in the differential diagnosis and pre-operative planning [17]. Scintigraphy is one of the most important diagnostic techniques, used to determine the location of the ectopic thyroid tissue, the presence or absence of an orthotopic thyroid gland and to assist with the treatment planning. Fine needle aspiration cytology (FNAC) is one of the most accurate methods, used to establish the diagnosis of ETT [18]. Surgery should be considered as elective treatment for mediastinal thyroid mass because of the high risk of suppression of the neighboring organs.

In our case Tc-99m was used to evaluate the thyroid gland. As long as it was not suspected clinically ectopic thyroid tissue, the anterior mediastinum was not included in the thyroid scan. That would have helped in diagnosing preoperatively the ectopic thyroid tissue, due to the uptake of I-131 by

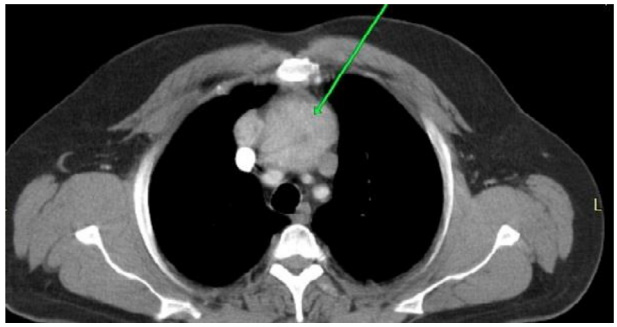

Fig. 1 – Contrast CT scan of the thorax shows marked contrast enhancement of the midline anterior mediastinal mass (arrow).

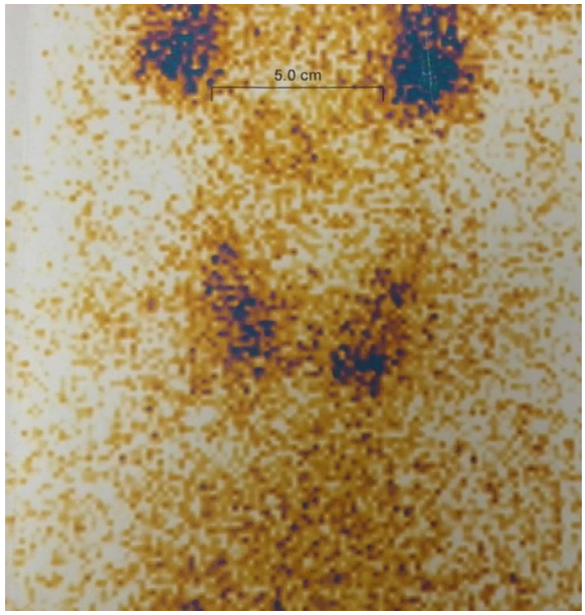

Fig. 2 – Thyroid scan using Tc-99m pertechnetate.

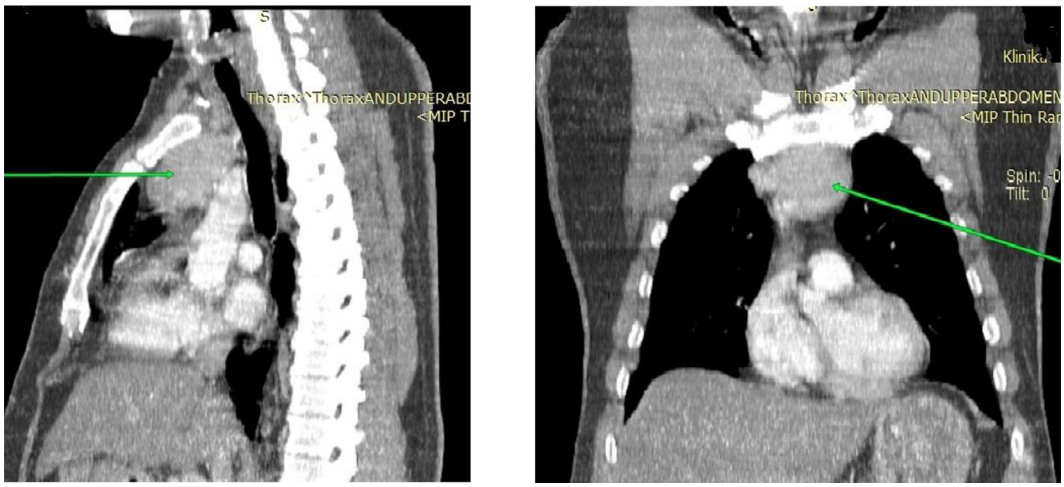

Fig. 3 – (a, b) Anterior mediastinal mass on contrast enhanced CT of the thorax (arrow) a. sagittal view, b. coronal view.

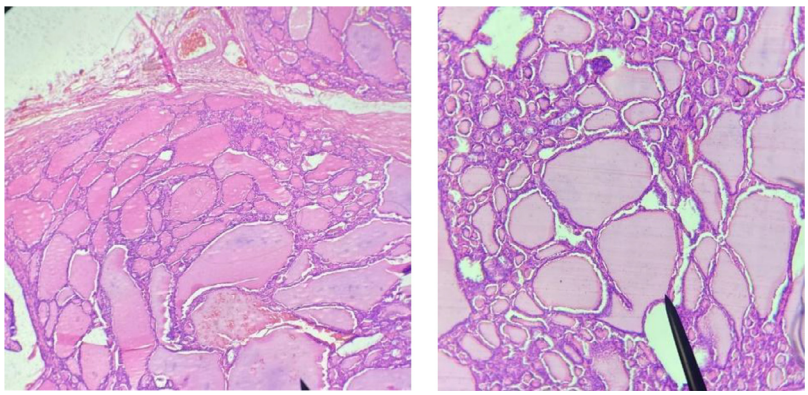

Fig. 4 – (a, b) Haematoxylin-eosin stained sections of the mediastinal mass, showing normal appearing colloid filled thyroid follicles. Features compatible with ectopic thyroid tissue without evidence of pathologies.

the ectopic mass. This emphasizes the importance of taking into the differential diagnosis clinically the presence of ectopic tissue, even when there is a normally located thyroid gland.

Mediastinal ETT, as in the case of our patient, accounts for less than 1% of ETT and they are believed to occur due to an overdescend of the thyroglossal tube residues. Differential diagnosis with other common mediastinal masses such as lymphomas, thymic tumors and dermoid cysts is essential to establish the definitive diagnosis. Figures 1–4

Conclusion

Ectopic mediastinal thyroid tissue is a rare variant that represents less than 1% of all cases of ETT. This case report underscores the importance of taking ETT into account when considering the differential diagnosis of a mediastinal mass, as other common diagnoses including lymphomas, dermoid cysts and thymic tumors, warrant a different management altogether. The preoperative diagnostic tests may provide anatomic details of the mass, however histological analysis is the cornerstone of the diagnostic confirmation.

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