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Thyroid Hemiagenesis with Multinodular Goiter: A Case Report and Review of the Literature

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Abstract. Thyroid hemiagenesis is a very rare abnormality, in which one thyroid lobe fails to develop. Most of the patients diagnosed have an associated thyroidal disease. The true prevalence of thyroid hemiagenesis is not known, but it is estimated to be 0.02% in normal children. We report a forty-five year-old female patient with a multinodular goiter in left lobe, associated with hemiagenesis of right lobe and isthmus.

Key words: Thyroid hemiagenesis, Nodular goiter

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THYROID hemiagenesis is a rare congenital anomaly, in which one thyroid lobe fails to develop. The first report of thyroid hemiagenesis dates back to 1866 to those by Handfield-Jones [1], to 1876 to those by Luschka [2], and to 1886 to those by Ehlers [3]. Congenital thyroid anomalies can be caused by abnormal descent or genesis of part of the thyroid gland. Approximately 270 cases have been reported in the world literature [4–34]. Most of the patients remain unknown until they become symptomatic. Most of the patients reported to have thyroidal hemiagenesis had several thyroid disorders. The true prevalance of the thyroid hemiagenesis is not known. However, it is estimated to be 0.02% in normal children [31]. Here we report a case presented with multinodular goiter associated with congenital thyroid hemiagenesis and we also review the relevant literature.

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Case

A 45-year-old female patient was presented with long-standing, painless, palpable left thyroid mass. She was clinically euthyroid, and had a palpable left lobe (Grade 1b) associated with probable 2 cm thyroid nodule in the lower pole of the left lobe. The rest of the physical examination was unremarkable. Her serum free T3, free T4, TSH, antithyroglobulin antibody, antimicrosomal antibody levels were 2.5 pg/ml (normal range: 2.3–4.2), 1.3 ng/ml (normal range: 0.8–1.5), 0.89 μIU/ml (normal range: 0.5–5.5), 20 IU/ml (normal range: 0–50), and 19 IU/ml (normal range: 0–50) respectively. As shown in Fig. 1, thyroid scintigraphy with Tc-99 m pertechnetate revealed the absence of right lobe and isthmus and a hypoactive nodule in the lower pole of left lobe. Ultrasonography confirmed the right lobe and the isthmus agenesis (Fig. 2). Ultrasonography revealed a left lobe (25 × 22 × 67 mm) with multiple nodules (Fig. 3). The dominant nodule was a degenerated cystic nodule in the lower pole of left lobe (20 × 22 × 25 mm). Fine needle aspiration biopsy revealed a degenerated colloidal nodule.

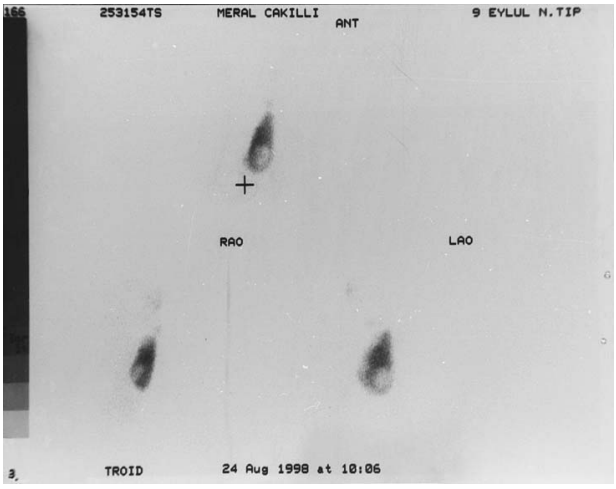


Fig. 1. Absence of technetium–99 m pertechnetate uptake in the right lobe that is compatible with thyroid hemiagenesis. A hypoactive nodule is also seen in the left lobe of thyroid.

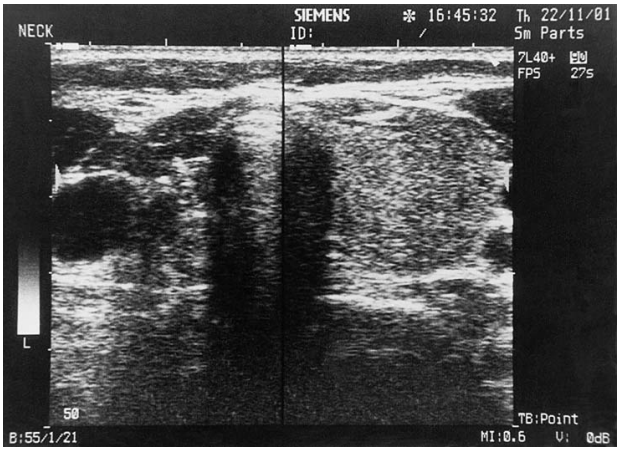


Fig. 2. Ultrasonography of the thyroid gland in transverse section: visualization of the left lobe with hypoechogenic nodules whereas no thyroid tissue on the right side and isthmus.

Discussion

Thyroid hemiagenesis is a rare congenital anomaly [13]. Our extensive review of the literature disclosed approximately a total number of 270 cases [12, 23, 29–36]. Thyroid hemiagenesis is a rare anomaly with an uncertain prevalence, since some patients have been found in a euthyroid state without abnormalities. Recently, Mikosch *et al.* reported the prevalence of thyroid hemiagenesis between 1 : 1900 and 1 : 2675 [29]. However, Mikosch *et al.* evaluated the previously published reports and mainly symptomatic patients who were evaluated for their thyroid problems. The actual prevalence of this anomaly was probably closer to that recently reported by Shabana *et al.* who evaluated 2845 school children in a systematic thyroid ultrasound study, and found 6 children (4 girls, 2 boys) with left lobe agenesis [31]. Their study showed that the estimated prevalence of thyroid hemiagenesis is 0.02% [31].

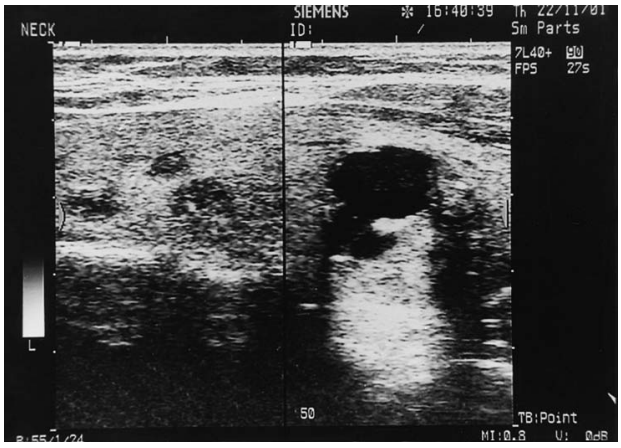


Fig. 3. Longitudinal section of the left thyroid lobe with multiple nodules.

The thyroid gland develops from a duct-like invagination of the endoderm in the primitive pharynx between the first and second pharyngeal pouches immediately dorsal to the aortic sac at 16–17 days of gestation. It continues to expand ventrally with the most rapid proliferation at its distal tip, but it remains attached to the pharyngeal floor by the stalk, now called the thyroglossal duct. Continued proliferation by the thyroid progenitors soon obliterates the lumen of the outpocketing, which becomes filled with cords of cells. The thyroid rudiment then begins to expand laterally, which leads to formation of the characteristic bilobular structure. Because the medial component of the thyroid is closely associated with the developing heart, the thyroid is essentially being pulled to its position near the base of the neck, in front of the pharynx [37].

It is not clear whether a descent disturbance or a lobulation defect is responsible for the hemiagenesis. No significant compensatory growth of the existing lobe in its normal anatomic localization in many patients suggests that the main problem is a lobulation defect rather than a descent disturbance. One aspect seems to

be a genetic one, because this rare disorder occurred in monozygotic twins [38], among sisters [39], or together with other thyroid malformations within one family [40, 41]. Recently several genes have been found to be involved in thyroid morphogenesis and descent. Thyroid transcription factors (TTF-1 and TTF-2) and PAX-8 are reported to be candidate genes for ectopy [42, 43]. However, these have yet to be studied in hemiagenesis.

The absence of the left lobe was detected in 80% of cases and agenesis of the isthmus was seen in 44–50% of cases [12, 29]. Our patient had right lobe agenesis with isthmus agenesis. The prevalence in women and girls is greater than in men and boys (75% versus 25%) [12, 29]. There is no convincing explanation for this female predominance. However, it may indicate a possible sex-related background.

Coexistent thyroidal disorder is almost a common feature of the patients diagnosed to be thyroid hemiagenesis. Such disorders are Graves' disease [9, 17, 18, 25, 29, 34, 36, 44–47], chronic lymphocytic thyroiditis, subacute thyroiditis [24, 48], nodular goiter [11, 12, 14, 25, 29, 49], hyperfunctioning adenoma [10, 15, 45], and primary or metastatic carcinomas [6, 7, 11, 19, 23, 25, 26]. Hyperthyroidism was reported to be the major reason for diagnosis. In general hypothyroidism was reported in a small group of patients (only in 21 cases) [9, 10, 13, 29, 50–53]. However Mikosch *et al.* reported a high prevalence of hypothyroidism (7 of 16 patients) in their survey in an iodine deficient geographic area [29]. Iodine deficiency had been verified in 4 of the 7 hypothyroid patients with hemiagenesis. In these four cases at least the iodine deficiency in combination with the lower functional reserve due to hemiagenesis was the most likely reason for hypothyroidism.

Thyroid hemiagenesis is usually diagnosed by thyroid scan via accumulation of tracer just one side within the thyroid region even after thyrotropin application. However there are several clinical conditions mimicking thyroid hemiagenesis in scintigraphic evaluation. Autonomously functioning nodules with suppressed normal thyroid tissue, primary or secondary neoplasms, infiltrative diseases such as amyloidosis, and unilateral inflammations of one lobe can mimic thyroid hemiagenesis [12, 15, 16, 44]. In these clinical conditions functional hemiagenesis based on thyroid scan alone may be misdiagnosed as congenital hemiagenesis. Therefore, thyroid scans should be confirmed by other methods revealing the morphology of the thyroid. Ultrasonography with a frequency between 5 and 10 MHz is widely available. It is cost effective, can be performed easily, and does not expose patients to radiation. Other techniques that can visualize hemiagenesis of the thyroid are computed tomography (CT) and magnetic resonance imaging (MRI). Both of the techniques are expensive and time consuming. In addition, diagnostic performance of these investigations is comparable with ultrasonography for the thyroid.

Thyroid hemiagenesis is commonly diagnosed during the investigation of accompanying thyroid disorder. In diagnostic procedures thyroid scintigraphy, which may show the functional hemiagenesis, should be combined by other methods revealing morphologic hemiagenesis. USG, CT or MRI can be used in this aspect. However USG is the most cost effective way of diagnosis. In addition, if nodular thyroidal disease is associated, fine needle aspiration biopsy should be performed in order to rule out primary and secondary malignancies.

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