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Painless Thyroiditis with Hyperthyroidism Following External Irradiation to the Neck

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Two months after finishing ^{60}Co external irradiation to treat squamous cell carcinoma of the larynx, a 47-year-old man became hyperthyroid. Although the thyroid gland was not tender, the radioactive iodine uptake was diminished. After subsequent periods of euthyroidism and hypothyroidism, the patient's thyroid function spontaneously returned to normal.

The features of this case mimic the syndrome of painless granulomatous thyroiditis. Although hypothyroidism is frequently observed following radiation thyroiditis, hyperthyroidism from external radiation has not been reported. Despite this low frequency, diagnosis is important to permit prompt, symptomatic treatment of the thyrotoxic phase.

Following external neck irradiation for nonthyroidal neoplasm, the thyroid gland may be adversely affected. Most frequently, varying degrees of thyroid hypofunction are observed as decreased serum thyroxine or elevated thyroid stimulating hormone (1-5). Rarely, Graves' ophthalmopathy or hyperthyroidism will occur many months or years after external neck irradiation (5-7). We report an additional complication: a clinical syndrome mimicking painless granulomatous (subacute) thyroiditis.

Case Report

In September 1976, a 46-year-old black man came to Henry Ford Hospital complaining of hoarseness. Otolaryngologic examination revealed chronic laryngitis, which was attributed to cigarette smoking. The patient returned in March 1977, complaining of swelling over the left side of his neck. A biopsy of this mass revealed an infiltrating squamous cell carcinoma. Therapy with 6600 rads of ^{60}Co was completed in May 1977.

In July 1977, he returned with symptoms of increased perspiration, fatigue, and nervousness. The patient denied that he was taking thyroid hormones or iodide. There was no thyromegaly, thyroid tenderness, or eye signs, but a slight tremor and pulse rate of 100 beats per minute prompted thyroid function studies (Fig. 1).

The initial serum thyroxine was 12.2 μg/dl (normal 5-11 μg/dl). T3 resin uptake ratio was 1.12 (normal 0.83-1.17). The free thyroxine index was 13.7 (normal 4.15-12.87). In August 1977, a thyrotropin releasing hormone (TRH) test was performed with 100 μg TRH injected intravenously. A flat thyroid stimulating hormone (TSH) response (0 minutes 3.0 μU/ml; 20 minutes 3.2 μU/ml) was compatible with thyrotoxicosis. Thyroidal radioactive iodine uptake after 10 uCi of ^{131}I had been administered was 4.6%. Because of his mild symptoms, no treatment was given.

In September 1977, the patient still had a slight tremor and a pulse rate of 88/minute, but again the thyroid was not enlarged or tender. Thyroid function studies confirmed a euthyroid state (serum thyroxine 5.0 μg/dl; triiodothyronine 128 ng/dl, normal 800-200 ng/dl). The Westergren sedimentation rate was 11 mm/hr (normal 0-15 mm/hr). In October 1977, the patient returned with no symptoms or new physical findings. The results of a TRH test suggested primary hypothyroidism (0 minutes TSH >100 μU/ml; 20 minutes TSH > 100 μU/ml).

The patient was lost to follow-up until October 1978. At this time, his thyroid function had spontaneously returned to normal (serum thyroxine 8.2 μg/dl; TSH 2.1 μU/ml).

Discussion

In this patient, treatment of squamous cell carcinoma of the larynx by external irradiation was followed within two months by transient hyperthyroidism associated with a nontender thyroid gland and low radioactive iodine uptake. Four months later the serum thyroxine was normal, but at five months an elevated TSH suggested primary hypothyroidism. Seventeen months later the serum thyroxine and TSH were found to be normal without treatment.
The clinical syndrome observed closely resembles painless granulomatous thyroiditis (8). Typically, these patients will have transient hyperthyroidism, often without thyroid enlargement, and always without thyroid tenderness. During the hyperthyroid phase, the radioactive iodine uptake is low. Within weeks, the patient becomes temporarily euthyroid before a hypothyroid phase which ends within months.

Much controversy surrounds the nosology of painless thyroiditis with hyperthyroidism (9). Some cases may represent a painless kind of granulomatous thyroiditis. Here, the sedimentation rate should be high in the acute stage, and biopsy will show granulomatous changes as described by DeQuervain (10). By contrast, many recently described patients had an essentially normal sedimentation rate (8), elevated human antithyroglobulin antibodies (11), and biopsies that suggested chronic lymphocytic thyroiditis (8,12). Thus, without biopsy or serologic data, we cannot determine whether a DeQuervain, chronic lymphocytic, or other histology underlies this episode in our patient.

Given a male patient with hyperthyroidism and a thyroidal radioactive iodine uptake of less than 5%, exogenous iodide or thyroid hormone ingestion must be considered in the differential diagnoses. Although our patient denied such exposure, the truthfulness of his statement could have been assessed with exogenous thyrotropin (TSH). A failure to respond normally to TSH with increased symmetrical radioactive iodine uptake suggests thyroiditis (13). However, in this patient his recovery from the thyrotoxic phase was followed by a marked elevation of TSH, which would suggest primary thyroidal failure. Also, the degree of TSH elevation was much greater than that which is seen after patients stop thyroid hormone treatment (14).

We were unable to find any case like ours in a review of the literature about the effects of external neck irradiation upon the thyroid (1-5,15). Therefore, the possibility exists that the relationship observed was temporal rather than causal.

Whatever the stimulus, transient hyperthyroidism from thyroiditis results in release of stored hormone into the circulation. At the same time, iodide trapping is limited. Lanaro and coworkers (16) showed that external irradiation to the thyroid transiently reduces radioactive iodine uptake. Perhaps the duration of hypothyroidism after external neck irradiation depends upon the severity of damage to the iodide trapping mechanism; without iodide uptake, thyroid hormone cannot be synthesized. Transient hypothyroidism in our patient could reflect excessive storage of thyroid hormone and a more vigorous inflammatory response leading to greater release of stored hormone (10).

The abrupt onset of hyperthyroidism may result in fatal cardiac events (17). Hence, in addition to hypothyroidism, one should look for occasional hyperthyroidism after head and neck irradiation. Appropriate therapy aimed at the effects of increased circulating thyroid hormone would include beta blockers and corticosteroids (9).
Thyroiditis with Hyperthyroidism

References