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“Thyroid dysfunction and autoimmune thyroid diseases among atomic-bomb survivors exposed in childhood 62–66 years after radiation exposure”

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Study Findings

A thyroid study involving atomic bomb survivors exposed as children (younger than 10 years old) showed no association between A-bomb radiation dose to the thyroid and the prevalence* of thyroid dysfunction or autoimmune thyroid diseases 62 to 66 years after the atomic bombings.

* Prevalence represents the proportion of people in a population with a disease at a certain point in time (at an examination) regardless of the timing of disease onset.

Explanation

The participants of the Adult Health Study (AHS) exposed to atomic bomb radiation before the age of 10 were studied for an association between A-bomb radiation dose and thyroid dysfunction/autoimmune thyroid diseases. The AHS has followed the health status of A-bomb survivors in Hiroshima and Nagasaki through biennial health examinations since 1958.

1. Study purpose

It is important from a public health perspective to know whether radiation effects on the thyroid persist into adulthood, long after childhood exposure to radiation. It is known that those exposed to radiation as children have a higher risk of developing thyroid cancer than those exposed as adults. It is not clear whether there are long-term effects of childhood exposure to low-to-medium doses of radiation on thyroid dysfunction and autoimmune thyroid diseases. The objective of this study is to examine the association between atomic bomb radiation exposure and thyroid dysfunction/autoimmune thyroid diseases among A-bomb survivors exposed as children more than 60 years ago.

2. Study methods

Interviews and blood tests (to measure thyroid function and antithyroid autoantibodies) were

performed for 3,087 A-bomb survivors who were younger than 10 years of age at the time of the atomic bombings and had participated in AHS health examinations from 2007 to 2011. In this population, an association between radiation dose to the thyroid and the prevalence of thyroid dysfunction and autoimmune thyroid diseases was studied for the 2,668 participants whose atomic bomb radiation dose to the thyroid had been estimated (1,213 men and 1,455 women; mean age: 68.2 years; mean dose: 0.182 Gy; dose range: 0–4.040 Gy).

3. Study results

- (1) Prevalence was 7.8% for hypothyroidism**, 1.2% for hyperthyroidism***, and 21.5% for positive antithyroid autoantibody. All cases of hyperthyroidism were found to be caused by Graves' disease.
- (2) Thyroid radiation dose was not associated with the prevalence of hypothyroidism, hyperthyroidism, or positive antithyroid autoantibody. Hypothyroidism cases were divided into antithyroid autoantibody-positive and -negative for analysis. Neither was associated with thyroid radiation dose.
- (3) Other studies looking at radiation effects in the thyroid, such as post-Chernobyl studies, used different diagnostic criteria for thyroid dysfunction. An additional analysis was conducted by diagnosing hypothyroidism and hyperthyroidism based on the diagnostic criteria used in these other studies, but again, no association with thyroid radiation dose was observed.

/ Hypothyroidism is a condition in which the body lacks sufficient thyroid hormone in the blood. Symptoms include fatigue, hair loss, and swelling. Hyperthyroidism is a condition in which the body has excessive amounts of thyroid hormone in the blood. Symptoms include excessive sweating, weight loss, and palpitations. Typically, the most common cause of hypothyroidism is chronic thyroiditis, and that of hyperthyroidism is an autoimmune thyroid disease called Graves' disease. Graves' disease is a thyroid disease caused by a breakdown of the immune system. People who test positive for antithyroid autoantibody are at a high risk of chronic thyroiditis.

Study Significance

This is the first study among A-bomb survivors to examine effects on adulthood thyroid dysfunction and autoimmune thyroid diseases from radiation exposure during childhood, when radiation sensitivity is high. The study, which is based on data accumulated over more than 60 years since radiation exposure, did not detect significant radiation effects. However, this was a cross-sectional study based on a study of A-bomb survivors at a certain point in time, like other studies that have looked into radiation effects on thyroid dysfunction. It is therefore necessary to

conduct a longitudinal study over time to better understand radiation effects on the thyroid.

The Radiation Effects Research Foundation has studied A-bomb survivors and their offspring in Hiroshima and Nagasaki for around 70 years. RERF's research achievements are considered the principal scientific basis for radiation risk assessment by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and for recommendations regarding radiation protection standards by the International Commission on Radiological Protection (ICRP). RERF expresses its profound gratitude to the A-bomb survivors and survivors' offspring for their cooperation in our studies.

[§]*The Journal of Clinical Endocrinology & Metabolism*, the most cited journal in its field, publishes clinical research and practice information involving the pathophysiology, diagnosis, and treatment of endocrine and metabolic disorders. (Impact factor in 2016/2017: 5.455)