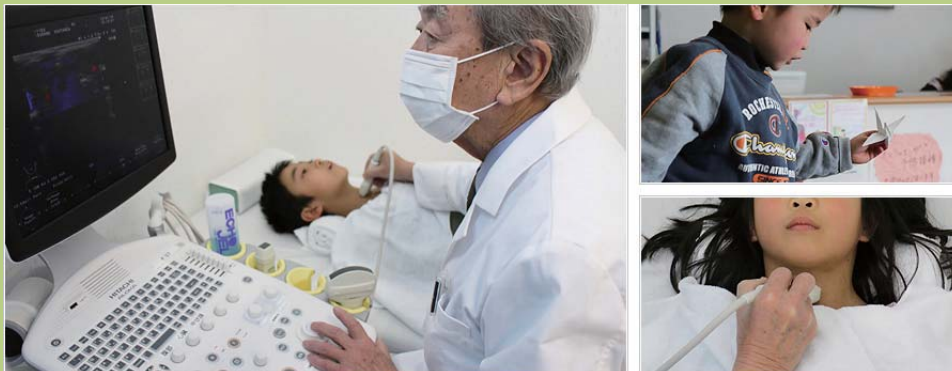


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Report on the Results of Thyroid Blood Tests



Report on the Results of Thyroid Blood Tests

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The following is a summary of the test results of the examinees of both thyroid ultrasound screenings and thyroid blood tests during thirteen months from December 1, 2012—the opening day of our clinic—to the end of December 2013. The summary is followed by some speculations regarding the results.

1. Subjects:

704 people received thyroid ultrasound screening, 254 of which were then administered blood tests. The examinees were both male and female, from 1 to 73 years of age. On March 11, 2011 — the time of the Fukushima Daiichi nuclear accident — 175 of the examinees were under 18 years of age, with the remaining 79 of age 18 or older.

2. Purpose of blood tests:

Neoplastic lesions, such as cysts and nodules, can be detected by ultrasound images. However, ultrasound images do not display disturbances of hormone-secretory function or evidence of inflammatory disease. These diseases can be found only by conducting blood tests. It is preferable for all examinees to receive blood tests concurrently with ultrasound screenings, but this was not done for two reasons. Firstly, the range of health insurance coverage is limited to some extent by law. Therefore it

is prohibitively expensive to give uniform treatment to every examinee. And secondly, there are many children among the examinees, making it somewhat problematic to draw blood from all of them. Therefore, we could not give everyone a blood test.

3. Test items:

(1) Examination to check hormone-secretory function:

TSH (Thyroid Stimulating Hormone is a hormone secreted by the pituitary gland to regulate the release of thyroid hormones. A low TSH level confirms hyperthyroidism and a high TSH level confirms hypothyroidism.)

FT3 and FT4 (Free T3 and Free T4 are the free hormones that are secreted by the thyroid gland. A high FT3/FT4 level confirms hyperthyroidism and a low FT3/FT4 level confirms hypothyroidism.)

(2) Thyroglobulin (Thyroglobulin is a protein produced by the thyroid gland, and is a

precursor to thyroid hormone. A high level of thyroglobulin results from inflammation or the presence of tumours. But the presence of thyroglobulin alone is considered insufficient as a marker of cancer.)

(3) Anti-TPO antibody and anti-thyroglobulin antibody (These antibodies are the autoantibodies resulting from abnormalities in the immune systems present in the thyroid gland. The former is an antibody against peroxidase and the latter is an antibody against thyroglobulin. High levels of these antibodies indicate hyperthyroidism or hypothyroidism.)

These test items are identical to the secondary, thyroid blood tests administered by Fukushima Medical University for those who were classified as B level risks (according to the thyroid ultrasound screening tests conducted by the Fukushima prefectural government).

4. Results:

200 (78.7%) remained within normal limits for all six test items, and 54 (21.3%) had abnormal or suspicious findings. The abnormal or suspicious findings are as follows;

(1) The examinees suspected of having latent chronic thyroiditis (latent Hashimoto's thyroiditis); either because of the presence of anti-TPO antibody, or anti-thyroglobulin antibody, or the presence of both antibodies, indicate high levels. But the FT3/FT4 remains within normal limits and hormone secretions function normally— 34 cases (24 out of them have significantly high level results

and the remaining 10 have mild to high level results).

(2) The examinees suspected as having latent hypothyroidism; the results of FT3 and FT4 remain within normal limits but the TSH results indicate high levels — 6 cases.

(3) The examinees suspected of having latent hyperthyroidism; the results of FT3/FT4 remain within normal limits but the TSH results indicate low levels — 6 cases.

(4) The examinee identified as having hyperthyroidism (Basedow's disease) — 1 case.

(5) The examinees identified as only having high levels of thyroglobulin — 7 cases

The following table is the list of the above findings classified according to age under 18 and age 18 or over.

5. Discussion

(1) Blood examination result:

The incidence of abnormal findings and suspected cases was 14.3 % for the subjects under age 18 and 36.7 % for age 18 and older in our blood examination result. Compared with young subjects, the incidence of abnormalities and suspected cases for the subjects for age 18 and older was more than twice as high. However, it may be not surprising, considering that thyroid diseases, in general, are found mainly in middle-aged and older populations.

In this examination, the 34 cases of latent chronic thyroiditis and its suspicion were the

most frequent abnormality, accounting for 13.4% of the total. For subjects under age 18, latent chronic thyroiditis and its suspicion accounted for 9.1%; for age 18 and older, 22.8%, which is significantly higher than the former.

The general ratio of people who have anti-TPO antibody and anti-thyroglobulin antibody higher than normal levels is not known. There is no reliable statistical report on large scale populations not exposed to radiation. Therefore, it is difficult to say whether the 9.1% positive rate for the subjects under age 18 is extraordinarily high or not. As for the age 18 and older, the 22.8% positive rate may be said to be close to the positive rate of general populations, considering for example that the positive rate in the comprehensive medical examination at St. Luke's International Hospital in Tokyo is 18%.

Latent chronic thyroiditis is the precursory stage of chronic thyroiditis (Hashimoto's thyroiditis or Hashimoto's disease), one of the auto-immune diseases caused by abnormalities of the immune system. After a long trajectory, some latent chronic thyroiditis may develop into hypothyroidism with symptoms of swollen thyroid glands and decreased thyroid hormone-secretion. This stage of the disease, patent chronic thyroiditis (Hashimoto's disease), needs to be treated with medication. Chronic thyroiditis sometimes temporarily presents symptoms of hyperthyroidism, such as an increase of thyroid hormone-secretion. In addition, it is confusing that the hyperthyroidism (Basedow's disease) also shows high positive rate of anti-TPO antibody and anti-thyroglobulin antibody. It is generally accepted that heredity

is one of the risk factors of chronic thyroiditis; many of the patients have a family history of Hashimoto's disease or Basedow's disease.

Latent chronic thyroiditis need not be actively treated. It is highly suggested, however, to continue medical examinations and follow-ups at 6 or 12 months intervals.

(2) Relation between ultrasound and blood examination findings:

We have found no conclusive answer. Nodules or suspected nodules were found in 12 out of 34 subjects showing latent chronic thyroiditis or its suspicion. In regard to the group with clearly high anti-TPO antibody and anti-thyroglobulin antibody, nodules or its suspected nodules were found in 10 out of 22 subjects (44%). Therefore, it might be said that there can be some correlation between chronic thyroiditis and the formation of nodules.

(3) Effects of radiation:

As mentioned above, owing to insufficient epidemiological data, it is difficult to judge whether the incidence of latent chronic thyroiditis in this examination is extraordinarily high or not.

Although chronic thyroiditis can generally occur independently of radiation exposure, several reports suggest that radiation exposure increases incidence of chronic thyroiditis. "Autoimmune thyroiditis is one of the first functional consequences of irradiation" (Yablokov et al., 2009).

Dr. Shun'ichi Yamashita, international award winning Professor of Faculty of Medicine at Nagasaki University, wrote, "there are

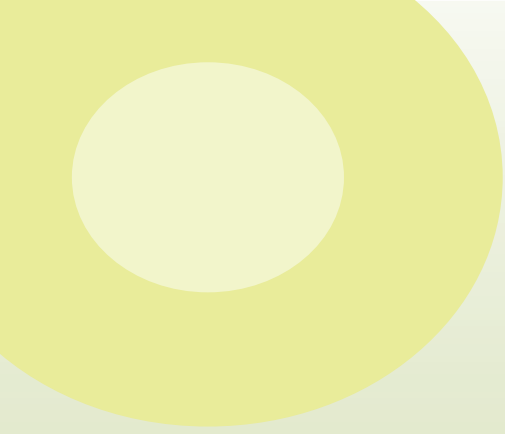
some noteworthy reports that production of autoantibody is a concomitant of development of thyroid cancer and irradiation increases frequency of positive findings of thyroid autoantibody” (Yamashita, 2003). He also noted that thyroid cancer and chronic thyroiditis had been found in 7.6 % and 22.6 % respectively of the 446 children with thyroid nodules by the cytodiagnostic examination conducted after 1993 in areas near Chernobyl (Yamashita, 2002) pointed out, “exposure to over certain amount of radiation can cause, after several months, thyroid gland cell deaths and consequent decrease of thyroid hormone-secretion—hypothyroidism.”

Almost all of hypothyroidism occurs from chronic thyroiditis (Hashimoto disease), the precursory stage of which is latent chronic thyroiditis. Therefore, we would like to continue our analysis, taking into account that there may be a close relation between these diseases and radiation, and comparing our analyses with research outcomes of other current studies by radiation and thyroid experts.

< Table1 >	Under 18 years of age		Age 18 or older		Total	
No abnormal or suspicious findings	150	85.7%	50	63.3%	200	78.7%
Latent chronic thyroiditis or its suspicious findings	16	8.6%	18	22.8%	34	13.4%
Suspicious findings of latent hypothyroidism	5	2.9%	1	1.3%	6	2.3%
Suspicious findings of latent hyperthyroidism	4	2.2%	2	2.5%	6	2.3%
Hyperthyroidism	0	0.0%	1	1.3%	1	0.4%
High levels of thyroglobulin	0	0.0%	7	8.9%	7	3.1%
Subtotal	25	14.3%	29	37.7%	54	21.3%
Total	175	100%	79	100%	254	100%

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