

CLINICAL EVALUATION OF MEASURING THYROIDAL IODINE CONCENTRATION BY IN VIVO X-RAY FLUORESCENT ANALYSIS. Noriaki Sekita, Yasuhito Sasaki, Keiko Imanura, Teruyuki Uji, Masamichi Fujii and Kazuhiko Someya. St. Marianna University School of Medicine, Kawasaki, Kanagawa, Japan

With the purpose to evaluate clinical usefulness of measuring thyroidal iodine content a simple apparatus was designed and constructed for in vivo X-ray fluorescent analysis. The apparatus consists of a Am-241 exciting source (300 mCi) and pure Ge detector (50mm² x 5mm) for measuring K_{α} fluorescent X-rays (28.3 and 28.6 Kev) emitted from excited iodine. A diversing collimator was so designed that most of one lobe of the thyroid is within the field of view.

Usually counting was continued for 4-5 minutes on each lobe to obtain the sensitivity of 0.2mg/g allowing 30% coefficient of variation. Iodine concentration measured in 10 resected normal thyroids at autopsy ranged 0.3-1.2mg/gm with the mean of 0.6mg/gm. The results correlated well with the measurement of the same thyroids by activation analysis ($r=0.93$). In vivo measurement was performed on healthy volunteers including 16 males and 14 females. Iodine concentration measured on each lobe of the thyroid revealed 0.40 ± 0.25 (m \pm 1S.D.) mg/gm for males and 0.67 ± 0.29 for females.

Five repeated measurement in 2 months in a female volunteer showed C.V. of 14.4% (1.04 ± 0.15 mg/gm) suggesting good reproducibility of the method. Forty nine measurements were performed on 47 patients with various thyroidal diseases. Iodine concentration was low in chronic thyroiditis and subacute thyroiditis except for one case of subacute thyroiditis with hyperthyroidism, who showed high iodine concentration. Most of Graves' diseases showed normal on low iodine concentration regardless of status of treatments (pre-, under- or post-treatment) or thyroidal function.

In vivo measurement of thyroidal iodine concentration may prove useful for the diagnosis and follow-up study of patients with thyroidal diseases.

EVALUATION OF IN VIVO THYROID FUNCTION TESTS

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In order to know achievement of remission in Graves' patients under antithyroid drug, or to differentiate Hashimoto's patients with thyrotoxicosis from Graves' disease, in vivo thyroid uptake tests were performed. Thyroid $^{99m}\text{TcO}_4^-$ uptake was measured 20 min. after i.v. 2 mCi $^{99m}\text{TcO}_4^-$ dose.

T3 suppression test was performed in 25 cases after 75 μg x 7 days T3 administration. In 10 cases with still active Graves' (aG) and 1 Hashitoxicosis uptake rate after T3 showed supranormal values even in cases showing more than 50 % suppression.

All 5 Graves' patients under remission (rG) showed normal uptake before and/or after T3, again irrespective of 50% suppression. Four euthyroid Graves' patients (eG) did not show increased uptake before and after T3 and one of them showed negative T3 suppression. While, 3 Hashimoto's patients (H) with increased uptake were all well suppressed after T3. There found 2 curious cases with thyrotoxicosis (UD) showing normal uptake before T3 and no suppressibility.

In 117 H patients, thyroid uptake and FTI were compared, and 19 cases showed elevated uptake and 14 showed elevated FTI.

In the former thyroid uptake was found closely correlated with serum TSH increment and negatively correlated with FTI. The latter group was divided in 3 types. Those were (1) normal uptake-, (2) low uptake-, and (3) high uptake type. The type (1) included patients with acute exacerbation stage. In the type (2) which had been considered as a model after episodic thyroidal damage, exogenous TSH administration caused significant response in thyroid uptake and circulating hormone.

The type (3) showed positive suppression by T3 and could be differentiated from aG. From these observations, we proposed a schematic model of Hashimoto's thyroiditis after episodic thyroidal damage.

In conclusion, thyroid uptake test including T3 suppression and TSH test were found quite a useful tools in these complicated conditions. Even though, there were 2 UD cases, and we are now carefully following them. Possibility of a new category of eG or pre aG are considered.