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THALLIUM-201 CHLORIDE SCINTIGRAPHY OF THYROID NODULES AND THEIR ACTIVITIES OF NA-K ATPASE.

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Thallium-201 is useful radionuclide for thyroid imaging. However, the mechanism of its accumulation into thyroid nodule has not been precisely elucidated. We determined Na-K ATPase activities of thyroid nodules and normal thyroid glands. Thallium-201 accumulations of these thyroid tissues were analyzed from biochemical and pathohistological aspects, and a new knowledge was revealed.

Malignant thyroid nodules, showing high accumulation of thallium-201, have high activity of Na-K ATPase, while macrofollicular adenomas showed similar level of accumulations as normal thyroid glands and Na-K ATPase activities were also at similar level. On the other hand intensively accumulated thyroid adenoma has a strong activity of Na-K ATPase. It was called "fetal" type follicular adenoma in pathology.

Na-K ATPase is implicated in active transport of Na out of and K into the cells. Thallium, replaceable to potassium, had a greater affinity in activation of Na-K ATPase than potassium.

A mechanism of thallium-201 accumulation in thyroid scintigraphy based upon the Na-K ATPase is proposed.

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DIFFERENTIAL DEAGNOSIS OF THYROID TUMORS BY Tl-201-CHLORIDE DYNAMIC STUDY

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Tl-201-cl scintigraphy requires long time to get delayed images. So we try to distinguish whether malignancy or benignancy of thyroid tumors by using Tl-201-cl dynamic study in a short time. The method is that after Tl-201-cl is injected, dynamic study is performed for an hour, acquired data is inputted to computer, ROI is created at four points, tumor, normal lesion of tumor side, normal lesion of nontumor side, background and time-activity curve, background subtraction curve is made. By using two curves, we make four parameters and investigate them. They are T_{max} , $T_{1/2}$, C_p/C_n (peak count at tumor side divided that at nontumor side), count ratio curve (time-activity curve of count at tumor divided that at not-tumor side). Twenty patients is classified as follow. Group a adenoma 10, Group b adenomatous goiter 3, Group c malignant tumor 7. There are no difference in T_{max} and $T_{1/2}$ between group a and group b but prolongation in group c. C_p/C_n of group a is high ratio, that of group c is low ratio. Count ratio curve of group c is all right up curve but there are no right up curve in group a. In group b two is parallel curve and one is right up curve.

So we think, C_p/C_n and count ratio curve is useful to distinguish of thyroid tumors.

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Tl-201Cl FUNCTIONAL IMAGE (WASHOUT RATE) IN THYROID NODULAR DISEASE.

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The purpose of this study is to differentiate malignant thyroid nodule from benign nodule with using a new procedure of Tl-201Cl functional image (washout rate). After i.v. injection of Tl-201Cl, 10 min. and 120 min. images were obtained. With using data storing system of matrix size 128x128, 5 minutes of each images were stored. Washout rate on each matrix was calculated by following formula, counts of 10 min - counts of 120 min / counts of 10 min. (%). Functional image of washout rate was demonstrated on color scale. 14 cases of thyroid cancer, 11 cases of benign thyroid nodule, 4 cases of chronic thyroiditis and 10 cases of control were examined. The mean value of washout rate was 46.4±18.3% in cancer nodule, 69.4±13.5% in benign nodule, 56.1±6.4% in chronic thyroiditis and 68.3±6.9% in controls. Regional washout rate study on thyroid nodule was very useful in differentiating malignant and benign nodule.

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EVALUATION OF Tl-201 SHORT DELAYED SCANNING IN THYROID TUMOR.

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The remaining of thallium-201 chloride (Tl-201) in the cells of almost nodular goiters is characteristic.

The subjects were 17 cases of malignant tumor and 29 cases of benign tumor consisted 4 cases of thyroid cyst.

Using Tl-201, the early (5 min), short delayed (25 min) scintigraphy and the subtraction were performed to differentiate the malignancy from the cold nodules on the I-131 or Tc-99m scintigraphy.

Compared were the retention of the Tl-201 accumulation on the subtraction images of the pathological malignant and benign nodules of 27 cases accumulated of Tl-201, consisted 15 cases of malignant tumor and 12 cases of benign tumor.

The Tl-201 retention on the short delayed scintigraphy was seen in 12 cases (80%) of malignancy and in only 2 cases (17%) of benign.

The more retention in the part of nodules on the short delayed scintigraphy suspect the malignant nodules.