Evaluation of the Radioisotope Examination for Surgical Thyroid Diseases and the Calculation of Thyroid Weight Using Thyroid Scintigram

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A diagnostic value of radioisotope examination for surgical thyroid diseases such as thyroid neoplasms or development anomalies were studied. A clinical usefulness of calculation of thyroid weight using empirical formulaes was also discussed.

1. From the results of ^{131}I scintigrams of thyroid neoplasms, the cold nodule costituted the majority of both cancer and adenoma. Consequently, it is rather difficult to differentiate between these two lesions by the ^{131}I scintigram alone. Generally speaking, however, the cold nodule may be considered to present definite indicatins for surgical treatment. Moreover, in view of the fact that even a small carcinoma frequently shows a cold nodule on the ^{131}I scintigram, the possibility of such a small cold nodule being malignant is much greater. On the other hand, if a large nodule shows warm nodule on the scintigram, this nodule may usually be considered benign. There is scarcely any possibility of a hot nodule being carcinoma.

The ^{131}I scintigram of thyroid neoplasms may provide useful informations for surgical management.

The ^{131}I scinticanning is also excellent clinical examination for the diagnosis of thyroid anomalies. The clinical data of substernal goiter, ectopic thyroid and right thyroid lobe aplasia were presented.

2. Various tumor scanning agents have been studied as a diagnostic method of malignant tumors. Recently, We found the fact that $^{197}HgCl_2$ was accumulated in thyroid cancer, and the diagnostic usefulness of ^{197} $HgCl_2$ scanning for various thyroid diseases was studied.

The positive scanning of tumor could be obtained in 8 out of 9 patients with thyroid cancer. Since in 13 patients with thyroid adenoma, only 2 patients revealed positive scanning, it may be possible to differentiate benign and malignant tumor of the thyroid.

In chronic thyroiditis, positive delineation was obtained in all patients and it is impossible to differentiate from thyroid cancer by ^{197} $HgCl_2$ scanning alone. However it may b generally possible to differentiate both disease by ^{131}I scintigram.

These results indicate that the scannir which usea $^{197}HgCl_2$ together with ^{131}I ma be valuable diagnostic method for thyro neoplasms.

3. Many attempts have been reporte concerning the calculation of the thyroi weight using thyroid scintigram. Howevei clinical significance of this method is stil debated.

The material of this study were 101 patients with hyperthyroidism treated surgically. Various factors obtained from thyroid scintigram

scanned just before surgery and the actual wight of the thyroid gland at surgery were compared.

The calculation of the weight was made according to the following two empirical equations.

A. $\text{Weight}=K\times S\left(\frac{RL+LL}{2}\right)$

B. $\text{Weight}=K\times\frac{\pi}{6}(RL\times RW^2+LL\times LW^2)$

Where: S is surface area in cm^2

: K is a constant

: RL and LL are a long distance of right and left lobe in cm.

: RW and Lw are a width of right and left lobe in cm.

There were relatively good mathematical relationship between calculated and actual weight. However, almost a half of total patients reveled positive or negative error over 30% of actual weight. These results indicate that the calculation of thyroid weight using scintigram is not to be valid.

Radionuclide Angiography of the Thyroid

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Radionuclide study has played an important role in thyroid clinics, however, the differential diagnosis of the thyroid nodules still continues to be a clinical problem. The purpose of this paper is to describe the result of the radionuclide angiography for evaluation of cold thyroid nodules and discuss its clinical usefulness.

A total of 51 patients was studied in this series. The patient is positioned under the detector of the scintillation camera and about 10mCi of ^{99m}Tc-pertechnetate was injected rapidly into the antecubital vein. Five seconds exposured serial images with Polaroid films were obtained for 35 seconds and a scintiphoto of thyroid was taken 3 minutes post-injection. A regular scanning of thyroid was also done with a rectilinear scanner 20 minutes after injection. In 23 patients, all data of the radionuclide angiography was collected onto the magnetic tape through the small computer and flow curves in the area of interests were obtained later.

Of 16 cold nodules with increased activity in the arterial phase, 11 (69%) were carcinoma and 5 (31%) were adenoma. Among the 16 cold nodules with normal activity in the arterial phase, 8 (50%) were carcinoma and 8 (50%) were adenoma. In the carcinoma, different histological tumors showed similar findings, so the differential diagnosis of these tumors was impossible. All of 4 cysts were visualized as cold areas in the arterial phase which were readily differentiated from other lesions.

The differential diagnosis of the thyroid cold nodules with ^{99m}Tc-pertechnetate seems to be difficult, but the thyroid cyst could be ruled out by this method. The use of ^{99m}Tc-pertechnetate to evaluate thyroid function and anatomy has many advantages over the ^{131}I or another radioactive isotope of iodine, so the radionuclide angiography with ^{99m}Tc-pertechnetate might be useful when this technique is used adjunct to other diagnostic studies in thyroid clinics.