

## I. Thyroid and Access or Thyroid

### Thyroid Scintigraphy Using $^{201}\text{Tl}$ -chloride

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A prospective study of thyroid scintigraphy obtained with both  $^{201}\text{Tl}$ -chloride and  $\text{Na}^{131}\text{I}$  has been performed in 41 patients of nodular thyroid diseases. 14 benign adenomas; 14 adenocarcinomas; 2 malignant lymphomas; 1 metastatic carcinoma; 3 cysts; 4 Hashimoto's diseases and 1 tuberculosis. Some cases were scanned with  $^{67}\text{Ga}$ -citrate, too.

In 13 cases of 14 adenomas and 13 cases of 14 carcinomas,  $^{201}\text{Tl}$  thyroid scan showed accumulation in accordance with cold nodules of  $^{131}\text{I}$  thyroid scan. Therefore differential diagnosis between adenoma and carcinoma may be impossible by  $^{201}\text{Tl}$ -scan alone.  $^{201}\text{Tl}$ -chloride scans were apt to show markedly increased accumulation in follicular adenomas. Detection of follicular thyroid adenoma less than 1 cm may be possible.

In addition to abnormal accumulation of  $^{201}\text{Tl}$ -chloride at the primary lesion,  $^{201}\text{Tl}$ -chloride scans showed increased accumulation in recurrence and distant metastasis of thyroid cancer in 75(6/8), and the accumulation degree of  $^{201}\text{Tl}$ -chloride in metastasis was greater than that of  $\text{Na}^{131}\text{I}$  and  $^{67}\text{Ga}$ -citrate. A significant advantage of  $^{201}\text{Tl}$ -chloride imaging is that we can carry out  $^{201}\text{Tl}$  scintigraphy without ceasing the administration of thyroid hormone in patients of thyroid cancer.

In primary malignant lymphomas of thyroid gland increased accumulation was observed by both  $^{201}\text{Tl}$ -chloride and  $^{67}\text{Ga}$ -citrate scans. Differential diagnosis between adenocarcinoma and malignant lymphoma may be possible by using them.

### Clinical Evaluation of Thallium-201 Chloride: Thyroid Uptake in the Thyroid Diseases

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Previously we observed marked thyroid uptake of  $\text{Tl-201}$  chloride in patients with goiter (J Nucl Med, 24(12),1977). In the present studies we report our results of thyroid uptake of  $\text{Tl-201}$  chloride in the various thyroid diseases. The 30 patients with thyroid diseases including Graves' disease, Plummer's disease, simple goiter, subacute thyroiditis, chronic thyroiditis, nontoxic nodular goiter, primary hypothyroidism, secondary hypothyroidism, was used in this studies. The 5 patients without thyroid disorder was also used for control studies. One mCi of  $\text{Tl-201}$  chloride was given intravenously by bolus injection and storage of counts was started 2,3,5,10,20,25,30,

60,120 and 180 minutes later for thyroid imaging and uptake. The instrument was a gamma camera with a collimator having 10,000 parallel holes for studies; collimator-to-patient distance was 6 cm. The following results was obtained by this studies. (1)  $\text{Tl-201}$  chloride was useful for thyroid imaging agent in patients with goiter. (2) Good correlation was observed between thyroid uptake of  $\text{Tl-201}$  chloride and thyroid weight estimated by method of Allen et al. (3) Disappearance rate of  $\text{Tl-201}$  chloride from thyroid gland was delayed in the patients with chronic thyroiditis and nontoxic nodular goiter. (4) It is possible that differentiate toxic nodular goiter from nontoxic nodular goiter

by disappearance rate of Tl-201 chloride from thyroid gland. (5) Before surgery, Tl-201 chloride detected a supraclavicular metastasis from a mixed

follicular and papillary adenocarcinoma of the thyroid.

### Thyroid Scintigraphy with $^{201}\text{Tl}$ Chloride

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Thyroid scintigraphy with  $^{201}\text{Tl}$  chloride was performed in 25 patients who were scheduled to be operated on.  $^{201}\text{Tl}$  chloride scintigraphy and histological findings of operated thyroid gland were investigated in this paper.

Thyroid diseases which were discussed in this series were 9 cases of papillary adenocarcinoma, one case of anaplastic carcinoma, one case of reticulosarcoma, 5 cases of follicular adenoma, 7 cases of benign cyst, one case of adenomatous goiter and 2 cases of Hashimoto's thyroiditis.

Comparison study of uptake ratio of  $^{201}\text{Tl}$  chloride into the thyroid gland analysed by computed image between normal thyroid gland and thyroidal lesion was investigated.

All cases of malignant goiter showed positive uptake ratio over than 1.2 even though diameter of the lesion was less than 1 cm.

Two cases of papillary adenocarcinoma in which

tumor was more than 3 cm in its diameter and one case of anaplastic carcinoma, more than 7 cm in its diameter were revealed high uptake ratio. On the other hand, low uptake ratio was observed in one case with huge reticulosarcoma of the thyroid gland.

In all 3 cases with bone and lymph node metastasis, positive uptake of  $^{201}\text{Tl}$  chloride was observed in the metastatic area.

In 3 out of 5 cases of follicular adenoma,  $^{201}\text{Tl}$  uptake was positive, but its ratio was less than 1.6.

In all cases with benign cyst, filling defects were observed in  $^{201}\text{Tl}$  chloride scintigraphy.

Diffuse and marked positive accumulation of  $^{201}\text{Tl}$  was observed in 2 cases with Hashimoto's thyroiditis in subacute stage. This finding was quite different from that of nodular goiter.

### Non-Gaussian Distribution of Free Thyroxine Index (Effective Thyroxine Ratio) and Serum Thyroxine Level in Euthyroid Subjects

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Simultaneous determinations of Effective  $\text{T}_4$  Ratio (ETR) and of  $\text{T}_4$  concentrations in serum were made in 6613 sera, using Res-O-Mat ETR test. The averages of 5080 euthyroid ETR and  $\text{T}_4$  values were  $0.98 \pm 0.07$  (SD) and  $8.1 \pm 2.6$   $\mu\text{g}/100$  ml., respectively. Distinct elevations of ETR and  $\text{T}_4$  values were found in 988 hyperthyroid sera (Mean  $\pm$  SD =  $1.24 \pm 0.13$  in ETR and  $17.4 \pm 4.2$   $\mu\text{g}/100$  ml. in  $\text{T}_4$ ), while these values were markedly diminished in 454 hypothyroid sera (Mean  $\pm$  SD =  $0.83 \pm 0.06$  in ETR and  $2.5 \pm 1.7$

$\mu\text{g}/100$  ml. in  $\text{T}_4$ ).

In order to use both ETR and  $\text{T}_4$  values as routine screening test for evaluation of thyroid function, it was necessary to define the euthyroid ranges of ETR and  $\text{T}_4$  values. The frequency distribution of ETR and  $\text{T}_4$  values for 5080 euthyroid sera was analyzed for normality by determining their skewness. The significant skewness was found in both ETR and  $\text{T}_4$  values ( $+0.47$  in ETR and  $+0.68$  in  $\text{T}_4$ ). Therefore, the mean  $\pm 2$  SD range did not define 95% of the euthyroid population