were malignant (90.9%). The percent positive scan of 13 cases of malignant tumors and 6 cases of benign tumors using $^{201}$Tl were 92.3% (12/13) and 84.3% (5/6) respectively. These results show that $^{131}$I scans exceed $^{201}$Tl scan for determining malignancy of the thyroid tumors. 2) There was more accumulation of either $^{131}$I or $^{201}$Tl in follicular tumors than in papillary tumors in the cases of both benign and malignant tumors. There was more accumulation of $^{131}$I in solid tumors than in cystic tumors in the cases of both benign and malignant tumors.

However, there was accumulation of $^{201}$Tl in both solid and cystic tumors. 3) In all of six cases with chronic thyroiditis verified by open biopsy or surgery, there was almost the same degree of accumulation of $^{201}$Tl as the normal functioning area on $^{131}$I scans in the localized hypofunctioning area. The combination of $^{131}$I and $^{201}$Tl on thyroid scan will be useful in the diagnosis of chronic thyroiditis.

**Evaluation of Thyroid Diseases Using Multi-nuclei Scintigraphy**

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Differential diagnoses of various thyroid diseases were performed with the combined use of Na$^{131}$I, $^{99m}$TcO$_4^-$ and $^{201}$TlCl. A total of 45 patients were examined: 12 patients with Graves' disease, 11 with Hashimoto's thyroiditis, 6 with cancer, 4 with thyroid cyst and 12 hospitalized controls without thyroid disease.

First, $100\mu$Ci of Na$^{131}$I was administered orally and the uptake was measured at intervals of 1,3, and 24 hrs. A scan dose of 1 mCi of $^{201}$TlCl was then administered IV and the thyroid uptake of the $^{201}$TlCl was continuously recorded for the first 30 minutes. Scintigraphy was subsequently carried out. The $^{201}$TlCl clearance rate was derived from the following ratio: 20 min. uptake/5 min. uptake value (%).

After $^{201}$TlCl scanning a dose of 1mCi of $^{99m}$Tc was given IV, subsequent to which the uptake rate was measured and scintigraphy was performed. Finally, following the Na$^{131}$I uptake measurement made at 24 hrs, a thyroid scan was carried out.

Nodules represented as cold features when Na$^{131}$I scanning is used in cases of chronic thyroiditis, adenomatous goiter, follicular adenoma and carcinoma are visualized as hot features in $^{201}$TlCl scanning. A high rate of positive scan using $^{201}$TCl is seen in both primary and metastatic lesions of thyroid cancer, especially in cases of well-differentiated follicular carcinoma. Therefore, $^{201}$TlCl scanning is useful for recongizing metastasis in the neck area. $^{201}$TlCl, however, does not concentrate in cystic lesions.

Additional scanning utilizing Na$^{131}$I and $^{99m}$Tc O$_4^-$ is necessary, due to difference in their metabolism. $^{99m}$TcO$_4^-$ usually concentrates in carcinomatous lesions of both well differentiated and undifferentiated types, so $^{99m}$TcO$_4^-$ scanning is useful for detecting malignant lesions. Also, $^{99m}$TcO$_4^-$ scanning usually shows a larger cold nodule than Na$^{131}$I scanning. The difference is probably due to the time elapsed after administration of the radionuclides. Such a phenomenon is seen in cases of follicular carcinoma with or without papillary foci.

In thyroid scintigraphy, therefore, it is necessary to use an adequate combination of various radionuclides such as Na$^{131}$I, $^{99m}$TcO$_4^-$ and $^{201}$TlCl for differential diagnosis.