Long-term Results of Radioiodine Therapy of Graves’ Disease and Evaluation of Low Dose Treatment

T. Okuno, K. Nakajima, K. Kasagi, K. Endo, J. Konishi, T. Mori and K. Torizuka

Department of Nuclear Medicine and Radiology, Kyoto University School of Medicine, Kyoto

In 1977, we performed a follow up examination of the patients with Graves’ disease treated with radioiodine 4 to 21 years before. Among 672 patients, 533 cases were given our conventional dosage of $^{131}$I, a mean initial dose of 5.2 mCi between 1956 and 1970. The rest treated between 1971 and 1973, were given a lower initial dosage, i.e. about 4 mCi invariably. 113 cases of conventional dosage and 41 of low dosage group were examined. The result was evaluated by clinical features and free T4 index (FTI). The incidence of hypothyroidism was 37.2% in the conventional dosage group. By using the life table method, an average annual increase of this complication was found to be approximately 3%. Incidence of hypothyroidism in older patients above 40 years of age at treatment was significantly higher than younger. This tendency was evident in the group given more than 100 $\mu$Ci/g of $^{131}$I. Among 6 patients with increased TSH and normal FTI 2 to 4 years before, 4 was found to be hypothyroid, supporting the latent hypothyroid state of these subjects.

The result of the treatment in the low dosage group was compared with that of the conventional dosage group studied in 1971. At 4 years after the treatment, no case of hypothyroidism was found in contrast to 6% in the control. But 37% of the former still remained thyrotoxic, twice as high as that in the latter.

At 6 years thyrotoxic patients decreased in number, but hypothyroid cases appeared, reaching 27% at 6 years after treatment. In the control group, hypothyroid patients were found 36% after 6 years.

These data indicate that the low dose treatment can cause the delay in its appearance, but not prevent the ultimate development of the late onset hypothyroidism.

I-131 Concentration in Air Measured at an I-131 Treatment Ward

Noboru Arimizu*, Kenji Saegusa*, Tetsuo Yamamoto*, Shozo Hongo** and Tadashi Yasumoto**

*Department of Radiology, Chiba University Hospital

**Department of Environmental Hygiene, National Institute of Radiological Sciences, Chiba

The maximum radioactive concentration in air is regulated by law not to have excess in using radiopharmaceuticals. The concentration in air can be calculated by applying volatilization ratio of nuclides from a patient, dimensions of a ward, a number of ventilation and an amount of radiopharmaceuticals administered. Volatilization ratio, however, was difficult to be exactly determined in routine uses. The authority in charge of medical regulation indiscriminately demands values (1/100) applied to the ordinary physical and chemical experiments, resulting in overmuch ventilation at a patient ward of an I-131 treatment, coming up more than several-ten times ventilation per hour. This makes much severe circumstances for living of a patient.

The purpose of the study is to attempt direct measurement of I-131 concentration in air at the treatment ward for obtaining actual informations concerning I-131 volatilization ratio. The method of measurement was based on the effective trap of I-131 by using high-performance charcoal filters, which were capable of trapping more than 90% of I-131 out of filtered air. The measurement was performed on two cases with thyroid carcinoma administered 100 mCi and 83 mCi and three cases with hyperthyroid administered 1.8 mCi, 5 mCi and 5 mCi respectively. The forced ventilation
system at the treatment ward was stopped during the measurements. The results of measurements showed that I-131 concentration ranged from order of $10^{-8}$ to $10^{-10}$ micro-curies per ml of air during 8 hours between the 1st and the 3rd day, suggesting that volatilization ratio ranged from order of $10^{-5}$ to $10^{-5}$.

Radioiodine Treatment of Thyroid Cancer: with Special Reference to the Whole Blood Radiation Dose

Hiyoshimaru OYAMADA*, Shoji TERUI* and Kiyomitsu KAWACHI**
*National Cancer Center, Tokyo, **National Institute of Radiological Sciences, Chiba

Nine patients were treated 11 times with radioiodine-131 for the metastatic lesions from thyroid cancer. The age ranged 19 to 67 (average: 44.8), and the dose 120 mCi to 220 mCi (average: 175.5 mCi).

Total thyroidectomy had been performed in all but one prior to the dose. Whole blood beta dose was calculated from the blood samples, which were taken at 1, 3, 6, 12, and 24 hours after the oral administration of radioiodine, and thereafter once every day for the period of 11 to 16 days.

The residual dose in each patient was estimated from the urinary excretion of radioiodine, for which a 24-hour urine samples were collected for the period of 4 to 11 days. Both beta and gamma doses were calculated by a computer, HITAC-M 160 II, using a sliced method.

The beta dose ranged 26.8 rads at least with 150 mCi to 160.3 rads at most with 160 mCi. The gamma dose ranged 16.6 rads at least with 200 mCi to 144.6 rads at most with 150 mCi. Now, the total dose ranged 51.1 rads at least with 200 mCi to 245.6 rads at most with 150 mCi.

As for the residual dose, the case presented the lowest whole blood dose showed 36.9 mCi at 24 hours and 8.7 mCi at 48 hours whereas the case of the highest whole blood dose showed 88.8 mCi at 24 hours and 53.2 mCi at 48 hours. Better correlation between the residual dose and the whole blood radiation dose was found for the gamma as well as for the gamma plus beta, but less for the beta.

Bone marrow examination revealed a decrease of nucleated cell count in 3 of 6 cases during 9 to 15 days post dose but 2 of them recovered within 3 to 9 months. The remaining one was not examined afterwards.

Nine cases as a total had their marrow studies between 3 and 9 months after the dose, which revealed a decrease of nucleated cell count in 2.

Although 5 out of 9 patients have died, the cause of death had nothing to do with the bone marrow suppression.

Nuclear Medicine in Primary Hyperparathyroidism

*Department of Radiology and Nuclear Medicine, Kyoto University Hospital
**Division of Endocrinology, Department of Internal Medicine, Tenri Hospital

In order to clarify the role of nuclear medicine in primary hyperparathyroidism (6 bone, 4 stone, and 3 chemical type), we studied, using the radioisotopic methods, the plasma immuno-reactive parathyroid hormone (i-PTH) level, the presence of bone lesion and the localization of abnormal parathyroid glands. Diagnosis of primary hyperparathyroidism was done by excluding other causes of hypercalcemia.

Plasma basal i-PTH was markedly high in all bone type, while the majority of both other types showed normal i-PTH level. The presence and ex-