Presentation by President

PRESENT STATUS OF NUCLEAR HEMATOLOGY IN JAPAN. Shigeo Kariyone. First Department of Internal Medicine, Fukushima Medical College, Fukushima, Japan.

New techniques are developed recently in the area of nuclear hematology, such as the observation of blood cell kinetics using ^{111}In labeled cells, scintigraphies of bone marrow, lymph nodes and thrombi by new pharmaceuticals and in vitro radioimmunoassay of prostaglandins. States of utilization of these techniques in Japan are investigated.

Number of reports of nuclear medicine increased year by year in the annual meetings of Japanese Society of Nuclear Medicine. The ratio of reports in nuclear hematology against to all reports were keeping constant values of 4 or 5%. The rate of in vivo tests concernning nuclear hematology against to all tests in clinical laboratories of university hospitals were one to 0.1% in order of lymph nodes scintigraphy, measurment of plasma volume, scintigraphy of thrombi, bone marrow scintigraphy, red cell survival study and ferrokinetics. Number of tests on nuclear hematology found in case reports of annual meeting of Japanese Clinical Hematology were investigated. Red cell survival study was used in 8% and ferrokinetics study was in 7% of all case reports, respectively. Clinical hematologist seemed to utilize well these classic techniques while they did not understand the necessity of new techniques, yet.

The amount of consumption of ^{59}Fe and ^{51}Cr had gradually increased year by year until 1981 which showed slightly decrease during recent three years. Remarkable increase was observed on the amount of consumption of ^{111}In chloride and ^{111}In oxine kit during recent 5 years. It might be suggested that ^{111}In was taking place of ^{51}Cr as a blood cell labeling agent.

There was no problem to use ^{51}Cr for labeling to red cell because we could easily take lots of quantity of them. Since the volume of granulocyte and lymphocyte were 1/1400 of red cell volume, a labeling agent with high efficiency was required for them such as ^{111}In-oxine or ^{111}In-tropolon. Using this method, granulocyte, lymphocyte and platelet kinetics were investigated.

The pattern of blood cell disappearance from the blood were single linear for red cell with life span of 120 days, single exponential for granulocyte with T1/2 of 10 hours, two exponentials for lymphocyte with T1/2 of 0.3 hours in the first phase and of 50 hours in the second phase and single linear for platelet with the life span of 10 days, respectively. Number of intravascular pools were only one for red cell, two for granulocyte and platelet and several numbers for lymphocyte, respectively. Importance of splenic pool on the distribution of blood cells were very high for granulocyte and platelet but it was low for red cell and lymphocyte. These kinetic patterns of each blood cells were changed to various fashion in pathological states.

Utilization of techniques in nuclear hematology may become more frequent in the future by Japanese clinical hematologists.

Special Lecture

FUTURE PROSPECT OF NUCLEAR MEDICINE. K. Torizuka, Kyoto University School of Medicine, Kyoto.

Nuclear medicine has grown up enormously since the radioactive compound was first introduced to human beings more than half a century ago, and the development in this field has been accelerating for the past decade. This paper summarizes the current status and future prospect of nuclear medicine.

Nuclear medicine is classified into two major categories, in vitro and in vivo studies. In vitro radioassays include reserve saturation analysis, competitive protein binding analysis, radioimmunoassay, radioreceptor assay and immunoradiometric assay. The quantitative analysis of the receptors has been possible, and diseases due to the receptor antibodies or the defect in the receptors have been disclosed by these assays. For example, TSH-binding inhibitory immunoglobulins, which was found in patients with hypothyroidism, have been demonstrated to be blocking antibodies against TSH receptors, in contrast to the stimulating antibodies observed in Graves'disease.

These results of basic in vitro studies are now being applied to in vivo nuclear medicine. Monoclonal antibodies have been utilized in the radioimmunoassay of tumor markers, radioimmunoimaging, and radioimmunotherapy of cancer. They are expected to be specific to the surface antigens of tumor cells, providing the great potentials of radioimmunoimaging and radioimmunotherapy of cancer.

Recent developments in positron emission computed tomography (PET) have introduced a new field in medical imaging. Extensive studies have been performed in order to measure physiological and biochemical processes in vivo by PET. These include measurement of regional blood flow, oxygen metabolism, uptake and utilization of various substrates for energy metabolism, and neuroreceptor mapping. On the other hand, the successes of PET are being extended to the use of more widely available gamma emitting radionuclides, such as Tc-99m and I-123. I-123 labeled IMP has been accepted as a compound for the assessment of regional cerebral perfusion by single photon emission computed tomography (SPECT), and various compounds are now being studied in order to accomplish the above aim.

The essential of nuclear medicine is the tracer study. In thyroid diseases, radioactive iodine has been used not only for the measurement of iodine uptake and for thyroid imaging but also for the treatment, and in vitro assays provide measurement of various thyroid hormons and antibodies, which demonstrated the close relation between in vitro and in vivo studies. Future roles of nuclear medicine can be defined as combining in vitro and in vivo nuclear medicine by PET, and extending these results to routine nuclear medicine by SPECT.