Symposium I. Radioisotopic Diagnosis of Bone Marrow

Reticuloendothelial Function in the Bone Marrow and Erythropoiesis

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I The main clinical interest in red marrow concerns its production of blood cells, and the RE function is incidental aside from utility in providing scans to demonstrate the distribution and activity of hemopoietic marrow. To help in the interpretation of these scans, we designed experiments to detect (1) changes in erythropoiesis after administration of drugs reported to alter RE function, and (2) effects of stimulation and depression of erythropoiesis on the localization in the marrow of intravenously administered radiocolloids. Seventy percents of the total experimental groups were in correlation. A discrepancy was found especially in RE or erythroid hypoplasia group.

II This experiment was designed to assess the correlation of the response of these functions to irradiation. The left pelvis and leg of rabbits were subjected to 800 R, 1,600 R, 3,200 R and 5,000 R respectively from a Telecobalt unit. The liver, spleen and marrow were subjected to radioassay with ^{59}Fe and ^{198}Au. The effect of irradiation upon the marrow was expressed as the ratio of decreased uptake of isotopes to the uptake in the unirradiated control. In another group of experiments, marrow scanning with ^{198}Au or ^{113m}In colloid was performed, in which the density of the scan and ratemeter tracings were used.

It was concluded that: 1) iron uptake by the erythron is remarkably suppressed depending on the dose; 2) the degree of suppression of ^{198}Au uptake by RE cells was slight as compared to the iron uptake of erythron regardless of dose. Bone marrow scanning confirmed this identity.

III The next experiments were designed to assess the status of RE function in the marrow following irradiation of a single dose of 6,000 R to the liver.

The liver decreased in size, both the scan density of the marrow and the external count over the sacrum were higher.

As time elapsed, the scan density of the marrow that had once increased turned to much less than that of the unirradiated control, although the liver continued to decrease in size.

The disappearance rate of colloids from the blood was delayed, and the liver blood flow was thought decreased in liver-irradiated animals.

The ^{198}Au uptake by RE cells in liver was inhibited by irradiation in accordance with the decrease of hepatic blood flow.

After this stage, the scan density of marrow declined, when the liver decreased more remarkably in size.

This phenomenon can be explained, as follows:

By that time, the test animals were exhausted following the hepatic irradiation, and the RE cells in marrow were also rendered less capable of phagocytosis of the colloids, although abundant colloids had been brought there by the increased blood flow to marrow. The results of ferrokinetic study showed correlation with the findings of marrow scanning.

IV The effect of radiochemical nature of colloids on the uptake by RE cells in the marrow were studied.

The particle size & temperature in preparation of colloids played major roles in distribution of colloids in the marrow. In addition, ^{113m}In & ^{99m}Tc with Antimony colloids prepared by the Hastings Radiochemical Works, U. S. A. were phagocytized better by RE cells in marrow than In $(OH)_3$ & Tc-sulfur colloids respectively.