Radioisotope angiography for differentiation of hepatic mass

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It has become well known that an ideal conbination of the rapid imaging properties of the scintillation camera and a large dose of a short-lived nuclide makes possible a dynamic study of the heart, the major blood vessels and the kidneys by a simple intravenous injection. By the intravenous radioisotope angiography using ^{113m}In Fe DTPA-ascorbic acid, renal cysts and neoplasm was easily distinguished. Likewise, the differentiation of hepatic cysts and neoplasms was thought to be possible by radioisotope angiography. An area of decreased radioactivity in the left lobe of the liver and remarkable visualization of the spleen were noticed on the liver scan made with ^{198}Au-colloid. A large space occupying lesion could be suspected. Serial 3-second-exposure scintiphotographs were obtained after injection of 10 mCi of ^{113m}In Fe ascorbic acid into an antecubital vein. In the frame from 14 to 17 seconds, image of the heart chamber and great vessel appeared and, in the frame from 24.5-27.5 seconds, radioactivity accumulated over the area corresponding to the defect on the radiogold scan. This is due to ample hepatic artery flow, that is tumor stain. In the frame from 35 to 38 second, the accumulation of radioactivity were observed more clearly. This corresponds to portal vein phase. In the frame 112 to 115 seconds, radioactivity was diminishing from tumor already. Thus, radioisotope angiograms gave us the evidence that this was the case having hypervascular tumors. This was proved by autopsy to be hepatoma.

Another case with cystic liver primarily occupied in the left lobe was shown. From the radiogold scan, the space occupying lesion was suspected to be located on the left lobe. Immediately following intravenous injection of 10 mCi of ^{113m}In Fe ascorbic acid, serial 3-second-exposure scintiphotographs were taken. In this case the lesion itself remained as a cold scan. This indicated the lesion was avascular. Thus, radioisotope angiography became a routine diagnostic tool in our department, when we discovered a space occupying lesion of unknown origin on the radiogold scan. At least, one can get easily an information whether tumor is hyper-vascular or not.

Radioalbumin Microaggregates for reticuloendothelial Organ Scanning

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Radioactive particulate materials has been used for scanning agent of the liver, spleen and bone marrow. ^{131}I colloidal albumin or ^{131}I aggregated albumin (AA) was applied for the study of liver circulation or RES function. However, the turnover rate of this substance was too fast for the purpose of organ scanning.

In 1967 Taplin and his associates reported a new method to prepare "micron" sized albumin aggregates using microwave oven and ultrasonic agitator. This new suspension of albumin aggregates was called "microaggregates", which is 1-5μ in size and shows

uniform distribution.

Mean blood disappearance rate of microaggregates is 2.1±0.23 in 13 dogs, which is faster than 3-5 minutes of AA. Half time disappearance from the liver is 4.7 hours in 5 dogs, which is considerably slower than 20-35 min. of AA.

Hepatic extraction rate was studied in rats using various rad radioactive colloids. Extraction rate of microaggregates was 90.2% and was better than 70.5% of Tc SC and 60.5% of AA. The size of Tc SC is reported as 300-500mμ. Therefore it was suggested that particles of larger size shows better hepatic extraction.

Albumin microaggregates can be labeled ^{131}I, ^{125}I, ^{99m}Tc or ^{113m}In. The authors have routinely been using ^{99m}Tc labeled albumin microaggregates and have already performed more than 500 liver-spleen scans. No untoward effect was observed so far.

These particles dose not stay within the body, since they are digestable in reticuloendothelial cells. Radiation dose of microaggregates can be considerably lower than those of nondigestable colloids.

^{131}I-Lipid Particle with Various Sizes and RES Deposits

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Owing to the fact that the emulsion intravenously administered deposits in the liver or other reticuloendotherial system, we here followed up the relationship between particles with various sizes and their organ deposits utilized by ^{131}I-Triolein emulsion on rabbits.

Furthermore these deposits are recognized by scinticamera. In this experiment with various kinds of radioactive lipid emulsion with various diameters (from 0.05-5μ), we studied about the following items.

1) Effects of dose administration.
2) Effects of particles with various diameters.
3) Time effects.
4) Intravascular clearance.
5) Particle sizes, doses, and depodits in liver and spleen.

Resalts.

1) Dose effects on intravascular clearance rate do not proportionally pararelled.
2) Deposits in liver and spleen altered by the particle size and dose.
3) On the deposits of emulsion in the unit weight of liver and spleen, liver deposits decreased at 50 minutes after administration compared with at 10 minutes, on the contrary the spleen deposits increased after that interval.
4) Liver deposits are recognized by scinticamera.