THE VALUE OF ^{75}Se-SELENITE IN BRAIN SCANNING

The recent communication by De Roo (*1*) in which he reported a relatively high incidence of positive ^{75}Se-selenite brain scans in his series of patients with cerebrovascular disease warrants comment since his results and conclusions differ from those of others.

Following injection of ^{75}Se-selenite in humans, most of the ^{75}Se is firmly attached to plasma protein (*2*). Blood clearance is multiexponential, with a relatively rapid phase during the initial 2–4 days (*2,3*). It is not surprising, therefore, to find positive ^{75}Se scans in some patients with cerebral infarcts, particularly when the scans are done during the first 24 hr after dose administration (*4*). In our experience the abnormal ^{75}Se brain scan in many such cases tends to become normal with time (beyond 24 hr) following the administration of the agent. (In contrast, intracerebral tumors and abscesses become more apparent in scans done at later times after the dose.) All of De Roo's scans were performed at 24 hr after dose administration; ours were repeated at 48 and sometimes at 72 hr as well. The relatively high incidence of positive selenite scans in his cases of cerebrovascular accident (CVA) (9/16), compared with our findings reported previously (5/24 cases), might be due at least in part to the difference in the times at which the scans were performed. The incidence of positive pertechnetate scans was similar in the two series.

Dr. De Roo is correct in pointing out that no currently available radiopharmaceutical, including selenite, is truly specific for tumors. Selenite has been shown to be actively concentrated by normal leukocytes in vitro (*5*) as well as by tumors (*2*). Although the physical characteristics of ^{75}Se and the biologic $T_{1/2}$ of this agent are not particularly suited for the use of selenite as a routine scanning agent, selenite does show a high degree of selectivity for mass lesions, either neoplastic or inflammatory (*3*). The principal value of selenite in brain scanning is probably as a secondary agent for use in cases in which the differential diagnosis rests between a CVA and a mass lesion. The finding of a positive pertechnetate scan and a negative selenite scan is strong evidence against a tumor or abscess. This combination was found in three of De Roo's cases of CVA but apparently in none of his patients with tumor.

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THE AUTHOR'S REPLY

I acknowledge gratefully the comments of Dr. Cavalieri concerning my study on the value of ^{75}Se-selenite in brain scanning.

As suggested by Dr. Cavalieri, it is possible that, due to the fact that ^{75}Se-selenite clearance from the plasma is rather slow, the hypervascularization surrounding the infarcted zone is partly responsible for the high incidence of positive selenite scans in cerebrovascular disease as found in my study. The incidence of the hyperemia phase, however, in cerebral infarct with early-filling veins (as demonstrated by cerebral angiography) is rather low [14%, Huber (*1*), 14%, Lanner and Rosengren (*2*), 33%, Laroche and Cronqvist (*3*), 45%, Taveras, et al (*4*)]. Using ^{133}Xe cerebral blood flow measurements, Cronqvist (*5*) found only focal hyperemia in 19% of his cases.

In the majority of the patients with positive selenite scans, the hyperactive zone must be attributed to impregnation of the infarcted tissue probably by alteration of the blood brain barrier. Even using ^{67}Ga-citrate, Wallner, et al (*6*) found uptake in cerebral infarcts. Interference of hyperemia is excluded with this tracer substance because of low blood concentration values at the moment of the scintigraphic exploration.

Taking into account the previously given data, it can be assumed that the focal hyperemia is not solely

responsible for positive scintigraphic images in cerebral vascular disease.

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TECHNETIUM-99m-SULFUR COLLOID LUNG SCAN IN PATIENTS WITH HISTIOCYTOSIS X

Recent communications to the *Journal of Nuclear Medicine* (*1,2*) indicate that there is still uncertainty about the cause of the lung scan that is sometimes obtained when putative ^{99m}Tc-sulfur colloid is administered.

We have recently studied two patients in whom this phenomenon occurred. Both patients were suffering from histiocytosis X and at autopsy both had abnormally large numbers of histiocytes in their lungs.

Technetium-99m-sulfur colloid was prepared in the usual way using thiosulfate. The first patient was scanned three times; the second patient was scanned twice. In every instance the colloid produced a lung scan as well as a liver scan. Other patients were scanned with the same preparation and they did not show accumulation of radioisotope in the lungs. A gamma camera was used to compare the amounts of radioactivity that had accumulated in the liver and lungs after 15 min in the second patient.

The lungs contained almost half as much radioactivity as the liver. When a control patient was given the same colloid his lungs accumulated only about 4% as much radioactivity as the liver. When the rate of accumulation of radioactivity in the lung after the injection of colloid was compared with the rate of accumulation of radioactivity after the injection of ^{99m}Tc-labeled macroaggregates, distinctly different curves were obtained. Colloid produced a curve that continued to rise slowly whereas macroaggregate produced a steep curve that rose to a plateau after 2 min. The blood clearance curves were complementary.

After colloid there was a slow decline in blood activity whereas after macroaggregate the blood activity declined rapidly to negligible amounts. These results are similar to those reported by Klingensmith (*3*) and support the hypothesis that ^{99m}Tc-sulfur colloid is removed by phagocytic activity in the lung in those patients in whom the colloid produces both a liver and a lung scan. It is possible, however, that radioactivity accumulated slowly in the lung as a result of the continuous formation of particles from colloid in the circulation. If this were the case, venous blood removed from the patient soon after the injection of colloid might be expected to contain macroaggregates on their way to the lungs. We found no evidence for this. Blood from the second patient was removed from the contralateral arm 35 sec after the injection of colloid. When plasma from this blood was injected into rabbits, 34 times as much radioactivity was found in the liver as in the lungs. When the patient's plasma was mixed with colloid in vitro and injected into another rabbit, the liver trapped 50 times as much radioactivity as the lungs.

We suggest that our observations provide strong evidence for an enhancement of phagocytic function in the lung as an explanation for the lung scans that are sometimes obtained when colloidal material is injected intravenously. Both of our patients had abnormal numbers of histiocytes in the lung, both had a pattern of accumulation of radioactivity in the lung unlike that seen after a macroaggregate injection, and when the second patient's blood was incubated, in vivo and in vitro, with sulfur colloid, it failed to produce a lung scan when injected into rabbits.

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