jnm/ CASE REPORT

HIGH CONCENTRATION OF ^{99m}Tc-SULFUR COLLOID FOUND DURING ROUTINE LIVER SCAN IN LUNGS OF PATIENT WITH ADVANCED BREAST CANCER

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A case is described in which both lungs were clearly visualized following an injection of 3.0 mCi of ^{99m}Tc-sulfur colloid for a routine liver scan. The colloid concentration in the lungs was similar to that in the liver.

A 46-year-old woman was treated by surgery and radiation for a primary breast carcinoma with axillary lymph node spread. Two months later she exhibited a palpable, tender liver and became jaundiced, with an alkaline phosphatase level of 47.3 King-Armstrong units. Her chest radiograph showed diffuse lymphangitic involvement. She was referred for a liver scan, which was performed with ^{99m}Tc-sulfur colloid prepared as follows:

1. A Duphar ^{99m}Tc sterile generator was eluted with 10-ml sterile isotonic saline.
2. The eluate was collected in a bottle containing 16 mg $Na_2S_2O_3$ in 0.4 ml of water.
3. 1.0 ml of 0.3 *N* hydrochloric acid was added.
4. The solution was placed in a water bath at 100°C for 5 min.
5. Approximately 2–3 ml of phosphate buffer was added through a 0.22-micron Millipore filter to bring the pH up to 6.8.
6. The preparation was allowed to cool to room temperature.

Over 1,000 liver scans have been performed in this department using colloid prepared in this manner which is a slightly modified version of the method proposed by French (*1*).

The particle size obtained is of the order of 1 micron, and we have found that the preparation remains stable over several days without the use of any additional stabilizer, thus avoiding a possible source of pyrogens (*2*). No previous example of lung accumulation has been detected.

The anterior scan obtained 10 min after injection is illustrated in Fig. 1; the patient was too ill to permit a lateral view. A high concentration of colloid was found in both lungs as well as in the liver; unfortunately, the scanning technician mistook the left lung for the spleen and therefore the scan field did not cover the area of the spleen. A second patient injected simultaneously from the same colloid preparation had a normal liver scan with no detectable accumulation in the lungs.

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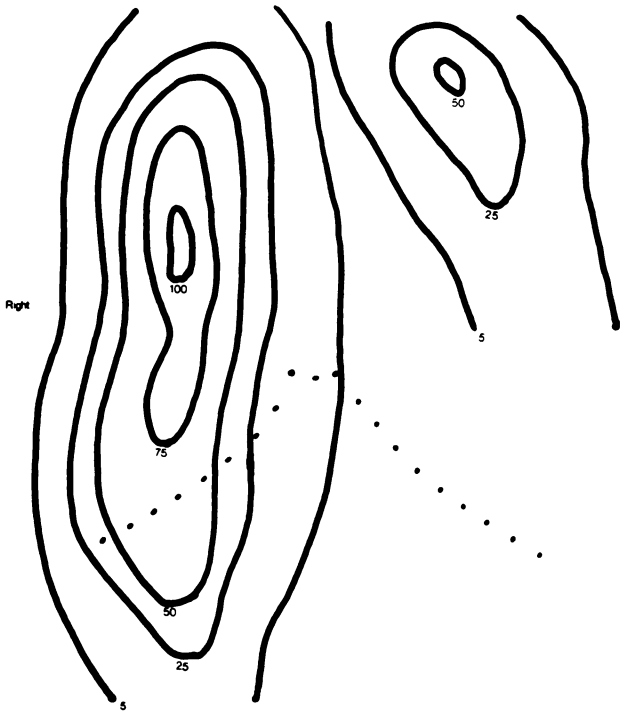

FIG. 1. Isocount lines of anterior liver scan showing marked accumulation of colloid in both lungs.

DISCUSSION

Since the colloid was prepared in the usual way and the second patient injected from the same stock failed to exhibit any scan abnormality, the possibility of a high concentration of large particles being present in the preparation may be discounted. The possibility that the colloid underwent some post-injection change resulting in the formation of large particles which could be trapped in the capillary bed of the lungs was considered. Aluminium ion in the eluted pertechnetate, even in concentrations as low as 1 μg/ml, can in the presence of phosphate buffer cause flocculation of the colloid preparation. Increased lung uptake from this cause has been reported recently (*3*). We considered the possibility that in vivo flocculation might occur if the patient had been receiving medication in the form of aluminium compounds such as are widely used for the relief of hyperacidity. However, since aluminium is characterized by an outstanding lack of absorption from the alimentary tract (*4*), this does not appear to be a likely explanation.

It is well recognized that particles of sulfur colloid are phagocytized by reticuloendothelial cells in sites other than liver and spleen. With care, bone marrow may be visualized using ^{99m}Tc-sulfur colloid, and according to DeLand and Wagner (*5*) a small concentration may also be expected in the lungs, particularly in cases where the phagocytic function of the liver is impaired.

To our knowledge the only other report of this phenomenon is that of Steinback (*6*), who found 19 cases of definite lung uptake. Ten out of the 17 of these patients for whom records were available had severe and long-standing liver disease, but as many patients with equally severe disease did not exhibit lung uptake.

We have on record several hundred scans demonstrating severe hepatic disease and have found only one case of pulmonary uptake although the data-presentation system we use would clearly demonstrate a lung uptake as low as 8% of that obtained in the liver. We therefore tend to feel that the very marked diffuse cancerous infiltration in this patient may in some way have been responsible. We could not investigate this further since the patient died 2 days after the scan was performed and her relatives refused permission for an autopsy. Therefore we cannot offer an explanation for what in our experience is a unique, and we feel an interesting, scan result. We would be interested to learn if other workers have encountered this phenomenon and would be grateful for suggestions regarding a possible mechanism.

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