
Increased Lung Uptake on Technetium-99m-Sulfur Colloid Liver-Spleen Scans in Patients with Hepatic Venocclusive Disease Following Bone Marrow Transplantation

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Three patients who developed signs and symptoms of liver dysfunction following autologous bone marrow transplantation showed varying degrees of increased lung uptake on technetium-99m-sulfur colloid (^{99m}Tc-SC) liver-spleen scans and were subsequently demonstrated to have hepatic venocclusive disease (VOD) at autopsy. Although increased lung uptake of labeled colloid has been noted in solid organ and bone marrow transplant patients, an association between this phenomenon and VOD has not been previously reported

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Increased lung uptake on technetium-99m-sulfur colloid (^{99m}Tc-SC) liver-spleen scintigraphy has been observed in association with a number of pathologic conditions, including diffuse hepatic parenchymal disease (1-4), mucopolysaccharidosis Type II (5), advanced metastatic carcinoma (3,6,7), amyloidosis (8), elevated serum aluminum level (9), and systemic infections (10-13). Solid organ and bone marrow transplant (BMT) patients have also been noted on occasion to demonstrate increased lung accumulation of colloid (14,15), presumably secondary to either decreased liver uptake as a result of hepatic damage from chemotherapy and radiation therapy (16) or stimulation of reticuloendothelial elements in the lungs with pulmonary migration of additional macrophages from the liver (17).

Hepatic venocclusive disease (VOD), a pathologic condition characterized by narrowing or obliteration of terminal hepatic venules and small sublobular veins, is a significant and sometimes fatal complication associated with bone marrow transplantation (18-21), but a specific association with increased lung uptake of sulfur

colloid has not been previously noted. We report on three BMT patients who showed increased lung uptake on liver-spleen scintigraphy and had subsequent autopsy diagnosis of VOD.

CASE REPORTS

Case 1

The patient was a 29-yr-old female with leiomyoblastoma of the ileum who developed a fever and abnormal liver function tests within 4 days of completing BMT induction chemotherapy. Liver-spleen scan demonstrated increased lung uptake of ^{99m}Tc-SC (Fig. 1). The patient died 13 days after initiation of chemotherapy, and postmortem examination demonstrated marked VOD throughout the liver.

Case 2

The patient was a 41-yr-old female with extensive local spread of breast carcinoma. Within 1 wk following BMT, mild hepatomegaly was noted on examination and liver function tests became elevated. Liver-spleen scan demonstrated an enlarged liver with increased lung uptake. The patient had progressive deterioration, with adult respiratory distress syndrome, sepsis, and renal failure, and died 39 days after chemotherapy was initiated. Autopsy demonstrated diffuse hepatic necrosis secondary to VOD.

Case 3

The patient was a 39-yr-old female with carcinoma of the breast and extensive lung and liver metastases. Several weeks following BMT, mild right upper quadrant tenderness was noted on physical examination. At 6 wk post-transplant, ultrasound demonstrated hepatomegaly and a small amount of ascites. A liver-spleen scan revealed shift of activity to the spleen and bone marrow, as well as increased lung uptake. The patient subsequently developed hepatic encephalopathy and died 8 wk after BMT. Autopsy demonstrated VOD in the liver.

DISCUSSION

Increased lung uptake on ^{99m}Tc-SC liver-spleen scans has been observed in association with infiltrative processes which involve the liver and the lung (1-8), as

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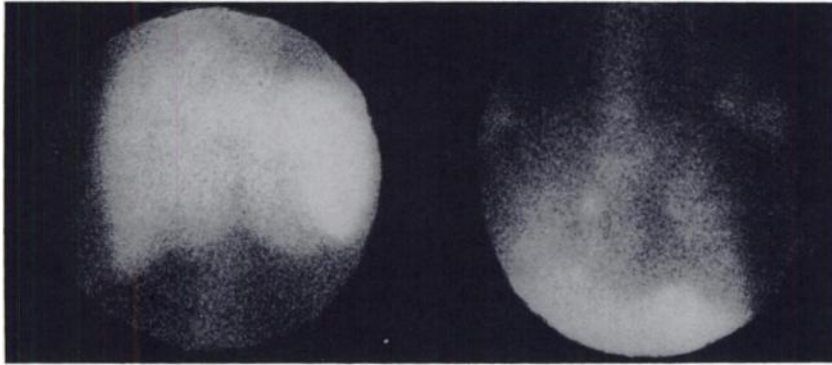


FIGURE 1

Anterior abdominal and chest images from liver-spleen scintigraphy of BMT patient (Case 1) at five days post-transplant shows increased spleen and lung activity. VOD was confirmed at subsequent autopsy. Focus of increased activity in the medial right chest represents retained tracer in the central venous catheter through which the radiocolloid was injected.

well as following exposure to hepatotoxic agents (14,22,23). Increased pulmonary uptake of radiocolloid has been reported in patients with severe liver dysfunction (1-4), as well as following chemotherapy for solid organ and bone marrow transplantation (14,15).

During an 18-mo interval, increased lung uptake of $^{99m}\text{Tc-SC}$ was observed in three BMT patients with subsequent autopsy confirmation of VOD. Three other patients who had clinical presentations consistent with VOD and were studied during this same interval also showed increased uptake of radiocolloid in the lungs. Premortem diagnosis of VOD is usually made based upon a characteristic combination of signs and symptoms, including hepatomegaly, ascites, and elevated serum bilirubin, which typically develop within the first two weeks following BMT (18-20). Imaging of the liver has generally played a subsidiary role in the evaluation of such patients. The six BMT patients described here all had liver scintigraphy as part of the clinical evaluation of new or progressive hepatic dysfunction. As asymptomatic BMT patients were not similarly studied, it is not possible to assess the specificity of the finding of increased lung colloid uptake for identifying VOD.

Decreased liver uptake of sulfur colloid as a result of hepatic injury is typically accompanied by increased colloid uptake by the spleen and, in cases of more severe hepatic impairment, the bone marrow (16,24,25). Since BMT patients no longer have a normal distribution of bone marrow, increased lung uptake of sulfur colloid in patients with VOD may be due in part to loss of marrow capacity for increased phagocytic activity. However, as increased colloid lung uptake has often been observed without concomitant increase in bone marrow activity (1,4,9-11,14), it is evident that increased accumulation of colloid in the lungs can occur independently of changes in colloid uptake by the marrow.

Hepatic injury, bone marrow compromise, and stimulation of reticuloendothelial function in the lungs probably all contributed to the increased lung uptake of colloid observed in the patients with VOD, although the relative importance of each factor is uncertain. While increased lung uptake of labeled colloid may

represent a marker of the presence of VOD, the specificity of this scintigraphic finding remains to be elucidated.

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