THE VALUE OF HEPATIC SCINTIANGIOGRAPHY AND STATIC LIVER SCANS IN SUPERIOR VENA CAVAL OBSTRUCTION: CASE REPORT

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Isolated increased uptake of ^{99m}Tc-sulfur colloid in a static liver scan with associated hepatic scintiangiography demonstration of collateral venous circulation is pathognomonic for superior vena caval obstruction. A case with these findings is reported and the differential diagnosis of "hot spots" occurring in liver scanning is discussed.

It is well documented now that the ^{99m}Tc-sulfur colloid liver scan displaying a localized increased uptake of the radiopharmaceutical may be related to superior vena caval obstruction. A review of the literature demonstrates at least eight previous cases of radiocolloid "hot spots" associated with superior vena caval obstruction (*1–5*). This increased radioactivity is seen best on the anterior scan and is generally above the region of the gallbladder fossa.

The purpose of this report is to provide another example of static liver scan findings noted with superior vena caval obstruction as well as to demonstrate that with combined hepatic scintiangiography or dynamic vascular imaging of the lower mediastinum and liver at the time of injecting the usual bolus of ^{99m}Tc-sulfur colloid, radionuclide visualization of the collateral pathways of abnormal venous flow may be shown. This requires the use of a scintillation camera. This has been demonstrated previously using high specific activity ^{99m}Tc-pertechnetate and imaging the mediastinum (*5–7,12*), but it is thought that the initial combination dynamic–static liver scan should be pathognomonic for the diagnosis of superior vena caval obstruction.

CASE REPORT

Patient EB, a 72-year-old white woman, presented with progressive weakness, weight loss, hemoptysis, and dyspnea. Physical examination revealed facial edema and significant neck vein distention. Chest examination on admission demonstrated a large right hilar and superior mediastinal mass. Bronchoscopy 6 days following admission revealed 95% occlusion of the right main stem bronchus and biopsy revealed oat cell carcinoma. Liver scanning was performed using the Anger camera (Pho/Gamma III). The dynamic study obtained immediately following the injection of 3 mCi ^{99m}Tc-sulfur colloid into a right antecubital vein produced an abnormal radionuclide flow pattern. The camera head was centered to include as much of the mediastinum as possible while allowing for visualization of the liver flow pattern. Demonstration of the collateral flow around an obstruction in the superior vena cava is noted (Fig. 1). Static liver scans performed 10 min later demonstrated localized increased uptake in the liver (Fig. 2). No evidence for space-occupying lesions to suggest metastatic involvement was demonstrated. Confirmatory radiographic venography with meglumine diatrizoate correlated with the hepatic scintiangiographic study. There was filling of the intercostal, azygos, and internal mammary veins as well as filling of the right iliac vein through epigastric vein collaterals. Demonstration of multiple abnormal veins in the region of the porta hepatis also occurred. Despite radiation therapy and a course of chemotherapy, the patient died approximately 1 month following these studies.

DISCUSSION

It is generally accepted now and is nicely demonstrated by this patient's case that the increased radionuclide accumulation in the liver seen with superior vena caval obstruction is due to the collateral circulation of the ^{99m}Tc-sulfur colloid through the epigastric venous channels into the umbilical vein and

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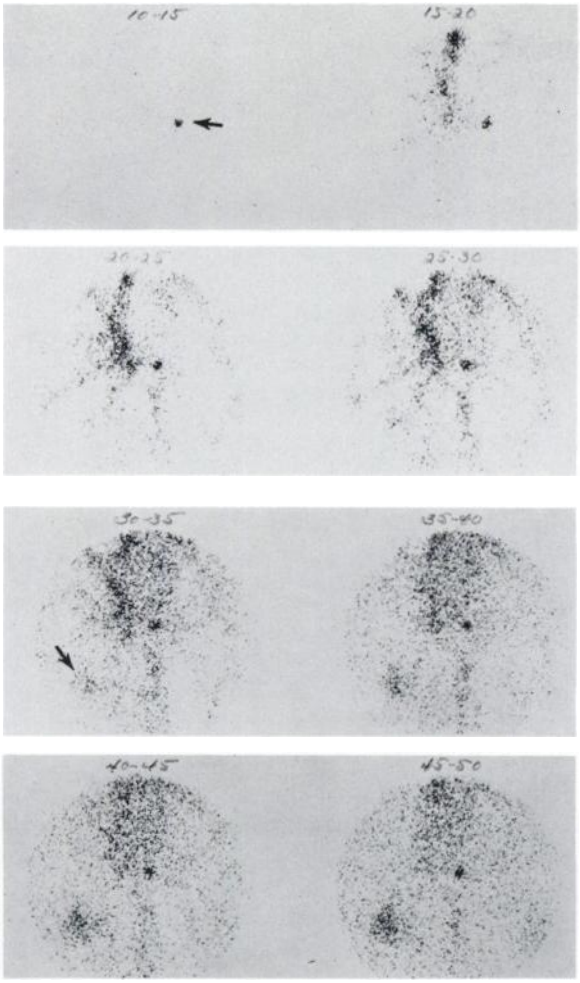

FIG. 1. Hepatic scintiangiography: sequential 5-sec 70-mm exposures immediately following injection demonstrate almost complete obstruction to superior vena cava, absence of normal cardiac flow, delayed emptying of radiocolloid in mediastinum, and appearance of multiple venous collaterals including intercostal, internal mammary, and azygos systems. Note increasing accumulation of radiocolloid in porta hepatis region of liver, indicative of venous stasis. Lower arrow demonstrates "hot spot" at 30 sec before good filling of aorta. Upper arrow marks xiphoid process. Numbers at top represent time in seconds.

hence into a small segment of the portal system in the region of the ligamentum teres (*5*). It is felt that the relative "hot spot" is thus based on stasis of the radionuclide in a small perfused segment and not due to increased phagocytosis by the reticuloendothelial system (RES) of the liver.

Other causes of selective uptake of the radiocolloid by the liver have been reported and should be considered particularly if there is no dynamic study present to suggest superior vena caval obstruction. These include Budd-Chiari syndrome (*8*), again based on relative venous stasis, free pertechnetate in the stomach overlying the liver (*9*), and other iatrogenic causes such as inadvertent injection of the radiocolloid directly into the hepatic vein through a malpositioned central venous catheter (*10*). No definite studies as yet have proven increased uptake in primary liver carcinomas where the scanning agent utilized is concentrated in the RES. Increased uptake has been shown with hemangiomas of the liver using colloidal ^{198}Au (*13*). Likewise, a functioning well-differentiated hepatoma has demonstrated normal-to-increased uptake when rose bengal ^{131}I scanning has been performed (*14*).

Although the positioning and dose injected into the antecubital vein of this patient was different from that described by DeNardo, et al (*11*) in their paper on hepatic scintiangiographic patterns, it is considered adequate to confirm the diagnosis of superior vena caval obstruction and to add another possible indication for hepatic scintiangiography.

There can be no argument that ^{99m}Tc-pertechnetate vena cavograms are far superior particularly in demonstrating the degree of obstruction (*12*) and also for following the response of patients receiving radiation therapy for their mediastinal tumors (*15*). However, as most patients are referred for liver scans to exclude metastatic involvement following tissue biopsy of the lung or mediastinal tumor, the combination dynamic–static liver scan findings previously discussed are thought adequate to diagnose superior vena caval obstruction and in most cases to justify referring the patient for radiation therapy.

The dynamic–static liver scan should be performed particularly in patients with known mediastinal en-

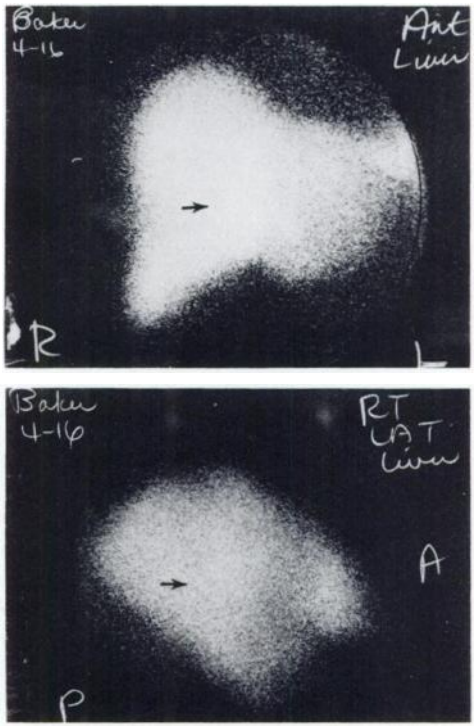

FIG. 2. Liver scan: static anterior and right lateral views demonstrate persistent accumulation of radiocolloid in gallbladder fossa region of liver (arrows).

largement, adenopathy, or suspected mass lesions as well as in any patient displaying the clinical findings compatible with superior vena caval obstruction.

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