Case Report: Delineated Radiocolloid Hepatic "Hot Spot" With Superior Vena Caval Obstruction

Don J. Talley

The Metropolitan General Hospital, Windsor, Ontario, Canada

When imaging the liver in the presence of superior vena caval obstruction, a region of increased radiocolloid uptake may occur in the area of the porta hepatis. Recently, this was demonstrated with a 32-year-old male patient. With advances in electronic spatial resolution, however, the imaged "hot" area is now considerably better delineated. This artifact within the liver in the presence of superior vena caval obstruction is thought to be due to collateral intrahepatic circulation in the liver's caudate lobe.

Occurrence of a single "hot spot" in hepatic scintigrams has been noted in the literature *(1-5)*. In all cases except one *(1)*, this uptake of radiocolloid in the general area of the ligamentum teres was accompanied by the presence of a superior vena caval obstruction (SVCO).

A pathological reason for this relationship is still not well defined; yet it has been theorized that it occurs because of caval-portal shunting *(2-4)*. Holmquest et al. *(2)* have more specifically suggested that this area of increased radiocolloid activity is due to collateral circulation using the umbilical vein, which even after birth remains usable; it is joined to the portal venous ramus retroflexus, which in turn is a branch of the left portal vein. Morita et al. *(5)* suggest that the collateral circulation leads to the internal mammary veins and eventually reaches the level of the umbilicus.

Case Report

Recently a similar case arose with a young man at my institution. This 32-year-old patient complained of persistent coughing especially while supine, weight loss, and swelling of upper torso. He appeared weak and pale. Chest x-rays showed a widened mediastinum but otherwise were within normal limits. The provisional diagnosis on hospital admission was carcinoma of the lung. Family history showed an uncle who died of cancer and two nephews being treated for cancer.

Materials and Method

This patient's first hepatic scintigram was performed with an updated Searle Pho/Gamma III HP gamma scintillation camera and a parallel hole, low-energy collimator. In this study 5.3 mCi of Tc-99m sulfur colloid was injected into the right antecubital vein as a bolus. The dynamic flow study was obtained with frames taken every 3 sec. Static pooled studies were imaged for 500 K counts each.

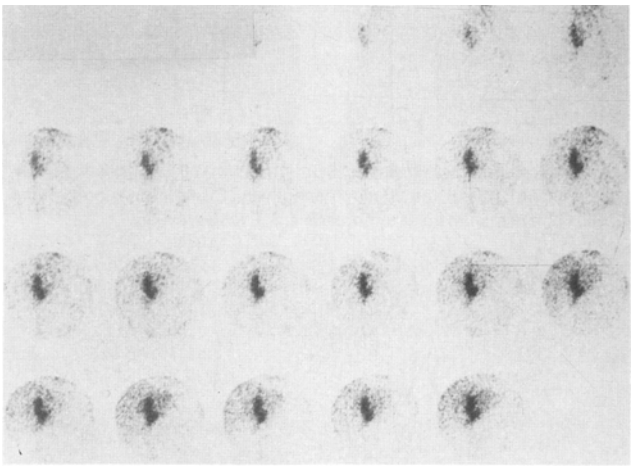

FIG. 1. First antecubital dynamic flow study, imaged serially every 3 sec. Progress is left to right and top to bottom; hot spot starts to appear in first frame (0-3 sec postinjection).

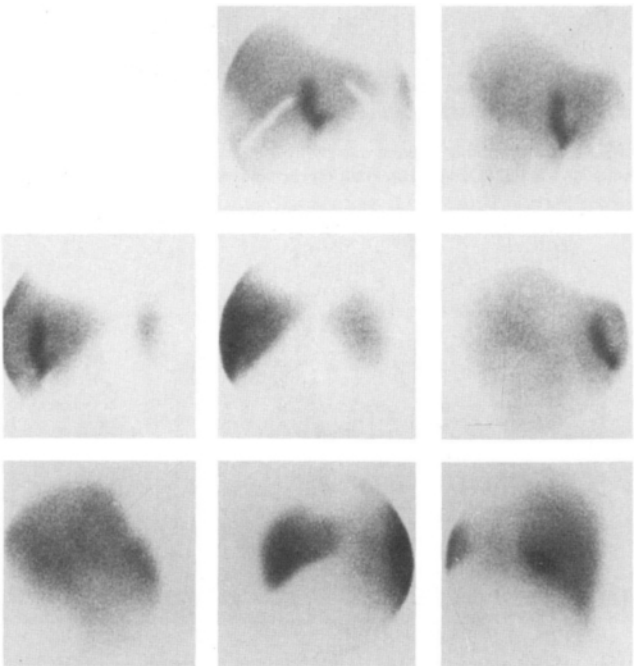

FIG. 2. Respective static images taken for 500 K each. Progression is left to right, top to bottom starting with anterior liver with costal margin markers, then anterior liver, anterior spleen, left anterior oblique, right anterior oblique, right lateral, posterior spleen, and finally posterior liver.

For reprints contact: Don J. Talley, Dept. of Nuclear Medicine, Prince George Regional Hospital, Prince George, BC, Canada V2M 1S2.

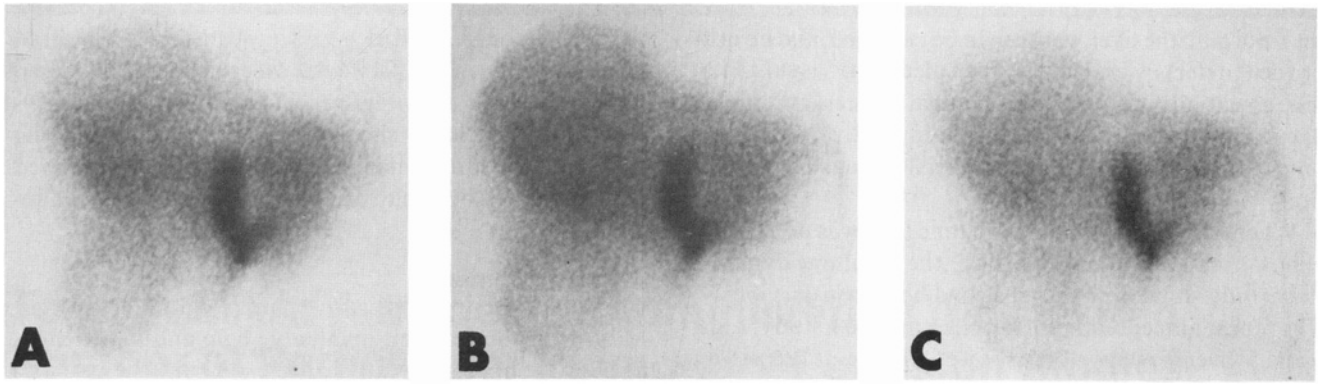

FIG. 3. Anterior liver images at 20-, 60-, and 120-min postinjection.

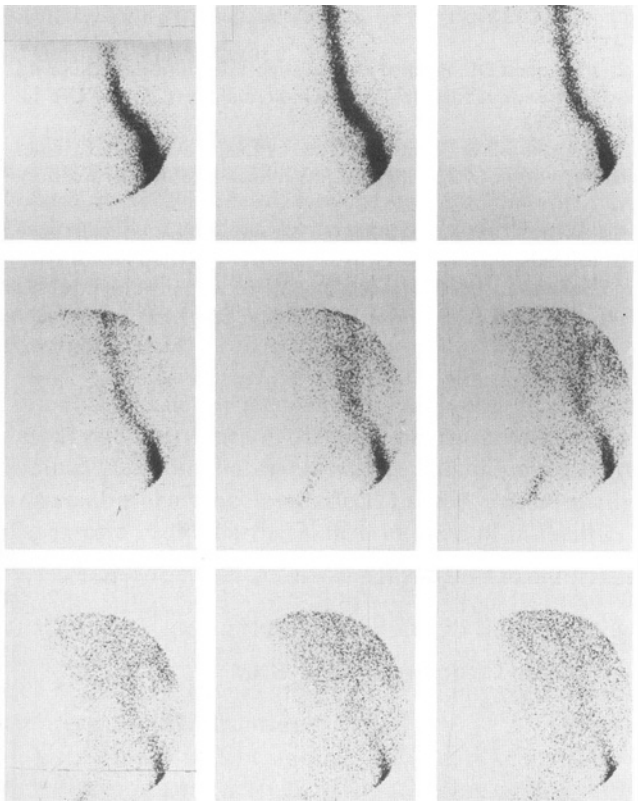

FIG. 4. Femoral injection dynamic flow study does not show previous hepatic hot spot.

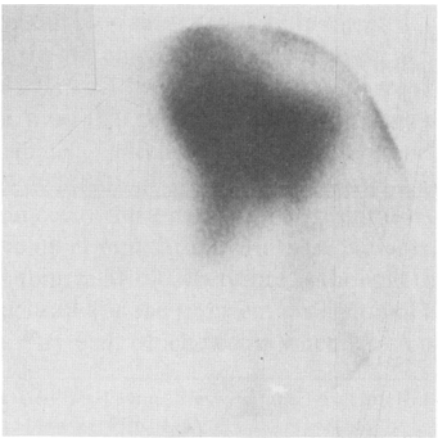

FIG. 5. Anterior view of liver follows femoral vein injection.

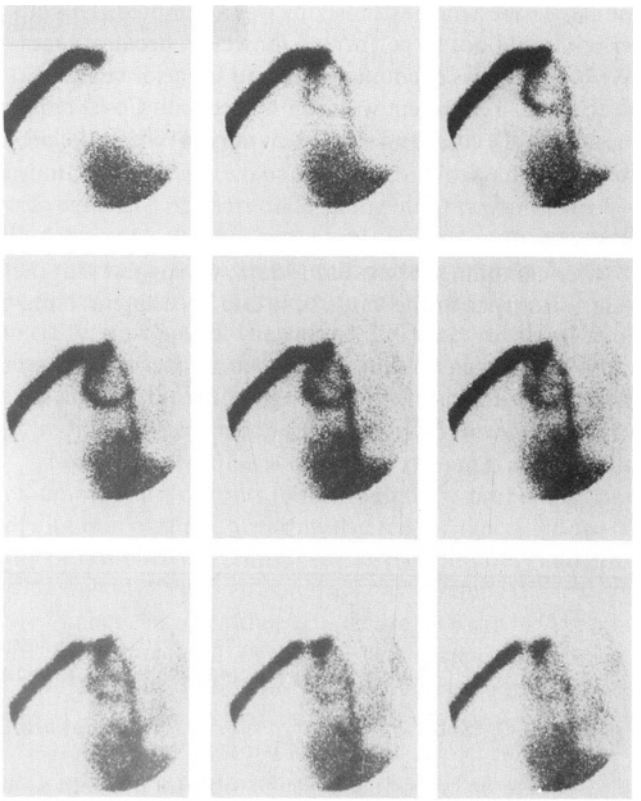

FIG. 6. Repeated antecubital vein injection flow study shows area of obstruction and detailed collateral circulation.

A supplementary dynamic flow study was performed 3 days later using Searle's LFOV gamma camera and Tc-99m stannous phytate as the imaging agent. The injection site this time was the left femoral vein and the resultant dynamic flow was imaged. Another injection of the same material was given in the right antecubital vein with the detector positioned over the upper torso.

Results

Almost immediately in the first dynamic flow study (Fig. 1), a hot area was observed in the liver's left lobe, just to the left of the ligamentum teres. The first static pooled images (Fig. 2) showed an apparent intrahepatic defect, which could still be visualized 2 hr postinjection (Fig. 3).

There was much less uptake of the radiopharmaceutical than normal; the liver was seen to be enlarged; and no other focal defects were noted. The spleen was visualized; it was essentially normal. The original impression of this particular scan was that the lesion in the liver's left lobe might best be explained as an arterial-venous malformation.

When the supplementary dynamic flow was performed (Fig. 4) with a femoral injection, the resultant dynamic flow study showed no defect as had been seen previously. The repeat antecubital vein injection and flow study (Figs. 5 and 6) over the upper torso showed complete obstruction of the subclavian vein with marked collateral circulation and subsequent superior vena caval flow retardation.

The patient went on to have a lymph node biopsy and at the same time a mediastinoscopy was attempted. This latter test could not be performed, however, because excessive bleeding was encountered due to superior vena caval obstruction. The patient was later treated with Co-60 radiotherapy to the chest and steroid therapy to reduce the precordial edema.

Discussion

After compiling the available data, we suggest that the unique hot spot in the left lobe is due to collateral circulation in the liver's caudate lobe. In previous studies *(1–5)*, the area in question had been simply described as a hot spot; however, in this particular case the area of increased uptake is much more defined. The anterior liver views (Figs. 2 and 3) clearly show a well-delineated area taking the shape of a mirror-imaged checkmark. Such improved definition may be due to advances in instrumentation resolution.

Acknowledgment

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