# False-Positive Liver Scan due to Portal Vein Thrombosis

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## Introduction

The radiocolloid scintigraphy, despite limits of resolution and relative non-specificity of its positive findings, has contributed greatly to the diagnosis and understanding of various hepatic disorders[1~2]. However, it is not unusual to see a focal cold defect on the scintiscan unrelated to a intrinsic solid or cystic lesions of the liver. There have been several reports pointed out numerous causes of false-positive scans, but reports related to the portal vein are very few[3~11]. We wish to illustrate characteristic defects on liver scintigraph in 2 patients with thrombosed and dilated portal vein.

## Case Reports

**Case I:** A 52-year-old man visited out patient clinic because of epigastric fullness and discomfort for 2 weeks. There was history of antrectomy and vagotomy due to peptic ulcer 5 year ago. On physical examination, he was apparently well and there was no palpable abdominal mass, hepatosplenomegaly, superficial collaterals, palpable lymph node, nor shifting dullness. Laboratory findings included serum bilirubin 1.85 mg/dl, alkaline phosphatase 75.3 K.A unit, protein/albumin 8.0/4.6 gm/dl, and SGOT/SGPT 93/73 unit. Scintigraph using $^{99m}T_c$-sulfur colloid demonstrated ill-defined bands of decreased activity extending from porta hepatis defect into mid-portion of the right and left lobe and a focal cold defect at postero-superior portion of the right lobe (Fig. 1 A-B). These porta hepatis defects was considered consistent with dilated intrahepatic biliary ducts because insufficient data was available at that time to ascertain nature of the defects. Ultrasonogram was performed to further evaluate the defects seen on scintigraph and

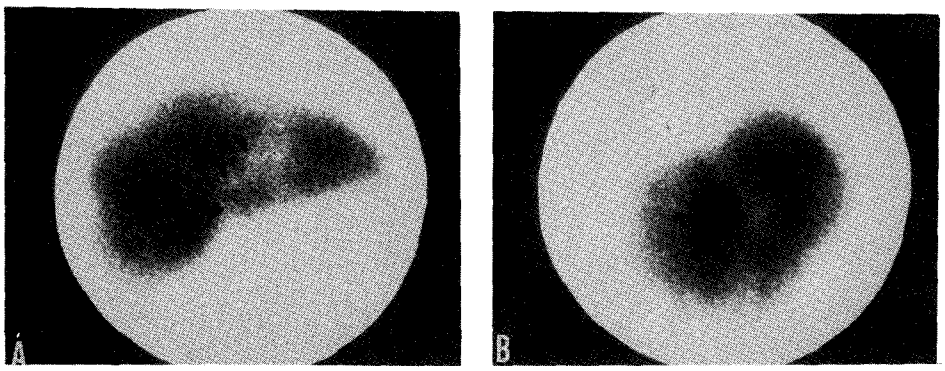


**Fig. 1. Case I.**
**A-B.** Anterior (A) and right lateral (B) view of $^{99m}T_c$-sulfur colloid scintigraphs demonstrate ill defined bands of decreased activity extending from the porta hepatis defect into midportion of the right and left lobes of the liver (arrow heads), and a cool lesion (arrow) at superolateral portion of the right lobe.


**Fig. 1. Case I.**

**C-D.** Right subcostal (C) and parasagittal oblique (D) ultrasonograms of the area of the scintigraphic defects reveal the dilated main portal vein (PVT) and its intrahepatic branches (arrow heads) filled with slight echogenicity of thrombus, and increased echogenicity of the liver (L). B=Bile duct.

there were cirrhotic pattern, an oval fairly well defined echogenic mass with halo of echo poor margin at the right lobe, and marked dilation of the main portal vein and its right and left branches filled with echogenic thrombus (Fig. 1 C-D). The suggested ultrasonographic diagnosis was hepatoma with tumor thrombus in main and all branches of the portal vein. These lesions was not pathologically verified but the thrombosed and dilated portal vein corresponded to the scintigraphic defects.

**Case II:** A 51-year-old man with diabetes mellitus was hospitalized because of anorexia and 10 kg weight loss for 2 months. On physical examination, he was chronic ill appearance, and the liver was felt 1 cm below the right costal margin. Palmar erythema was present. Laboratory data included: SGOT/SGPT 34/35 unit, GGT 200 mμ/ml, alkaline phosphatase 35.3 K.A unit, serum bilirubin 0.93 mg/dl, protein/albumin 7.1/3.6 mg/dl, CEA 1.2 unit, and alpha 1-fetoprotein more than 700 nμ/ml. HBs Ag was positive. Gastroscopy disclosed esophageal and

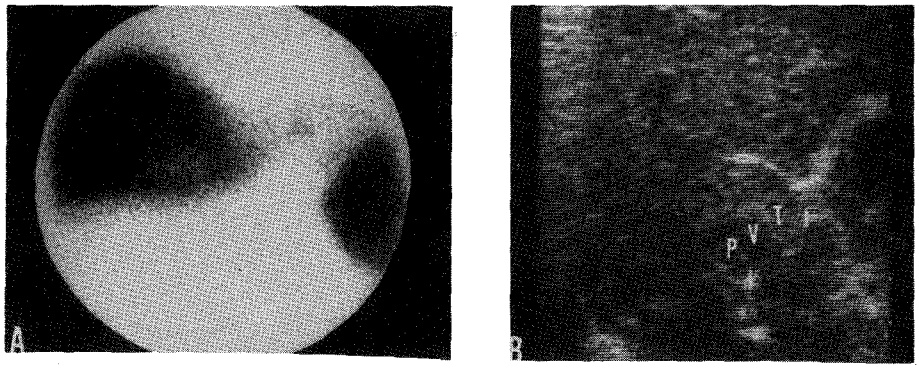


**Fig. 2. Case II.**

**A.** Anterior scintigraph shows linear defects radiating from the porta hepatis into the right and left lobes (arrow heads).

**B.** Right parasagittal oblique ultrasonogram discloses the dilated main portal vein with echogenic thrombus (PVT).

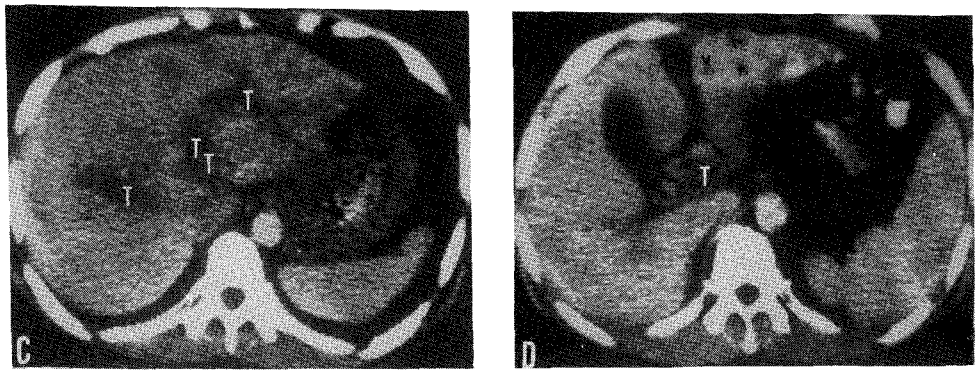


**Fig. Case II.**
**C-D.** Postcontrast CT scan demonstrate low density of thrombus in the dilated main portal vein and its intrahepatic branches (T), and small multiple low density lesions of metastatic foci at the left lobe (arrow heads).

gastric varices (grade III), and chronic hyperplastic gastritis. Ultrasonogram revealed the main portal vein and its all intrahepatic branches filled with thrombus of slight echogenicity, and slight dilation of the superior mesenteric vein (Fig. 2B). Liver-spleen scintigraph disclosed linear defects radiating from porta hepatis defect into the right and left lobe of the liver (Fig. 2A), but bone scintigraph demonstrated no definite abnormality. On CT of the abdomen with contrast enhancement, there were low density filled in the dilated main portal vein and all its intrahepatic branches, and multiple small low density lesions at the left lobe (Fig. 2C-D). Pathologically, adenocarcinoma was confirmed by US guided needle aspiration cytology of portal vein thrombus and focal hepatic mass.

## Discussion

In spite of the general accuracy of liver-spleen scintigraphy as well as the advances on conventional instrumentation, there has been a difficulty in interpretating scintigraphic image. This difficulty relates to the limitations of equipment resolution; difficulty in portraying an area of decreased activity in a large organ with prominent activity; numerous developmental variations in configuration; superimposed or inherent anatomic structures and nonspecificity of scintigraphic defects[9].

The liver can change its shape and form owing to its great pliability when impinged upon by the pathologic processes in adjacent structures and organs, and so the resultant false-positive scan, a picture portrayed on scintigraph, is frequently indistinguishable from that of intrinsic space occupying lesions of the liver[7]. The more common juxtahepatic causes for false-positive scan have been known; enlarged gallbladder, dilated bile ducts, dilated hepatic vein, pancreatic masses, renal masses, ribs, subdiaphragmatic fluid collection, etc.[3~11]. However, there have been very few reports of false-positive scans related to the portal vein with/without thrombus. Shanser, et al. reported bifurcation of the portal vein appearing as a focal-cold defect on hepatic scintiscan of patient with cirrhosis and portal hypertension[5]. Takayasu, et al. observed false-positive scan, as a discrete defect in the porta hepatis, due to the dilated umbilical portion of the left portal vein (larger than 25×20 mm) in the portal hypertension[4].

Anatomically, in the liver, the portal venous system correspond in course and distribution to the biliary ducts. However, the portal venous system tend to be in the deeper aspect of the anterior

portion of the liver than the biliary ducts. According to Shanser, et al.[5], a false-positive scan by the dilated umbilical portion of the left portal vein has basically the same mechanism as that seen in the dilated left hepatic duct. The band like defects radiating from porta hepatis to the right and left lobe, as seen in our cases, can not be described simply as a nonspecific defect. Furthermore, these scintigraphic findings were similar to known characteristic findings of intrahepatic biliary duct dilation[3,6,7], and so an erroneous diagnosis was made. The scintiscan defects seen in our cases were attributed to the dilated main portal vein and all its intrahepatic branches which do not concentrate colloid particles as does normal hepatic tissue, and additional compression upon the surrounding parenchyma by increased intraluminal pressure; a similar phenomenon operating on the dilated biliary ducts. Sample, et al. reported that the correct determination of abnormalities involving portal venous and biliary systems could be made from multiplane tomographic nuclear scanner than conventional nuclear imaging[10], but more recent development in US instrumentation resolved clearly all these problems and a specific diagnosis was possible[11,12].

In summary, one ought to include the possibility of the dilated portal vein with/without thrombus, when bands of decreased activity extending from porta hepatis defect into the right and left lobes is detected on radiocolloid scintigraph of nonjaundiced patient.

## REFERENCES


1) Drum DE: *Current status of radiocolloid scintigraphy for space-occupying disease. Semin Nucl Med 12:64-74, 1982*
2) Ashare: *Radiocolloid liver scintigraphy. Radiol Clin of Nor Am 18:315-319, 1980*
3) Gammill SL, Maxfield WS, Front RG, et al: *Filling defects on scintillation scans of the liver associated with dilation of the bile ducts. AJR 107:37-42. 1969*
4) Takayasu K, Moriyama N, Suziki M, et al: *False-positive liver scans due to portal hypertension; Correlation with percutaneous transhepatic portograms in 33 patients. Radiol 147:211-214, 1983*
5) Shanser JD, Korolkin M, Hattner RS, et al: *Bifurcation of the portal vein appearing as an focal defect on the liver image. Radiol 114:399-401, 1975*
6) Chaudhuri TK, Stadalnik RC, Chaudhuri TK: *Juxtahopatic structures causing false postitve liver scintiscan. Semin Nucl Med 11:61-63, 1981*
7) Freeman LM, Meng CH, Johnson PM, et al: *False positive liver scans caused by disease processes in adjacent organs and structures. Br J Radiol 42:651-656, 1969*
8) Heck LL, Gottschalk A: *The appearance of intrahepatic biliary duct dilation on the liver scan. Radiol 99:135-140, 1971*
9) McClelland RR: *Focal porta hepatis scintiscan defects; What is their significance? J Nucl Med 16: 1007-1012*
10) Sample WF, Gray RK, Poe ND, et al: *Nuclear imaging, tomographic nuclear imaging and gray scale ultrasound in the evaluation of the porta hepatis. Radiol 122:773-779, 1977*
11) Merritt CRB: *Ultrasonographic demonstration of portal vein thrombosis. Radiol 133:425-427, 1979*
12) Gansbeke DV, Avni EF, Delcour C, et al: *Sonographic features of portal vein thrombosis. AJR 144: 749-752, 1985*