

Discordant uptake of Tc-99m PMT and Tc-99m GSA by two hepatocellular carcinoma lesions

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Tc-99m PMT and Tc-99m GSA can be taken up by hepatocellular carcinoma (HCC), but there has been no report concerning HCC showing accumulation of both of Tc-99m PMT and Tc-99m GSA. In this paper we describe a case of two simultaneously developed HCCs, one of which took up both tracers but the other took up neither of them.

Key words: Tc-99m PMT, Tc-99m GSA, hepatocellular carcinoma

INTRODUCTION

SCINTIGRAPHY with Tc-99m-Sn-N-pyridoxyl-5-methyl-tryptophan (Tc-99m PMT) or Tc-99m-diethylenetriaminepentaacetic acid-galactosyl human serum albumin (Tc-99m GSA) is used for the evaluation of liver function.^{1–4} It is important to know the entire or regional hepatic function for treating hepatocellular carcinoma (HCC) and this significantly relates to the choice of the therapy. In addition, as these tracers are thought to be taken up by HCC in association with the degree of differentiation, they make it possible to estimate the grade of malignancy of HCC and the involvement of extrahepatic sites, and to use them in evaluating the efficacy of therapy.^{5–7} We routinely perform Tc-99m PMT and Tc-99m GSA studies combined with other radiographical examinations of the liver when HCC is suspected, and several kinds of therapies are taken into consideration. This report describes a patient with two HCCs. The findings of radiographical studies other than scintigraphy for the tumors were similar, but the results of Tc-99m PMT and Tc-99m GSA studies were quite discordant.

CASE REPORT

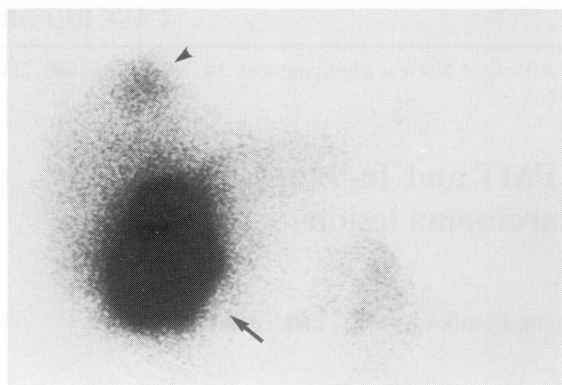
A 76-year-old woman was referred to our hospital for

further examination of liver tumors suspected of being HCC, which had been detected by abdominal ultrasonography performed as a periodic workup for liver cirrhosis caused by hepatitis C virus infection. On admission, the laboratory evaluation was remarkable for a GOT level of 108 IU/L (normal 0–40 IU/L), and a GPT level of 97 IU/L (0–47 IU/L), and retention of indocyanine green in plasma after 15 min (ICGR-15) was 26% (0–10%). The serum protein induced by the vitamin K absence-II (PIVKA-II) level had increased to 2.2 AU/mL (≤ 0.1 AU/mL), whereas the level of the serum α -fetoprotein (AFP) was normal.

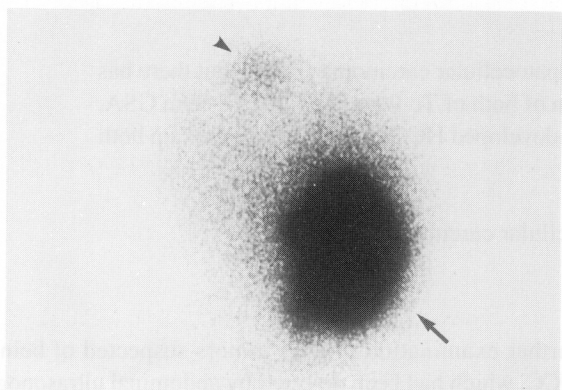
Dynamic CT imaging revealed two well-enhancing tumors in contact with each other in the anterior superior segment of the liver. Tc-99m PMT scintigraphy showed no intrahepatic bile stagnation on sequential images for 60 minutes. But a solitary high uptake was found in the hepatic dome, which became more apparent on the planar abdominal image obtained 3 hours later (Fig. 1). Tc-99m GSA SPECT images of the liver obtained after sequential upper abdominal imaging for 20 minutes identified a humpy uptake in the area corresponding to high accumulation of Tc-99m PMT and a cold area adjacent to it (Fig. 2). CT during arterial portography (CTAP) showed the two tumors as filling defects and CT arteriography (CTA) depicted them as well enhancing masses (Fig. 3). On hepatic angiogram, the tumors accompanied irregular vessels and stains (Fig. 4). According to the radiological results and the laboratory data, the two liver tumors was diagnosed as HCC and transcatheter arterial embolization therapy (TAE) was performed. On dynamic MRI performed later to evaluate the effect of TAE, it was clearly

Received August 17, 2000, revision accepted October 23, 2000.

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A



B

Fig. 1 A, B: Tc-99m PMT planar abdominal images (anterior projection, A and right lateral projection, B) obtained 3 hours after the administration exhibited a high uptake in the hepatic dome (arrowheads). Arrows indicate the gallbladder.

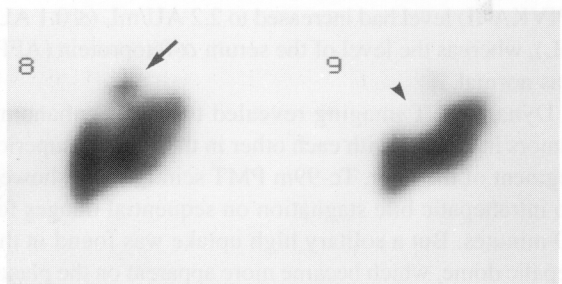
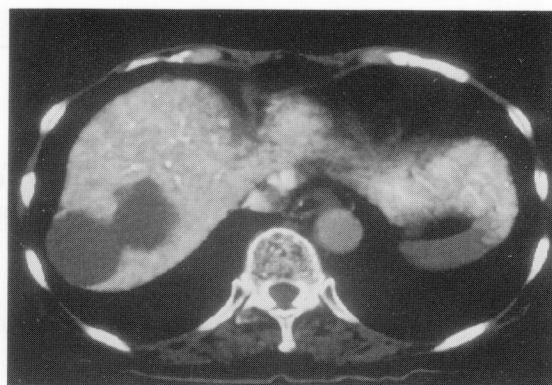
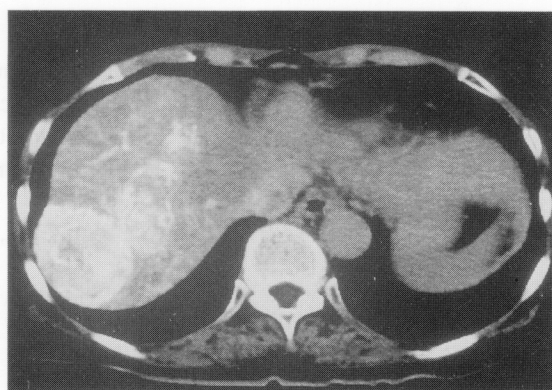


Fig. 2 Coronal SPECT of the liver with Tc-99m GSA showed a humpy uptake at the right lobe consistent with the high uptake seen in Tc-99m PMT study (arrow) and a cold area was also depicted right infero-laterally to the hump (arrowhead).

seen that of the two tumors the supero-medial one showed signs of considerable accumulation of Tc-99m PMT and Tc-99m GSA, and the other which was located right infero-laterally to it showed no sign of accumulation of these tracers (Fig. 5).



A



B

Fig. 3 A, B: The two hepatic tumors were demonstrated as filling defects in CT during arterial portography (CTAP) (A) and were well enhanced in CT arteriography (CTA) (B).

DISCUSSION

Tc-99m PMT is taken up by hepatocytes and excreted into bile, and therefore allows us to assess hepatobiliary function of the liver.⁸ It has also been reported to concentrate in HCC in liver and its metastatic sites.^{5,9} Its mechanism of uptake by HCC is thought to be due to the hepatocytic function remaining in the tumor. The uptake of hepatobiliary imaging agents is correlated with the degree of histologic differentiation of HCC.¹⁰

Tc-99m GSA is one of the synthetic radioligands which bind specifically to asialoglycoprotein receptors (ASGP-R) on the membrane of hepatocytes. After binding, the ligand-receptor complex is transported to hepatic lysosomes where the ligand is catabolized.¹¹ Due to this characteristics, Tc-99m GSA can be used for evaluating a normally functioning hepatocyte mass.^{3,4,12} Receptor-mediated binding with subsequent cellular endocytosis usually does not occur in HCC, because surface asialoglycoprotein receptors are lost during malignant dedifferentiation.¹³ But it has also been pointed out that some well-differentiated HCCs contain ASGP-R,¹⁴ and such tumors take up ASGP-R binding radiopharmaceutical.⁶ By keeping this characteristic in mind, it is possible to diagnose

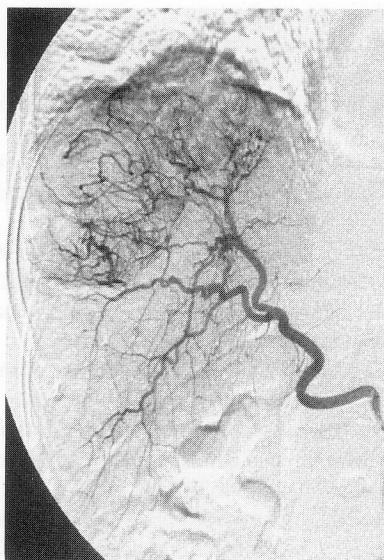


Fig. 4 Angiography of the right hepatic artery replaced from the superior mesenteric artery showed irregular tumor vessels in the superior anterior segment.



Fig. 5 Dynamic MR examination was performed after TAE. The relative location of the tumors in the liver are well recognized on the coronal image.

hepatic tumors qualitatively.

The patient had developed two HCCs in the anterior superior segment of the liver. Progressive increase in the arterial supply and parallel decrease in the portal supply are pointed out as the grade of malignancy increases in various types of hepatocytic nodules in the experimental and clinical investigation.^{15,16} According to the CTAP and CTA, both of the tumors in this patient had the same kind of blood supply with decreased portal and increased arterial blood flow, which was consistent with dedifferentiated HCC,¹⁵ but the tumors showed quite different findings in Tc-99m PMT and Tc-99m GSA scintigraphy. One of the tumors took up Tc-99m PMT and Tc-99m GSA, but the other took up neither of them. Although the reason for this discordance cannot be fully explained, it may be due to a cellular functional difference between the two HCCs which was not demonstrable by other radio-

logical examination including CTAP and CTA.

The differentiation of HCC is related to the response to TAE or percutaneous ethanol injection therapy and the chemosensitivity.^{17,18} In addition, HCC can be composed of tumor cells of more than one cellular differentiation,¹⁹ so that evaluation of cellular differentiation of HCC appears to be essential for treating HCC. The hepatocytic function of HCC is closely associated with the degree of differentiation of the tumor cells.⁷ Although there is need for further investigation into the correlation with histopathology, scintigraphical study with Tc-99m PMT or Tc-99m GSA, which can noninvasively demonstrate the characteristics of HCC on the basis of the hepatocytic function of tumor cells as in this patient, may play a role in the management of HCC.

ACKNOWLEDGMENT

The authors thank Ken-ichi Endou, B.S. and Tsuyoshi Nishio, B.S. for their technical assistance.

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