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A case of an intra-atrial tumor thrombus from hepatocellular carcinoma (HCC), first indicated by ^{67}Ga-citrate scintigraphy

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We encountered a very rare case of an intra-atrial tumor thrombus from hepatocellular carcinoma (HCC). Conventional XCT and US gave evidence of HCC. In nuclear medicine studies performed incidentally, the first study with ^{99m}Tc-phytate liver scintigraphy showed 2 SOLs and evidence of chronic liver disease, and the second study with ^{67}Ga-citrate scintigraphy demonstrated 2 hot lesions within the liver parenchyma, and also another unexpected hot area just above the left lobe of the liver, seemingly beyond the diaphragm. When echocardiography was performed, in addition to ECG, because the patient began to complain of dyspnea, an oblong mass lesion was detected within the right atrium. Reexamination with XCT and angiography clearly proved the existence of an intra-atrial tumor thrombus. These results indicate the need for routine examination by echocardiography for HCC patients complaining of dyspnea.

Key words: hepatocellular carcinoma (HCC), an intra-atrial tumor thrombus, ^{67}Ga-citrate scintigraphy

INTRODUCTION

IT IS VERY RARE to see a tumor thrombus in the right atrium of the heart as a result of invasion of hepatocellular carcinoma (HCC).[1-3] Although such lesions are usually discovered at autopsy in most cases,[4] we were able to find intra-atrial tumor growth in our patient before his death. Color-Doppler ultrasonography, XCT, and angiography have been most widely used today as new methods in imaging diagnosis of HCC, and nuclear medicine has gradually lost its usefulness in the identification of HCC. Nevertheless, ^{67}Ga-citrate scintigraphy first indicated what was later shown to be an intra-atrial tumor thrombus in our patient, whereas other methods all failed to demonstrate the lesion at that time.

CASE REPORT

A 61-year-old man visited a nearby practitioner complaining of right flank pain. His XCT scan demonstrated hepatic tumors. He was therefore referred to our hospital for further examination. This patient had had liver dysfunction 10 years previously, but no treatment was pursued. Liver function tests performed at admission disclosed a higher level of GOT than that of GPT, indicating GOT-dominant mild liver dysfunction. His AFP value was also high at 265 ng/m*l*.

As shown in Figure 1, US, which was performed first, visualized 2 tumor masses in the liver parenchyma: one at S_6 (10 cm diameter) and another at S_4 (5 cm diameter). Conventional abdominal XCT scanning also demonstrated 2 early hyperperfused lesions. Based on these findings, the patient was definitely diagnosed as having HCC. When we incidentally performed nuclear medicine studies, ^{99m}Tc-phytate liver scintigraphy demonstrated 2 SOLs, one in the right and one in left medial lobe, mild splenomegaly, and increased bone marrow visualization (Fig. 2); and subsequent ^{67}Ga-citrate scintigraphy demonstrated not only hot lesions corresponding to these SOLs (Fig. 3), as expected, but also an unexpected hot lesion just above the left lobe. At that time, we could not determine the exact location or nature of the unexpected lesion.

Because the patient soon began to complain of dyspnea, ECG and echocardiography were performed, demonstrating a mass lesion within the right atrium (5 cm

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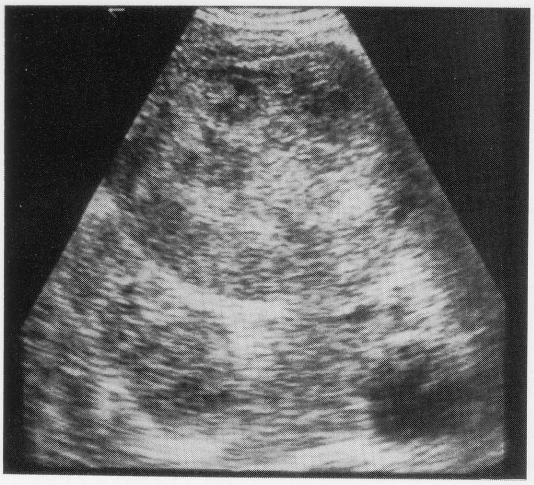

Fig. 1 An ultrasonogram of the liver. Two encapsulated tumor masses, respectively one in the right and one in left medial lobe, are suspected of HCC.

Fig. 2 Four projections of liver scintigram with ^{99m}Tc-phytate. Two SOLs in the liver parenchyma are evident: a larger one at S_6, and a smaller one at S_4. Bone marrow visualization and slight splenomegaly give evidence of chronic liver disease.

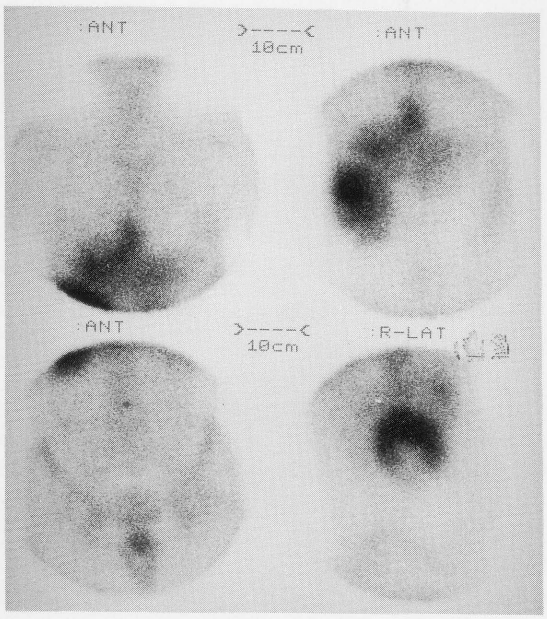

Fig. 3 Four spot images by ^{67}Ga-citrate scintigram. Two hot lesions, respectively one in the right and one in left medial lobe of the liver, are observed, in addition to a hot area just above the left lobe, probably in the thorax.

diameter). XCT was therefore repeated, the results supporting the echocardiographic findings: a low dense oblong lesion was visualized in the right atrium (Fig. 4). We finally obtained celiac arteriograms, which showed 2 hypervascular tumors, one in the right and one in left medial lobe, and an A-V shunt in the middle hepatic artery, which continued to the right atrium through the IVC in the form of threads and streaks (Fig. 5). We therefore made a final diagnosis of an intra-atrial tumor thrombus from HCC.

DISCUSSION

An intra-atrial tumor thrombus is extremely rare in cases of HCC.[1-4] Extension of the tumor thrombus to the inferior vena cava and/or right atrium is first disclosed at autopsy in most cases, there are some cases in which the intra-atrial tumor growth could have heen diagnosed by echocardiography or angiography 3–4 months prior to death.[2]

According to a survey of 78 cases of a tumor thrombus in the inferior vena cava by Simpson, the tumor thrombus most commonly originated in malignancies of the kidney or adrenal gland, and a tumor thrombus secondary to HCC was noted in only seven cases.

The incidence of HCC in Japan is about ten times as high as in Western countries, and such an extension is encountered more frequently. Nevertheless, reports on an intra-atrial tumor thrombus in HCC first indicated by ^{67}Ga-citrate scintigraphy could have been unpublished. This case is therefore very interesting because it shows the utility of nuclear medicine tools for HCC invasion of the right atrium. Newly developed ME has changed imaging methods used in decision making to obtain a correct diagnosis. In the diagnosis of HCC, color-Doppler ultrasonography, helical XCT scanning and MRI have become the most important standards, leading to waning popularity of nuclear medicine. In the earlier days, ^{99m}Tc-colloidal scintigraphy had served as the first step in obtaining evidence of SOL.[5] If any SOL was observed in the liver, ^{67}Ga-citrate scintigraphy would have been performed as the next step, to determine if the SOL was positive for Ga, which would be probable evidence of HCC or metastatic lesions.

A B

Fig. 4 A. Abdomen: this slice at the right lobe of the liver demonstrates a large low dense SOL and a low dense area within the IVC, suggesting HCC and a tumor thrombus, respectively. B. Thorax: this slice at the right atrium demonstrates an oblong low dense lesion, which occupies most of the right atrium.

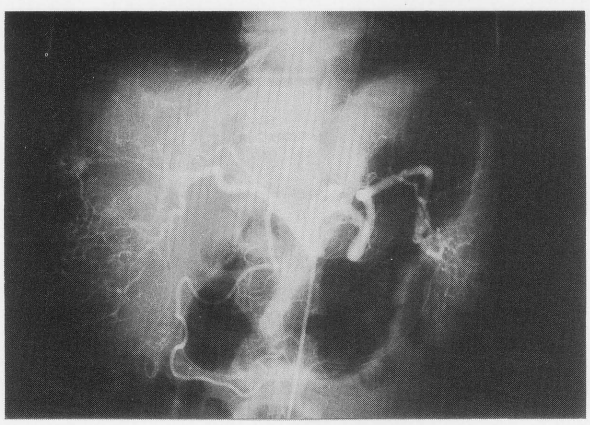

Fig. 5 A celiac arteriogram. Two hypervascular lesions, one in the right and one in left medial lobe of the liver are observed, in addition to threads and streaks sign from the middle hepatic artery into the right atrium through the IVC, giving evidence of an A-V shunt and a tumor thrombus.

New methods are replacing previously popular nuclear medicine. ^{99m}Tc-colloidal liver scintigraphy has shown the most prominent decline. Nevertheless, ^{67}Ga-citrate scintigraphy caused us to undertake further studies with angiography and XCT scanning of upper areas. This underscores the important differences anatomical imaging methods such as XCT and US, and nuclear medicine, which analyzes the space and chronological distribution of physiological and biochemical elements in the body. A mass seen in the right atrium of our patient was positive on the Ga scan, disclosing its viability. In this point, nuclear medicine was superior to XCT and US. Further, we believe that hepatobiliary scintigraphy with ^{99m}Tc-PMT would have been very helpful in visualizing our patient's invasion by HCC[6] had it been performed. We could also imagine that SPECT would have demonstrated continuous abnormal accumulation from the region just above the left lobe of the liver to the right atrium, had it been used concomitantly at the time of ^{67}Ga-citrate scintigraphy. The failure to notice such a distant lesion might have been compensated for MRI, because a small number of coronal and sagittal slices are sufficient to identify tumor invasion of the IVC and/or right atrium.[7] Regrettably, we were not able to examine our patient by means of MRI.

Consistent with our patient's complaint, dyspnea is a clinical symptom characteristic of an intracardiac tumor thrombus, in addition to ascites, leg edema, and venous dilatation.[8] We must therefore carefully interpret cardiac accumulation on ^{67}Ga-citrate scans, whenever a patient with HCC complains of dyspnea. Because HCC patients are increasing in number, and because it is easy to perform, we recommend that echocardiography be routinely used in these patients.

In conclusion, we emphasize that old-fashioned nuclear medicine methods are still useful for cases such as that which we have reported here.

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