

## Case report

# Regional Liver Disorder with Differences in the Accumulation of $^{99m}\text{Tc}$ -phytate and $^{99m}\text{Tc}$ -galactosyl Human Serum Albumin

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## Abstract

We report a 56-year-old woman with regional liver disorder due to acute hepatitis. Computed tomographic images showed low signal density at a plain phase and prolonged contrast effect at a late phase in the left hepatic lobe, in which an accumulation of  $^{99m}\text{Tc}$ -phytate increased, whereas that of  $^{99m}\text{Tc}$ -galactosyl human serum albumin (GSA) decreased. Meanwhile, in the right lobe, an accumulation of  $^{99m}\text{Tc}$ -GSA showed more increased than that of  $^{99m}\text{Tc}$ -phytate. Liver biopsy showed massive hepatocyte necrosis and interface hepatitis in the left lobe, and moderate hepatitis in the right lobe. Differences in the accumulation between these scintigrams were helpful for understanding rapid necrosis in the left lobe, resulting in a compensatory enlargement of the right lobe. Clinicians should be aware that some cases of acute hepatitis cause regional liver disorder although most cases show homogeneous inflammation.

**Keywords:**  $^{99m}\text{Tc}$ -galactosyl human serum albumin,  $^{99m}\text{Tc}$ -phytate, acute hepatitis, regional liver disorder

## Introduction

Regional liver disorders are observed in acute hepatitis including severe or fulminant hepatitis,<sup>[1,2]</sup> hepatic tumors, irregular fat deposition, irradiation,<sup>[3]</sup> and abnormality of intrahepatic portal vein, hepatic vein, hepatic artery, or bile duct.<sup>[4]</sup> Hepatic scintigraphy is a useful functional modality for evaluating liver dysfunction. Among the techniques used,  $^{99m}\text{Tc}$ -phytate scan indicates Kupffer cell function,<sup>[5]</sup> whereas  $^{99m}\text{Tc}$ -galactosyl human serum albumin (GSA) scan indicates hepatocyte function.<sup>[6]</sup> Herein, we report the case of a patient with acute hepatitis and regional disorder, which showed different accumulations with  $^{99m}\text{Tc}$ -phytate and  $^{99m}\text{Tc}$ -GSA scan.

## Case Report

A 56-year-old woman was diagnosed with liver dysfunction. She had a history of chronic thyroiditis due to Hashimoto's disease. Her body mass index was 24.8 kg/m<sup>2</sup> and alcohol consumption was 65 g/day. She took no daily medicine. Laboratory tests were as follows: aspartate aminotransferase: 1461 IU/L; alanine aminotransferase: 1389 IU/L; gamma-glutamyl transpeptidase: 505 IU/L; alkaline phosphatase: 637 IU/L; total bilirubin: 1.1 mg/dL; serum albumin: 3.1 g/dL; prothrombin time activity: 82%; immunoglobulin G (IgG): 2283 mg/dL; and platelet:  $12.8 \times 10^4/\mu\text{L}$ . Her thyroid hormone levels maintained normal range. She tested negative for hepatitis B surface antigen and hepatitis C virus antibody; the dilution of the antinuclear antibody used was 1:80.

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Computed tomography (CT) showed low signal density at a plain phase and prolonged contrast effect at a contrast-enhanced phase in the left hepatic lobe [Figure 1]. We examined hepatic scintigraphy to assess function of the left and right lobes. Scintigraphy using <sup>99m</sup>Tc-phytate showed an atrophy of the left lobe and a downward enlargement of the right lobe, and an accumulation of <sup>99m</sup>Tc-phytate increased in the left lobe. Meanwhile, <sup>99m</sup>Tc-GSA scintigraphy revealed a reduced accumulation in the left lobe while an increased accumulation was observed in the enlarged portion of the right lobe. Single photon emission CT of each scintigraphy and CT fusion images were useful in determining regional accumulations [Figure 2]. The above findings suggest rapid necrosis in the left lobe, resulting in a compensatory enlargement of the right lobe. Laparoscopy showed 5 mm or smaller nodules in a diffused pattern on the left lobe surface, and large nodules on the downward side of the right lobe [Figure 3]. Liver biopsy showed marked hepatocyte necrosis with subcapsular interstitial proliferation and interface hepatitis in the left lobe, and lymphoplasmacytic infiltration and moderate hepatitis with bridging fibrosis in the right lobe [Figure 4].

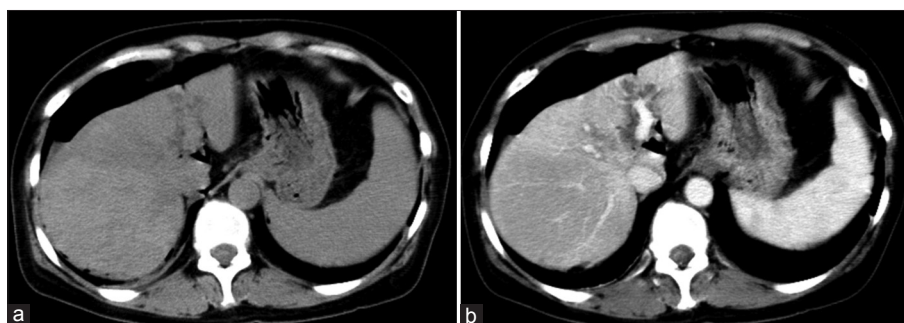
Regarding the cause of regional liver disorder, alcoholic liver disease was considered, but no specific changes for histological findings such as fat deposition and ballooning of hepatocytes were not seen. On the other hand, autoimmune hepatitis (AIH) was suspected because the IgG level and the titer of the antinuclear antibody were high, and the pretreatment score according to the international diagnostic criteria of AIH were 14 points suggesting “probable AIH” and the simplified AIH score was 6 points suggesting “probable AIH.”<sup>[7,8]</sup> The patient had been followed without steroid administration because liver enzymes became stable by medication of glycyrrhizin and ursodeoxycholic acid.

## Discussion

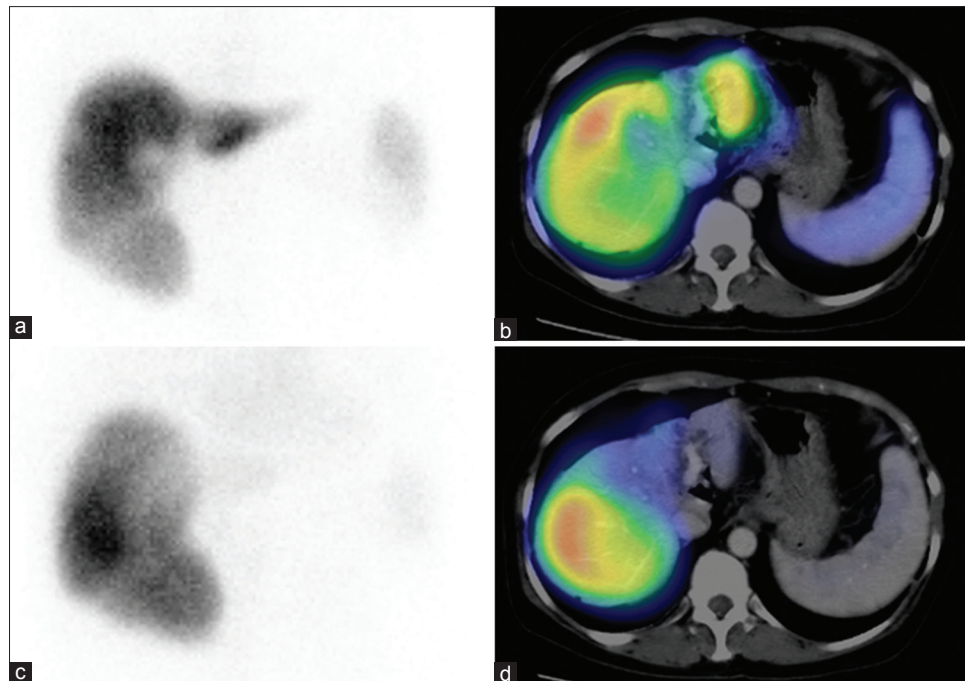
Hepatic scintigraphy is a very useful modality for an evaluation of the morphology and molecular function

of the liver. Scintigraphy using <sup>99m</sup>Tc-phytate is useful for evaluating shapes of the liver and spleen and reticuloendothelial functions because phytate is taken up by Kupffer cells of the liver and reticuloendothelial cells of the spleen.<sup>[5]</sup> On the other hand, GSA specifically binds to asialoglycoprotein receptors on the hepatocyte cell surface, and hence, <sup>99m</sup>Tc-GSA scintigraphy is an excellent method to examine liver function based on hepatocyte function.<sup>[6]</sup> In our patient, <sup>99m</sup>Tc-GSA scintigraphy showed less accumulation in the left lobe, thus suggesting hepatocyte necrosis while accumulation of <sup>99m</sup>Tc-phytate increased in the left lobe. Shiomi *et al.* suggested that Kupffer cell function might temporarily increase in the necrotic lesion because phytate transiently accumulated in the region intensively where was coagulated and necrotized by ethanol immediately after the ethanol infusion therapy for hepatocellular carcinoma.<sup>[9]</sup> Akaki *et al.* studied a case in which phytate accumulated intensively in the left hepatic lobe, which had decreased the accumulation of GSA due to hepatocyte necrosis, and they reported that severe disruption of the hepatocytes, prominent inflammatory cell infiltration, and obvious Kupffer cell hypertrophy and clustering was histologically observed.<sup>[10]</sup> The scintigraphy results suggested that our patient had rapid necrosis in the left lobe, which temporarily increased Kupffer cell functions.

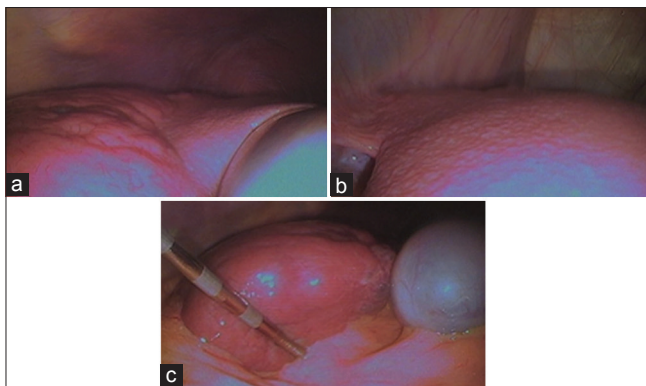
In our patient, there was no history of irradiation and no signs of hepatic tumors, fat deposition, left portal vein obstruction, left hepatic venous obstruction such as Budd-Chiari syndrome, and left bile duct obstruction such as intrahepatic stone or cholangiocellular carcinoma. Her alcohol consumption was large in quantity, but the histological findings did not match those of an alcoholic liver damage such as fat deposition and ballooning of hepatocytes. In general, diffuse inflammation occurs in acute hepatitis; however, there are some cases in that heterogeneous inflammation occurs.<sup>[2]</sup> Above all, some case of acute AIH showed heterogeneous inflammation, and an AIH case that presented a postnecrotic scar at the time of detailed examination of liver damage has also been



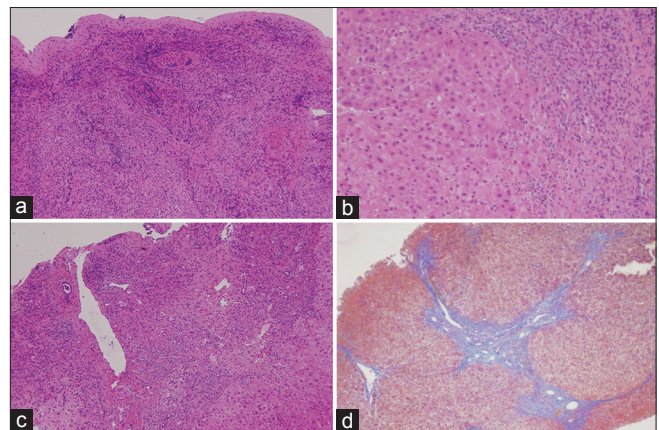
**Figure 1:** Computed tomography scans. (a) Plain phase image shows atrophy of the left hepatic lobe, and decrease in the density of the left lobe. (b) Late phase image shows prolonged contrast effect in the left lobe



**Figure 2:** <sup>99m</sup>Tc-phytate and <sup>99m</sup>Tc-galactosyl human serum albumin scans. (a and b) Anterior planar image and single photon emission computed tomography/computed tomography fusion image of <sup>99m</sup>Tc-phytate scan shows radioisotope accumulation in both lobes with slight increase in the left lobe. (c and d) Anterior planar image and single photon emission computed tomography/computed tomography fusion image of <sup>99m</sup>Tc-galactosyl human serum albumin scan shows little radioisotope accumulation in the left lobe while increased radioisotope accumulation was observed in the right lobe. These images explain the regional discrepancy of radioisotope accumulation between <sup>99m</sup>Tc-phytate and <sup>99m</sup>Tc-galactosyl human serum albumin, suggesting hepatocyte necrosis in the left lobe and hyperfunction with compensatory enlargement in the right lobe



**Figure 3:** Laparoscopic findings. (a) An obvious difference of surface appearance was seen on the border of the both lobes. (b) The surface presents micronodular appearance on the left lobe. (c) Meanwhile, the surface presents large nodules on the downward side of the right lobe



**Figure 4:** Histological findings. (a) Massive hepatocyte necrosis with subcapsular interstitial proliferation (H and E,  $\times 80$ ) and (b) interface hepatitis (H and E,  $\times 200$ ) was observed in the left lobe. Meanwhile, (c) lymphoplasmacytic infiltration (H and E,  $\times 80$ ) and (d) moderate hepatitis with bridging fibrosis (Azan,  $\times 80$ ) were observed in the right lobe

reported.<sup>[1]</sup> In our patient, AIH was suspected as a cause of liver dysfunction although definitive diagnosis was not obtained because the score of international diagnostic criteria of AIH was 4 points reduced by the amount of alcohol consumption and the simplified AIH score did not reach 7 points by which histological findings showed not “typical” but “compatible,” and heterogeneous damage due to acute hepatitis or acute exacerbation of chronic hepatitis probably by AIH showed different image pattern between both hepatic lobes.

## Conclusion

We experienced the rare case of a patient who showed regional liver disorder with functional discrepancy between two liver lobes. Hepatic scintigrams were helpful for understanding rapid necrosis in the left lobe, resulting in a compensatory enlargement of the right lobe. Clinicians should be aware that some cases of acute

hepatitis cause regional liver disorder although most cases show homogeneous inflammation.

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### Conflicts of interest

There are no conflicts of interest.

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