jnm/CASE REPORT

EXCESS EXTRAHEPATIC UPTAKE OF RADIOCOLLOID ASSOCIATED WITH LIVER ABSCESSES

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A 12-year-old boy with multiple pyogenic liver abscesses had increased extrahepatic accumulation of radiocolloid. After surgical drainage and 2 weeks of antibiotic therapy, the cirrhosis-like scan image was reversible.

The value of liver scanning in the detection of hepatic masses is established. It is also useful for estimation of hepatocellular function and portal hemodynamics. This is a report of abnormal extrahepatic accumulation of radiocolloid during a pyogenic liver infection. Later, upon recovery, reversal of the cirrhosis-like liver scan image occurred.

CASE REPORT

A 12-year-old boy was admitted to Kern County General Hospital, Bakersfield, California, on June 30, 1971, with a 12-hr history of abdominal pain. A diagnosis of appendicitis was made and at laparotomy, a gangrenous, nonperforated appendix was removed.

Twenty-four hours later he had febrile spikes up to 105°F. Blood cultures resulted in growth of anaerobic streptococci and a species of bacteroides. Ampicillin and kanomycin were administered without affecting his febrile course. His liver was enlarged and tender. Liver function tests revealed low serum albumin (2.0 gm%) and prothrombin time (27%) with increases in alkaline phosphatase (295 mU/ml: Normal = 30–85), LDH (360 mμ/ml: Normal = 90–200), SGOT (300 mu/ml: Normal = 10–50), and cephalin flocculation (4^+). Two ^{99m}Tc-sulfur-colloid liver scans were performed with a 5-in. rectilinear scanner on the 12th and 16th hospital days (Fig. 1); both showed uneven distribution of radiocolloid throughout the enlarged liver with multiple filling defects especially in the right lobe. Excessive extrahepatic accumulation of colloid was shown by an enlarged spleen (13 × 6 cm) and vertebral bone marrow imaging.

Shortly after the initial liver scan, a second laparotomy was performed. Multiple abscesses were located within the enlarged liver. Two were drained by needle aspiration and a liver biopsy was done. Culture of the aspirate again yielded an anaerobic streptococcus and a species of bacteroides. The liver biopsy was normal. Antibiotic therapy was changed to penicillin and tetracycline and clinical improvement followed.

The patient was transferred to Children's Hospital of Los Angeles on July 20, 1971. Penicillin and chloramphenicol were chosen for antibiotic therapy. The patient improved further with his liver becoming smaller and less tender. Hepatic function tests were improved: serum albumin = 4.0 gm%; prothrombin time = 87%; alkaline phosphatase = 6.7% Bessey-Lowry units (Normal = 3.4–15.5); LDH = 400 Wroblewski units (Normal = 200–450); and SGOT = 18 Karmen units (Normal = 15–40). Another ^{99m}Tc-sulfur-colloid liver scan was performed on a 5-in. rectilinear scanner 2 weeks after his second surgery (Fig. 2). Compared to the previous scan, there was increased liver uptake of radiocolloid and more homogeneous distribution. The liver had diminished in size and multiple small filling defects were no longer evident. A solitary abscess cavity in the posterior-superior aspect of the right hepatic lobe persisted although smaller in size compared to the corresponding area in the original scan. Extrahepatic accumulation of radiocolloid was markedly diminished and the spleen was smaller (11 × 5 cm). Selective celiac angiography was performed at this time and revealed no evidence of

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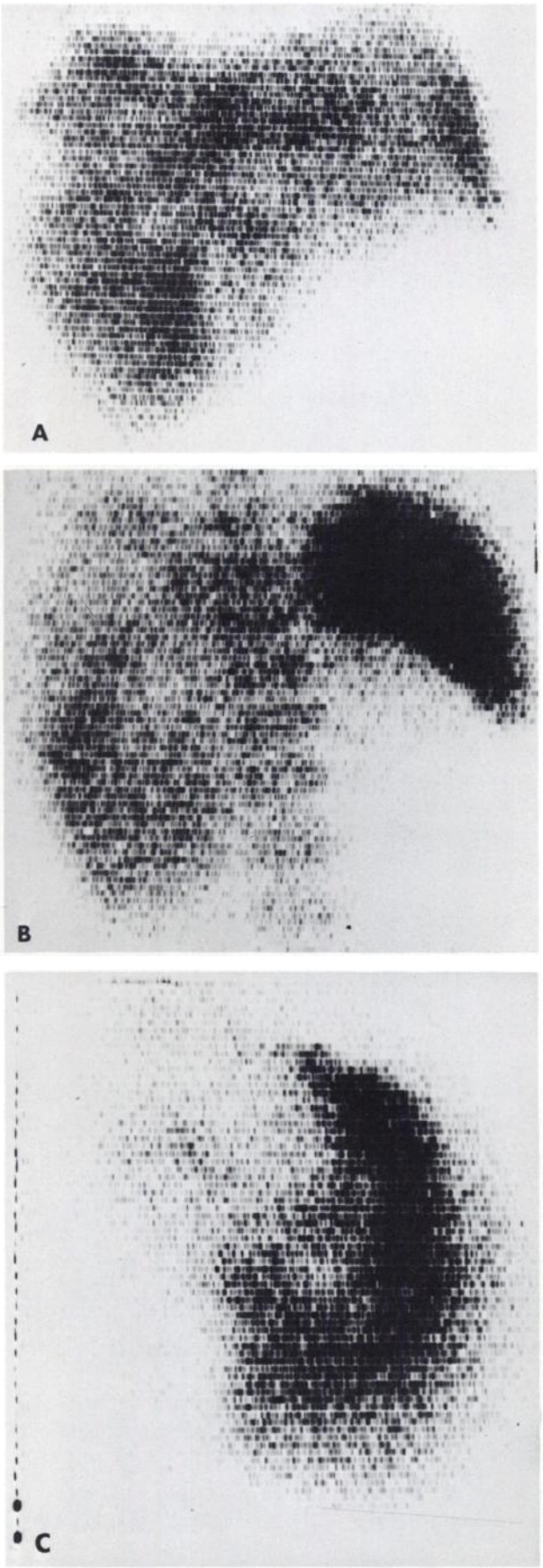

neovascularity, cirrhotic changes, arteriovenous communications, or portal-systemic shunting. An esophagram was normal. Antibiotic therapy was continued and he was discharged on September 22, 1971, in satisfactory condition.

DISCUSSION

Liver scanning is used for the estimation of portal hemodynamics and hepatocellular function. Radiocolloid transported to the liver is removed with great efficiency by the Kupffer cells. Diminished hepatic extraction of colloid results from either decreased vascular perfusion, damage to cellular transport mechanisms involved with phagocytosis, or excessive load of particulate matter. Heterogeneity of hepatic radionuclide uptake is a nonspecific indication of diffuse hepatic-reticuloendothelial dysfunction. Colloid bypassing the liver and entering the systemic circulation is phagocytized by the reticuloendothelial cells of the bone marrow and spleen. Intrahepatic and extrahepatic distribution of radiocolloid are inversely related: splenic and bone marrow accumulation increase when hepatic extraction of colloid is impaired.

Decreased hepatic extraction of radiocolloid is related to various parameters of liver function. Castell, et al (*1*) determined a nearly linear relationship between the magnitude of impaired hepatic extraction of colloid and the maximum arterial ammonia concentration after an oral ammonia load. Fernandez, et al (*2*) concluded that patients with significant splenic and/or vertebral bone marrow imaging had an hepatic wedge pressure of at least 18 mmHg. Significant extrahepatic reticuloendothelial distribution of radiocolloid was a more constant and sensitive indicator of portal hypertension than the presence or absence of varices as determined by esophagoscopy. Gourgoutis, et al (*3*) determined that splenic uptake of radiocolloid exceeding 30% of total liver uptake differentiated patients with a portal pressure above 18 mmHg from those with a lower pressure. Rankin, et al (*4*) showed that the rate of radiocolloid extraction by the bone marrow was the same as that of liver and spleen in cirrhotic patients. Others have also concluded that significant extrahepatic deposition of colloid is proportional to collateral circulation and liver dysfunction (*5,6*) and increases with progressive deterioration in liver function (*7–11*).

Increased extrahepatic accumulation of radiocolloid is commonly encountered in cirrhosis. Scan fea-

FIG. 1. Anterior (A), posterior (B), and right lateral (C) liver scans showing heterogenous distribution of radiocolloid with multiple abscesses throughout enlarged liver, especially right lobe. Extrahepatic accumulation in spleen and vertebral bone marrow occurred.

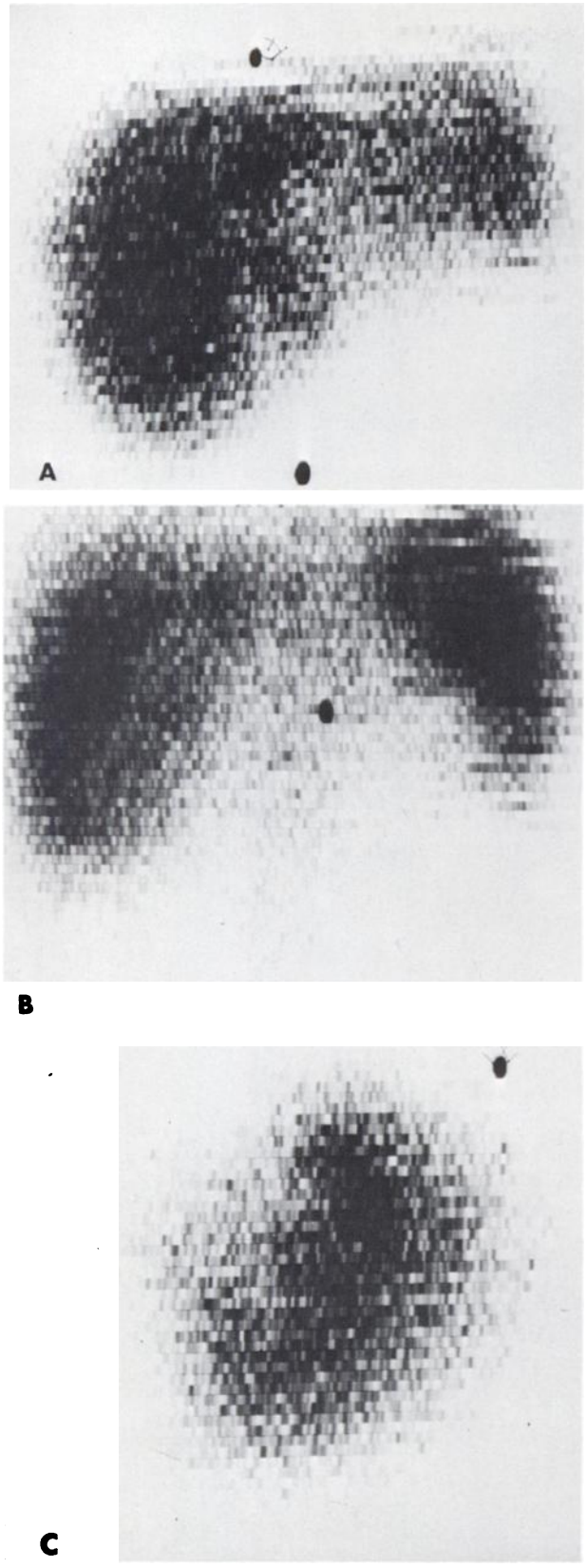

FIG. 2. Anterior (A), posterior (B), and right lateral (C) liver scans obtained 2 weeks after Fig. 1. There is near homogenous distribution of radiocolloid throughout smaller liver except for localized right hepatic lobe abscess which also is diminished. Extrahepatic accumulation of nuclide is much decreased.

tures are heterogeneous hepatic distribution of radiocolloid with increased splenic and/or vertebral bone marrow imaging (*6*). Other conditions with similar scan features include hepatic metastases, serum and infectious hepatitis, fatty infiltration of the liver, hepatoma, hereditary hemorrhagic telangiectasis, chronic lung disease, and anemia (*1,6,10, 12–15*). This scan appearance has not been previously reported to occur with multiple liver abscesses.

In this patient the gangrenous appendix presumably seeded bacteria into the portal vein producing multiple liver abscesses with subsequent hepatic-reticuloendothelial dysfunction. The initial scan image of an enlarged liver with heterogenous distribution of radionuclide and multiple abscess cavities indicated severe, diffuse liver disease. Decreased hepatic extraction of colloid with subsequent increase in extrahepatic accumulation could have resulted from three processes: (A) diffuse hepatocellular dysfunction; (B) overloading the phagocytic capacity of the reticuloendothelial cells; and (C) collateral circulation bypassing the portal system. Hepatocellular damage due to multiple abscesses might have impaired or overloaded the phagocytic process resulting in colloid passing through the liver and accumulating in the extrahepatic reticuloendothelial system. Contrariwise, portal venous pressure might have been elevated due to liver swelling associated with the pyogenic liver infection resulting in collateral shunting. Transient portal hypertension can occur in serum hepatitis (*13*), but in children a thrombus in the portal vein, which may remain obstructed or undergo cavernous transformation, is the usual cause of portal hypertension (*17,18*). Other causes include hepatitis, hepatolenticular degeneration, Fanconi's syndrome, fibrocystic disease of the pancreas, Gaucher's disease, choledochal cysts, and congenital hepatic fibrosis (*18–22*).

This case shows a previously unreported manifestation of acute pyogenic liver infection. The reversible cirrhosis-like scan image correlated with the patient's clinical improvement. The transient nature of this process emphasizes the usefulness of serial scanning.

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