

# Unique Scintigraphic Findings of Bile Extravasation in the Presence of Ascites: A Complication of Hepatic Transplantation

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A  $^{99m}\text{Tc}$ -HIDA scan was performed on a 4-mo-old female, six days after hepatic transplantation. Gradually, a diffuse increase in activity was seen over the peritoneal region, consistent with a slow bile leak into ascitic fluid. Although the scintigraphic appearance of a bile leak has been previously described, it is usually seen as a focal area of extrabiliary activity. In this case, we report a pattern identified when the leak occurs in conjunction with ascites.

**J Nucl Med 1992; 33:115-116**

**H**uman orthotopic liver transplantation was introduced by Starzl in 1963 (1). Dynamic  $^{99m}\text{Tc}$ -iminodiacetic acid derivative (IDA) scintigraphy, first described by Klingensmith et al. (2,3), has been used for the evaluation of graft function and postoperative complications. Functional and structural abnormalities resulting from rejection, infection, vascular insufficiency, biliary obstruction, or extravasation can be identified.

The rate at which a liver graft extracts and excretes the hepatobiliary radiopharmaceutical correlates well with hepatic function. An assessment of the integrity of the biliary system can also be made by observing the pattern of excreted activity.

A case is presented in which a small biliary leak is identified on a HIDA (a N-substituted IDA derivative) scan. Although compromise of biliary integrity is easily identified by the focal appearance of radioactivity in the peritoneal cavity (4), we demonstrate a unique pattern when the leak occurs in association with ascites.

## CASE REPORT

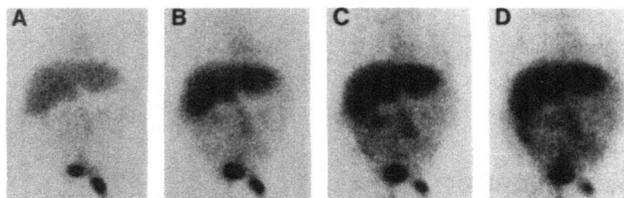
The patient is a 4-mo-old female, who was the 35-wk product of an uncomplicated delivery and had no neonatal problems. She

was first seen by her local pediatrician at 2 wk of age for jaundice and failure to thrive. At 1 mo of age she was referred for evaluation of persistent elevation of direct bilirubin. Her total bilirubin was 7.0 mg/dl and her direct bilirubin was 6.0 mg/dl. She was explored surgically and found to have biliary atresia. A modified Kasai procedure was attempted without success.

Orthotopic liver transplantation was performed when she was 4 mo of age. This included a cholecystectomy and a biliary appendico-duodenostomy, a technique developed by Crombleholme et al. (5). In this procedure, the appendix, divided from the cecum with its ileocolic blood supply intact, is brought up to the hilum of the liver and anastomosed to the biliary radicals in the porta hepatis (5). The cecal end of the appendix is anastomosed end-to-side to the duodenal mucosa opposite the ampulla of Vater on the right lateral wall. The advantage of this procedure is the creation of a non-refluxing vascularized conduit for biliary reconstruction which decreases the subsequent risk of cholangitis.

On the first postoperative day, she was returned to surgery for removal of a thrombus from the portal vein. She was then placed on heparin. On the sixth postoperative day she developed fever, tachypnea, and tachycardia, and began leaking bile-stained ascitic fluid from her abdominal wound. In view of her jaundice it was not possible to distinguish between biliary disruption, cholangitis or ascitic fluid stained by hyperbilirubinemia. Therefore, a  $^{99m}\text{Tc}$ -HIDA scan was performed to evaluate the presence of a bile leak and/or other complication.

The scan (Fig. 1) showed gradual accumulation of activity over the peritoneal region, which was felt to be consistent with slow bile extravasation into an abdomen distended by ascites. She was returned to surgery for an exploratory laparotomy. At surgery, in addition to ascites, a small disruption at the site of the biliary anastomosis (at the junction of the appendiceal conduit and the



**FIGURE 1.** Technetium-99m-HIDA scan images in the anterior projection. (A) 20 min; (B) 40 min; (C) 90 min; (D) 2.50 hr. Note the gradual diffuse increase in abdominal activity, indicating bile leaking into a relatively large volume of ascitic fluid.

Received Apr. 22, 1991; revision accepted Jul. 21, 1991.

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common bile duct) was found and repaired. The remainder of her hospital course was complicated by gastrointestinal bleeding and difficulty weaning from ventilatory support. Eventually she improved and was discharged approximately 5 wk after transplantation.

## DISCUSSION

Anatomic integrity of liver transplants in the postoperative period is of major concern because of the complexity of the necessary vascular and biliary anastomoses and ligamentous attachment. Since the transplanted organ is initially stunned physiologically, common operative complications including vascular accidents, rejection, infection, and biliary disruption are difficult to diagnose with conventional radiographic tests. Hepatobiliary scintigraphy using  $^{99m}\text{Tc}$ -IDA derivatives has proven valuable in this context, as it provides a sensitive noninvasive assessment of hepatic blood flow, hepatocyte function, biliary drainage, and complications (6–9). In many institutions, in fact,  $^{99m}\text{Tc}$ -IDA scintigraphy is employed routinely in the early postoperative evaluation of liver transplants.

The vascular, hepatobiliary, and intestinal phases of IDA scintigraphy disclose a wealth of diagnostic information in the recently transplanted liver recipient. The initial “angiographic” phase of the scan is used to evaluate the arterial and portal venous supply of the liver. On post-flow dynamic images, the rapidity of hepatic concentration and excretion of the radionuclide directly correlates with hepatocyte function. Not only is this useful in the detection of infection and rejection—two common complications which characteristically cause a significant reduction in hepatocyte function and which are seen as delayed uptake and clearance of  $^{99m}\text{Tc}$ -IDA from the liver on scintigraphic images—but it is particularly helpful when used sequentially to follow the response of the liver to therapy for these complications.

The functional and anatomic integrity of the biliary system can be evaluated by observing the pattern of nuclide excretion during the intestinal phase. In cases of postoperative biliary stenosis or obstruction, Lohen et al. (6) have found IDA findings to be quite specific, with good uptake by the grafted liver but with delayed excretion.

Bile leaks are sensitively shown, characteristically appearing as focal extrabiliary abnormalities that persist for several hours (4,6–11). Typically, the sites of abnormal extrabiliary radionuclide accumulation are along the right

paracolic gutter but may occur anywhere within the peritoneum. Rienzo et al. (11) also describe the “tail sign” in which the extravasated radionuclide from a bile leak tracks down the right flank resembling a tail attached to the inferior portion of the right hepatic lobe.

In our patient, we found a progressive increase in HIDA activity discretely outlining the peritoneal region due to the combination of the bile leak and ascites. With this in mind, it is important that serial HIDA images be obtained to a standard time and displayed with identical parameters. Since there are several potential reasons for liver transplant recipients to have ascites, the standard HIDA scintigraphic depiction of bile extravasation may be augmented with the results of the findings we have observed and sensitivity for biliary extravasation improved.

## ACKNOWLEDGMENTS

The authors extend special thanks to Jeanne Yanke and Carmen Breslin for their invaluable assistance in preparing this manuscript and to John P. Roberts, MD for his technical assistance regarding the surgical procedures for this patient.

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