jnm/CASE REPORT

THE SCINTIGRAPHIC DEMONSTRATION OF BILE LEAKAGE UTILIZING ^{131}I-ROSE BENGAL

Stephen N. Wiener and Mahendra Vyas

Mt. Sinai Hospital of Cleveland, Cleveland, Ohio

Scintillation camera images of three cases of bile leakage including two bronchobiliary fistulas are reported.

Following intravenous injection and hepatocellular excretion, ^{131}I-rose bengal serial scintiphotos may be used to follow the course of biliary excretion. This procedure has been recommended to evaluate patients with congenital abnormalities and extrahepatic obstruction (*1,2*). The use of this technique to demonstrate major bile duct leakage and bronchobiliary fistulas has not previously been emphasized. The case histories of three patients will be presented to illustrate that important medical and surgical information concerning the presence, location, extent, and progress of pathologic bile collections may be obtained by serial ^{131}I-rose bengal scintigraphy.

CASE HISTORIES

Case 1. PS, a 25-year-old woman, was admitted July 8, 1972 in shock following a stab wound in the epigastrium. The lungs were clear to auscultation. The abdomen was soft. A 2-cm linear laceration was noted in the central portion of the upper abdomen. Hematocrit was 37%. An x-ray film of the chest revealed a probable right pleural effusion. Exploratory laparotomy, July 8, 1972, identified a lacerated left lobe of the liver. The hepatic artery was ligated to control extensive hepatic bleeding. A T-tube was inserted into the common duct. The bile appeared clear without evidence of blood staining.

A T-tube cholangiogram performed July 17, 1972 revealed extravasation of contrast medium from the left hepatic duct into the region of the lesser sac. A ^{99m}Tc-sulfur colloid hepatoscan performed July 19, 1972, showed a concavity at the medial aspect of the left lobe of the liver (Fig. 1, left). Following this, ^{131}I-rose bengal serial images were obtained at 20 min, 60 min, and 180 min following intravenous injection. There was progressive accumulation of radionuclide within the left lobe of the liver, presumably within an extravasated pocket (Fig. 1, right).

A repeat T-tube cholangiogram, August 15, 1972, no longer evidenced the presence of extravasation

Received April 9, 1974; original accepted May 22, 1974.

For reprints contact: Stephen N. Wiener, the Nuclear Medicine Section, Mt. Sinai Hospital of Cleveland, 1800 E. 105 St., Cleveland, Ohio 44106.

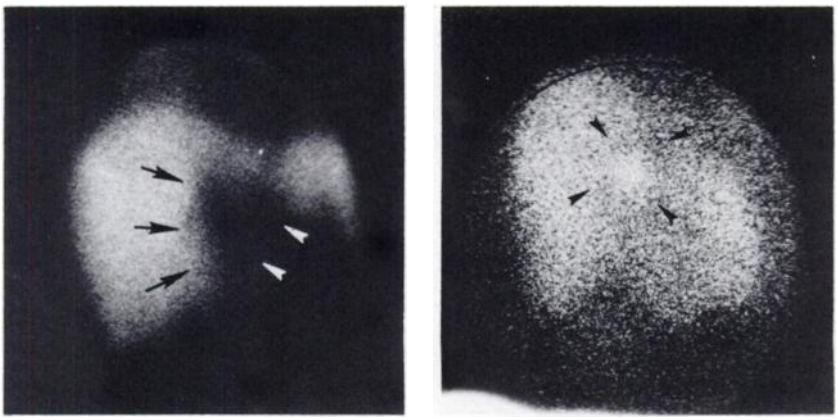

FIG. 1. (Left) ^{99m}Tc-sulfur colloid hepatoscan showing large defect in central portion of liver at region of porta hepatis. (Right) ^{131}I-rose bengal hepatoscan at 1 hr postinjection indicating pooling of extravasated bile at porta hepatis. Defect seen on colloid hepatoscan much less apparent.

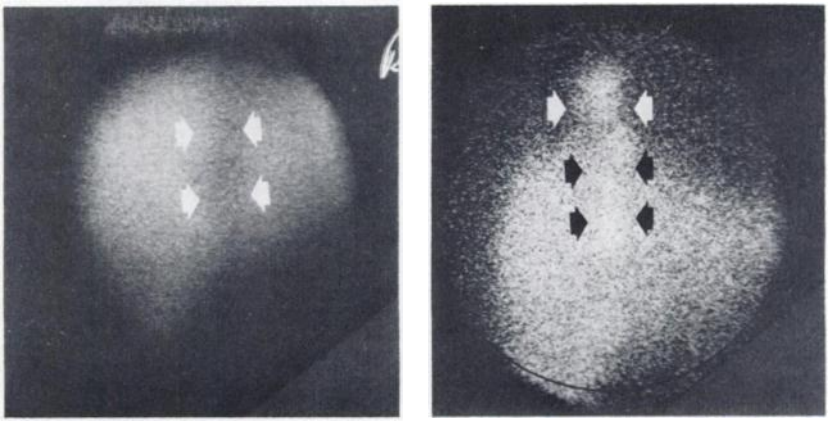

FIG. 2. (Left) ^{99m}Tc-sulfur colloid hepatoscan showing vertical linear defect in midportion of liver. (Right) ^{131}I-rose bengal hepatoscan at 1 hr postinjection showing linear collection of radioactivity extending from liver into right lower lung.

from the bile duct and the T-tube was then removed. The patient was discharged on August 18, 1972 improved.

Followup hepatoscans, December 11, 1972, continued to reveal a defect within the left lobe following injection of ^{99m}Tc-sulfur colloid. The serial ^{131}I-rose bengal studies, however, showed a normal accumulation within the liver, excretion into the gallbladder, and no evidence of extravasation.

Final ^{99m}Tc-sulfur colloid images on May 16, 1973 showed a marked decrease in the defect within the left-lobe.

Comment. Serial ^{131}I-rose bengal images demonstrated the leakage of bile from a lacerated left hepatic duct. Followup imaging studies confirmed the closure of the bile leakage and the gradual improvement in the hepatic duct.

Case 2. JC, a 49-year-old man, was admitted to the hospital, August 17, 1972, following a gunshot wound of the right upper chest. Immediate surgical exploration revealed perforations of the diaphragm, liver, gallbladder, right side of the transverse colon, and multiple perforations of the ileum. Surgical treatment consisted of plication, drainage of the right subphrenic space, cholecystectomy, small-bowel resection, and drainage of the gallbladder bed. The postoperative course was complicated by paralytic ileus and a cutaneous fistula.

Barium studies of the upper gastrointestinal tract, small intestine, and colon were normal. An opaque fistulogram on September 7, 1972 revealed contrast material entering the liver parenchyma and filling the biliary tree.

The patient then developed cough with expectoration of bile. A repeat opaque fistulogram, September 21, 1972, outlined a tract of contrast material extending from the subdiaphragmatic region into the bronchi of the right lower lung. A ^{99m}Tc-sulfur colloid hepatoscan, September 22, 1972, revealed a linear defect superiorly between the right and left lobes (Fig. 2, left). Serial scintiphotos following intravenous injection of ^{131}I-rose bengal demonstrated a radioactive tract extending from the region of the hepatic defect into the thoracic cavity (Fig. 2, right).

Surgical treatment, September 26, 1972, consisted of a right middle lobectomy. The patient was discharged, October 5, 1972, in an improved condition.

Comment. Serial ^{131}I-rose bengal scintigraphy demonstrated the passage of labeled bile from the hepatic parenchyma into the lower thorax, a hepatopulmonary fistula.

Case 3. JG, an 82-year-old man, was admitted, December 7, 1973, with fever and jaundice of undetermined cause. The physical examination was further noncontributory. An x-ray film of the chest, December 7, 1973, showed an elevated right hemidiaphragm. GI series, barium enema, and intravenous urography failed to define an underlying cause. A ^{99m}Tc-sulfur colloid hepatoscan, December 17, 1973, revealed a large defect within the right lobe of the liver (Fig. 3, left). Serial ^{131}I-rose bengal scintiphotos revealed the area of the defect to be filled in with radioactivity. In addition, a vertical collection of the radionuclide was noted extending superiorly into the region of the right lower lung (Fig. 3, right). On the basis of the previous case, a diagnosis of an hepatobronchial bile fistula was suggested.

Surgical exploration, December 18, 1973, revealed an hepatic abscess within the right lobe and a bronchobiliary fistula extending into the right lower lobe. The source of the abscess was considered to result from a perforated empyema of the gallbladder. Culture grew E. coli and Pseudomonas organisms.

Comment. The ^{131}I-rose bengal serial scintigraphs provided an explanation of the cause of the defect demonstrated on the ^{99m}Tc-sulfur colloid hepatoscan. The presence of an abnormal hepatic collection of bile and the presence of an hepatobronchial communication was demonstrated and proved surgically.

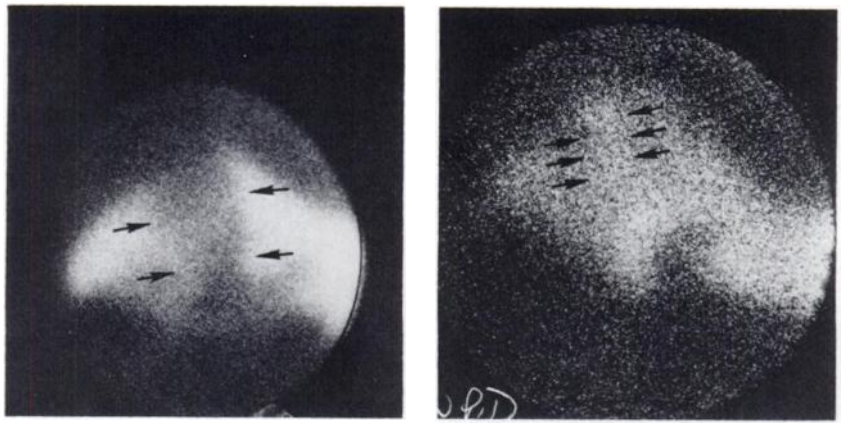

FIG. 3. (Left) ^{99m}Tc-sulfur colloid hepatoscan showing large oval defect between right and left lobes of liver. (Right) ^{131}I-rose bengal hepatoscan 1 hr postinjection. Oval defect shown on colloid hepatoscan less apparent and linear collection of radioactivity extending to right lower lung.

DISCUSSION

Biliary fistulas may be congenital or result from trauma, inflammation, or obstruction. Infection includes extension from amebic, echinococcic, and pyogenic abscesses. Obstruction may result from either intrinsic or extrinsic causes and be of surgical or nonsurgical origin. The fistulous tract may open on the skin, within the lungs, under the diaphragm, into the peritoneum, stomach, small bowel, urinary tract, and rarely, into a blood vessel. Associated signs and symptoms depend upon the site and origin of involvement but may include fever, jaundice, and/or the presence of a mass.

The demonstration of intra-abdominal bile leakage using ^{131}I-rose bengal has been accomplished by serial measurements of radioactivity in ascitic fluid obtained through an indwelling catheter (*3*) and by abdominal scanning following liver biopsy (*4*). In the neonatal period, perforation of a common bile duct complicating biliary atresia has been identified (*1*). Although any breech in the continuity of excretion of the labeled rose bengal from the hepatic cell to the duodenum is potentially susceptible to detection by serial scintigraphs, the method is limited and is less sensitive than competing radiographic examinations using opaque injections. There are, however, several advantages afforded by the scintigraphic method of detecting abnormal biliary drainage. Radionuclide scintigraphy is the least demanding on the patient, can be simply and safely performed, and in fact, may be the only nonoperative or noninterventional technique available. Only when there are accessible tracts can one perform opaque injections. In the absence of an injectable fistula, the use of percutaneous injections is generally considered more complicated and hazardous.

The potential benefits of serial ^{131}I-rose bengal scintigraphy suggests a broader application of this technique than is suggested by previous literature. Especially following trauma of a penetrating nature and the demonstration of a defect within the colloid scan, further information concerning the integrity of the biliary system may be necessary. In addition, bronchial fistulas originating from a biliary site may be distinguished from nonbiliary hepatic communications or those arising from subhepatic abscesses (*5*). The method is convenient as a means of determining the effects of medical or surgical management on previously identified bile leaks.

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