Hepatobiliary Imaging to Demonstrate Drainage Patterns in a Patient with an Indwelling Hepatic Catheter

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The presence of normal biliary flow was established in a patient with an indwelling hepatic catheter placed to drain an intrahepatic cyst cavity with the use of sequential hepatobiliary scintiscans. In the initial study drainage was demonstrated from the indwelling catheter; when the catheter was clamped, drainage was observed in the native biliary system. Serial biliary scintigraphy not only confirmed the patency of the hepatobiliary system, but served as a guide in the removal of the intrahepatic catheter.

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The functional status of a distensible conduit system is a dynamic process determined by physiologic variables including flow, volume, and pressure. Experience in urinary tract imaging with percutaneous ureteral pressure and perfusion techniques clearly demonstrate the efficacy of scintigraphic imaging in clinical decision making (*1*). We applied a similar approach to the evaluation of a patient with a large intrahepatic cyst resulting in a partial obstruction of biliary flow and the use of hepatobiliary imaging to determine the patency of the native hepatobiliary tree in the presence of an indwelling hepatic catheter.

CASE HISTORY

A 62-yr-old white male with a 2-mo history of darkened urine, clay-colored stool, and pruritus, developed increasing painless jaundice 7 days before hospital admission. There was no prior history of hepatitis, gallbladder disease, blood transfusions, or illicit needle use. On physical examination the liver was palpable and noted to be 8 cm below the right costal margin, without splenomegaly or other palpable abdominal masses. On admission total bilirubin was 11.4 (0.1–0.9 mg/dl), serum glutamic oxalacetic transaminase 180, (2–23 IU/l) alkaline phosphatase 994 (30–100 IU/l), 15.9 prothrombin time (control 12 sec), and partial thromboplastin time of 37.7 (control 25 sec). A technetium-99m sulfur colloid ([^{99m}Tc] sulfur colloid) liver/spleen scan demonstrated a large focal defect in the liver (Fig. 1A) and computed tomography of the abdomen depicted a large mass in porta-hepatis with evidence of secondary biliary obstruction (Fig. 1B). At laparotomy an 8- to 10-cm cyst was found compressing the hilus of the liver. Subsequent pathologic examination disclosed a benign squamous-lined keratin cyst most likely arising as a congenital bile duct cyst. A T-tube was placed in the right hepatic duct and a hepatic drain was placed in the region of the cyst cavity. Postoperatively, bilirubin declined to 4.8 mg/dl by the 14th day after surgery. Ultrasound showed a decrease in ductal diameter, the common hepatic duct measured 6–7 mm and there was minimum residual intrahepatic ductal dilatation. The T-tube was removed and the hepatic drain was left in place. Repeat cholescintigraphy was performed on the 16th day after surgery. Neither the biliary tree nor intestinal activity were identified, although radioactivity was seen in the hepatic drain (Fig. 2A–C). Cholescintigraphy was repeated 24 hr later after clamping of the hepatic drain, and activity in the biliary tree and bowel were visualized by 35 min postinjection (Fig. 2 D–F). The pattern of imaging was compatible with a patent, but partially obstructed common bile duct (*2*). The hepatic tube was removed and the patient was subsequently discharged from the hospital.

DISCUSSION

The common bile duct does not dilate after surgical intervention unless there is pathologic obstruction to bile flow (*3*). Once an obstruction has resulted in a significantly enlarged duct, however, it may not return to a normal caliber despite relief of the obstruction (*4*). Therefore, ductal dilatation in and of itself is not a sine

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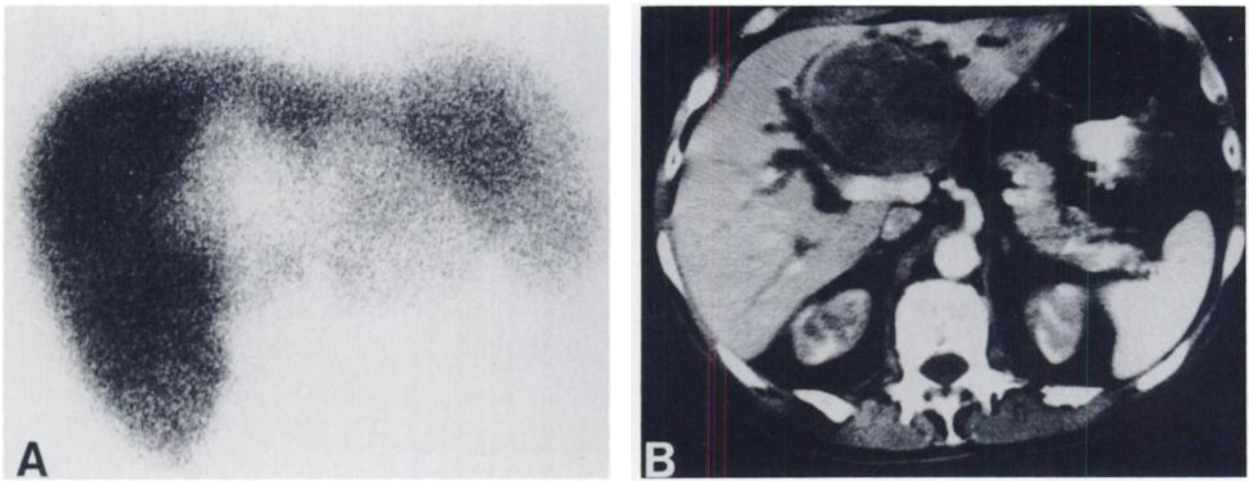

FIGURE 1
A–B: Pre-operative [^{99m}Tc]sulfur colloid liver scan (A) demonstrates a large central defect that is depicted as a large space-occupying lesion by CT (B). Note the dilated intrahepatic vasculature seen in the region of the lesion.

qua non for obstruction. Similarly, the demonstration of a nondilated duct does not, by itself, exclude obstruction. Van Sonnenberg et al. (*5*) reported eight patients with ductal obstruction and elevated intraductal pressures without dilatation. Thus, anatomic localization may not suffice to define the degree or in some cases the presence of significant ductal obstruction. Functional evaluation may allow discrimination of dilatation from obstruction (or partial obstruction) especially after surgical intervention (*6*).

Prompt hepatic uptake with persistent nonvisualization of the CBD and bowel usually signals the presence of significant common bile duct obstruction (*2*). The scintigraphic finding of complete obstruction is specific

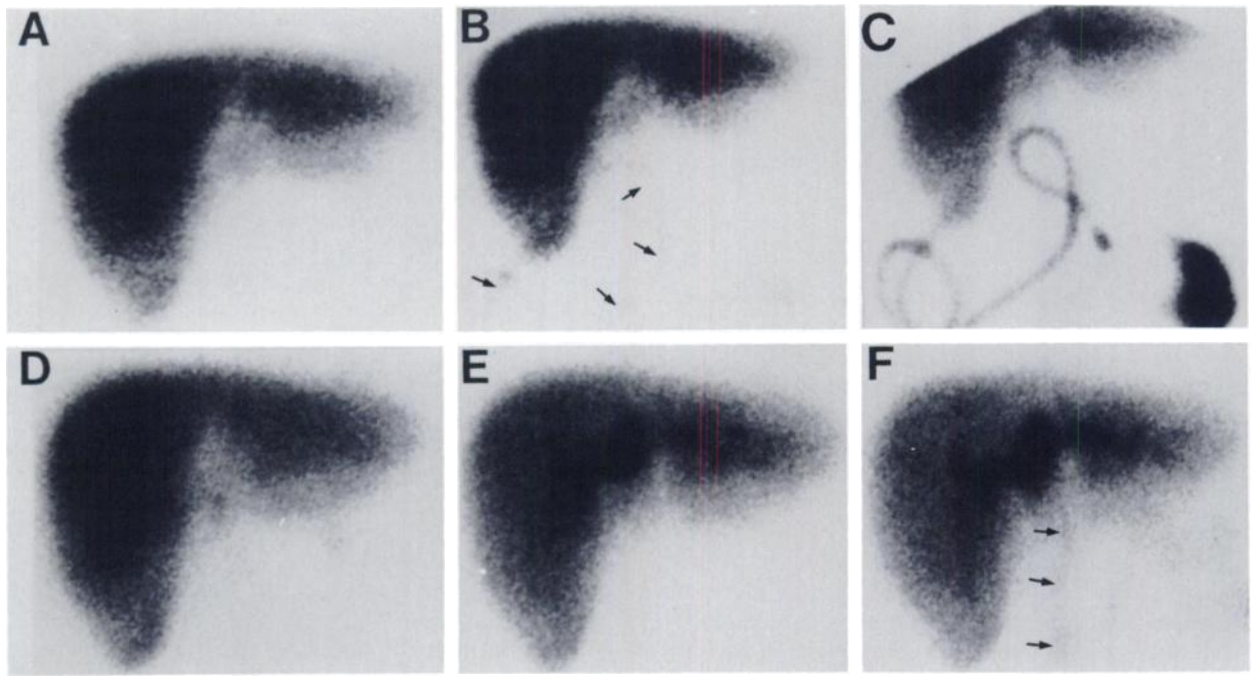

FIGURE 2
A–C: Anterior abdominal [^{99m}Tc]disofenin hepatobiliary scans show prompt hepatic uptake without common bile duct or bowel radioactivity (A), only the intrahepatic catheter (arrows) draining the region of the lesion is visualized (B–C). D–F: With the intrahepatic catheter occluded a repeat [^{99m}Tc]disofenin hepatobiliary scan demonstrates radioactivity in the intrahepatic ducts, the common bile duct and the duodenum (arrows) seen at 35 min post-tracer injection.

in the postoperative evaluation (*7*). However, because the biliary system is a distensible conduit, additional physiologic variables such as flow and pressure must be taken into account, especially in the case of a patient with an instrumented hepatobiliary tree. The tube draining the region of the cyst represents in this case an "artificial low-pressure drainage system." It is not surprising, therefore, that in the initial examination (with the hepatic drain open) radioactivity was seen only in the extrahepatic conduit. The absence of radioactivity within the common bile duct suggests that the system is obstructed, an erroneous conclusion as the second study, when performed with the external drainage system closed, demonstrated prompt visualization of the common bile duct and intestine. However, the presence of residual (partial) obstruction would explain the preferential bile flow in the artificial "low-pressure" circuit.

Van Sonnenbert et al. (*5*) have correctly emphasized the importance of manometric and perfusion studies during percutaneous transhepatic cholangiography and after percutaneous biliary drainage procedures. Manometry and perfusion studies, however, are invasive procedures. Simple pressure manipulations during postoperative cholescintigraphy with a drainage catheter as performed in this case allowed discrimination of a dilated but nonobstructed biliary system and was helpful in the determination of the status of the hepatobiliary tree.

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