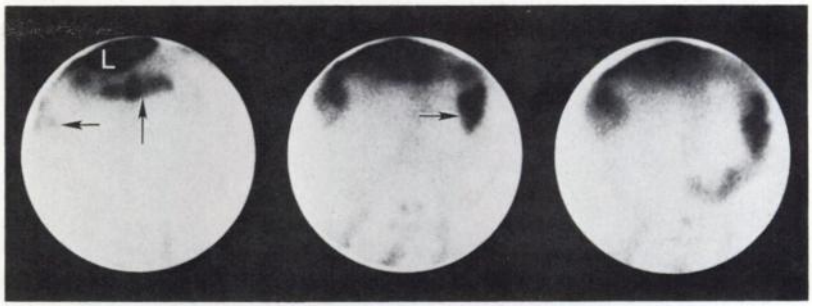

FIG. 1. Tc-SC extravasation into colon in active GI bleedings. The 5–10-min film (left) shows radionuclide activity in distal ascending (←) and transverse colon (↑). "L" is liver. The 10–12-min film (center) shows tracer progressing to distal transverse and proximal descending colon (→). The 12–14-min film (right) shows Tc-SC activity advanced to sigmoid colon.

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Tc-99m HIDA Cholescintigraphy: The Distended Photon-Deficient Gallbladder

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Four patients with distended, photon-deficient gallbladders are presented. Markedly delayed appearance of Tc-99m HIDA in a distended gallbladder may represent chronic cholecystitis, partial obstruction of the common bile duct, or physiologic gallbladder distention. Obtaining delayed images is important in this group of patients to avoid premature diagnosis of cystic-duct obstruction. If the distended gallbladder fails to visualize within 24 hr, hydrops with cystic-duct obstruction is suggested.

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Biliary scanning with Tc-99m HIDA has evolved as the primary study for the diagnosis of acute cholecystitis (*1–3*). While persistent nonvisualization of the gallbladder indicates cystic-duct obstruction, recognition of a photon-deficient area in the region of the gallbladder fossa may suggest various conditions, and should alert the physician of the need for delayed views before interpretation of the scintigram. We report four cases in which patients had delayed or absent filling of large photon-deficient gallbladders.

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CASE REPORTS

Case 1. A 57-year-old female with chronic renal failure was admitted for revision of an arteriovenous fistula. On the second postoperative day she became febrile, with right upper quadrant pain. Laboratory evaluation revealed a markedly elevated amylase but otherwise normal liver function studies. Sonography (Fig. 1) revealed a large round gallbladder containing a single stone. Tc-HIDA scans (Fig. 1) showed an initially photon-deficient gallbladder that filled in with activity at 6 hr. Cholecystectomy was performed; many small stones were found in the gallbladder, but no obstruction of the cystic duct.

Case 2. A 48-year-old male, hospitalized for a cerebrovascular accident, developed pleuritic upper abdominal and lower thoracic

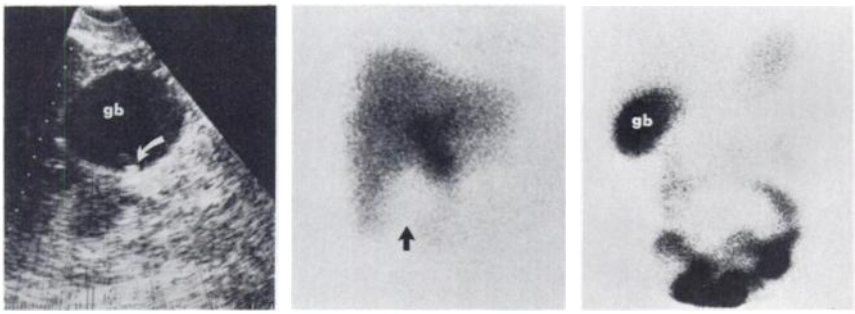

FIG. 1. Case 1. Sonogram (left): large round gallbladder (gb) containing at least one stone (curved arrow). Tc-HIDA scintigram at 2 hr (center): photon-deficient gallbladder fossa is seen (arrow). Tc-HIDA scintigram at 6 hr (right): gallbladder has filled with activity (gb). Bowel also contains tracer.

pain. The gallbladder felt distended. Amylase, lipase, and liver function tests were normal. A sonogram (Fig. 2) demonstrated a distended gallbladder without evidence of gallstones. Tc-HIDA scans showed an initially photon-deficient gallbladder that required 8 hr to fill in with activity. Subsequently, a right lower lobe pneumonia was identified and treated. The patient is asymptomatic at 9-mo follow-up.

Case 3. A 35-year-old ethanolic male was admitted with chronic relapsing pancreatitis. Serum and urine amylase were markedly elevated, yet with normal serum bilirubin levels. Parenteral narcotics (meperidine) were administered for analgesia. Sonography (Fig. 3) revealed evidence of pancreatitis. The gallbladder was free of stones (not shown). Tc-HIDA scans demonstrated delayed appearance of bowel radioactivity as well as delayed visualization (4 hr) of a distended photon-deficient gallbladder. Subsequent oral cholecystogram was negative for stones, and the patient made an uneventful recovery.

Case 4. A 61-year-old diabetic male, admitted for coronary artery bypass surgery, developed abdominal pain and fever 1 wk after surgery. Serum bilirubin was mildly elevated, but amylase and other liver function tests were normal. The sonogram (Fig. 4) revealed a distended gallbladder with a shadowing opacity at its neck. A Tc-HIDA scan showed a photon-deficient gallbladder fossa, which failed to fill despite views obtained up to 24 hr. At surgery a distended, gangrenous gallbladder was found, with cystic-duct obstruction.

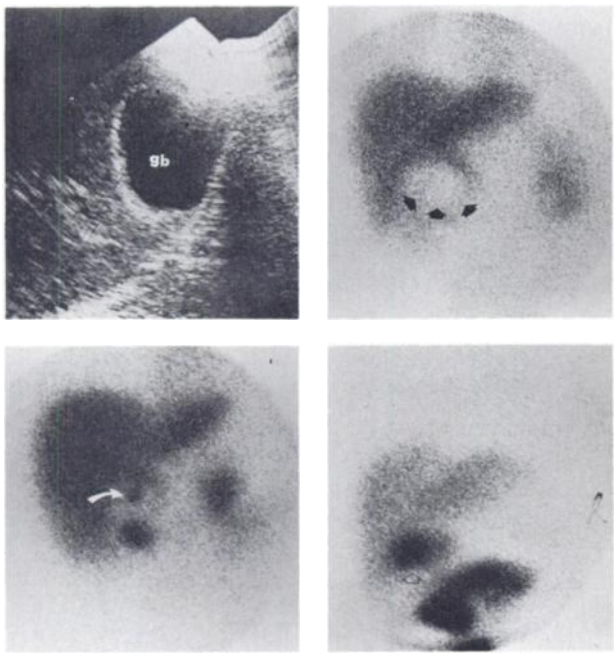

FIG. 2. Case 2. Sonogram (upper left): distended, ovoid gallbladder (gb) without evidence of stones or debris. Tc-HIDA scintigram: 1 hr (upper right): large, photon-deficient gallbladder fossa (arrows). 2.5 hr (lower left): partial filling of gallbladder is seen (curved arrow). 8 hr (lower right): full size of gallbladder is shown (open arrow), corresponding to previously seen photon-deficient region.

DISCUSSION

Hepatobiliary scintigraphy with Tc-99m-labeled compounds has rapidly become the primary screening procedure to evaluate patients with right upper quadrant pain. Failure of tracer entrance into the gallbladder is highly suggestive of acute cholecystitis. However, the four cases presented demonstrate the occasional need for delayed images in order to avoid premature diagnosis of cystic-duct obstruction. Cholecystokinin (*4*) was not used in this group of patients, and while no attempt is made to recommend the optimal timing for delayed views, it is apparent that gallbladder visualization may take place beyond the traditional 2- or 4-hr delay (*5*), if the tracer remains in the hepatobiliary tract.

In most cases of cystic-duct obstruction observed clinically, there is failure of radiotracer to enter the gallbladder but without recognition of a discrete photon-deficient area. The presence of a readily recognizable photon-deficient region in the vicinity of the gallbladder fossa is the result of gallbladder distention, with or without cystic-duct obstruction. When distended, the gallbladder appears as a "cystic" nonvascularized structure, well demarcated by adjacent hepatic uptake. Recognition of the distended gallbladder on initial images should suggest that the tracer will require a longer time to penetrate the gallbladder, just as radiographic contrast diffuses slowly into this organ during percutaneous transhepatic cholangiography. In this setting, delayed views are mandatory and will confirm the presence of either delayed visualization or nonvisualization, the latter indicating hydrops of the gallbladder with cystic-duct obstruction.

The cases presented are representative of the conditions that may produce gallbladder distention, resulting in delayed or absent visualization. Case 1 represents chronic cholecystitis. An early pathological stage of chronic cholecystitis is the large, deformed, poorly contractile gallbladder that precedes the final stage of atrophic cholecystitis (*6*). Sonographic demonstration of cholelithiasis is very likely in this situation.

Physiologic distention of the gallbladder without demonstrable gallbladder disease (as in Case 2) may mimic hydrops both clinically and sonographically. The gallbladder is enlarged, often spherical in shape, and even painful to palpation. Cholescintigraphy with delayed views is necessary to confirm cystic-duct patency. As illustrated by Case 3, pancreatitis, producing partial obstruction of the common bile duct, may result in backtransmitted pressure to the gallbladder through a patent cystic duct (*7,8*). In addition, this patient received meperidine, which can induce spasm of the sphincter of Oddi (*9*). Supportive of the diagnosis of partial biliary obstruction in this case is the delayed appearance of tracer in the bowel and poor drainage from the common bile duct. Persistence of a photon-deficient gallbladder after the tracer has left

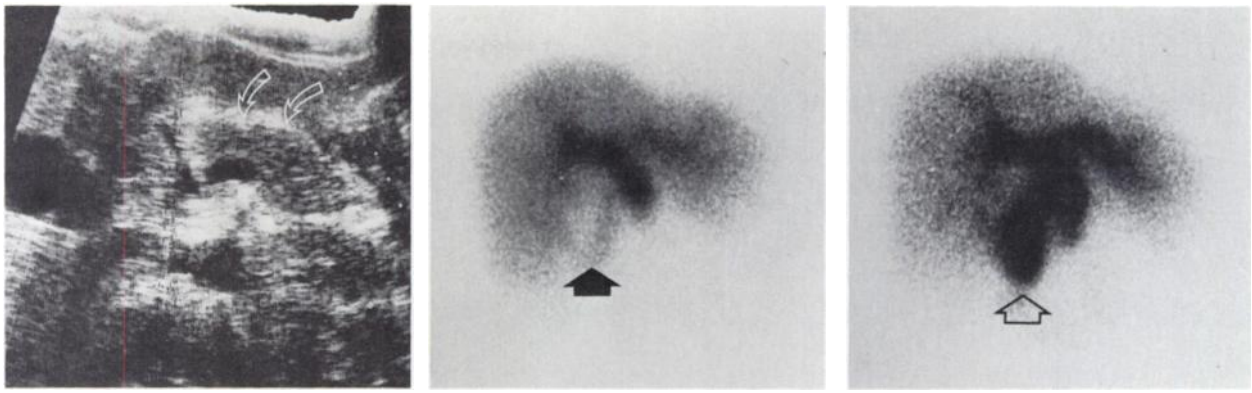

FIG. 3. Case 3. Sonogram (left): pancreas appears enlarged and somewhat lucent, indicating pancreatitis (arrows). Tc-HIDA scintigram at 1 hr (center): photon-deficient gallbladder (arrow) is identified. Common bile duct and intrahepatic ducts appear prominent. No evidence of bowel excretion. Tc-HIDA scintigram at 4 hr (right): complete gallbladder filling (open arrow) is noted. Bile ducts are prominent without evidence of bowel activity.

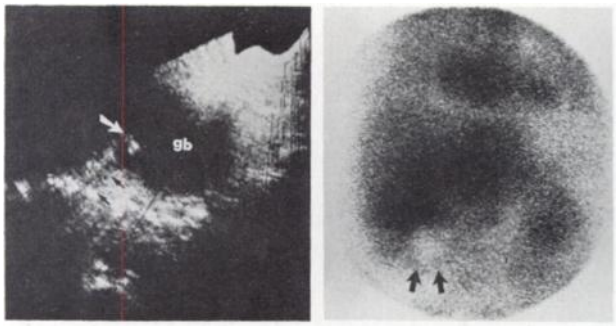

FIG. 4. Case 4. Sonogram (left): gallbladder (gb) is enlarged with stones (white arrow) producing shadowing (black arrows). Tc-HIDA scintigram at 5 min (right): photon-deficient gallbladder fossa is seen (arrows); this persisted on views obtained to 24 hr.

the biliary tract, as in Case 4, is diagnostic of cystic-duct obstruction.

In summary, gallbladder distention may occur with or without cystic-duct obstruction. Delayed filling of the gallbladder excludes cystic-duct obstruction and indicates that the distended gallbladder may result from partial obstruction of the common bile duct, chronic cholecystitis, or physiologic gallbladder distention. Detection of a photon-deficient gallbladder fossa on initial views suggests that delayed images will be necessary.

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