Transient Nonvisualization of the Gallbladder by Tc-99m HIDA Cholescintigraphy in Acute Pancreatitis: Concise Communication

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In five of seven patients with acute pancreatitis, Tc-99m HIDA scintigraphy failed to visualize the gallbladder. In all five patients the gallbladder was later found to be normal and in three of them normal filling was obtained at a repeat examination performed after the attack had subsided. Transient nonvisualization of the gallbladder in acute pancreatitis is probably due to disturbed motility of the biliary tree.

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Acute pancreatitis and acute cholecystitis may resemble each other so much that they are impossible to distinguish on the basis of clinical findings alone, yet the correct differential diagnosis is of the utmost importance. Pancreatitis responds well to medical management whereas in cholecystitis early surgery is the method of choice. As cholescintigraphy is rapidly gaining ground as a reliable procedure for the diagnosis of acute cholecystitis, we report here our results in this differential diagnosis.

MATERIAL AND METHODS

Seven consecutive patients with acute pancreatitis were studied. They all had severe epigastric pain and upper abdominal tenderness. The diagnosis was based on a level of urinary amylase elevated to more than 30 μkat/l (= 600 Somogyi units) and persisting for 3 days or more. Hepatobiliary scintigraphy was performed after an 8-hr fast, using a scintillation camera with a high-resolution collimator (15,000 parallel holes) interfaced to a minicomputer system. With the patient in the supine position, 2.2 mCi (80 MBq) Tc-99m HIDA was injected into an arm vein. During one hour, sequential scintigrams of the liver and biliary tree were recorded in the frontal projection, with 1-min exposures. Cholecystokinin was not used. Nonvisualization of the gallbladder after 1 hr was interpreted as abnormal.

To obtain time-activity curves of the liver, two regions of interest were chosen. One area, consisting of the liver with the exclusion of the biliary tree, was delineated with a light pen (Fig. 1). The other was designed to monitor the body background: a rectangular area below the right lobe, avoiding the kidney. These areas were normalized. The resulting time-activity curve represented the uptake and discharge of Tc-99m HIDA by the liver, corrected for background. To estimate hepatic discharge, we calculated the retention index at 50 min after injection (RI_{50}). The RI_{50} is the count rate at 50 min, expressed as a percentage of the maximum count rate. We found this value to be more discriminative than the RI_{30} proposed by Pors-Nielsen and co-workers (*1*).

To obtain time-activity curves of the common duct, we chose as a region of interest a rectangular area encompassing the terminal portion of the common duct, avoiding the duodenum (Fig. 1).

Twenty-one consecutive patients with epigastric pain and abdominal tenderness but without elevated urinary amylase were admitted during the same period and studied in the same manner. They served as controls.

Significance was tested with nonparametric methods as described by Siegel (*2*). Nonparametric methods were chosen since the normality assumption seemed hazardous.

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FIG. 1. Regions of interest chosen for study of time-activity curves: liver exclusive of biliary tree, terminal portion of common duct, and blood background.

RESULTS

In two of the seven patients with abdominal symptoms and persistently elevated urinary amylase, normal visualization of the gallbladder was obtained. In the other five the gallbladder did not visualize. One patient, a 31-yr-old alcoholic, was immediately operated on. At laparotomy signs of severe pancreatitis were found. The gallbladder, which contained highly viscous bile, was distended but otherwise normal. The second patient, a 37-yr-old man with severe abdominal pain after an alcoholic bout, was treated conservatively. Two weeks later repeat cholescintigraphy showed normal visualization of the gallbladder (Fig. 2). The third patient, a 74-yr-old man, was also treated conservatively. Repeat cholescintigraphy, performed after the acute symptoms had subsided, showed normal filling of the gallbladder. The fourth patient, a 68-yr-old man, also had a normal scintigram after the attack. Finally, in the fifth patient, a 42-yr-old woman, normal visualization of the gallbladder was obtained with oral cholecystography, performed after the acute symptoms had subsided.

In 15 of the 21 patients without elevated urinary amylase, no filling of the gallbladder was obtained. They were all subjected to cholecystectomy, which as a rule was performed on the next routine operating list. In all these patients, the diagnosis of cholecystitis was confirmed at operation. In the other six patients without elevated urinary amylase, the gallbladder was visualized at cholescintigraphy. The absence of gallbladder disease in these patients was confirmed by intravenous cholangiography.

We compared the hepatic time-activity curves of three groups of patients. One group consisted of the five patients with acute pancreatitis and nonvisualizing gallbladders that were later found to be normal. The second group comprised the 15 patients with acute cholecystitis and nonvisualizing gallbladders. Finally, the third group consisted of six patients with normally visualizing gallbladders. Figure 3 shows the results. In the first group the RI_{50} values ranged from 53% to 91% (median 64%, mean 69%). The second group had RI_{50} values ranging from 21% to 93% (median 54%, mean 55%). The third group had RI_{50} values ranging from 22% to 55% (median 32%, mean 35%). With the Mann-Whitney U test, the difference between the third group (normally visualizing gallbladders) and the first (pancreatitis with nonvisualizing gallbladders) is significant at the 1% level. With the same test the difference between the second group (cholecystitis) and the first (pancreatitis with nonvisualizing gallbladders) did not reach the 5% level of significance.

In the first group (pancreatitis with nonvisualizing gallbladders) and the second (cholecystitis) we also compared the time-activity curves of the common duct. These curves showed a slow and irregular rise, inter-

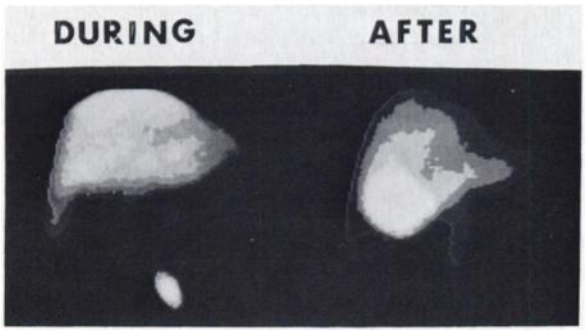

FIG. 2. Hepatobiliary scintigram during and after acute pancreatitis. During: nonvisualization of the gallbladder; after: normal filling.

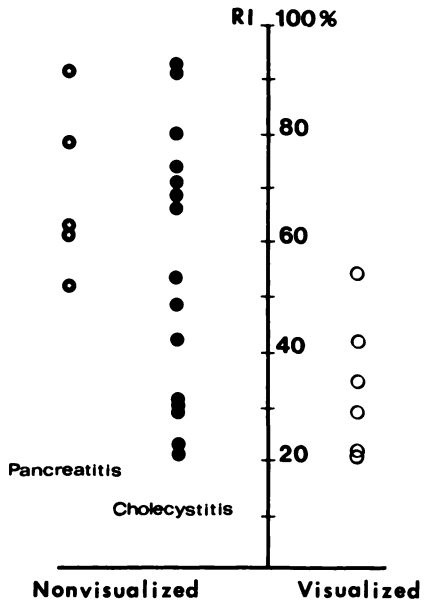

FIG. 3. Retention index values at 50 min in three groups of patients.

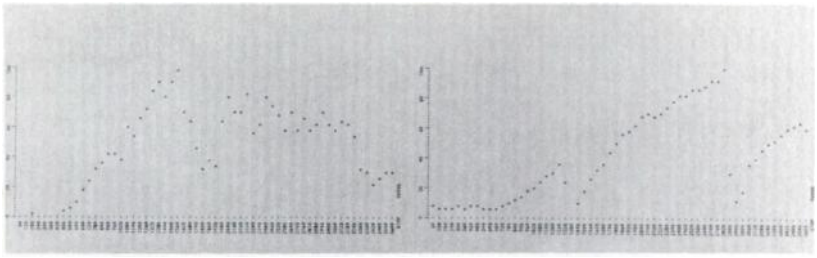

FIG. 4. Time-activity curves of the common duct. Left: acute cholecystitis. Right: acute pancreatitis. Only two large dips suggest release of a spastic sphincter of Oddi.

rupted by dips. In patients with pancreatitis the curves seemed to show fewer and larger dips than in patients with cholecystitis, but the difference was not statistically significant. Figure 4 shows an example. In this case of pancreatitis the time-activity curve of the common duct shows only two very large dips.

DISCUSSION

In five of our seven patients with acute pancreatitis, the gallbladder failed to fill by Tc-99m HIDA scintigraphy performed during the attack. In three of these five patients the nonvisualization was shown to be transient, since normal filling was obtained at repeat examination after the attack had subsided. In the fourth case the gallbladder was found to be normal at laparotomy and in the fifth at oral cholecystography performed later. Thus, in all five patients the scintigrams gave false information.

In these five false-positive cases the time-activity curves of the liver showed delayed discharge with increased RI_{50} values. Pors-Nielsen et al. (*1*) found that delayed discharge results from obstruction of the common duct. In pancreatitis the obstruction is probably due to pancreatic swelling. In acute cholecystitis hepatic discharge is also delayed because of pressure on the common duct by the distended gallbladder (unpublished data). Thus the hepatic time-activity curve cannot differentiate between false- and true-positive findings.

As for the time-activity curve of the common duct, in one of our cases of pancreatitis the curve was clearly abnormal, presenting only two very large dips (Fig 4). These dips in the curve probably arise when the sphincter of Oddi opens and bile pours into the duodenum. It seems likely that in this patient there was a spasm in the sphincter which opened only twice during the examination.

The reliability of Tc-HIDA scintigraphy in acute pancreatitis is disputed. Frank et al. (*3*) obtained normal visualization of the gallbladder in eight patients with acute pancreatitis without gallstones. They used Tc-99m HIDA but gave no further details of their technique. Using Tc-IDA, Fonseca and co-workers (*4*) reported filling in 13 of 15 patients with acute pancreatitis. As the remaining two patients were later shown to have chronic cholecystitis, the examination gave correct information in all 13 patients with pancreatitis in whom the gallbladder was normal. By contrast, Zeman et al. (*5*) reported nonvisualization in four of seven patients who had severe acute pancreatitis but normal gallbladders. Table 1 summarizes the technique used in the latter two studies and in the present series. The table shows conspicuous differences between our technique and that of Zeman et al. (*5*). There is a difference in duration of the imaging period, in length of fast, and in radiopharmaceutical. In spite of these differences the results were nearly identical. These aspects of the technique seem to play a subordinate role; they cannot explain the difference between the results of Fonseca et al. (*4*) on the one hand, and those of Zeman et al. (*5*) and the present series on the other. With these parts of the technique ruled out, there is only one detail left, namely, cholecystokinin, which was used by Fonseca et al. (*4*) but not by the others.

When oral cholecystography was introduced some sixty years ago (*6*), it soon became apparent that a normal gallbladder may fail to visualize during acute pancreatitis (*7–9*). The reason for this failure is still not entirely clear. It could be that in acute pancreatitis there is a transient disturbance of gallbladder motility. This could be part of the paralysis of the small intestine

TABLE 1. METHODS AND RESULTS IN THREE SERIES OF PATIENTS WITH ACUTE PANCREATITIS AND NORMAL GALLBLADDERS

Authors	Radio-pharmaceutical	CCK	Imaging period	No. of patients		
				Total	Nonvis.	Vis.
Fonseca et al. (*4*)	Dimethyl IDA	used	4 h	13	0	13
Zeman et al. (*5*)	Dimethyl IDA	not used	up to 24 h	7	4	3
Present series	Diethyl IDA	not used	1 h	7	5	2

sometimes seen on the scout film as a localized segmental small-bowel dilatation. (*10*). As a result, bile excreted by the liver could bypass the gallbladder on its way to the duodenum. If this hypothesis is correct, the difference in the results obtained at scintigraphy with and without cholecystokinin has a logical explanation. This hypothesis could also explain our findings in the patient subjected to operation, namely, highly viscous bile in a gallbladder that was distended but otherwise normal. Finally, the abnormal time-activity curve of the common duct found in one patient, suggestive of spasm of the sphincter of Oddi, also points to disturbed motility of the biliary tree.

If this hypothesis is correct, however, scintigraphy may be even less reliable in acute pancreatitis than is oral cholecystography. In the latter the dye becomes involved in an enterohepatic circulation and has a chance to enter the gallbladder each time it recirculates. In scintigraphy on the other hand, the radiopharmaceutical is not reabsorbed, and gets only one chance to enter the gallbladder. Admittedly cholecystokinin may help to reduce the risk of nonvisualization of a normal gallbladder. Still, since the radiotracer passes the gallbladder only once, this risk must be kept in mind when Tc-HIDA scintigraphy is performed in patients with clinical or laboratory signs suggestive of acute pancreatitis.

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