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# Naloxone Reverses Pattern of Obstruction of the Distal Common Bile Duct Induced by Analgesic Narcotics in Hepatobiliary Imaging

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It is widely known that narcotics, such as morphine, cause spasm of the sphincter of Oddi, increasing pressure in the common bile duct. This pharmacologic effect has been applied to hepatobiliary scintigraphy in patients with chronic cholecystitis or cholestasis to reducing the time required for a diagnostic study. However, this feature of narcotics could result in delayed or nonvisualization of the small bowel, simulating a distal common bile duct obstruction, in patients requiring parenteral narcotic analgesics who must undergo hepatobiliary scintigraphy. We report on three patients where administration of intravenous naloxone hydrochloride (Narcan), a narcotic antagonist, was helpful in distinguishing narcotic-induced spasm of the sphincter of Oddi from true obstruction of the common bile duct.

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**N**arcotics, such as morphine, cause spasm of the sphincter of Oddi, thereby increasing pressure in the common bile duct (1-2). This effect has been applied as a useful adjunct to cholescintigraphy. By hastening visualization of the gallbladder, which is often delayed in chronic cholecystitis, acute cholecystitis can more readily be excluded (3-6). However, in patients premedicated with parenteral narcotics for analgesia or sedation, nonvisualization of the small bowel, simulating a partial common bile duct obstruction, could occur. We report three such patients on parenteral narcotics with nonvisualization of the intestine 60 min after injection of <sup>99m</sup>Tc-iminodiacetic acid (IDA). In each of these patients, naloxone allowed distinction between narcotic-induced spasm of the sphincter of Oddi and true obstruction of the common bile duct.

## MATERIALS AND METHODS

Hepatobiliary imaging was performed in each patient in the same manner. After fasting for at least 4 hr, each patient was given 5-6 mCi of <sup>99m</sup>Tc-methylbromiminodiacetic acid ("Cho-

lectec," Squibb, Princeton, NJ) intravenously. Using a large field of view camera with a parallel-hole, low-energy (GAP) collimator, 500,000 count images of the liver were acquired every 5 min for 30 min, then every 10 min for another 30 min. When the gallbladder, but not the small bowel, was visualized by 60 min, the patients were given 0.8 mg (2 ampules) of naloxone hydrochloride ("Narcan," Elkins-Sinn, Inc., Cherry Hill, NJ) intravenously. Serial 500,000 count images were then obtained immediately and every 10 min for the next 60 min.

## CASE REPORTS AND RESULTS

### Case 1

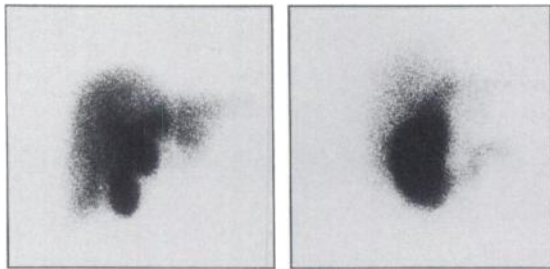
A.O., an obese 25-yr-old Hispanic female, was hospitalized with quadriplegia following an alcohol-related motor vehicle accident. After several weeks, she developed nausea, bilious vomiting, and abdominal pain after fatty meals. A limited ultrasound of the abdomen was normal, with no gallstones. Because of persistent pain and an elevated serum amylase, a <sup>99m</sup>Tc-IDA scan was obtained. The patient had received parenteral meperidine (Demerol) for pain just prior to the scan. The liver appeared normal with visualization of the gallbladder by 10 min postinjection. Activity was seen in the common bile duct, but not in the duodenum, at 60 min postinjection of IDA (Fig. 1, first panel). At this time, 0.8 mg of Narcan was administered intravenously. Within 1 min, prominent activity was seen in the small intestine (Fig. 1, second panel), excluding the diagnosis of biliary obstruction. The patient responded to conservative therapy for presumed pancreatitis.

### Case 2

T.J., a 63-yr-old hypertensive Oriental male, presented after 4 days of abdominal pain in the right upper quadrant, radiating to his back. Numerous gallstones, but normal ducts, were demonstrated by ultrasound. Morphine was administered for pain just prior to an IDA scan. The liver and gallbladder were visualized within 15 min. By 60 min postinjection, no activity was seen beyond the proximal common bile duct (Fig. 2, first panel). Following the administration of 0.8 mg of naloxone, activity was seen in the distal common duct by 1 min and within the small intestine by 10 min (Fig. 2, second panel). The patient's symptoms subsequently improved. Several weeks later, at

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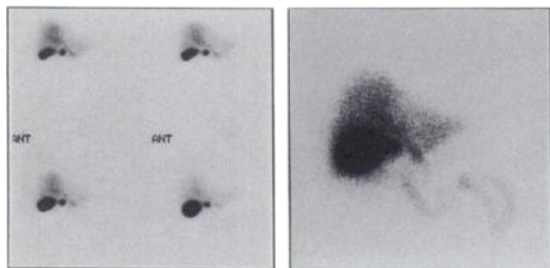


**FIGURE 1.** Patient 1. The left panel demonstrates nonvisualization of the small intestine 60 min after injection of  $^{99m}\text{Tc}$ -IDA in a patient on meperidine. The right panel demonstrates prompt visualization of the small intestine 1 min after injection of naloxone. The subsequent clinical course was one of uncomplicated pancreatitis, without evidence of obstruction of the common bile duct.

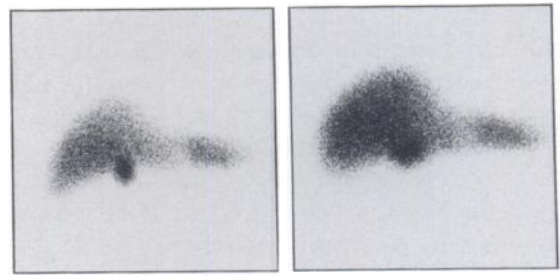
elective cholecystectomy, cholelithiasis, changes of chronic cholecystitis, and normal ducts were noted.

### Case 3

J.S. was a 54-yr-old white male with a glioblastoma multiforme. Having failed irradiation and chemotherapy, he had been started on an experimental chemotherapeutic protocol when he developed epigastric pain and fever. Ultrasonography revealed several small stones in the gallbladder. A hepatobiliary scan was begun 1 hr after the patient had received morphine for pain control. The scan showed prompt hepatic uptake with visualization of the gallbladder by 35 min. Activity was seen neither in the distal common bile duct nor in the intestine by 60 min (Fig. 3, first panel). The patient was then given 0.8 mg of naloxone intravenously. Imaging of the abdomen was performed for an additional hour, without visualization of the intestines or common bile duct (Fig. 3, second panel). A delayed image the next morning demonstrated only faint activity within the cecum. Based on these findings, the scan was interpreted as demonstrating partial obstruction of the common bile duct. The clinical course of the patient worsened rapidly, with fever, jaundice, an elevation



**FIGURE 2.** Patient 2. The left panel demonstrates nonvisualization of the distal common bile duct and small intestine over the interval from 2–60 min after injection of  $^{99m}\text{Tc}$ -IDA in a patient on morphine. The right panel demonstrates prompt visualization of the entire common bile duct and the small intestine 10 min after injection of naloxone. The patient was shown at surgery to have a normal common bile duct.



**FIGURE 3.** Patient 3. The left panel demonstrates nonvisualization of the common bile duct and small intestine 60 min after injection of  $^{99m}\text{Tc}$ -IDA in a patient on morphine. The right panel demonstrates persistent non-visualization of the common bile duct and small bowel 60 min after injection of naloxone. The patient was shown at autopsy to have had obstruction of the common bile duct.

in hepatocellular enzymes, and disseminated intravascular coagulopathy. With the suspicion of cholangitis and sepsis, the patient was taken to surgery, where cholelithiasis and changes of chronic cholecystitis were found. An intraoperative cholangiogram reported patency of the common bile duct. The patient hemorrhaged and died soon after surgery. At autopsy, the intrahepatic ducts showed evidence of severe obstructive jaundice. No stone was present within the common duct; however, the common duct was dilated and distally inflamed and abraded, suggesting the recent passage of a stone. The pathologists believed that the common duct had probably been obstructed at the time of the IDA scan, but that the stone had probably been dislodged by the intraoperative cholangiogram.

### DISCUSSION

The use of  $^{99m}\text{Tc}$ -labeled IDA agents for hepatobiliary scintigraphy has been used for many years in evaluating patients with clinically suspected acute cholecystitis. In the typical normal subject, visualization of the small intestine will occur no later than 1 hr postinjection, with visualization of the gallbladder prior to that of the intestine. The diagnosis of chronic cholecystitis often presents logistical diagnostic problems because visualization of the gallbladder may be significantly delayed (7). Modifications of the protocol for hepatobiliary scintigraphy have facilitated a more rapid distinction between acute and chronic cholecystitis. These included delayed imaging, the use of cholecystokinin (CCK) or Sincalide as a premedicate and the administration of narcotics (3–8).

Hepatobiliary scintigraphy has also been shown to be useful in the identification and characterization of obstruction of the common bile duct (9). However, in patients medicated with narcotics prior to an IDA scan, spasm of the sphincter of Oddi could result in nonvisualization of the small intestine, as has been shown to occur in normal subjects treated with narcotics (10). In both of the patients in our series with chronic cholecystitis, visualization of the gallbladder occurred within a normal time interval. There-

fore, in addition to confusing the distinction between common duct obstruction and sphincter of Oddi spasm, the use of narcotics masked the most common scintigraphic manifestation of chronic cholecystitis: a delay in visualization of the gallbladder.

Naloxone, a competitive opiate antagonist, has previously been reported to reverse narcotic-induced spasm of the sphincter of Oddi during contrast cholangiography (1). In our small series, the action of naloxone is applied to hepatobiliary scintigraphy in patients treated with narcotics. Rapid visualization of the common duct and small intestine occurred after the administration of naloxone when mechanical of the common duct was absent, but not when the common duct was obstructed.

None of our patients reported a significant increase in their level of discomfort after the administration of the single dose of naloxone required for a diagnostic study. Therefore, it is likely that naloxone would be better tolerated than would CCK or Sincalide, agents which can hasten visualization of the common duct and intestines but, in our experience, can cause significant pain in patients with partial distal common duct obstruction.

#### SUMMARY

The results of these three cases suggest a possible benefit of naloxone in the distinction between common duct obstruction and sphincter of Oddi spasm in patients or

narcotics who have nonvisualization of the small intestine or common duct during hepatobiliary scintigraphy. Additional investigation with a larger number of patients is warranted before the optimization or limitations of this technique can be defined.

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