



Understanding the effect of morphine on the accuracy of nuclear hepatobiliary imaging through a case study

Sandeep Dhadvai, MS4, University of Arizona College of Medicine - Phoenix,
Nishant Verma, M.D., Melissa Singer Pressman, PhD, MLIS

Abstract

Many patients present with upper abdominal pain and receive some type of pain-relieving therapy prior to gallbladder imaging. The physiologic effect of morphine and other analgesics on gallbladder function has been well-studied. What hasn't been studied as much are the implications on clinical practice and the decision about whether morphine is the best option to use in suspected chronic gallbladder disease. This case study serves to illustrate the influence of morphine in a patient who underwent both inpatient and outpatient hepatobiliary scintigraphy with dramatically different results. This case study perfectly shows the considerations that must be taken when using morphine because it eliminates many confounding variables; the only difference in the patient at the time of initial and subsequent presentation was the presence of morphine.

Case Presentation

This patient was a 54 year old male who presented complaining of epigastric and right upper quadrant abdominal pain. He had been having intermittent sharp right upper quadrant abdominal pain for four months, often having three to four episodes per day lasting up to four hours at a time. Episodes at work were disabling, causing the patient to double over. His symptoms were unrelated to meals and he denied fatty food intolerance. He used antacids without relief.

His physical exam at the time of presentation was significant for a soft, non-distended abdomen with well-healed supraumbilical and infraumbilical midline surgical incisions. There was mild voluntary guarding in the right upper quadrant on deep palpation, no involuntary guarding, and Murphy's sign was negative.

Upon hospital admission, the patient received morphine and pantoprazole. Abdominal ultrasound showed no cholelithiasis and there was no biliary ductal dilation. The initial HIDA scan was then performed, and again performed five days later.

Methods

A case study using hepatobiliary iminodiacetic acid scan (HIDA) was performed with a single patient from the Scottsdale Medical Imaging practice as a retrospective review. The HIDA scan results of the patient were utilized to provide the results to the case theory. The HIDA scan has two components. First, the radiotracer Tc99m mebrofenin is injected, and then transported to the liver bound to serum albumin. After arriving at the hepatic perisinusoidal space, these tracers then dissociate from albumin and are extracted by hepatocytes. These tracers are secreted into the biliary calculi unchanged. Initial imaging is done during this time, and if the gallbladder does not fill normally, it can be a sign of acute cholecystitis. Secondly, sincalide, a synthetic analogue for cholecystokinin (CCK), is administered intravenously as a continuous infusion to simulate physiologic CCK release in the body. In response, the gallbladder should empty over time with an EF of $\geq 38\%$ to be considered normal. This was the test that was performed in order to determine if the patient was suffering from chronic cholecystitis.

Figures

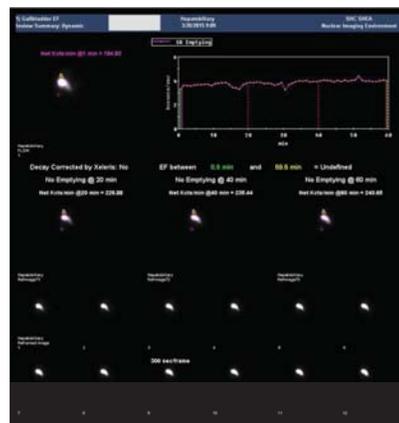


Figure 1: Initial HIDA scan in hospital, the purple oval is drawn around the gallbladder. Activity vs. time in the top-right plot shows no emptying of the gallbladder over time.

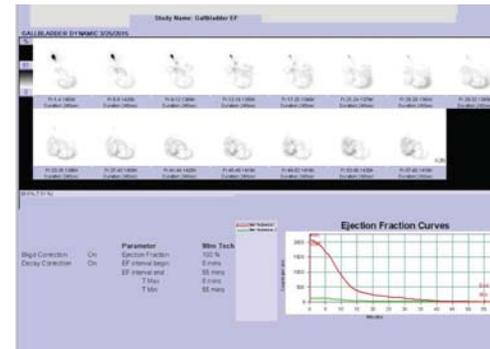


Figure 2: HIDA scan 5 days after initial presentation at SMIL. The graph of activity vs. time in the bottom-right corner shows clear emptying and activity change, especially when compared to Figure 1.

Results

The patient's initial HIDA was performed on admission at the hospital. The HIDA scan demonstrated normal filling of the gallbladder with no measurable response to sincalide. Figure 1 shows the HIDA scan completed at the initial presentation of the patient. Sincalide was administered in a continuous 60 minute infusion with imaging performed throughout. It can be clearly seen that the gallbladder does not empty over time, and the emptying is read is undefined, or 0%.

Five days after the initial presentation the HIDA scan was repeated at an outpatient facility. The only change in the patient's medication was the removal of morphine. Figure 2 shows the HIDA scan 5 days after initial presentation at SMIL. Imaging shows that the gallbladder empties quickly and washes out into bowel, showing completely normal function and 100% emptying. The graph of activity vs. time shows clear emptying and activity change.

Discussion and Conclusions

The differences between the imaging of the patient from admission with morphine and five days later without morphine clearly indicate a discrepancy in gallbladder emptying. In the initial presentation, it is easy to see that the gallbladder does not empty in response to sincalide, while in the subsequent presentation it does. A very clear difference in activity vs. time plotted in the imaging graphs confirms this as well.

The only difference in this patient's condition from the first to the second set of imaging was the presence of morphine in the patient's system. There are no other variables or medical conditions that play a role and explain the mechanism of morphine contributing to a delay in gallbladder emptying. Morphine is well-known to constrict the sphincter of Oddi, leading to increased pressure in the biliary tree. While this quality is helpful in identifying acute calculous cholecystitis and assessing the patency of the cystic duct, it is problematic for the subsequent investigation of chronic cholecystitis disease in patients. This case illustrates the clinical judgment that must be utilized when making pain control decisions for patients with acute vs. chronic cholecystitis, with the implications for possible future hepatobiliary nuclear imaging considered.

Acknowledgements

I wish to thank my mentor Dr. Nishant Verma, M.D. and his collaborator Dr. Melissa Pressman, Ph.D. I would also like to the Dr. Matthew McEchron, Ph.D. for supervising this project.