Pictorial Review of Congenital Anomalies of the Gallbladder and Biliary Ducts: Findings on Hepatobiliary Iminodiacetic Acid Scan

Saeed Elojeimy
Nupur Verma
Steven Neeley
Manuela Matesan
Marguerite Parisi

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LEARNING OBJECTIVES

1. To become familiar with the imaging appearances on Hepatobiliary Iminodiacetic Acid (HIDA) scan of congenital gallbladder and biliary duct anomalies.

2. To understand the diagnostic utility of functional imaging with HIDA when evaluating biliary tract anomalies.

CASE 1.

(A) Dynamic HIDA imaging in a patient presenting with chronic right upper quadrant pain shows radiotracer exclusion from the liver into the bowel; gallbladder was not visualized up to one hour. (B) Delayed static image shows apparent defect in a cystic duct structure in the expected location of the gallbladder consistent with a duplicated gallbladder (Y-type). (C) Subsequently, MRCP was obtained and confirmed the duplicated gallbladder. (D) Dynamic imaging following CCK injection showed prompt secretion of radiotracer from both gallbladders excluding biliary dyskinesia. In patients with right upper quadrant pain, HIDA can be used to evaluate for cystic duct obstruction and to exclude biliary dyskinesia in each of the gallbladders in the setting of a duplicated gallbladder. (E) Diagrammatic illustration of the different types of gallbladder duplication variants based on the Blasimiel classification. Recognizing and reporting the duplicated gallbladder finding to the surgeon is important for surgical planning purposes because it may change the simple laparoscopic cholecystectomy into an open procedure to avoid biliary injury during surgery.

CASE 2.

A 2-month old infant presents with mild hyperbilirubinemia. Double common bile ducts with one duct opening in the ampulla of Vater and the other duct opening in different parts of the GI tract. (A) HIDA scan shows rapid clearing of the radiotracer from the blood pool, and accumulation within a tubular structure in the expected location of the common bile duct (orange arrow) consistent with a Todani type 1 choledochal cyst. (B) Static 2 hour delayed anterior image shows the gallbladder (yellow arrow) adjacent to the cystic biliary structure, and excretion of the radiotracer into the bowel excluding biliary obstruction. Patients with choledochal cysts have increased risk for having gallbladder disorders, and anomalous junction of the pancreaticobiliary duct leading to increased incidence of pancreatitis. In addition, the dynamic imaging appearance of congenital choledochal cysts in this patient is reported to be low (about 40%) due to delayed transit of the radiotracer within the choledochal cyst. (C) Right upper quadrant ultrasound shows cystic dilation of the biliary duct confirming the HIDA imaging findings. (D) Diagrammatic illustration of the Todani classification for the different congenital choledochal cyst variants which may be incidentally encountered on HIDA and on other imaging modalities. Choledochal cysts are associated with increased risk for cholangiocarcinoma and are associated prophylactically; thus recognizing them on HIDA has important clinical implications for the patient. (E) Subsequent MRCP was obtained and confirmed the HIDA scan findings and demonstrates the accessory duct (orange arrow) projecting from the right posterior biliary duct with associated active contrast extravasation into the cholecystectomy bed (yellow arrow). Recognizing and raising the possibility of this biliary duct variant is crucial because it may be surgically managed, as opposed with the other types of leak which may be managed by observation and delayed removal of the surgical drain. (F) Diagrammatic illustration of the two most common congenital accessory biliary duct variants that may result in leaks following cholecystectomy. The accessory biliary duct may connect to the gallbladder (duct of Luschka), or to the cystic duct (cysticobiliary duct). Failure to recognize biliary duct congenital variants an imaging result in continuous bile leak following cholecystectomy.

CASE 3.

(A) A 2-year old infant presents with right upper quadrant pain. (B) Dynamic sequential HIDA imaging over the anterior abdomen shows rapid clearing of the radiotracer from the blood pool, and accumulation within a tubular structure in the expected location of the common bile duct (orange arrow) consistent with a Todani type 1 choledochal cyst. (C) Static 2 hour delayed anterior image shows the gallbladder (yellow arrow) adjacent to the cystic biliary structure, and excretion of the radiotracer into the bowel excluding biliary obstruction. Patients with choledochal cysts have increased risk for having gallbladder disorders, and anomalous junction of the pancreaticobiliary duct leading to increased incidence of pancreatitis. In addition, the dynamic imaging appearance of congenital choledochal cysts in this patient is reported to be low (about 40%) due to delayed transit of the radiotracer within the choledochal cyst. (D) Right upper quadrant ultrasound shows cystic dilation of the biliary duct confirming the HIDA imaging findings. (E) Diagrammatic illustration of the Todani classification for the different congenital choledochal cyst variants which may be incidentally encountered on HIDA and on other imaging modalities. Choledochal cysts are associated with increased risk for cholangiocarcinoma and are associated prophylactically; thus recognizing them on HIDA has important clinical implications for the patient. (F) Subsequent MRCP was obtained and confirmed the HIDA scan findings and demonstrates the accessory duct (orange arrow) projecting from the right posterior biliary duct with associated active contrast extravasation into the cholecystectomy bed (yellow arrow). Recognizing and raising the possibility of this biliary duct variant is crucial because it may be surgically managed, as opposed with the other types of leak which may be managed by observation and delayed removal of the surgical drain. (G) Diagrammatic illustration of the two most common congenital accessory biliary duct variants that may result in leaks following cholecystectomy. The accessory biliary duct may connect to the gallbladder (duct of Luschka), or to the cystic duct (cysticobiliary duct). Failure to recognize biliary duct congenital variants an imaging result in continuous bile leak following cholecystectomy.