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

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Gallbladder agenesis in association with biliary atresia; rarely Dynamic HIDA imaging in a patient presenting with Ectopic or floating gallbladder which is often associated with Static 2 hour delayed anterior image shows the gallbladder (yellow 3D 26 year old female with right upper quadrant pain To understand the diagnostic utility of functional imaging with HIDA dynamic imaging shows rapid hour. When evaluating biliary tract anomalies.

LEARNING OBJECTIVES

1. To become familiar with the imaging appearance on Hepatobiliary Inomiodiacetic Acid Scan (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 egress from the liver into the bowel; gallbladder was not visualized up to one hour. (B) Delayed static image shows delayed appearance of a cystic duct structure in the expected location of the gallbladder consistent with a duplicated gallbladder (Y-type). (C) Subsequent MRCP was obtained and confirmed the duplicated gallbladder. (D) Dynamic imaging following CC injection showed prompt secretion of radiotracer from both gallbladders excluding biliary dyskinesia. 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. Diagrammatic illustration of the different types of gallbladder duplication variants based on the Boyden classification.

Recognizing the appearance of hypoplastic (aka nonverifiable) gallbladder on HIDA is important so that it does not get confused with other gallbladder anomalies such as choledochocele cysts. In addition, it is important to report this incidental finding because hypoplastic gallbladder is often associated with right upper quadrant, which resolves following cholecystectomy.

CASE 2. 26 year old female with right upper quadrant pain for one year. (A and B) HIDA dynamic imaging shows rapid clearance from the liver into the bowel and uptake into two cystic structures in the expected location of the gallbladder consistent with a duplicated gallbladder (Y-type). (C) Subsequent MRCP was obtained and confirmed the duplicated gallbladder. (D) Dynamic imaging following CC injection showed prompt secretion of radiotracer from both gallbladders excluding biliary dyskinesia. 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. Diagrammatic illustration of the different types of gallbladder duplication variants based on the Boyden classification.

Recognizing and reporting the duplicated gallbladder finding to the surgeon is important for surgical planning purposes because it may change the laparoscopic cholecystectomy into an open procedure to avoid bililiary injury during surgery.

CASE 3. A 2-month-old infant presents with mild hyperbilirubinemia. (A) Dynamic sequential HIDA imaging over the anterior abdomen shows rapid clearing of the radiotracer from the blood pool, and accumulation within a similar structure in the expected location of the common bile duct (orange arrows) 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 radiotracer is also secreted into choledochocele in these patients is reported to be low (about 40%) due to delayed transit of the radiotracer within the choledochal cyst. (C) Right upper quadrant ultrasound showed cystic dilation of the biliary duct containing the HIDA imaging findings. (D) Diagrammatic illustration of the Todani classification for the different congenital choledochal cyst variants that may be incidentally encountered on HIDA and on other imaging modalities. Choledochal cysts are associated with increased risk for cholecystocholelithiasis and are described prophylactically; thus recognizing them on HIDA has important clinical implications to the patient. Recognizing and raising the possibility of this biliary duct variant is crucial because it may manage surgically, as opposed with the other types of leak which may be managed by observation and delayed removal of the surgical drain.

CASE 4. A 55 year-old man status post cholecystectomy was admitted from an outside hospital with RUQ pain. (A) HIDA scan shows linear radiotracer activity projecting from the liver towards the cholecystectomy bed (orange arrows) with an associated area of focal accumulation on delayed images (yellow arrow) consistent with a biloma related to a missed accessory biliary duct during surgery. (B) Fluoro-energy-Guided ERCP 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 choledochocele (yellow arrow). Recognizing and raising the possibility of this biliary duct variant is crucial because it may manage surgically, as opposed with the other types of leak which may be managed by observation and delayed removal of the surgical drain.

REFERENCES


SUMMARY

Gallbladder congenital anomalies may present as incidental findings on HIDA. Recognizing and reporting these incidental anomalies on HIDA may have important clinical implications for the patient.

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Other rare biliary and gallbladder congenital anomalies reported in the literature to be familiar with include:

- Gallbladder agenesis in association with biliary atresia; rarely gallbladder agenesis may occur in association with duodenal atresia and without associated biliary atresia.
- Gallbladder diverticulum which is associated with multiple gallbladder pathologies including paracolic cholecystolithiasis, recurrent cholangitis and cholangiocarcinoma.
- Giant gallbladder which can reach up to 1.5L in volume (exceeding the size of the liver).
- 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.
- Rare anomaly is associated with increased risk of pancreatic and cholangiocarcinoma, and predisposes the patient to surgical complications if not recognized before surgery. Similarly, double cystic ducts have also been reported.
- Ectopic or floating gallbladder which is often associated with other biliary and hepatic anomalies (such as left or right hepatic bile tube hypoplasia).