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

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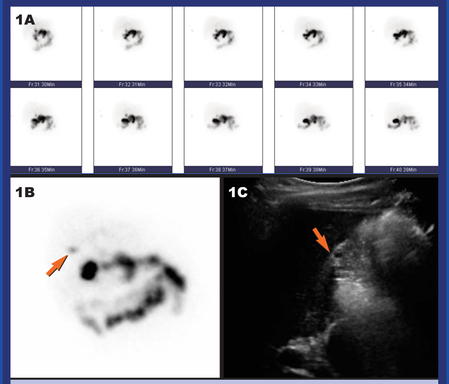
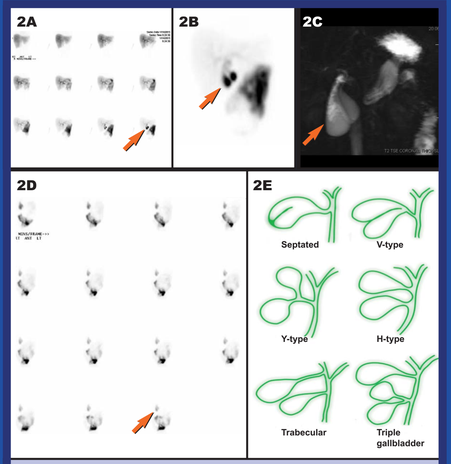
LEARNING OBJECTIVES

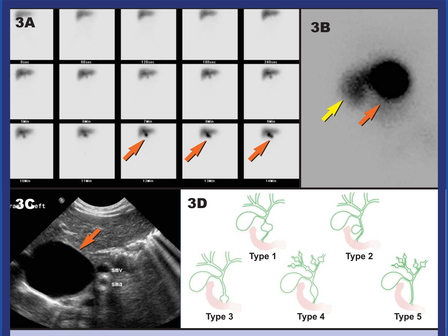
1. To become familiar with the imaging appearance on Hepatobiliary Iminodiacetic Acid (HIDA) scan of congenital gallbladder and biliary duct anomalies.
2. To understand the diagnostic utility of functional imaging with HIDA when evaluating biliary tract anomalies.



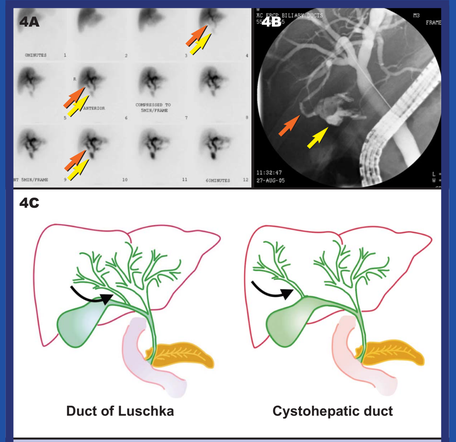
CASE 1. (A) Dynamic HIDA imaging in a patient presenting with chronic right upper quadrant pain shows radiotracer excretion from the liver into the bowel; gallbladder was not visualized up to one hour. (B) Delayed static image shows delayed appearance of a small cystic structure in the expected location of the gallbladder (arrow), which was further investigated with ultrasound (C) and confirmed the diagnosis of a hypoplastic gallbladder (arrow). ***Recognizing the appearance of hypoplastic (aka rudimentary) gallbladder on HIDA is important so that it does not get confused with other gallbladder anomalies such as choledochal 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 CCK injection showed prompt excretion of radiotracers 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 Boydens classification. ***Recognizing and reporting the duplicated gallbladder finding to the surgeon is important for surgical planning purposes because it may change the simple laparascopic cholecystectomy into an open procedure to avoid biliary injuries during surgery.***



CASE 3. A 2 month old infant presents with mild hyperbilirubenimia. (A) 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 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 diagnostic accuracy of HIDA for acute cholecystitis in these patient is reported to be low (about 40%) due to delayed transit of the radiotracer within the choledochal cysts.*** (C) Right upper quadrant ultrasound showed cystic dilatation of the biliary duct confirming the HIDA imaging findings. (D) Diagrammatic illustration of the Todani classification for the different congenital choledochal cysts variations that may be incidentally encountered on HIDA and on other imaging modalities. ***Choledochal cysts are associated with increased risk for cholangiocarcinoma and are resected prophylactically; thus recognizing them on HIDA has important clinical implications to the patient.*** HIDA can be also helpful to characterize indeterminate congenital cystic structures found in the porta hepatis region by demonstrating their communication to the biliary tract (which would indicate choledochal cysts) and differentiating them from other incidental mesenteric or foregut duplication cysts.



CASE 4. A 55 year-old man status post cholecystectomy was referred 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 arrows) consistent with a biloma related to a missed accessory biliary duct during surgery. (B) Fluoroscopy-guided ERCP confirms 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 is managed surgically, as opposed with the other types of leak which may be managed by observation and delayed removal of the surgical drain.*** (C) Diagram illustration of the two most common congenital accessory biliary duct variants that may result in leaks following cholecystectomies. The accessory biliary duct may connect to the gallbladder (duct of Luschka), or to the cystic duct (cystohepatic duct). ***Failure to recognize biliary duct congenital variants on imaging will result in continuous bile leak following cholecystectomy.***

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
- Galbladder diverticulum which is associated with multiple gallbladder pathologies including acalculous cholecystitis, recurrent cholangitis and cholangiocarcinoma
- Giant gallbladder which can reach up to 1.5 L 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. This rare anomaly is associated with increased risk of pancreatitis and cholangiocarcinoma, and predisposes the patients to surgical complications if not recognized before surgery. Similarly, double cystic duct has been also reported.
- Ectopic or floating gallbladder which is often associated with other biliary and hepatic anomalies (such as left or right hepatic lobe hypoplasia)

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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