The Double Gallbladder: An Unusual Anatomic Variant

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Abstract

Gallbladder duplication is a rare congenital anomaly formed due to exuberant budding along the developing fetal biliary tree in utero. These typically occur when the caudal head and hepatic diverticulum divide; these variants can be separated into numerous types according to Boyden's classification. Fully bifid gallbladders can be seen in "Y-shaped" or "H shaped" types, based on the attachment sites of each cystic duct into the rest of the biliary tree.[6] In this case report, we describe the workup & operative management of a 27-year-old woman who is approximately four months post-partum who presented with several weeks of biliary colic symptoms. She had been seen in the emergency room for evaluation of an acute exacerbation of her waxing-and-waning right upper quadrant abdominal pain, undergoing both CT and ultrasound imaging showing cholelithiasis without signs of acute cholecystitis. Imaging did not reveal the presence of a double gallbladder, only a fold within the gallbladder. Patient underwent an elective robotic cholecystectomy with ICG. Intra-operatively, however, there was significant difficulty in identifying biliary anatomy. A second duct was encountered during the dissection of a critical view of safety. Initially thought to be the common hepatic duct, indocyanine green was used and showed the second ductal structure to be a bile duct. A plane between this ductal structure and dissected portion of the gallbladder was not identified. We then decided to approach it top down and connect the planes of dissection laterally and medially around the upper half of the gallbladder. During that dissection we noted an unusual, thickened peritoneum in the middle of the gallbladder. With blunt dissection, that peritoneal fold separated and a plane opened up to the posteriorly dissected liver bed. At this point we confirmed with ICG and realized that the patient likely has an H-Shaped double gallbladder variant. This is a very rare anomaly with an incidence of 1/4000 births with unknown incidence of symptomatic cholelithiasis or cholecystitis. It poses anatomic danger in cholecystectomy as it can be misleading and increases risk for bile duct injuries. Adhering to principles of safe cholecystectomy is crucial in identifying these anomalies and avoiding bile duct injuries. Use of robotic platforms and ICG proved very useful for our patient as it allowed for better visualization, retraction and clear identification of anatomy.

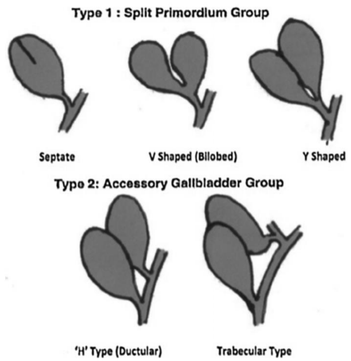


Figure 1: Boyden's classification.

Background

- Gallbladder anatomy can be highly variable, including variations in ductal anatomy, vascular anatomy, and bifid/duplication of gallbladder
- Variable anatomy significantly increases the risk for intra-operative complications & bile duct/biliary tree injury
- Duplication of the gallbladder itself is variable, with many different types/anatomic construction of the area
- Very rare, seen in only 1/4000 births (includes any/all types of duplication)[1,4]
- Duplication is described via Boyden's classification[1,4,6], detailed below (Fig. 1)
- Robotic surgery has become an increasingly popular & researched; for example, between 2010 and 2020, robotic surgery is estimated to have increased 8-fold [3,8]
- Some surgeons contend that robotic-assisted cholecystectomy may be safer due to the 3-D visualization, enhanced instrument articulation/ability for more complex maneuvers, and novel ways to enhance visualization of biliary anatomy, such as Indocyanine Green (ICG)
- Indocyanine Green is an injectable dye that is taken up rapidly by hepatocytes & excreted via bile and can be seen using fluorescent filters[7]. Intraoperatively, this can be used to identify biliary anatomy



Figure 3: Intra-operative ICG visualization of H-type gallbladder duplication.

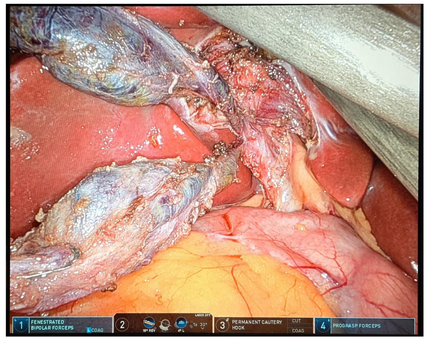


Figure 4: Intra-operative photograph taken of H-type gallbladder duplication

References

Acknowledgements and Disclosures

Clinical Background

- Our patient: 27-year-old female, four months post-partum
- Several week history of biliary colic
- Workup revealed cholelithiasis without evidence of cholecystitis
- Imaging revealed possible Phrygian cap, possible fold within gallbladder. No evidence of gallbladder duplication on radiology nor surgical team assessment
- Elective robotic cholecystectomy was offered

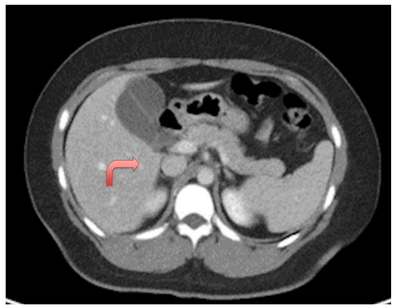


Figure 2: Pre-operative CT abdomen & pelvis with IV contrast. Axial cut frame with arrow pointing to fold identified prior to operation.

Operative Findings & Post-Operative Course

- During standard dissection of the critical view of safety, a second ductal structure was encountered medially
- Initially thought to be the common hepatic duct, indocyanine green was used, confirming it to be a second bile duct.
- Top-down approach was used to connect planes of dissection laterally and medially around the upper half of the gallbladder
- A thickened peritoneal fold in the center of the gallbladder was noted. This was bluntly dissected and a plane was developed posteriorly to the liver bed
- ICG confirmed our suspicion of an H-type gallbladder duplication
- Safe dissection of both gallbladder bodies was performed & visualized below (Fig. 5)
- Patient recovered well with unremarkable post-operative course

Conclusion

- Gallbladder duplication (of any subtype) poses significant danger during cholecystectomy
- The critical view of safety is crucial in all cholecystectomies
- ICG or intra-operative cholangiograms are supportive maneuvers able to enhance intra-operative decision making
- Use of robotic platforms and ICG proved very useful for our patient as it allowed for better visualization, retraction and clear identification of anatomy