

Research Article: Human Anatomy Case Report

Duplicated gallbladder: surgical application and review of the literature

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Submitted June 30, 2010; accepted August 19, 2010

Summary

Duplicated gallbladder is a rare congenital anomaly, usually asymptomatic and occurring as incidental radiographic or surgical finding during upper abdomen, liver and extrahepatic biliary tract surgery. We report on a case of two separate gallbladders, one main and one accessory, each one with its own cystic duct. The main cystic duct drained into the common bile duct while the accessory bile duct extruded into the left side of common bile duct just inferior to the main cystic duct termination. Imaging advances such as computerized tomography, intraoperative endoscopic retrograde cholangiopancreatography and magnetic resonance cholangiopancreatography may aid in the establishment of accurate diagnosis. The anomaly is of great importance because the surgeon may miss the main or the accessory gallbladder and the patient may need to be re-operated in case of cholelithiasis.

Key words

Duplicated gallbladder; separate cystic ducts; anomaly.

Abbreviations

ERCP: endoscopic retrograde cholangiopancreatography; MR: magnetic resonance.

Introduction

Potential congenital anomalies of the gallbladder include absent or vestigial, mobile and multiple gallbladder, deformation, ectopias, intrahepatic position and heterotopic mucosa (Harlaftis et al., 1977; Sarli et al., 2000; Senecail et al., 2000). Double or duplicated gallbladder contributes to the presence of two chambers that may extrude independent or with a common cystic duct into the common bile duct. The first report of duplicated gallbladder was in 1674 during an autopsy by Blasius (1674), while the first description in alive humans was in 1911 (Sherren, 1911). Over 200 cases have been reported so far in the literature, corresponding to 1/3 of total congenital gallbladder anomalies (Papaziogas and Paraskevas, 2006). The incidence is relatively equal between the two genders, however due to higher occurrence of gall-

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bladder disease in women, the reported cases of duplication are higher in females than in males, 1.7:1 (Skanadalakis et al., 2004).

Case Report

During a laboratory educational dissection course for medical students, an abnormal extrahepatic biliary tract was noticed in a 78-year-old male formalin embalmed cadaver. Written informed consent was obtained from the cadavers' next of kin for the publication of the case and respective images. After careful resection of the covering tissues of the upper abdomen and appropriate dissection of the infrahepatic region we observed an abnormal extrahepatic biliary tree. In particular, we found two separate gallbladders, one main and one accessory, each one with its own cystic duct. The main gallbladder was typically positioned at the inferior surface of the right hepatic lobe, while its cystic duct was short and spiral, with a length of 1.6 cm, entering the right side of the common bile duct at acute angle. The accessory gallbladder was relatively hypoplastic and located under the left half of the splanchnic surface of the left hepatic lobe, whereas its own cystic duct was short and straight, with a length of 1.3 cm, terminating at the left side of the common bile duct at right angle, just 0.3 cm inferior to the right cystic duct ending. All measurements were made with the assistance of a Vernier digital sliding caliper with an accuracy of 0.1 mm. Neither gallbladder had signs of chronic inflammation or lithiasis and the cadaver did not show any pathological condition of the upper abdomen nor had it in the medical history. In the presented case, both gallbladders had a separate tunica muscularis and tunica serosa.

Discussion

Duplicated gallbladder is a rare congenital anomaly, nevertheless the exact incidence is not known because only symptomatic cases or incidental surgical, radiological and cadaveric findings are registered. Double gallbladder derives from the distal portion of hepatic diverticulum. An abnormal differentiation of the primordial gallbladder during the 4th and 5th week of gestation may lead to multiple gallbladders. According to Boyden (1926), there is some small residual extrahepatic embryonic derivation, usually from the junction between the right and left hepatic ducts. During normal embryonic development these secondary anlagen involute, while in case of persistence one or more ectopic gallbladders may arise.

Gallbladder duplication is classified into two major groups, according to the presence or absence of a common cystic duct. In the first one, the split primordium group, the duplicated gallbladder shares the same common cystic duct, while three subgroups describe the structure of the gallbladder itself: septate gallbladder (11.3%), bilobar or "V" shaped gallbladder (8.5%), and "Y" shaped gallbladder (25.3%). The second major group concerns gallbladder duplication with a separate cystic duct for each gallbladder. Two subgroups are distinct. i) Ductular "H" duplication (47.2% of cases), in which each cystic duct drains separately into the common bile duct. The accessory cystic duct may empty into the right or left side of the common bile duct or even into the right or left hepatic duct. ii) Extrusion of accessory cystic duct into the

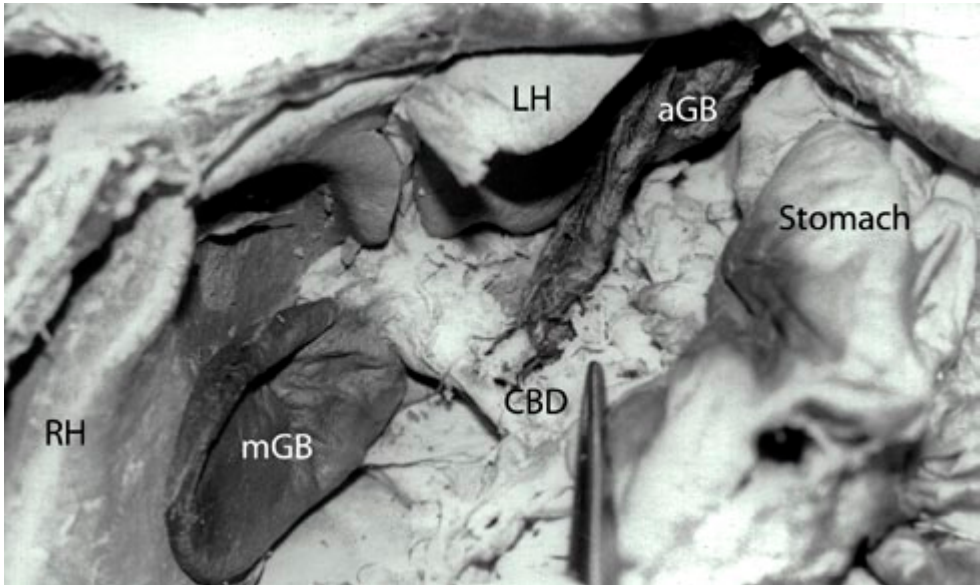


Figure 1 – Duplicated gallbladder. The main gallbladder is positioned at the inferior surface of the right hepatic lobe and the main cystic duct is short and drains into the right side of the common bile duct at acute angle. The accessory gallbladder is relatively hypoplastic and located under the left half of the inferior surface of the left hepatic lobe and the accessory cystic duct is short and straight terminating into the left side of the common bile duct at right angle, inferior to the right cystic duct ending. CBD: common bile duct; mGB: main gallbladder; aGB: accessory gallbladder; LH: left hepatic lobe; RH: right hepatic lobe.

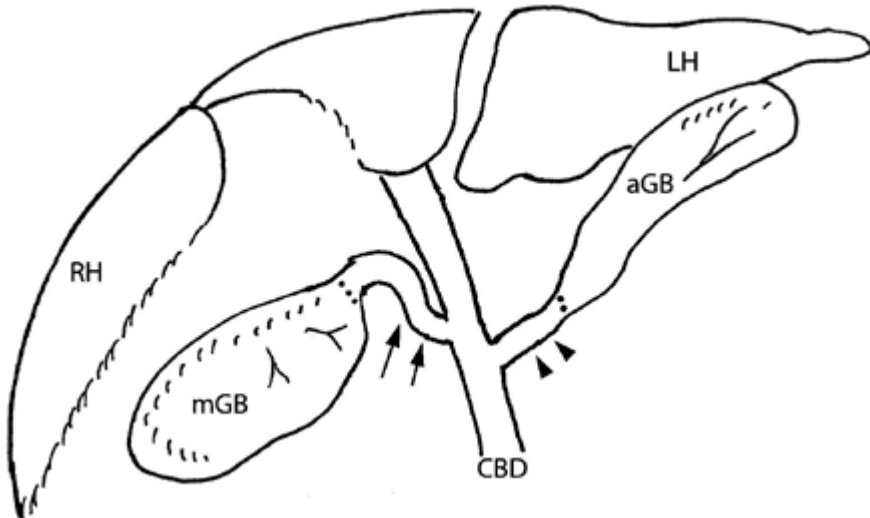


Figure 2 – Schematic representation of Fig. 1. CBD: common bile duct; mGB: main gallbladder; aGB: accessory gallbladder; LH: left hepatic lobe; RH: right hepatic lobe; arrows: main cystic duct; arrowheads: accessory cystic duct.

right hepatic duct or to the liver can occur in 2.1% of gallbladder duplications (Gray et al., 1974; Harlaftis et al., 1977). Colborn et al. (1987) modified the previous mentioned classification according to the following five types. In Type A the two gallbladders are separated and located in the right subhepatic space draining into the common bile duct. In Type B, the accessory cystic duct drains into the right hepatic duct, while in Type C the accessory gallbladder is situated inferiorly to the left hepatic lobe and its cystic duct drains into the common bile duct. In Type D the accessory cystic duct enters into the right hepatic duct inside the liver. Finally, Type E corresponds to a double cystic duct with a macroscopically normal single gallbladder, however a septum is present separating the gallbladder into two chambers.

Mochizuki and Makita (1996) suggested a six group classification in swine, according to the merging type of the accessory gallbladder with the extrahepatic biliary tract. Type I, II and III concern duplication cases in which the accessory gallbladder extrudes directly or indirectly into the main one. In type IV the accessory gallbladder empties into the middle part of the common bile duct through an accessory cystic duct. Type V corresponds to duplication of the gallbladder fundus, while in type VI the accessory gallbladder is adapted to the left hepatic duct. Our reported case falls under ductular type accessory gallbladder of Harlaftis et al. (1977), type C according to Colborn et al. (1987), and type IV according to Mochizuki and Makiya (1996). However, the accessory cystic duct in our case was found terminating inferior to the main cystic duct, representing a small variation to the above mentioned classifications. Specifically, in Harlaftis et al. (1977) ductular "H" duplication as well as in Colborn et al. (1987) type C, the accessory cystic duct terminates into the common bile duct just superior to the main cystic duct ending.

Gallbladder duplication may coexist with right hepatic artery anomalies (Udelman and Sugarbaker, 1985), congenital small bowel diverticulosis (Galambos, 1953) and ectopic gastric tissue onto gallbladder wall (Baillie et al., 2003). The entity has been described in combination with gallbladder adenocarcinoma (Kin et al., 1994) and primary biliary cirrhosis (Granot et al., 1983). Most of times the duplication is an incidental preoperative control finding or a cholecystectomy discovery. In a study on 500 laparoscopic cholecystectomies, an intraoperative endoscopic retrograde cholangiopancreatography (ERCP) was essential in 8% of cases to illustrate more accurately the extrahepatic biliary tract anatomy (Carbajo et al., 1999). The use of ERCP is an imaging advantage with superior ability in demonstrating variant gallbladder morphology and should be used more frequently in cases of nebulous preoperative biliary tree representation (Miyajima et al., 1995). Moreover, computed tomography as well as magnetic resonance (MR) cholangiopancreatography can assist in the establishment of accurate diagnosis (Ozgen et al., 1999). Gallbladder duplication is associated with wall hypomobility and increased incidence of gallstones development in one or both cavities (Urbain et al., 1989; Hardoff et al., 1990). Miklas (1964) has reported on a case of fistula development between the two gallbladder cavities due to calcular cholecystitis in one of them.

Abnormal biliary tree morphology may predispose to iatrogenic injuries, leading to increased morbidity and mortality (Miyajima et al., 1995; Carbajo et al., 1999; Paraskevas et al., 2009). Surgeons should be cautious during preoperative clinical and laboratory controls, especially in cases of laparoscopic surgery, because misdiagnosis of a second gallbladder presence may lead, in case of inflammation, to repetition of cholecystectomy (Shapiro and Rennie, 1999) or other complications.

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