

Role of Magnetic Resonance Cholangiopancreatography in Diagnosis of Gall Bladder Duplication: A Case Report and Review of the Relevant Literature

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ABSTRACT

Congenital anomalies of the hepatobiliary system may involve the biliary duct or the gall bladder. Gall bladder duplication is an infrequent malformation of the biliary system. Identification of gall bladder duplication is pivotal for operative planning, especially before laparoscopic cholecystectomy. Magnetic resonance cholangiopancreatography (MRCP) is the investigation of choice to portray the biliary anatomy and for accurate preoperative workup. The radiologists should be conversant with gall bladder duplication for the accurate diagnosis to be made to avoid serious complication of laparoscopy in this category of patients.

Keywords: Laparoscopic cholecystectomy, Magnetic resonance cholangiopancreatography, Symptomatic duplicated gall bladder

INTRODUCTION

Congenital anomalies of the hepatobiliary system may involve the biliary duct or the gall bladder. Gall bladder duplication is an infrequent malformation of the biliary system with an estimated prevalence of one in 4000 live births.[1] They can evolve from two sources, as a split primodium or as an accessory gall bladder. [2] Patient with this pathology may be symptomatic or asymptomatic. There are no specific symptoms attributable to gall bladder duplication and clinical symptoms are similar to that of a single gall bladder.[3] Nonetheless, increased prevalence of cholelithiasis and intermittent cystic duct obstruction has been associated with gall bladder duplication.[4] It frequently presents with symptoms associated with cholelithiasis, cholecystitis, cholangitis or pancreatitis. They are usually discovered during surgery or pre-surgical evaluation for gall stone or other surgeries involving the biliary system.[5]

Gallbladder duplication was first described by Boyden in 1926 and anatomic variants of gall bladder duplication are still differentiated according to Boyden's classification.[6] Identification of gall bladder duplication is

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pivotal for operative planning before cholecystectomy. It is imperative in clinical practice to be aware of duplex gall bladder as it may cause some clinical, surgical and diagnostic blunders. A preoperative diagnosis is crucial, especially considering the increasing frequency of laparoscopic cholecystectomies.[7] Presently, magnetic resonance cholangiopancreatography(MRCP) is the modality of choice for preoperative diagnosis and characterization of the variants of gall bladder malformation. The radiologists should be conversant with gall bladder duplication for the correct diagnosis to be made to avoid the second gallbladder being missed during surgery with these patients re-presenting with biliary symptoms thereafter and subsequently undergoing another Surgery.

Case Report

A 40-year-old male patient presented in the emergency department (ED) with a history of sudden onset right upper quadrant abdominal pain. Laboratory investigations revealed elevated liver enzymes. The patient was immediately referred to the Department of Radiology for an abdominal Ultrasound Scan (US) which showed a positive sonographic Murphy sign and gall bladder stone. However, two cystic structures were identified in the right upper quadrant, one in the gall bladder fossa with multiple stones and the other inferomedial to the former with stones also. This finding raised the suspicion of an anomalous biliary system. Consequently, magnetic resonance cholangiopancreatography (MRCP) was recommended. MRCP was done on a 1.5 Tesla superconducting Magnetic Resonance Imaging(MRI) system manufactured by General Electric (GE), following standard imaging protocols. For optimal visualization of the ducts, the acquired images were reformatted in different planes using the maximum intensity projection (MIP) algorithm as post-acquisition image processing to produce a three-dimensional cholangiogram.

MRC showed two gall bladders, one in the gall bladder fossa with multiple intraluminal stones and a second gall bladder with also multiple stones, adjacent and inferomedial to the former. Both gall bladders have separate cystic ducts that joined to form a common cystic duct. The common cystic duct then joined the common hepatic duct to form the common bile duct. The dominant gall bladder showed increased wall thickness.(Figures 1-3) Based on this finding patient underwent laparoscopic cholecystectomy of the two gall bladders and recovered full.t complication.

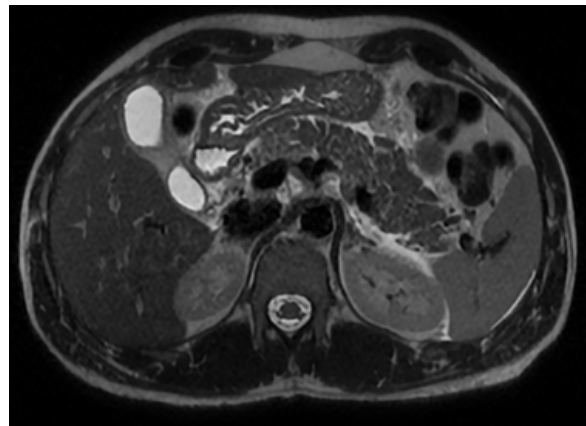


Figure 1: Axial T2 SS FSE shows two separate gall bladders in the gall bladder fossa. (Arrows) [key: T2 SS FSE – T2 Single-shot fast spine echo]



Figure 2: Coronal 3D MRC shows two separate gall bladders with separate cystic ducts that joined to form a common cystic duct (Arrows).

Key: 3D MRC – Three dimensional magnetic resonance cholangiogram

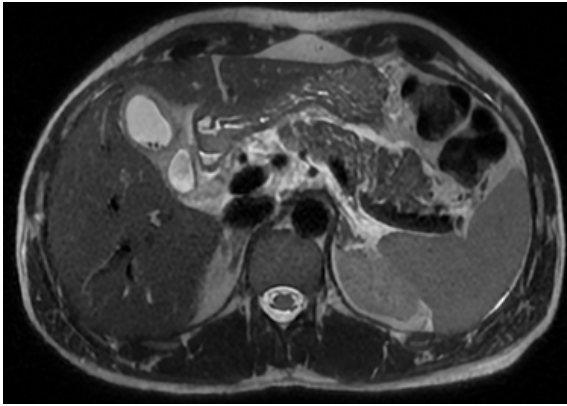


Figure 3: Axial T2 SS FSE shows two separate gall bladders with increased wall thickness and multiple stones in one of them (big arrow).

key: T2 SS FSE – T2 Single-shot fast spine echo

DISCUSSION

Gall bladder duplication is a rare congenital anomaly of the biliary system which is extremely important in clinical practice especially for surgeons and radiologists alike. The radiologists must be conversant with gall bladder duplication for correct diagnosis to be made and properly guide surgical intervention especially when laparoscopic cholecystectomy is considered.

Gall bladder duplication can appear from two separate origins during embryological development. As a split primordium, when there is only one cystic duct entering the common bile duct or as an accessory gall bladder; when two separate primordium arises on the biliary tree.[2,8] Multiple anatomic variants of gall bladder duplication exist and were first described by Boyden in 1926. [6] Classification according to Boyden's divides gallbladder duplication into three groups as follows: [3,6,9]

1. bilobed, incomplete gallbladder division with one common cystic duct,
2. complete gallbladder duplication with separate cystic ducts joining the common hepatic duct and
3. complete gallbladder duplication with a common cystic duct entering the common hepatic duct.

The differential diagnosis of gall bladder duplication should include phrygian cap,

choledochal cyst, compartmentalization due to gallbladder folding, dilated cystic duct remnant, gall bladder diverticulum, focal region of pericholecystic fluid, focal adenomyomatosis and intraperitoneal fibrous (Ladd's) bands.[10]

Congenital anomalies of the gall bladder and its anatomical variants are associated with an increased risk of complications especially during laparoscopic gall bladder removal.[11] Preoperative imaging is mandatory especially when gall bladder anomaly is suspected. Gall bladder duplication can be identified with Oral cholecystography (OCG), scintigraphy and helical computed tomography (CT) performed after OCG. [7] However, each of these techniques is associated with some disadvantages, which do not always allow accurate preoperative diagnosis of this anomaly even when combined. Others investigations such as percutaneous transhepatic cholangiography and endoscopic retrograde cholangiopancreatography(ERCP) can be used to discern suspected gall bladder duplication. However, both are invasive and not routinely used in patients with biliary disease. [7] Besides, all the techniques mentioned above are associated with exposure to ionizing radiation.

Ultrasound is generally the imaging modality of choice in patients with suspected gall bladder disease. Although US finding may suggest a double gall bladder, it does not always allow adequate visualization of the cystic duct. In recent times, magnetic resonance cholangiopancreatography (MRCP) is the investigation of choice to portray the biliary anatomy and for precise preoperative planning. [1] MRCP is advantageous over other imaging modalities for the detection and characterization of gall bladder duplication due to noninvasiveness, absence of contrast medium injections, and does not use ionizing radiation and three-dimensional images. The fast acquisition time makes the technique suitable even for infants and other uncooperative and debilitated patients. MRCP enables adequate preoperative information to be obtained without much risk to the patient [7] In the case under review, the ultrasound finding was

confusing but strongly suggested biliary tract anomaly. MRCP rapidly revealed the gall bladder duplication, allowing the correct preoperative diagnosis of gall bladder duplication to be made. Duplication should be considered when two cystic ducts are present on preoperative imaging.[3] The currently accepted surgical treatment for gall bladder stones is laparoscopic cholecystectomy, hence the preoperative diagnosis of gall bladder duplication and its variants are crucial.[7] Simultaneous removal of both gall bladders at surgery is recommended to avoid cholecystitis and symptomatic gall stones in the remaining organ.[3] However, it should be known that prophylactic cholecystectomy in an asymptomatic patients with gall bladder duplication is not recommended because there seem to be no significant increase in the risk of gall bladder disease in patients with a duplicated gall bladder. [3]

CONCLUSION

The pre-operative diagnosis of gall bladder duplication is especially crucial to prevent possible surgical complications and repeat laparotomies. MRCP is the modality of choice to characterize this anomaly. Radiologists play decisive role in providing accurate preoperative diagnosis via appropriate imaging such as MRCP to prevent serious complications of laparoscopic surgeries in these patients.

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Author contributions

All authors have read and approved the manuscript. Each author participated sufficiently in this submission and the roles of the authors are: ANM, KMA, HMA were the main researchers, drafted the manuscript, responsible for data capturing, presentation of results, ANM, KMA, MPO, NA and MA carried out the interpretation of results while MPO, NA, HMA and MA gave recommendations on the review of literatures, and provide critical comments on the research work.

Data availability:

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

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Consent for publication

'Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal'.

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