

# ULTRASOUND EXAMINATION OF ANATOMICAL VARIATIONS OF THE GALL BLADDER

**Afrim Pirraçi, Arben Mitrush, Drita Totozani**

Faculty of Medicine, Tirana, Albania.

**Corresponding author:** Afrim Pirraçi, Faculty of Medicine;  
Address: Rr. "Dibres", No. 370, Tirana, Albania;  
Telephone: +355672058684; E-mail: afrim\_pirraci@yahoo.com

## Abstract

In surgical settings, it is very important to know and understand the anatomy and different types of variations of the gall bladder and the biliary tract, because these structures are in close connection with the adjoining organs and may show various anomalies and anatomic variations. There exist several variations of the normal gall bladder including duplications (ectopic cysts), septate cholecyst, agenesis and hypognesis of the gall bladder, variations of the form of the gall bladder including "Phrygian cap", Hartmann's pocket, as well as other types of anatomic variations. In this short report, we highlight some of these anatomic variations of the gall bladder which are also examined and documented among hospitalized patients at the University Hospital Center "Mother Teresa" in Tirana and in a large and representative sample of primary health care users in Tirana municipality, the Albanian capital.

**Keywords:** *anatomic anomaly, anatomic variation, biliary tract, ectopic gallbladder, gall bladder, multiseptate gall bladder, Phrygian cap.*

## Introduction

The gall bladder and the biliary tract are structures in close connection with the adjacent organs and may show various anomalies and anatomic variations. Therefore, in surgical settings, it is very important to know and understand the anatomy and different types of variations of the gall bladder and the biliary tract (1,2).

There exist several variations in the normal gall bladder including duplications (referred to as *ectopic cysts*), septate cholecyst, agenesis and hypognesis of the gall bladder, variations of the form of the gall bladder including "Phrygian cap", Hartmann's

pocket, as well as other types of anatomic variations (1,3,4).

In this short report, we highlight some of these anatomic variations of the gall bladder which are also examined and documented among hospitalized patients at the University Hospital Center "Mother Teresa" in Tirana, and in a large and representative sample of primary health care users in Tirana municipality, the Albanian capital city. More specifically, Box 1 presents some of the major anomalies of the gall bladder which were also addressed in Tirana study through a systematic and comprehensive ultrasound examination.

## Phrygian cap

It has been well-documented that the gall bladder often folds on itself, at the junction of the fundus with body, which may result in a normal anatomical variation referred to as the “Phrygian cap” gall bladder (5). This appearance sometimes can be erroneously labeled as a “septate gall bladder” by the ultrasound examiners. It should be pointed out that the commonest cause for the “septate” appearance of the gall bladder is the Phrygian cap anatomical variation (5). Nevertheless, the ultrasound examination sometimes fails to detect the Phrygian cap variation of the gall bladder, because this assessment depends on the discretion/ judgment of the examiner (operator) [5]. Therefore, magnetic resonance cholangiopancreatography (MRCP) examination is considered a more objective means of diagnosis of this anatomic variation of the gall bladder as compared to the “subjective” ultrasound examination (5). Furthermore, ultrasound examination may also fail to detect the recurrent pyogenic cholangitis (RPC), a condition which is characterized by recurrent inflammation of the bile ducts (5,6), because echography can merely evaluate the dilatation of the biliary tree and not the inflammatory response of the biliary tree wall (7,8), which is best distinguished by contrast enhancement, such as the case of the MRCP examination (5). Thus, the delayed phase contrast enhances imaging on MRI, which can portray the RPC (5).

In our study in Tirana, including hospitalized patients at tertiary level as well as primary health care users, the frequency of Phrygian cap was evident in about 1%-6% of the examined individuals. Details on the main findings of this study are under review elsewhere, but can be made available upon request (email: afrim\_pirraci@yahoo.com).

## Multiseptate gall bladder

Multiseptate gall bladder is a rare variance which was first described in 1963 by Simon and Tandon (9). This condition is considered as a consequence of an incomplete cavitation of the developing gall bladder bud (10-12). Since 1960s, over 30 cases with this anomaly have been reported in detail in the international literature (10). Thus, a few cases of multiseptate gall bladder have been reported to be associated with cholelithiasis, with choledochal cyst,

or with primary biliary cirrhosis (10). Furthermore, in some other cases, the gall bladder turned out to be hypoplastic (10). Multiseptate gall bladder is a condition that may exist as an isolated variation or may coexist with other biliary system anomalies such as e.g. hypoplasia (10,13), or a choledochal cyst (10,12).

Diagnostic imaging means for multiseptate gall bladder include oral cholecystography, intravenous cholecystography, sonography, CT, endoscopic retrograde cholangiopancreatography, and MRCP (10,14). It has been demonstrated that the MRCP provides more constant visualization of biliary abnormalities (10). However, availability of this examination procedure and its related cost are major limitations of MRCP compared with sonography. Therefore, it has been suggested that the primary imaging means for gall bladder abnormalities should consist of sonography (10).

## Ectopic gall bladder locations

Ectopic gall bladder locations include intrahepatic, left-sided within the lesser omentum, within the falciform ligament, suprahepatic, retrohepatic, retroperitoneal, retroduodenal, retropancreatic, and within the abdominal wall (15). As for the diagnostic imaging means, both sonography and MRCP may be helpful for demonstration of ectopic gall bladders. Nonetheless, it has been argued that the MRCP may be more informative because it enables a clearer visualization of the relationship between the cystic duct, ectopic gall bladder, and common hepatic duct (10).

## Congenital malformations of the gall bladder

Congenital malformations of the gall bladder can be categorized by their location, size, number, and shape. The most common congenital anomaly of the gallbladder is variation in its location. Agenesis and duplication of the gallbladder are less common. Multiseptate gallbladder, an anomaly of shape, is extremely rare. It may exist as an isolated anomaly or coexist with other biliary system anomalies such as hypoplasia (10,13), or choledochal cyst (10,12).

## Study about anatomic variations of the gall bladder in Tirana, Albania

A study was conducted in Tirana in 2011-2012 including about 6300 hospitalized patients at the University Hospital Center "Mother Teresa" – the only tertiary level facility in Albania – and a representative sample of about 3100 primary health care users in Tirana city. Both study groups (hospitalized patients and primary health care users) underwent an ultrasound examination for assessment of anatomic variations of the gall bladder. The aim

of this study was to assess the overall prevalence of anatomic variations of the gall bladder. Furthermore, among individuals with anatomic variations of the gall bladder, a secondary objective was to describe the distribution of the major types of anatomic variations of the gall bladder. In addition, an important objective of this study was to assess the association of the anatomic variations of the gall bladder with demographic characteristics (including sex and age of the examined individuals). Findings from this study are currently under review in another scientific journal.

### Box 1. Selected anatomic variations of the gall bladder

- Duplications (*ectopic cysts*)
- Septate cholecyst
- Agenesis / Hypogenesis
- Variations of the form of the gall bladder
- Hartmann's pocket
- Phrygian Cap
- Biliary porcelanosa

## References

1. Onder H, Ozdemir MS, Tekba° G, Ekici F, Gümü° H, Bilici A. 3-T MRI of the biliary tract variations. *Surg Radiol Anat* 2013; 35: 161-167.
2. Mortelet K, Ros PR. Anatomic variants of the biliary tree: MR cholangiographic findings and clinical applications. *AJR Am J Roentgenol* 2001; 177: 389-394.
3. Puente SG, Bannura GC. Radiological anatomy of the biliary tract: variations and congenital abnormalities. *World J Surg* 1983; 7:271-276.
4. Schwartz SI (1999). Gallbladder and extrahepatic system. In: Schwartz SI, Shires GT, Spencer FC et al (eds.) *Principles of surgery*, 7th edn. McGraw-Hill, New York.
5. Basaranoglu M, Balci NC. Recurrent cholangitis associated with biliary sludge and Phrygian cap anomaly diagnosed by magnetic resonance imaging and magnetic resonance cholangiopancreatography despite normal ultrasound and computed tomography. *Scand J Gastroenterol* 2005; 40:736-740.
6. Cook J, Hou PC, Ho HC, McFadzean AJ. Recurrent pyogenic cholangitis. *Br J Surg* 1954; 42:188-203.
7. Bortoff GA, Chen MY, Ott DJ, Wolfman NT, Routh WD, et al. Gallbladder stones: imaging and intervention. *Radiographics* 2000; 20:751-766.
8. Hakansson K, Leander P, Ekberg O, Hakansson HO. MR imaging in clinically suspected acute cholecystitis. A comparison with ultrasonography. *Acta Radiol* 2000; 41:322-328.
9. Simon M, Tandon BN. Multiseptate gallbladder: a case report. *Radiology* 1963; 80:84.
10. Türkvatani A, Erden A, Celik M, Olçer T. Ectopic hypoplastic and multiseptate gallbladder with coexisting choledochal cyst: evaluation with sonography and magnetic resonance cholangiopancreatography. *J Clin Ultrasound* 2006; 34:88-91.
11. Kapoor V, Federle MP, Peterson MS, et al. Long term

- sonographic follow-up of stable imaging findings of multiseptate gallbladder. *J Ultrasound Med* 2002; 21:677.
12. Tan CE, Howard ER, Driver M, et al. Non-communicating multiseptate gallbladder and choledochal cyst: a case report and review of publications. *Gut* 1993; 34:853.
  13. Jena PK, Hardie RA, Hobsley M. Multiseptate hypoplastic gallbladder. *Br J Surg* 1977; 64:192.
  14. Nakazawa T, Ohara H, Sano H, et al. Multiseptate gallbladder: diagnostic value of MR cholangiography and ultrasonography. *Abdom Imaging* 2004; 29:691.
  15. Pradeep VM, Ramachandran K, Sasidharan K. Anomalous position of the gallbladder: ultrasonographic and scintigraphic demonstration in four cases. *J Clin Ultrasound* 1992; 20:593.