

Morphological variations of gallbladder in the Albanian population

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Abstract

Aim: In surgical settings, it is important to understand the anatomy and different types of variations of the gallbladder and the biliary tract, because these structures are in close connection with the adjoining organs and may show various anomalies and anatomic variations. Our aim was to assess the level of morphological variations of gallbladder in the Albanian population.

Methods: A sample of 9481 primary health care users aged ≥ 80 years was examined in Tirana, the Albanian capital city, during 2011-2012 (response rate: 95%). All participants underwent an ultrasound examination of the gallbladder.

Results: Overall, the length of gallbladders ranged from 5 cm to 12 cm. However, in 81% of study participants, the length of gallbladders ranged from 7 cm to 10 cm. Conversely, the width of gallbladders ranged from 2.5 cm to 5.0 cm (mean value: 3.89 ± 0.75 cm). There was evidence of a moderate positive correlation between length and width of gallbladders ($r=0.34$, $P=0.008$). Overall, there were 74 (0.78%) cases with gallstones (95%CI=0.61%-0.98%). About 85% of study participants had a pear-type gallbladder.

Conclusion: Our study provides novel evidence on the morphological variations of gallbladder in the Albanian population. Our findings pertinent to the prevalence of gallstones and anatomical variation of the gallbladder are generally compatible with similar reports from other countries.

Keywords: anatomic variation, biliary tract, gallbladder, gallstone, morphological variation.

Introduction

The gallbladder 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 gallbladder including duplications (referred to as *ectopic cysts*), septate cholecyst, agenesis and hypoplasia 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).

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 (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 a study conducted 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: afirim_pirracci@yahoo.com).

Multiseptate gall bladder is a rare variance and is considered as a consequence of an incomplete cavitation of the developing gall bladder bud (9-12). 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 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 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). Distribution of dimensions and shapes of the gallbladder in the Albanian population has not been

reported to date. From this point of view, the information about morphological variations of the gallbladder in the general Albanian population is scarce. In this context, the aim of our study was to assess the level of morphological variations of the gallbladder examined in a large and representative sample of primary health care users in Tirana municipality, the Albanian capital city.

Methods

A sample of 10000 primary health care users in Tirana (aged ≥ 80 years) was targeted for inclusion in our study during 2011-2012. Of the overall target population, 285 individuals were not eligible for inclusion in this study, whereas a further 234 individuals refused to participate in our study. The final sample which was examined consisted of 9481 individuals who agreed to participate in the study (response rate: 94.81%).

All participants underwent an ultrasound examination of the gallbladder after being informed about the aims and procedures of the study. The lengths, widths and shapes of gallbladders were measured and defined among all individuals who agreed to participate in the study.

The descriptive analysis consisted of presentation of the distribution of dimensions and shapes of gallbladders among our study participants. Absolute numbers, percentages and their respective 95% confidence intervals (95%CI) were calculated with use of WIN-PEPI (Program for Epidemiologists).

Results

The length of gallbladders ranged from 5 cm to 12 cm in the total sample included in this study. Overall, 334 (3.52%, 95%CI=3.16%-3.91%) of the study participants had a gallbladder length from 5.0 cm. to 7.0 cm; 7679 individuals (80.99%, 95%CI=80.19%-81.78%) had a gallbladder length from 7.1 cm to 10.0 cm, and; 1468 further participants (15.48%, 95%CI=14.76%-16.23%) had a gallbladder length from 10.1 cm to 12.0 cm (Table 1).

Table 1. Distribution of gallbladder length in a large sample of primary health care users in Albania (N=9481)

Gallbladder length	Number	Percentage	95%CI
5.0-7.0 cm	334	3.52	3.16-3.91
7.1-10.0 cm	7679	80.99	80.19-81.78
10.1-12.0 cm	1468	15.48	14.76-16.23
Total	9481	100%	-

On the other hand, the width of gallbladders in the total sample ranged from 2.5 cm to 5.0 cm (mean value: 3.89 ± 0.75 cm). Overall, 1089 (11.49%, 95%CI=10.85%-12.15%) of the study participants had a gallbladder width from 2.5 cm to 3.0 cm; 6371 individuals (67.20%, 95%CI=66.24%-68.14%) had a gallbladder width from 3.1 cm to 4.5 cm, and; 2021 participants (21.32%, 95%CI=20.50%-22.16%) had a gallbladder width from 4.6 cm to 5.0 cm (Table 2).

Table 2. Distribution of gallbladder width in a large sample of primary health care users in Albania (N=9481)

Gallbladder width	Number	Percentage	95%CI
2.5-3.0 cm	1089	11.49	10.85-12.15
3.1-4.5 cm	6371	67.20	66.24-68.14
4.6-5.0 cm	2021	21.32	20.50-22.16
Total	9481	100%	-

There was evidence of a moderate positive correlation between the length and width of gallbladders ($r=0.34$, $P=0.008$).

Table 3. Distribution of gallbladder shapes among study participants (N=9481)

Gallbladder shape	Number	Percentage	95%CI
Pear	8039	84.79	84.05-85.50
Cylindrical	321	3.39	3.03-3.77
Balloon	493	5.20	4.76-5.67
Sand watch	329	3.47	3.11-3.86
Inverted	158	1.67	1.42-1.94
Disordered	141	1.49	1.19-1.84
Total	9481	100%	-

Table 3 presents the distribution of gallbladder shapes among study participants. Overall, 8039 (84.79%, 95%CI=84.05%-85.50%) individuals had a pear-type gallbladder; 321 (3.39%, 95%CI=3.03%-3.77%) had a cylindrical type of the gallbladder; 493 (5.20%, 95%CI=4.76%-5.67%) had a balloon shape of the gallbladder; 329 (3.47%, 95%CI=3.11%-3.86%) had a sand watch shape of the gallbladder; 158 (1.67%, 95%CI=1.42%-1.94%) had an inverted type of the gallbladder, and; a further 141 individuals (1.49%, 95%CI=1.19%-1.84%) had a disordered-type of the gallbladder.

Overall, there were 74 (0.78%) cases with gallstones (95%CI=0.61%-0.98%) [data not shown in the tables].

Discussion

This is the first report from Albania presenting the morphological variations of the gallbladder in a large representative sample of the Albanian population

attending primary health care services in Tirana. Our study provides valuable evidence on the distribution of gallbladder dimensions (length and width) in the general population. In addition, this study informs about the distribution of the major shaper of gallbladders in the Albanian population.

Generally, our findings are compatible with prior international reports involving population-based studies conducted in different countries worldwide (1,3,4). From this point of view, our findings pertinent to the prevalence of gallstones and anatomical variations of gallbladders are generally compatible with similar reports from other countries (5-15).

Another 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. The hospitalized patients underwent an ultrasound examination for assessment of anatomic variations of the gall bladder (findings from this study are currently under review in another scientific journal). 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. Findings from this study including hospitalized patients are comparable with the current survey involving primary health care users in Tirana. From this perspective, the distribution of dimensions (length and width) and shapes of gallbladders were essentially similar in both study populations (that is hospitalized patients and primary health care users). Our study may have several limitations. Notwithstanding its relatively huge size, the sample included in this study may not be representative of the overall Albanian population given the fact that our study participants were recruited from primary health care services in Tirana. However, we included in our study primary health care users selected at random over a defined time period.

In conclusion, our study provides novel evidence on the morphological variations of gallbladder in the Albanian population. Future studies in Albania should involve population-based samples and should explore in detail the link between gallbladder shape and size with morbidity outcomes.

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