

Variations In The External Morphology Of Gall Bladder: A Cadaveric Study In South Coastal Population.

Chakka Sreekanth¹, Makani Thanuja Kumari², Lattupalli Hema³,

¹Associate professor of anatomy, Sri Padmavathi Medical college for women, SVIMS Tirupathi.

²Assistant professor of anatomy, Narayana Medical College, Nellore

³Professor and head of anatomy, Narayana Medical College, Nellore.

Abstract

Background: The extra hepatic biliary apparatus usually presents with some anatomical or embryological variations which go unnoticed and are commonly encountered during some radiological investigations or in operation theaters. Such variations of the morphology of Gall bladder have been well documented in the literature for many years but a detail morphological study of variations of the gall bladder and its incidence is very rare. In this era of quick results, increasing use of diagnostic and interventional procedures makes it important to study variations of gall bladder morphology. Most of the interventional procedures in this modern era are done laparoscopically and there is tremendous increase in the number of laparoscopic cholecystectomies. So, sound knowledge of possible variations in morphology of gall bladder is important.

Materials and Methods: This study was undertaken on 100 cadaveric liver and gall bladder specimens in terms of length, maximum transverse diameter, and shape, external variations of gall bladder, Interior and length of gall bladder below the inferior border of the liver.

Results: Gall Bladder had length ranging between 3.3 and 10 cm, transverse diameter between 2.0 and 5.0 cm. The commonest shape observed in this study was pear shaped in 80% of cases. The length of gall bladder below the inferior border of liver varied between 0.4 and 2.5 cm.

Conclusion: The growing importance of such variations, lie not only from the point of biliary disease but also with respect to the various invasive techniques in the diagnosis and treatment of gall bladder and extra hepatic bile duct disease.

Keywords: Cholecystectomies, Laparoscopically, Variations, Interventional, Malformations, external variations, shapes of gall bladder.

I. Introduction

The gall bladder (GB) is a pear shaped hollow viscus, slate blue in colour situated obliquely in a non peritoneal fossa on the under surface of the right lobe, and extends from the right end of porta hepatis to the inferior border of liver. It measures about 7cms to 10 cms in length, maximum breadth being 3cms and capacity is 30 – 50 ml. The presenting parts of gall bladder are from below upwards and downwards: fundus, Body and Neck. The fundus is the lower expanded free end of the gall bladder which projects below the liver. It is directed downwards, forwards and to the right meeting the anterior abdominal wall at an angle of 30°. It is invested by peritoneum on all sides. The body of gall bladder extends from the fundus to the neck, and is directed upwards, backwards and to the left. Upper surface of the body is non peritoneal, and the lower surface and sides are covered by peritoneum. The neck forms an S shaped curve and extends from the body to the cystic duct. At first the neck passes upwards and forwards, then turns abruptly downwards and backwards, and is continuous with the cystic duct separated by a constriction. From the neck a small diverticulum known as Hartmann's pouch sometimes projects downwards and backwards towards the duodenum .the portion of the neck giving attachment to Hartmann's' pouch is sometimes called the "ISTHMUS OF GALL BLADDER."

Though human beings are thought to be singularly thought to be alike in their general anatomic construction, yet we come to investigate one particular region with more detail, it is surprising how frequent we meet one sort or another type of variation. This is also very true in case of anatomy of extra hepatic biliary apparatus, that according to some eminent workers, there is no normal anatomy of extra hepatic biliary tract instead, a common pattern of variations exist and it is the surgeons duty to be familiar with and recognize the normal variations when present [2]. Anomalies of the extra hepatic biliary apparatus can arise from the gall bladder, cystic duct, hepatic duct and the common bile duct and it is imperative to be familiar with them in order to avoid the disastrous consequences during surgeries.

It is very much essential to have a basic knowledge regarding the development and normal anatomy of biliary tract which gives us a fuller understanding of the anatomical and embryological anomalies. The knowledge of these variants will make the laparoscopic procedures easier, though preoperative diagnosis sometimes goes un seen in few cases, which in turn is an unexpected finding during laparoscopic surgeries. This

study will be an addition to the literature and will create awareness among anatomists, radiologist, to surgeons and also gastroenterologist medical and surgical to be thorough regarding the normal and abnormal aspects of Gall Bladder

II. Materials And Methods

This study was carried on 100 liver and gallbladder specimens obtained from 10% formalin fixed cadavers in the Department of Anatomy of Narayana Medical College, Nellore. Cadavers with obvious abdominal surgery and crush injury to the abdominal organs were excluded from the study. The parameters studied were the maximum length of gall bladder, maximum transverse diameter, shape, external variations of gall bladder, Interior, Level i.e. length of gall bladder below the inferior border of the liver. Maximum length and maximum transverse diameter was measured using metallic measuring tape graduated in centimeters. The shape of gall bladder was noted down. Any variation in external appearance of gall bladder was also noted. Part of the gall bladder i.e. fundus that lie below the inferior border of liver was noted. Interior of gall bladder was also visualized to see any abnormality by cutting across its wall with the help of a scalpel blade.

III. Results

Maximum length of gall bladder: Average length of gall bladder was found to be 10 cm. The smallest gall bladder was 3.3 cm in length and the largest had length 12 cm. 48% (48/100) GB had length ranging between 7 and 10cm.

Maximum transverse diameter of gall bladder

Mean breadth of gall bladder was 3.46 cm. The shortest transverse diameter was 2.0 cm and largest 5.0 cm. 68% (68/100) GB had a maximum transverse diameter between 2 and 5cm.

Shape of gall bladder:

The gall bladders were classified according to their shapes. Various shapes observed were pear shaped, cylindrical shaped, hourglass shaped, retort shaped, flask or irregular shaped. The commonest shape found was pear shaped (80/100, 80%).

External appearance of gall bladder:

Foldings of neck and fundus (whether anteriorly or posteriorly) were noted. Folding of neck or fundus was noted in 6 out of 100 specimens of GB.

Length of gall bladder below inferior border of liver:

The length of gall bladder below the inferior border of liver varied between 0.4 and 2.5 cm.

Interior of gall bladder:

In most of the gall bladders, interior was found to be normal with numerous rugosities of the mucosa. Gall stones were not observed in any of the specimens either singly or in multiples, but calcified structures were found singly but we could not differentiate it. Mucosal adhesions and septa were observed.

IV. Discussion

The gall bladder, liver and the biliary ductal system develop from the hepatic endodermal diverticulum of the foregut, at the beginning of the fourth week of development. This diverticulum rapidly proliferates into the septum transversum and divides into two parts – the cranial part develops the liver and the bile ducts while the caudal part gives rise to the gall bladder and the cystic duct. Any arrest or deviation from the normal embryological developmental process may result in some sort of malformation of the gallbladder and of the biliary system [2].

The measurements of length and breadth of gallbladder were very similar to that found by Shari RS and Shah SA1 (2008) and Jaba Rajguru et al (2012). Comparison of length and breadth with other workers has shown in table I. Size of gall bladder varies in different diseased conditions as well as in some physiological conditions too. It may be impossible sometimes to distinguish between various parts described. The size of GB may increase after vagotomy, diabetes, Pregnancy, sickle cell disease, after cystic duct or common bile duct obstruction [2].

Shapes of GB vary tremendously and various authors have described various shapes. The terminologies describing the shape are also very confusing. We found pear shaped GB as most common in 80 patients (80%). Jaba Rajguru et al [2] noted pear shaped gall bladder in 85% Specimens. Holinshed [3] (1983), Shaher [4] (2005), Moore and Dalley [5] (2006), Chari and Shah [1] (2008) noted various shapes of GB.

The gall bladder is relatively constant in its development and the two most significant variations are the folded fundus and variation at the neck of the gall bladder [3]. The folded fundus of the gall bladder, also called as the Phrygian cap, was reported in 3-7.5% of GB by Lichtenstein & Nicosia [6] (1955). They proposed that it could due to a disproportion between the size of the gall bladder and that of the gallbladder bed, but without any pathological significance [2].

In our study, we found folded fundus in 2 GB (2%) and folded neck in 4 GB (4%) folded fundus and neck 02 (02%). Deutsch⁷ (1986) and Gore et al [8] (2000) recorded folded fundus in very few percentage of GB [2]. The length of Gall bladder below the inferior border of the liver in our study was found to be ranging between 0.4 and 2.5 cm. This is the most susceptible part of GB that can be damaged in laparoscopic procedures.

The interior showed adhesions and septa. Septum was observed in only 2 GB (2%). Csepel et al (2003), Chalkoo (2009) and Talpur et al (2010) also observed septum in some gall bladders [2]. In our study, five gall bladders (5/100, 5%) showed the presence of stones in its interior. However congenital anomalies of gallbladder are rare and can be accompanied with other biliary and vascular malformations [9]. Due to these anatomical variations, complications seen were bleeding and biliary leaks leading morbidity [10].

V. Conclusion

The occurrence of cluster of congenital anomalies and anatomical variations of gall bladder and extra-hepatic biliary tree though are not common but can be of clinical importance and surprising to the surgeons if present. But the literature regarding morphological variations of the gall bladder and their incidence is scarce. These variations generally remain symptoms free but often lead to complications and therefore must be correlated clinically. Awareness of these anomalies will decrease morbidity, and re exploration in such patients. Most of the interventional procedures in this modern era are done laparoscopically and there is tremendous increase in number of laparoscopic Cholecystectomies. So, thorough knowledge of possible variations in morphology of gall bladder is important. This article will be of utmost useful to the surgeons to understand and identify possible variations of GB morphology.

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1. SMALL GALL BLADDER



2. IRREGULAR SHAPED GALL BLADDER



3. CYLINDRICAL SHAPED GALL BLADDER



4. RETORT SHAPED GALL BLADDER



5. FLASK SHAPED GALL BLADDER



6. HOUR GLASS SHAPED GALL BLADDER



7. FUNDUS FOLDED ANTERIORLY



8. PHYRGIAN CAP



9. FOLDED NECK POSTERIORLY



10. FOLDED NECK ANTERIORLY



11. LARGE GALL BLADDER



Table: 01. Shape of the gall bladder.

SHAPE	NUMBER	PERCENTAGE
PEAR	80	80%
FLASK	10	10%
CYLINDRICAL	4	04%
HOUR GLASS	2	02%
RETORT	2	02%
IRREGULAR	2	02%

Table: 02. External variations of the gall bladder.

External variation	Position of folding	Number of specimens	percentage
Folded fundus	Anteriorly	01	01%
	posteriorly	01	01%
Folded neck	Anteriorly	02	01%
	Posteriorly	02	01%
Folded Fundus and Neck	Posteriorly	02	02%

Table: 03. Showing length and transverse diameters of gall bladder as recorded by other authors.

Sr. No.	Authors	Length Of Gall Bladder	Transverse Diameter Of Gall Bladder
1	Turner&Fulcher/(2000) 3	10cm	3-5cm
2	Chari &Shah (2008) 5	7-5cm	2-5cm
3	Vakili& Pomfret (2008)	7-4cm	4cm
4	Jaba Rajguru et al2 (2012)	5-12cm	2.5-5cm
5	Present study (2016)	7-10cm	2-5cm