

**A STUDY OF VARIATIONS IN THE EXTERNAL MORPHOLOGY OF GALL BLADDER**

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**ABSTRACT**

Extrahepatic Biliary apparatus comprises of gall bladder, cystic duct, hepatic ducts and CBD. Gall Bladder flask shaped blind end diverticula which are situated in contact with the undersurface of right lobe of liver. In adult the length is between 7-10 cms with a capacity of upto 50ml.<sup>[1]</sup> The gall bladder is described as having a fundus, body and neck. The fundus lies at the lateral end of the body and usually projects below the inferior border of the liver to a variable length.<sup>[2]</sup> There are a lot of variations in the anatomical structure of gall bladder and arrangements of ducts Variations in shape, size of gall bladder has long been debated by abdominal surgeons.<sup>[2]</sup> Variations in shape and size are not uncommon. The variations are frequent during imaging of gall bladder and during surgical procedures like laparoscopy and cholecystectomy. Normally gall bladder is found in right upper quadrant but may be found rarely in retrodudenal, retropancreatic or within falciform ligament, intrahepatic or retroplaced (retrohepatic).

**KEYWORDS:** Extrahepatic, cystic duct, CBD, retroplaced.**INTRODUCTION**

Extrahepatic Biliary apparatus comprises of gall bladder, cystic duct, hepatic ducts and CBD. Gall Bladder flask shaped blind end diverticula which are situated in contact with the undersurface of right lobe of liver. In adult the length is between 7-10 cms with a capacity of upto 50ml.<sup>[1]</sup> The gall bladder is described as having a fundus, body and neck. The fundus lies at the lateral end of the body and usually projects below the inferior border of the liver to a variable length.<sup>[2]</sup> There are a lot of variations in the anatomical structure of gall bladder and arrangements of ducts Variations in shape, size of gall bladder has long been debated by abdominal surgeons.<sup>[2]</sup> Variations in shape and size are not uncommon. The variations are frequent during imaging of gall bladder and during surgical procedures like laparoscopy and cholecystectomy. Normally gall bladder is found in right upper quadrant but may be found rarely in retrodudenal, retropancreatic or within falciform ligament, intrahepatic or retroplaced (retrohepatic).

**MATERIAL AND METHOD**

The study was conducted on 50 gall bladder obtained from formalin fixed cadavers used for undergraduate students during a period of 2 years After taking necessary permission from institutional ethical committee Cadavers with abdominal surgery and crush injury to abdominal organs were excluded. Following parameters were studied-

- 1) dimensions of gall bladder
- 2) shapes
- 3) Variations in the external morphology of gall bladder.

Parameters included maximum transverse diameter of gall bladder at the level of body of gall bladder and maximum from the tip of fundus to the neck of gall bladder with the help of metallic tape graduated in cms. To visualise interior of the gall bladder incision is made on the wall of gall bladder and observed.

**RESULTS**

50 cadaveric specimens were inspected in situ by the naked eye and then removed and measured.

Shape- according to shape gall bladder were classified as Pear shaped, Cylindrical, irregular, Hourglass shaped, Flask shaped and retort shaped.

**Table 1: Incidence of these shapes is presented in.**

Shape	Number	%
Pear	41	82%
cylindrical	7	14%
hourglass	1	2%
retort	1	2%
flask	0	0
irregular	0	0

**Length:** smallest length was 4.25cms and largest 10.5cms Average length 9.5 cms.

Transverse Diameter – shortest diameter was 2.5 cms and largest was 4.75cms. Average diameter was 3.62 cms.

Length of fundus below inferior margin 0-1.25 cms.

Folding of neck and fundus was observed in 6 cases (12%) out of which folding of neck in 2 cases and folding of fundus (phryngian cap) in 4 cases.

Interior of gall bladder was found to have large number of rugosities.

Gall stone was found in 1 case only.

## DISCUSSION

Variations in the anatomy of gall bladder, extrahepatic biliary system and the arteries that supply them and liver are important for the surgeons. Failure to recognise them may lead to inadvertent ductal ligation, biliary leak and strictures after laparoscopic cholecystectomy.<sup>[4]</sup> The liver primordium appears in the middle of the third week as an outgrowth of the endodermal epithelium at the distal end of the foregut, this outgrowth the hepatic diverticulum or liver bud consists of rapidly proliferating cells that penetrate the septum transversum that is the mesodermal plate between the pericardial cavity and the stalk of yolk sac. While hepatic cells continue to penetrate the septum, the connection between the hepatic diverticulum and the foregut narrows, forming the bile duct. A small ventral outgrowth is formed by the bile duct and this outgrowth give rise to the gall bladder and cystic duct.<sup>[5]</sup>

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.<sup>[6]</sup>

In present study the measurement of length and breadth of gallbladder is similar to the findings of chari and shah (2008), Jaba Rajguru et al (2012), Anjankar Vaibhav et al (2013), Rajendra R et al (2015) and J desai, N. bhojak (2015). Comparison of length and breadth is given in table no. 2.

Size of gall bladder may vary in some physiological condition as well as in some diseased conditions. Gore et al stated that size of gall bladder may increase after vagotomy, in diabetes because of autoimmune neuropathy, in sickle cell disease, after cystic and common duct obstruction, in pregnancy and in obese. Microgall bladder may found associated with cystic fibrosis.<sup>[7]</sup>

In present study folded gallbladder is found in 6 cases out of which 2 specimen of folded neck and 4 specimen of folded fundus. Rajendra R et al,<sup>[8]</sup>

Found incidence of normal gall bladder was 53.2%, oval shaped 11.4%, cylindrical 11.4%, hourglass shaped 6.3%, partially intrahepatic 5.1% and intrahepatic 3.8%, Phrygian cap 3.8%, left gallbladder 2.5%, double gall bladder 1.5%. Meistrup et al,<sup>[9]</sup> observed bending of gallbladder can occur anteriorly and posteriorly. Futura et al,<sup>[10]</sup> observed high prevalence of kinking of gall bladder and Hartmann's pouch in females. Prakash AV et al found folded fundus in 5.56% and folded neck in 4.44%. In present study we found in 12% cases folded neck in 2 cases and folded fundus in 4 cases.

**Table 2: Showing length and transverse diameter and shape (most common).**

	Author	Length (cms)	Breadth(cms)	Shape
1	Turner and fulcher (2000)	10	3-5	Elliptical
2	Chari and shah (2008)	7-10	2-5	Pear shaped
3	Vakil and Pomfret (2008)	7-10	4	Pyriform
4	Standring (2008)	7-10	---	Flask shaped
5	Jaba Rajguru et al (2012)	5-12	2.5-5	Pear shaped (85%)
6	Prakash AV et al (2013)	7-10	2-5	Pear shaped (71.11)
7	Rajendra et al (2015)	4-11	2.5-5	Pyriform shaped (53.2%)
8	J desai, N bhojak (2015)	4.5-11	2.8-5	Pear shaped 84%
9	Present study	4.25-10.5	2.5-4.75	Pear shaped (82%)

Length of fundus below inferior margin 0-1.25 cms.

Variation folded fundus & folded neck in 6 cases (12%). Gall stone in one case. No septation or duplication of gallbladder in present study.

Septation inside the gallbladder and diverticulum of gallbladder are also reported. Rajguru et al (2013) reported diverticulum of gallbladder in 9% cadavers. Duplication of gallbladder is also reported by

G.Desolneux et al in 2009. Agnesis of gallbladder was reported in association with trisomy 22 and 18.<sup>[11]</sup>

In present study septation and diverticulum are not found.

Gall bladder agnesis is an extremely rare embryological aberration with a reported incidence ranging between 0.075% (10-75 per 100,000 population).<sup>[12]</sup>

In present study septation and diverticulum are not found

## CONCLUSION

Congenital anomalies and anatomical variation of extrahepatic biliary tree are rare but not uncommon. Failure to recognise those can lead to iatrogenic injuries and increase morbidity and mortality. Awareness of these anomalies will help in performing interventional procedures. This study will help surgeons and interventional radiologists to understand and identify the possible variation of gall bladder.

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