

Cadaveric Study of Morphology, Capacity & Peritoneal Relations of Gall Bladder

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Abstract

Context: In case of gall bladder disease the surgeon can efficiently handle the case if he is aware of the variations of the extra hepatic biliary apparatus without which the prognosis is unwelcome. *Aims:* The aim of the study is to study the volume, peritoneal relations & variations in the external morphology of the gall bladder, the knowledge of which is important for imaging of gall bladder and surgical procedures on gall bladder such as cholecystectomy and laproscopy surgery. *Settings and Design:* It was an observational study. The observations were made on following parameters - Capacity (Volume), morphological variations, peritoneal investment of the gall bladder, Relation of the fundus of gall bladder to the anterior margin of the liver. *Methods and Material:* The study was conducted on 100 gall bladders obtained from dissection of abdomen of formalin fixed cadavers. The specimen of gall bladder was observed for morphological variations on the visceral surface of the liver in the gall bladder fossa. *Statistical Analysis used:* Percentage for various parameters was calculated. *Results:* In 80% of the cases the capacity of gall bladder was ranging from 40 to 75ml. In 75% of cases the peritoneal investment on the non hepatic surface was 2/3rd to 3/4th. In 57% of cases the fundus was inframarginal & one case of bilobed gall bladder was observed. *Conclusions:* The gall bladder shows variations which the radiologists and the operating surgeons should keep at the back of their mind while imaging and operating for good surgical outcomes.

Keywords: Gall Bladder; Peritoneal Relations; Volume; Fundus; Marginal.

Introduction

Abdomen is known as Pandora's box and the viscera it contains are well known for their variations in size, shape, relations and vascular supply. The diagnosis of medical and surgical conditions associated with the abdominal viscera is always not possible with precision. As a result most of the diagnosis is done on the operation table. In case of gall bladder disease the surgeon can efficiently handle the case if he is aware of the variations of the extra hepatic biliary apparatus without which the prognosis is unwelcome. Gall

bladder lies in the gall bladder fossa on the visceral surface of the liver. It has neck, body and the fundus. The fundus is related to the inferior margin of the liver. Deaver (1911) [1] emphasised the variations of morphology of gall bladder and bile duct especially in the surgery of the aforesaid organ. The present study is a part of study of variations in extrahepatic biliary apparatus in which the variations in the external morphology of the gall bladder are described. The aim of this study is to study the volume, peritoneal relations & variations in the external morphology of the gall bladder, the knowledge of which is important for imaging of gall bladder and surgical procedures on gall bladder such as cholecystectomy and laproscopy surgery.

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Materials and methods

The study was conducted on 100 gall bladders obtained from dissection of abdomen of formalin fixed cadavers in the department of Anatomy,

Patna medical college and hospital over the period of three years. The specimen of gall bladder was observed for morphological variations on the visceral surface of the liver in the gall bladder fossa. The observations were made on following parameters - Capacity (Volume), morphological variations, peritoneal investment of the gall bladder, Relation of the fundus of gall bladder to the anterior margin of the liver. The capacity of the gall bladder was measured by distending the gall bladder with direct injection of the aqueous suspension.

Results

In 80% of the cases the capacity of gall bladder was ranging from 40 to 75ml, while in 12% of cases the capacity range was 25 to 40ml and in 7% of cases the capacity was around 80 to 120ml (Table 1). In 75% of cases the peritoneal investment on the non hepatic surface was $2/3^{\text{rd}}$ to $3/4^{\text{th}}$, while in 13% of cases it was more than $3/4^{\text{th}}$ and in 12% of cases it was less than $2/3^{\text{rd}}$ (Table 1). In 57% of cases the fundus was inframarginal, while in 26% of cases it



Fig. 1: Bilobed gall bladder with wall thickening and gall stones. Arrow pointing towards peritoneal covering of one of the lobe

was marginal and in 17% of cases it was supramarginal (Table 1).

Bilobed gall bladder was seen in 2% cases in which one of the lobe was attached to a separate mesentery (Figure 1). In 20% of the cadaveric dissections the gall bladder showed evidence of disease. In 12% of cases there was cholelithiasis (Figure 1), 3% there was choledocholithiasis and 4% of cases showed adhesion with gross thickening.

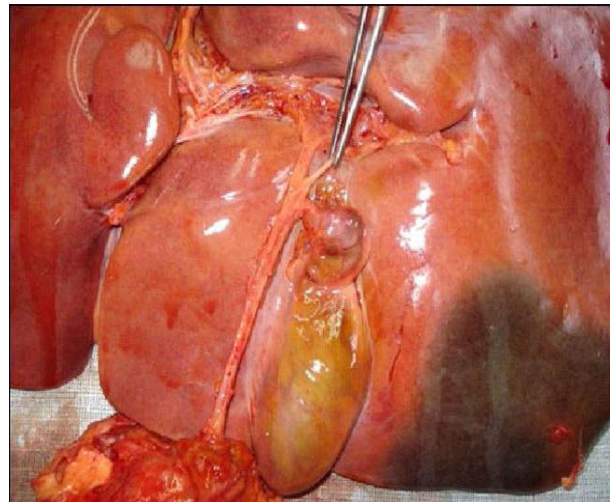


Fig. 2: Inframarginal fundus of the gall bladder



Fig. 3: Gall bladder is distended by aqueous injection. Non hepatic surface completely covered by peritoneum and fundus is supramarginal

Table 1:

Capacity	No. of cases	Extent of peritoneal investment	No. of cases	Level of fundus	No. of Cases
25 to 40 ml	12	$2/3^{\text{rd}}$ to $3/4^{\text{th}}$	-	Supramarginal	17
40 to 75 ml	80	More than $3/4^{\text{th}}$	-	Marginal	26
80 to 120 ml	07	Less than $2/3^{\text{rd}}$	-	Inframarginal	57

Discussion

In the present study, the range of capacity of the gall bladder varied from 25ml, to 120ml and the average capacity was 50ml (Figure 2). 80% of gall bladder had capacity ranging between 42ml to 75ml.

Nilsell K (1990) [2] has suggested that gallbladder storage capacity is a determining factor of bile acid pool. Decrease in capacity, is seen in gallstone disease, which may be caused by gall bladder fibrosis and shrinkage. Increase in gall bladder volume might be responsible for defective motor function of the gall bladder (Palasciano G) [3].

In the present study two cases of bilobed gall bladder were observed. Similar finding was reported by Tariq Ahmed et al, a rare anatomical variation. Duplication occurs in 1 in 4000 births [4]. More than 300 years ago Huber [5] in Switzerland recorded first "Y" shaped gall bladder in man. However anomalies of this organ are relatively rare. Variations in the form and position of gall bladder are rare as discussed by Gross and Boyden in 1926 [6], Schanner [7], Moosman and Collier (1951) [8]. A comparative infrequency of such variations has also been reported by, Schachner [7], Latimar [9] and his associates.

In the present study in 2% cases the gall bladder wall showed local thickness with adhesions with

surrounding structures. Gall stones with stones in the duct was evident in 15% cases. Afrim Pirraci [10] et al found gall stones in 74% of cases in a population screened by Ultrasound over 80 years of age.

Peritoneal investment of the gall bladder varied to a great extent. In the present study 2/3rd to 3/4th investment was found in 75% of the cases. The hepatic surface of the gall bladder was devoid of peritoneum. More than 3/4th (Figure 3) and less than 2/3rd investment were found in 13% and 12% respectively. This finding concurs with the study of JabaRajguru [11] et al who found differential peritoneal investment of gall bladder in 7% of cases. (Table 2).

Table 2:

	Peritoneal relations	Volume	Incidence of gall stones and wall thickenings
Present study	2/3 rd to 3/4 th peritoneal investment - 75% of cases More than 3/4 th peritoneal investment - 13% of cases Less than 2/3 rd peritoneal investment - 12% of cases.	25 to 40 ml 12% of cases. 40 to 75 ml 80% of cases. 80 to 120 ml 07% of cases.	Wall thickness with adhesions - 2% of cases Gall stones - 15% of cases.
Afrim Pirraci			80% in population over 80 years of age on ultrasound examination
Jaba Rajguru et al	Differential peritoneal investment - 7% of cases.		

In the present study one of the bilobed gall bladder was attached to a separate mesentery. Wendel (1898) [12] first reported a case of torsion of Gall bladder suspended by a mesentery. Torsion of gall bladder also has been reported by Short and Paul [13].

Torsion of gall bladder often presents as acute abdomen and often mimics acute cholecystitis. Preoperative diagnosis is difficult and often made during emergency laparoscopy [11].

The relationship of the fundus of the gall bladder to the anterior margin of the right lobe of the liver was extremely variable. The fundus of the gall bladder was inframarginal (Figure 2) in 60%, Marginal in 25% and supramarginal (Figure 3) in 15% of the cases.

Thus inframarginal fundus is more commonly observed. This finding small gall bladder observed by Jaba Rajguru [11] et al and Lurje [14] et al who stated that supramarginal variety is difficult to palpate even in the distended state of the viscus. The length of the fundus below the inferior margin could be 0.4 to 2.5cm as noted by Chakka Sreekanth [15]. The fundus is the most susceptible part of gall bladder during laparoscopy.

Conclusion

The gall bladder shows variations in relation to volume, number of lobes, peritoneal investment and relation of the fundus to the anterior margin of the liver. The radiologists and the operating surgeons should be keep these rare variations at the back of their mind while imaging and operating for good surgical outcomes.

Key Message

The gall bladder shows variations in relation to volume, number of lobes, peritoneal investment and relation of the fundus to the anterior margin of the liver which is surgically and radiologically important.

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