

# Evaluation of Variations in the Position of Fundus and Peritoneal Reflections of Gall Bladder and Its Surgical Significance in Biliary System Diseases: Study Conducted at a Tertiary Care Hospital

Ajay Reddy A<sup>1</sup>, Khwaja Moizuddin<sup>2\*</sup>

<sup>1</sup>Associate Professor, Department of General Surgery,  
Dr. V.R.K. Women's Medical College Teaching Hospital & Research Centre, Aziznagar, Telangana, India.

<sup>2\*</sup>Assistant Professor, Department of Anatomy,  
Kamineni Institute of Medical Sciences, Sreepuram, Narketpally, Nalgonda, Telangana, India.

## ABSTRACT

**Background:** Biliary system diseases are a common pathology in medical practice. The gallbladder is evaluated by means of right subcostal oblique sections while for the hilum evaluation sections perpendicular on the ribs are used. Hence; the present study was conducted for assessing the variations in the position of fundus and peritoneal reflections of gall bladder.

**Materials & Methods:** A total of 40 adult liver specimens were obtained. The sample size was obtained during routine dissection from cadavers between the age of 40 to 60 years. During regular dissection, the specimens used in the study were extracted from cadavers. Three types of relationships were identified between the fundus of the gall bladder and the inferior border of the liver: supramarginal, marginal, and intramarginal. Using a Vernier caliper, the length of the fundus of an inframarginal kind of gall bladder was measured from the cystic notch on the inferior border of the liver to the gall bladder's farthest point from its mouth. Variations in the gall bladder's peritoneal connection were observed. Every outcome was entered into a Microsoft Excel spreadsheet and then statistical analysis was performed with SPSS software.

**Results:** In 30 percent, 25 percent and 45 percent of the cases, gall bladder showed supramarginal peritoneal reflection, marginal peritoneal reflection and inframarginal peritoneal

reflection. One specimen showed the appearance of a folded gall bladder because the fundus, right and left edges, and a tiny portion of the gall bladder's body were covered with peritoneum that extended across the liver's superior side and eventually joined to its inferior surface.

**Conclusion:** The most typical site was inframarginal type, with peritoneum covering the fundus. Doctors need to understand how important it is to detect patients who may have gallbladder torsion.

**Key words:** Gall bladder, Peritoneal, Fundus.


## \*Correspondence to:

**Dr. Khwaja Moizuddin,**  
Assistant Professor,  
Department of Anatomy,  
Kamineni Institute of Medical Sciences,  
Sreepuram, Narketpally, Nalgonda, Telangana, India.

## Article History:

**Received:** 16-10-2019, **Revised:** 05-11-2019, **Accepted:** 27-11-2019

### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2019.5.6.060	

## INTRODUCTION

Biliary system diseases are a common pathology in medical practice. A frequent situation in everyday practice is a patient with pain in the right upper quadrant, in which the suspicion of biliary disease is the first diagnosis to confirm or exclude. Ultrasound is a reliable method for the evaluation of the biliary system and is the first method of choice when a biliary disease is suspected. Ideally a correct examination of the gallbladder and the biliary tree is performed on fasting patients. The gallbladder is evaluated by means of right subcostal oblique sections while for the hilum evaluation sections perpendicular on the ribs are used. The structures are assessed regarding their size, wall thickness and content.<sup>1-3</sup> Most significant gallbladder disease is associated with gallbladder stasis. Gallbladder motility is controlled by a complex

interplay of hormonal and neural factors. Experimental and clinical studies have demonstrated impaired motility in gallstone disease, and experimental evidence indicates that motility disturbances precede gallstone formation. The ability to measure gallbladder motility clinically has also resulted in better diagnosis and treatment for patients with chronic acalculous cholecystitis.<sup>4-6</sup> Defective gallbladder muscle contraction is associated with supersaturated bile with cholesterol and with pregnancy due to high circulating levels of progesterone. These abnormalities result in bile stasis that facilitates gallstone growth. A defective gallbladder muscle contraction may also contribute to the pathogenesis of acute and chronic cholecystitis. In addition, an impaired gallbladder contraction may be the source of recurrent

biliary colicky pain in patients with acalculus gallbladder disease. The gallbladders of these patients have an abnormal ejection fraction of less than 35% in response to an intravenous infusion of cholecystokinin (CCK). Although histology of the gallbladder wall is grossly normal, the muscle cells are functionally abnormal, with an impaired response to agonists that act on membrane and cytosolic receptors.<sup>7,8</sup> Hence; the present study was conducted for assessing the variations in the position of fundus and peritoneal reflections of gall bladder.

**MATERIALS & METHODS**

The present study was conducted for assessing the variations in the position of fundus and peritoneal reflections of gall bladder. A total of 40 adult liver specimens were obtained. The sample size was obtained during routine dissection from cadavers between the age of 40 to 60 years. During regular dissection, the specimens used in the study were extracted from cadavers. Three types of relationships were identified between the fundus of the gall

bladder and the inferior border of the liver: supramarginal, marginal, and intramarginal. Using a Vernier caliper, the length of the fundus of an intramarginal kind of gall bladder was measured from the cystic notch on the inferior border of the liver to the gall bladder's farthest point from its mouth. Variations in the gall bladder's peritoneal connection were observed. Every outcome was entered into a Microsoft Excel spreadsheet and then statistical analysis was performed with SPSS software.

**RESULTS**

The mean age was 48.2 years. In 30 percent, 25 percent and 45 percent of the cases, gall bladder showed supramarginal peritoneal reflection, marginal peritoneal reflection and intramarginal peritoneal reflection. One specimen showed the appearance of a folded gall bladder because the fundus, right and left edges, and a tiny portion of the gall bladder's body were covered with peritoneum that extended across the liver's superior side and eventually joined to its inferior surface.

**Table 1: Anatomic correlation**

Location	Number	Percentage
Supramarginal	12	30
Marginal	10	25
Inframarginal	18	45
Total	40	100

**Table 2: Correlation of age with anatomic location**

Variable	Odds Ratio	p-value
Anatomic location Versus gender	0.255	0.337

**DISCUSSION**

The human biliary system consists of the gallbladder, the cystic duct, common bile duct and the sphincter of Oddi. The gallbladder is a thin-walled, pear-shaped sac and generally measures 7-10 cm in length and about 3 cm in width. This muscular sac is located in a fossa in the posterior of the right lobe of the liver. The average storage capacity of a gallbladder is about 20-30 mL. Bile, the liquid that flows in the biliary system, is composed of three major components: cholesterol, bile salts, and bilirubin. When the gallbladder is not functioning properly, the components of the bile are supersaturated leading to the formation of solid crystals, called gallstones.<sup>7,8</sup> Ideally a correct examination of the gallbladder and the biliary tree should be performed on fasting patients (they should not eat or drink anything at least 8 hours before ultrasound examination), because fasting distends the gallbladder and reduces the bowel gas for an optimal visualization. In emergency situations, however, the examination can be also performed if the gallbladder is partially contracted.<sup>9-12</sup>

Yi SQ et al clarified the innervation of human gallbladder, with special reference to morphological understanding of gallstone formation after gastrectomy. The liver, gallbladder and surrounding structures were immersed in a 10 mg/L solution of alizarin red S in ethanol to stain the peripheral nerves in cadavers (n = 10). Innervation in the areas was completely dissected under a binocular microscope. Similarly, innervation in the same areas of

10 *Suncus murinus* (*S. murinus*) was examined employing whole mount immunohistochemistry. Innervation of the gallbladder occurred predominantly through two routes. One was from the anterior hepatic plexus, the innervation occurred along the cystic arteries and duct. Invariably this route passed through the hepatoduodenal ligament. The other route was from the posterior hepatic plexus, the innervation occurred along the cystic duct ventrally. This route also passed through the hepatoduodenal ligament dorsally. Similar results were obtained in *S. murinus*. The route from the anterior hepatic plexus via the cystic artery and/or duct is crucial for preserving gallbladder innervation. Lymph node dissection specifically in the hepatoduodenal ligament may affect the incidence of gallstones after gastrectomy.<sup>13</sup> Cholangiocytes, the cells lining the bile ducts, are now recognized as important contributors to and modulators of bile formation. During the last few years, remarkable insights have been made into the mechanisms of fluid, electrolyte, and solute transport by biliary epithelia, as well as increasing knowledge of the complex endocrine, paracrine, and neurologic factors regulating bile formation. Advances in the past year include an increased understanding of the interaction between bile acids and cholangiocytes in the regulation of bile formation in normal and cholestatic states and greater insight into the pathogenic mechanisms of biliary diseases.<sup>14</sup>

## CONCLUSION

The most typical site was inframarginal type, with peritoneum covering the fundus. Doctors need to understand how important it is to detect patients who may have gallbladder torsion.

## REFERENCES

1. Hanbidge AE, Buckler PM, O'Malley ME, Wilson SR. From the RSNA refresher courses: imaging evaluation for acute pain in the right upper quadrant. *Radiographics* 2004; 24: 1117-35.
2. Høgholm Pedersen M, Bachmann Nielsen M, Skjoldbye B. Basics of clinical ultrasound, Ed. Ultrapocketbooks, Copenhagen, 2006: 41-53.
3. Nuernberg D, Ignee A, Dietrich CF. Ultrasound in gastroenterology. Biliopancreatic system. *Med Klin* 2007; 102: 112-126.
4. Sporea I, Cijejschi Prelipcean C. Ecografia abdominală în practica clinică, Ediția a II-a, Editura Mirton, Timișoara Editura Mirton, 2004: 9-99.
5. Ichii H, Takada M, Kashiwagi R, Sakane M, Tabata F, Ku Y, Fujimori T, Kuroda Y. Three-dimensional reconstruction of biliary tract using spiral computed tomography for laparoscopic cholecystectomy. *World J Surg*. 2002;26:608–611.
6. Persson A, Dahlström N, Smedby O, Brismar TB. Volume rendering of three-dimensional drip infusion CT cholangiography in patients with suspected obstructive biliary disease: a retrospective study. *Br J Radiol*. 2005;78:1078–1085.
7. Dodds WJ, Hogan WJ, Green JE, Motility of the biliary system. In: Schultz SG. *Handbook of Physiology: the gastrointestinal system*, Vol. 1, Section 6, Part 2(28) Bethesda: American Physiological Society; 1989. pp. 1055–1101.
8. Mack AJ, Todd JK. A study of human gall bladder muscle in vitro. *Gut*. 1968;9:546–549.
9. Washabau RJ, Wang MB, Dorst CL, Ryan JP. Effect of muscle length on isometric stress and myosin light chain phosphorylation in gallbladder smooth muscle. *Am J Physiol*. 1991;260:G920–G924.
10. Bird NC, Wegstapel H, Chess-Williams R, Johnson AG. In vitro contractility of stimulated and non-stimulated human gallbladder muscle. *Neurogastroenterol Motil*. 1996;8:63–68
11. Shaffer E. Acalculous biliary pain: new concepts for an old entity. *Dig Liver Dis*. 2003;35 Suppl 3:S20–S25.
12. Smythe A, Ahmed R, Fitzhenry M, Johnson AG, Majeed AW. Bethanechol provocation testing does not predict symptom relief after cholecystectomy for acalculous biliary pain. *Dig Liver Dis*. 2004;36:682–686.
13. Yi SQ, Ohta T, Tsuchida A, et al. Surgical anatomy of innervation of the gallbladder in humans and *Suncus murinus* with special reference to morphological understanding of gallstone formation after gastrectomy. *World J Gastroenterol*. 2007;13(14):2066-2071. doi:10.3748/wjg.v13.i14.2066
14. Prall RT, Larusso NF. Biliary tract physiology. *Curr Opin Gastroenterol*. 2000;16(5):432-436. doi:10.1097/00001574-200009000-00008.

**Source of Support:** Nil. **Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMPP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Cite this article as:** Ajay Reddy A, Khwaja Moizuddin. Evaluation of Variations in the Position of Fundus and Peritoneal Reflections of Gall Bladder and Its Surgical Significance in Biliary System Diseases: Study Conducted at a Tertiary Care Hospital. *Int J Med Res Prof*. 2019 Nov; 5(6): 255-57. DOI:10.21276/ijmrrp.2019.5.6.060