Original Study

Morphometric Study of Gall Bladder in Maharashtra Population

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Abstract

Background: Variations in morphology and metrical values of Gall Bladder (GB) is quite common. These variations are frequently observed during imaging and procedures like laparoscopy and cholecystectomy. The anatomical variation of GB is essential to clinician.

Method: 48 adult cadavers were studied to evaluate the morphometric study of GB. The size and shape were classified with percentage. The length and breadth were measured with tailors tape.

Results: 52.08% pear shaped, 10.4% flask shaped, 12.5% cylinder shaped, 6.25% hour glass shaped, 6.25% intra hepatic, 2.08% left GB, 2.08% double GB were studied. The mean length of GB was 6.80 (±1.42), 2.82 (±0.78) was mean breadth of GB, t test was 17.2 and $p<0.01$

Conclusion: The anatomic variations of GB and biliary tract are critical during surgical procedure. The present study will certainly help surgeon to carry out surgeries without causing morbidity and mortality. Moreover these variations will help the radiologist for proper reporting the diseases related to GB and biliary apparatus.

Keywords: Morpho-metric, tailor tape, laparoscopy, cholecystectomy, Maharashtra

Introduction

Gall bladder (GB) is usually pear shaped, hallow and viscous organ, situated obliquely in a non-peritoneal fossa on the surface of right lobe of the liver, and extends from the right end of portahepatis to the inferior border of liver. Its dimensions are about 7 to 10 cm in length, maximum breadth being 3cm and capacity is between 30 to 50 ml. It presents fundus, body and neck [(1)].

The GB and biliary tract structure are in close connections with adjacent organs and may show various anomalies and anatomic variations [(2)].

GB varies greatly in size and shape. It may be duplicated, bifid or sometimes absent GB also varies in position. Sometimes abnormal position includesintra-hepatic, retro hepatic, supra-hepatic, retroperitoneal and transverse position [(3)]. These positions are frequently noticed during imaging of GB and surgical procedures like laparoscopy and cholecystectomy. Therefore in surgical settings it is very important to know morpho-metric values of GB and biliary tract [(4)]. Moreover morpho-metric variations of GB will misguide the inexperienced radiologist and he may report normal GB as pathological GB. Hence knowledge of variations of morpho-metric study of GB is essential to surgeon, radiologist and anatomist because these variations are symptoms free. The awareness of these variations may prevent the morbidity and mortality of patients with liver and GB diseases.

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Material and Method

48 Gall bladders of both sexes were studied in the cadavers present at dissection theatre of Anatomy department of SSPS Medical College Padave, Sindhudurga, and Maharashtra-416534.

Inclusive Criteria: Non-pathological, non-ruptured GB was selected for study.

Exclusion Criteria: Pathological (cirrhosis of liver), ruptured GB were excluded from study.

Method: Morphological classification was done as per the appearance, position of GB. The length and breadth of GB was measured by Tailors tape by putting the liver in anatomical position.

Duration of Study was June-2020 to July-2022.

Statistical analysis: Morphological classification was done with percentage. Metrical study was done with t test value. The statistical analysis was carried out in SPSS software. The ratio of Male and female was 3:1.

Observation and Results

Table-1: Morphological classification of GB

25 (52.08% per shaped, 5 (10.4%) flask shaped, 6 (12.5%) cylindrical, 3 (6.25%) hour glass shaped, 2 (4.16%) partially intra-hepatic, 3 (6.25%) intra-hepatic, 2 (4.16%) Phrygian cap, 1 (2.08%) left GB, 1 (2.08%) double GB.

Table-2: Present morphological classifications were compared with previous studies. Highest occurrence was (52.08%) and least were irregular viz. partially intra-hepatic, intra-hepatic, double GB

Table-3: Comparison of length and breadth of GB – 6.80 (± 1.420 length of GB, 2.82 (± 0.78) breadth of GB, t test 17.2 and p<0.001.

Table 1: Morphological classification of Gall Bladder

Detail of Morphology	Incidence	Percentage
Pear shaped	25	52.08
Flask Shaped	5	10.4
Cylindrical	6	12.5
Hour glass shaped	3	6.25

Continue .....

Detail of Morphology	Incidence	Percentage
Partially intra-hepatic	2	4.16
Intra-hepatic	3	6.25
Phrygian cap	2	4.16
Left GB	1	2.08
Double GB	1	2.08
Total	48	

Table 2: Comparison of present Morpho-metric study with previous workers

Sl No	Worker and date	Frequency of various shape of GB
1	Raj guru 2012	85% pear shaped, 5% flask shaped, 3.33% cylindrical, 3.33% hour glass bladder, 1.67% retort, 67% Irregular
2	Desai J 2015	84% pear shaped, 10% cylindrical, 2% hour glass shaped , 1.67% retort shaped, 67% Irregular
3	Rajendra. R 2015	53.2% pear shaped, 11.4% cylindrical, 63% hour glass shaped , 11.4% oval, 16.5% Irregular
4	Nadeem 2016	82.8% pear shaped, 2.86% cylindrical, 1.43 bilobed, 7.14% Irregular
5	Tiwari 2018	52% pear shaped, 28% flask shaped, 12% cylindrical, 4% hour glass bladder, 4% Irregular
6	Present study 2022	52% pear shaped, 10.4% flask shaped, 12.5% cylindrical, 6.25% hour glass shaped, 6.257% Intra double, 4.16% Irregular

Table 3: Comparison of length and Breadth of GB

Length of GB Mean Value (SD±)	Breadth of GB Mean Value (SD±)	t test	p value
6.80 (± 1.42)	2.82 (± 0.78)	17.02	P<0.01

Discussion

Present morpho-metric population (Cadaveric study) out of 48 GB 25 (52.08%) pear shaped, 5 (10.4%) flask shaped, 6 (12.5%) cylindrical, 3 (6.25%) hour glass shaped, 2 (4.16%) partially intra-hepatic, 3 (6.25%) Intra-hepatic, 2 (4.16%) Phrygian cap, 1 (2.08%) left GB, 1 (2.08%) double GB (Table-1). Mean length of GB 6.80 (± 1.42), 2.82 (± 0.78) Mean breadth of GB, t test 17.02 and $p<0.01$ (p value was highly significant) (Table-3). These findings are more or less in agreement with previous studies [5][6][7].

There is no exact known cause to define these variations but following are the probable reasons. A) As contraction of GB and secretions of bile are under activation of cholecystokinin and secreting hormones which are released from adreno-axis of pituitary gland, maturations of functional activity of liver depends on adreno-axis of pituitary. Hence role of pituitary may be responsible for these variations [8]. B) Microscopically, there is no muscularis mucosa in GB rather there is a muscularis lamina consisting of irregular anastomosing bundles of smooth muscles running in longitudinal, circular and oblique directions, moreover concentration of bile solely depends on the ability of epithelium which withdraws water and inorganic ions from the bile. The height of the cells of the epithelium is quite variable to respond to the degree of contraction of bile [9]. Hence indefinite muscular framework might have resulted into variations of shape and size of the GB. C) The plasticity of hepatic parenchyma is observed in foetal life as it does not develop completely until several years after birth but with proliferation of hepatic parenchyma there is an increase in the size and shape of the GB, cystic duct and common bile duct hence there is a mutual or reciprocal relation between GB and functional liver as pars cystica is a spurt of pars hepatica [10]. Hence delay in proliferation or plasticity of hepatic parenchyma might result in Variations of morphometricity of GB. D). As there is an intimate relation between germ layers, fate or destiny of Anatomy of any gland or organ is difficult to predict, especially in the secondary mesoderm which undergoes such an intimate differentiation that it is hardly possible to follow[11]. Hence it clearly indicates that these variations of the GB resulted in response to the functional need of the body. In the metrical study, length and breadth of GB is highly significant ($p<0.01$) (Table-3).

The present study of length and breadth of GB is in agreement with previous studies [12][13]. This certainly indicates that there was a migration of the different races to India for the sake of survival [14]. Apart from this, genetic signalling requires proper nutrition because each hormone or enzyme is regulated by each gene [15]. Nutritional, ecological or environmental factors also play a contributory role for deciding the morphometricity of any gland. Anthropologists or anatomists still have much to learn about the relative roles of genetic and direct environmental influences on the variations in the size and shape of glands in humans because humans have developed from the interaction between hereditary and environment.

Summary and Conclusion

These variations and significant values will certainly help the clinician, anatomist, anthropologist and medico-legal expert to differentiate the Maharashtra findings with other parts of the country and abroad. Above all this study will help the laparoscopic surgeon to take preventive measures before cholecystectomy and the radiologist to differentiate the normal from anomalies. But it requires further study to throw more light upon genetic, embryological and nutritional factors because exact mechanism of contraction of GB, concentration and secretion of bile by GB is yet to be known. As gall bladder is cut and discarded if pathological, hence least attention is paid for this study in research literature.

Limitation of study: Owing to small number of samples and lack of latest technologies, we have limited findings and results.

This research work was approved by Ethical Committee of SSPM Medical College Padave, Sindhudurga Maharashtra – 416534

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