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ORIGINAL RESEARCH

Study of Variations in External Morphology of Gall Bladder in Cadavers

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ABSTRACT:-
Background- In modern era increasing interventional and diagnostic procedures and laparoscopic cholecystectomy make study of variation in external morphology of gall bladder important variation of morphology of gall bladder commonly encounter during radiological investigation a during surgeries. **Aim and Objective:** To Study of Variations in External Morphology of Gall Bladder in Cadavers. **Material and Method:** Study was conducted on 100 gallbladder obtained from formalin fixed cadavers. Shape length and transverse diameter of gall bladder studied. **Result:** Commonest shape observed in this study was pear shaped in 82% cases. Average length of gallbladder was found to be 6.54cm. **Conclusion**: - Variation in extra hepatic billiary in not uncommon. Knowledge of this variation important for surgeon and radiologist for avoid iatrogenic injuries during procedures.
Kew words: Gall Bladder, Cadavers, cholecystectomy

Introduction

Gall bladder is a reservoir for bile resembles the flask or pear-shaped blind ending diverticulum attached to the common duct by the cystic duct. It is normally present in the right hypochondrium and partly sunk in a fossa in the right hepatic lobe's inferior surface. It extends forward from a point near the right end of the porta hepatis to inferior hepatic border. Its upper surface is attached to the liver by connective tissue elsewhere it is completely covered by the peritoneum from hepatic surface. It typically lies in closer proximity to the duodenum, pylorus and hepatic flexure of right colon and right kidney[1].

The gall bladder and biliary tract are the structures in close connection with the adjacent organs and may show various anomalies and anatomic variations which become crucial during surgical settings. [2] A rudimentary gall bladder may be associated with other congenital anomalies such as tracheo-oesophageal fistula or imperforate anus. [3] Some other anatomic variations include double & triple gall bladder, irregular gall bladder, longitudinally divided or constricted gall bladder.

Gall bladder also varies in its position. Some of the abnormal positions include intrahepatic, retro hepatic, suprahepatic, retroperitoneal, anterior epigastric, floating and transverse position. [4] One of the most frequent sites of operative intervention is biliary tract, with an estimated 850,000 biliary tract procedures performed every year in our country. The most common operative procedures performed on biliary tract is cholecystectomy.[5]

Anatomic variations of gall bladder & biliary tract are important during any operative procedures because failure to recognize them may lead to inadvertent ductal ligation, biliary leaks and strictures after laparoscopic cholecystectomy.[6] The present study Study of Variations in External Morphology of Gall Bladder in Cadavers

Material and Methods:-

The study was conducted on 100 gall bladders collected from formalin fixed cadavers from the Department of Anatomy of Index Medical College. Each specimen was studied for morphological variations. Parameter studied maximum transverse diameter of gallbladder at the level of body of gallbladder and maximum length from tip of fundus to the neck of gall bladder with help of metallic tape gradated in centimetre. Shapes and external appearance of gallbladder noted. To visualized interior of gallbladder incision is made on the wall of gall bladder and observed.

Inclusion Criteria: Adults cadavers between the age group of 20-60 yrs were included andalso patients between age group of 20-60 was included in this study.

Exclusion criteria: Cadavers with due to past history of liver disease was excluded from this study.

STATISTICAL ANALYSIS:
The Data wasanalysed using SPSS software version 27. Statistical test of Significance (t-test was applied wherever found necessary. (P< 0.05 was considered statistically significant).

Results:-
All specimens were inspected in situ by naked eye.

Table no.1:Length of Gall bladder

Number of specimen	Length in cm	Mean	Standard division
100	5.1-9.2	6.54	1.04

Table no1:The length of gall bladder ranged from 5.1cm -9.2cm .The mean±SD for length of gall bladder was6.54±1.04cm.

Shapes of gallbladder: - According to their shape gallbladder were classified into pear shaped, cylindrical shaped, irregular shaped, hourglass shaped, flask and retort shaped. Their incidences are presented in table-1 and in figure 1-6.

Maximum length of gall bladder-Smallest length of gallbladder was 5.1cm and maximum length of gallbladder was 9.2 cm. Average length of gallbladder was found to be 6.5cm.

Graph no.1: Length of Gall bladder

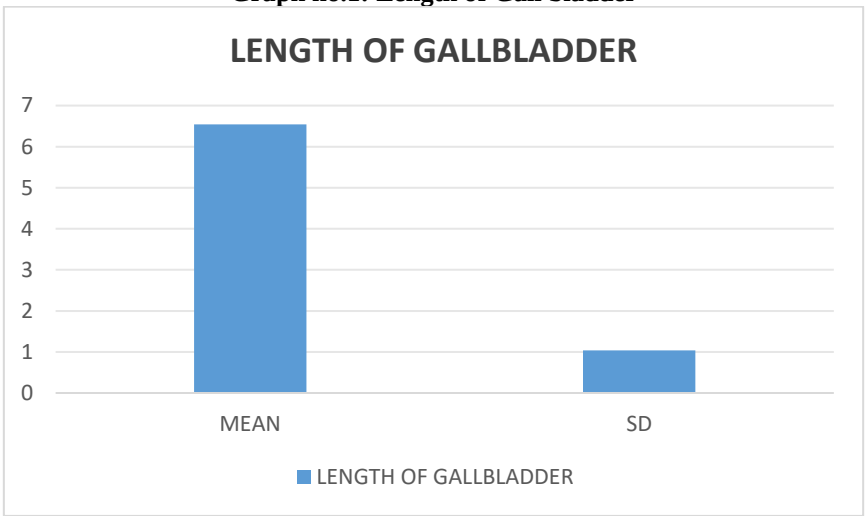


Table no.2: Variations in Shape of gall bladder

Variations	Shape of Gall bladder	No. of specimen	Percentage(%)
1	Pear shaped	96	96
2	Cylindrical	38	38
3	Hourglass	8	8
4	Flask shaped	50	50
5	S shaped	10	10
6	Irregular	12	12

Table no.4: shows the various shapes of gall bladder observed during the study. Pear shaped gall bladder was observed in 96 specimens (96%), flask shape in 50 specimens(50%), cylindrical shape in 38 specimens (38%), irregular shape in 12 specimens (12%), hourglass shape in 08 specimens(08%) and s shaped in 6 specimens (6%)

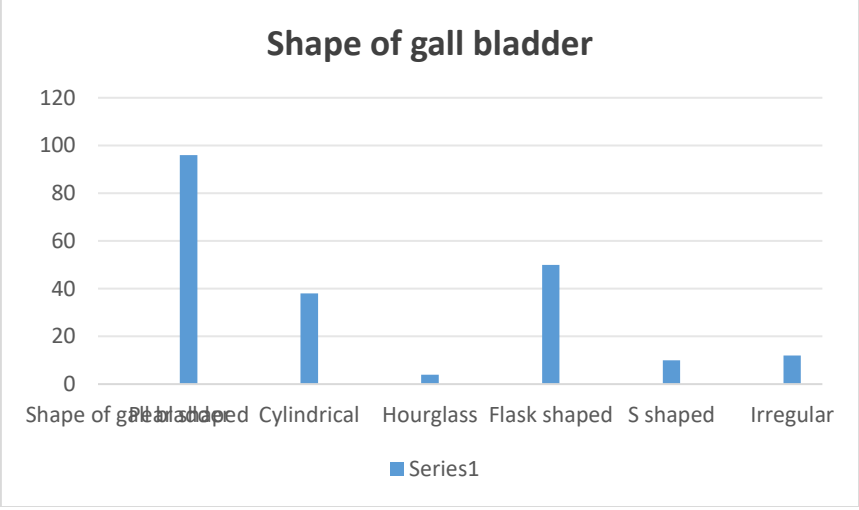
Figure no. 1: Cylindrical shaped

Figure no.2: Pear shaped

Figure no.3: Hour glass shaped

Figur no.4: Flask shaped

Graph no.2: Variations in Shape of gall bladder



Maximum transverse diameter of gallbladder- shortest transverse diameter was 2.7cm and largest was 5.2 cm. Mean diameter was 3.7 cm.

External appearance of gallbladder-folding of neck and foldedfundus noted in 20specimens (20%)

Interior of gall bladder: -in most of cases mucosa of gallbladder found to be with numerous rugosities. Gall stone found in 17 cases.

The different measurements and shapes of gall bladder reported by different authors have been summarized in Table 3.

Author	No. of specimens	Length (cms)	Breadth (cms)	Shape
Rajguru J et al. (2012)	60	4-9	2.5 - 5	Pear (85%), flask (5%), cylindrical (3.33%), Irregular (1.67%), hourglass (3.33%), Retort (1.67%)
Sah et al (2013)	30	3.9 – 9.0	0.7- 5.2	Pear (60%), Flask (26.7%), Tubal (6.7%), Hourglass (6.7%).
Prakash AV et al(2013)	50	7-10	2-5	Pear shaped (71.11%)
Rajendra et al (2015)	78	3.7-8.8	2.5 - 5	Pear (53.2%), cylindrical (11.4%), hourglass (6.3%) oval (11.4%) others (16.5%).
Jdesai, et al (2015)	50	4.5 -11	2.8 - 5	Pear (84%), cylindrical (10%), hourglass (2%), retort (4%)
Nadeem (2016)	70	4.5 - 11.6	2.7 - 5.2	Pear (82.85%), flask (2.86%), Cylindrical (2.86%), irregular (1.43%), Bilobed (1.43%), others (7.14%)
Tiwari (2018)	50	4.1-9.2	2.4 - 4.7	Pear (52%), flask (28%), cylindrical (12%), Irregular (4%) hourglass (4%)
Sharad Kumar et al.	75	5.3 - 10.2	2.8 - 5	Pear (64%), flask (14.6%), cylindrical (12%), Irregular (2.6%), hourglass (5.3%)
Present study (2024)	100	5.1-9.2	2.1-5.7	Pear (96%), flask (50%), cylindrical (38%), Irregular (12%), hourglass (8%)

Discussions

Variations in the anatomy of gallbladder, extra hepatic billiary system and the arteries that supply them and liver are important for surgeons. Failure to recognize them may lead to inadvertent ductal ligation, billiary leaks and strictures after laparoscopic cholecystectomy [6,7]. The liver primordium appears as an outgrowth of the endodermal epithelium at the distal end of the foregut in the middle of the third week. This liver bud or hepatic diverticula consist of rapidly proliferative cells that penetrate mesodermal plate called septum transversum. Hepatic cell continue to penetrate septum so the connection between the hepatic diverticulum and foregut narrows forming bile duct. Small ventral outgrowth formed by hepatic bud gives rise to the gallbladder and the cystic duct [8]. Malformation of gallbladder and the billiary system may result of deviation and arrest normal embryological developmental process [9] .

The present study was undertaken to assess“Anatomical Variations of Human Gall Bladder and its Clinical Importance”It was carried out in Index Medical College, Hospital and Research Centre, Indore, MP, India.The study was conducted on 100 gall bladders collected from formalin fixed cadavers from the Department of Anatomy of Index Medical College. The parameter that was studied in this are maximum length,breadth(transverse diameter) and shape of gall bladder.

The length of gall bladder ranged from 5.1cm -9.2cm .The mean±SD for length of gall bladder was6.54±1.04cm.The measurement of length and transverse diameter found in present study it similar to that found by Chari & Shah [10] and Jabarajguru et aland Prakash AV et al [11] Rajendra R.et al [12] Comparison of the length, breadth and the shape of gall bladder. The breadth of gall bladder ranged from 2.1cm -5.7cm .The mean±SD for length of gall bladder was 3.6±0.92cm.

Similar study done by **Sharad Kumar Pralhad Sawant et al.** In 48 specimens, gall bladder was pear shaped. Other shapes observed were Cylindrical, Hourglass, Flask shaped and Irregular. In specimen, the gall bladder was partially intrahepatic. A very prominent Hartmann's pouch was observed in 22 specimens. Length of Gall bladder ranged between 5.3 cms to 10.2 cms and transverse diameter ranged between 2.8 cms and 5 cms. Different positions of the fundus in relation to inferior border of liver were also noted.Anatomical variations of Gall bladder become vital during surgical settings. [13]

Dr. Stuti Srivastava et al. Study found thatGall bladder had length ranging between 5.52 and 11.32 cm, transverse diameter between 2.78 and 5.57 cm, thickness at neck, body and fundus was not found uniform. The commonest shape observed in this study was pear shaped. The length of gall bladder below the inferior border of liver varied between 0.46 and 3.93 cm.[14]

Pear shape is the most common shape of gall bladder observed by almost all authors during literature study followed by flask shape. Other shapes observed in the range of 2 - 6% by most authors have been cylindrical, Irregular and hourglass shape.Hourglass gallbladder is a constriction at the junction of middle and lower third of gallbladder, which divides the gallbladder into a wider upper zone and a smaller lower portion. Courvoisier (1890) reported the first case of hourglass gallbladder and considered it to be a cicatrical contraction secondary to in inflammation.[15]

Rajendra R et al. Found that 15 found incidence of normal gallbladder was 53.2%, oval shaped was 11.4%, cylindrical 11.4%, hour glass shaped 6.3%,partially intrahepatic 5.1%, intrahepatic 3.8%, Phrygian cap 3.8%, left gallbladder 2.5%, double gallbladder1.5%.Meistrup et al17observed bending of gall bladder could occur anterior or posterior. Futura et al18 observed that there was a higher prevalence of the kinking of the gallbladder and Hartmann's pouch in females .Gore et al16 found folded fundus in 1- 6% population and Jaba rajguru12 6.67% and Prakash AV et al found folded fundus in 5.56% and folded neck in 4.44% .In present study we found 8% cases. Septations inside the gallbladder reported quite infrequently. This condition may be associated with cholelithiasis and abdominal colic18.Septations in the gallbladder has been reported to be single19 or multiple 20.

Conclusion:-

Congenital anomalies of gallbladder and variants of billiary tree are rare. These anomalies can provide surgeons with an unusual surprise during laparoscopic surgery, as failure to recognize those leads to iatrogenic injuries and can increase morbidity and mortality. Awareness of these anomalies helps in performing invasive procedures,
therapeutics and diagnostics in this region.

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