



MORPHOMETRIC ANALYSIS OF LIVER & ITS CLINICAL IMPLICATION

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ABSTRACT

The shape of liver is an acute-angled triangular prism. The liver is abdominal organ occupies most of the right hypochondrium and epigastrium and extends into left hypochondrium as far as left lateral line and under left dome of diaphragm. Anatomically liver has two lobes right and left lobes, by the line of reflection of falciform ligament anteriorly, the fissure for ligamentum venosum posteriorly and by fissure for ligamentum teres inferiorly. The anatomical right lobe is larger than the left lobe. Gross abnormalities of the liver are rare despite its complex development. The variations observed in the anatomy of human liver have been classified as congenital or acquired. Although segmental anatomy of the liver has been researched there are few studies regarding the surface variations of the liver. Hence we have undertaken this study to note the variations on the surface of the liver.

KEYWORDS : ligamentum, segmental, fissure.

INTRODUCTION

The liver is abdominal organ occupies the right hypochondrium and epigastrium and extends into left hypochondrium as far as left lateral line and under left dome of diaphragm^{1,2}.

The division of liver by anteriorly reflection of falciform ligament, posteriorly by the fissure for ligamentum venosum and inferiorly by fissure for ligamentum teres. it has right smaller and left larger lobe^{1,2,4,5,6}.

It has caudate and quadrate lobes as the part of right anatomical lobe. The hilum of the liver or porta hepatis is situated on its visceral surface and it transmits the blood vessels and the nerves of the liver. The fossa for gall bladder is situated on the inferior surface of the right lobe of the liver and the gall bladder is situated in it. The fundus of gall bladder usually projects beyond the inferior border of the liver.

In most cases the accessory lobes are found in infrahepatic portion. Riedel's lobe is the best-known example of a sessile accessory lobe^{7,8}.

The Riedel's lobe was first recognized as the anatomical variant of the liver. It is an inferior extension of the right lobe. The variants of other lobes are less recognized⁹.

The liver is classified on internal architecture which is different from the above classification. The most widely accepted classification is that described by Couinaud (1957) and Healy and Schroy (1953). According to these classification, an imaginary plane passing through the gall bladder fossa, divides the lobe into functional right and left lobes. Segments I (Caudate lobe), II, III and IV make up the functional left lobe and segments V, VI, VII and VIII make up functional right lobe. This classification is also accepted by the Federative committee on Anatomical Terminology^{7,10,11}.

The modern era of liver surgery started after the intrahepatic segmentary anatomy was classified¹². Hepatic imaging technique is usually performed to search for primary or metastatic liver diseases¹³.

The variations found in the anatomy of human liver. The variation classified as congenital or acquired. Congenital changes in the organ are characterized by the following aspects: -

- Lobes separated by glands.
- Atrophy at some locations in the parenchyma.
- Presence of only one lobe.
- Presence of multiple lobe.
- Small lobes.
- Peduncular lobes.
- Lobes without division.
- Accessory lobes.
- Agenesis of one lobe.

The Acquired changes in morphology of liver are represented by the

following

- Linguiform lobes
- Costal organ with small left lobe
- Deep renal impressions^{14,15,16}.

Studies were on segmental anatomy of the liver has been researched but studies regarding the surface variations of the liver were less in found. Hence, we have undertaken this study to note the variations on the surface of the liver.

The study was undertaken to investigate the anatomical variations in the cadaveric liver in the Department of Anatomy, D.Y. Patil Medical College at D.Y. Patil Education Society, Deemed to be University, Kolhapur.

MATERIALS AND METHODS

64 formalin fixed liver were used for this study. All these livers belonged to adults of unknown age and gender. These livers were taken during the routine dissection from embalmed cadavers during last 3 years (from 2014-2017 batch) apparently normal liver were considered for the study. Liver specimens were observed for any morphological variations. Photographs of all variations were noted.

OBSERVATION AND RESULTS

The 64 liver specimens available at D.Y. Patil Medical College, Kolhapur.

The following morphological features were recorded. Accessory lobe, Hypoplastic left lobe, Absence of quadrate lobe, Lingular process of left lobe, Accessory fissure, Normal fissure and lobes, Absence of fissure for ligamentum teres, Spiegel's lobe/Couinaud's segment-enlargement, Sulci on anterior surface. Out of 64 livers specimens; Liver with normal architecture were 30 (46.87%) and liver with variations were 34 (53.12%).

Table no.1 Variation of liver

Sr. No.	Type of variation	No. of liver specimens	Percentage
1	Accessory lobe	4	6.2%
2	Hypoplastic left lobe	4	6.2 %
3	Absence of quadrate lobe	3	4.6%
4	Lingular process of left lobe	4	6.2%
5	Accessory fissure	9	14.0%
6	Normal fissure and lobes	30	46.8%
7	Absence of fissure for ligamentum teres	2	3.1%
8	Spiegel's lobe/Couinaud's segment-enlargement of papillary process	2	3.1%
9	Sulci on anterior surface	6	9.3%

Out of 34 livers with variations 5 liver (7.8%) showed sulci on the anterior superior surface of right and left lobes. The sulci were superficial in 1 liver (1.5%) and deep in 4 (6.2%) Out of 34 livers with variation, caudate lobe in 3 livers (4.6%) showed morphological variations; such as enlargement of papillary process in 1 liver (1.5%), variation in shape on 1 liver (1.5%) and accessory caudate lobe found in 1 specimen (1.5%)

Out of 34 livers with variations, quadrate lobe in 6 liver showed morphological variations such as pons hepatis segment connecting quadrate lobe to left lobe over the fissure for ligamentum teres hepatis was noticed in 1 liver (1.5%) and presence of horizontal fissure in 2 livers (3.1%) and absence of quadrate lobe in 3 specimens (4.6%)



figure 1: absence of quadrate lobes

Out of 34 livers with variations 14 liver (21.8%) showed morphological variations of left lobe with right lobe normal. Hypertrophy of left lobe was noticed in 1 liver (1.5%); while fissure on left lobe were seen in 3 livers (4.6%) and Lingular process was noticed in 6 livers (9.3%). Hypo plastic was showed in 4 specimens (6.2%) and agenesis of left lobe was absent.

34 livers with variations 4 liver (6.8%) showed accessory lobes. In these 2 livers (3.1%) showed Reildels lobe.



Figure 2: accessory lobes

DISCUSSION

The liver is known to show variations in the form of lobes or fissure anomalies. The congenital anomalies of liver in humans are very rare in spite of its complex development and are rare as compared to other organs of the body. Anomalies may be high in society, but we do not notice them as they are asymptomatic^{8, 17}. In our study out of 64 livers specimens variations were present in 34 specimens (53.12%). Out of 34 livers with variations 5 specimens showed sulci on the anterosuperior surface (7.8%) of both the lobes. The sulci were superficial in 1 liver (1.5%) and deep in 4 (6.2%).

According to Schafer and Symington (1896) and De Burlet (1910) the sulci result from uneven growth of the hepatic parenchyma caused by variable resistance offered by different bundles of diaphragm muscle¹⁸. Fissure was present in 2 specimens (4%) and in 2 specimens (3.1%) horizontal fissures were present on the quadrate lobe.

Any collection of fluid in the deep sulci may be mistaken for a liver cyst, intrahepatic hematoma or liver abscess. Implantation of peritoneally disseminated tumor cells into these spaces may mimic intrahepatic focal lesions^{10, 20}.

Out of 34 livers with variations morphological variation in the shape of caudate lobe were observed in 3 specimens (4.6%) and one liver showed the enlargement of papillary process (Spiegel's lobe or Couinand's segment) in our study. Auh et. al. an enlarged papillary process may mimic a pancreatic body mass if it extends very far²¹.

Out of 34 livers with variation, in our study 6 specimens (9.3%) presented morphological variations in the Quadrate lobe such as pons hepatis segment connecting quadrate lobe over the fissure for

ligamentum teres hepatis in one specimen (1.5%) and horizontal fissure in 2 specimens (3.1%) and there was absence of quadrate lobe in 3 cases (4.6%). In cases of pons hepatis bridging the fissure for ligamentum teres normal visualization of the fissure would not be possible and dimensions of right and left lobes may be mistaken²².

Out of 34 livers with variations 14 (21.8%) showed morphological variations of left lobe with normal right lobe. In our study hypertrophy was seen in one specimen (1.5%). such enlargement was also noticed by Pratibha Baruah and Hammond L.J.^{23, 24}. In our study 6 (9.3%) specimens showed tongue like elongation, such lingular process were observed by Hammond L.J, Chiba S, Dunlop DJ, Sultana S.^{24, 25, 26, 27}. In this study Hypoplastic livers showed in 4 (6.2%) and fissure on left lobe were found in 3 (4.6%) and agenesis of left lobe were absent.

CONCLUSION

Morphological variations in liver could be developmental in origin or due to pressure exerted by diaphragm, peritoneal relations and other organs in relation with liver so developed during life time of a person. The study was carried out to add on knowledge of the variations for the anatomist, surgeons and imaging specialist; which will prevent misdiagnosis of cystic lesions or any macroscopic pathological lesions of the liver.

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