



STUDY OF NORMAL MORPHOLOGICAL VARIATIONS IN FISSURES AND LOBES OF ADULT LIVER – AN CADAVERIC STUDY

Anatomy

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ABSTRACT

Liver is a wedge shaped largest gland in human body. It is situated under right dome of diaphragm and mainly occupies the right hypochondrium and epigastric region. Many of its anomalies go unnoticed as they are asymptomatic.

Background and Aims:- There are many kinds of congenital variations of liver as agenesis of lobes, absence of its segments, deformed lobes, accessory fissures and accessory lobes have drawn attention for study to evaluate the morphological features of human liver specimens by macroscopic examination.

Materials and methods:- The present study was conducted on 52 liver specimens in the department of anatomy in kakatiya medical college, Warangal. The mean age of the cadavers ranging from 45 to 70 yrs. The lobes of liver surfaces studied in detail for the presence of accessory lobes and fissures which are recorded and photographed.

results :- In present study out of 52 livers 18 livers were found to have variations. Accessory lobes found in 10 (19%) livers, accessory fissures are found in 15 (28.84%). Union of left lobe with the quadrate lobe (pons hepatis) is seen in 4 livers and thinning of left lobe is seen in liver. in the present study no accessory lobes or accessory fissures are seen in left lobe.

Conclusion:- The present study found the occurrence of accessory lobes, accessory fissures, pons hepatis on different surfaces of the liver. The study is useful for the anatomists, surgeons and radiologists for proper diagnosis.

KEYWORDS

Accessory lobes, Accessory fissures ,Pons hepatis.

INTRODUCTION

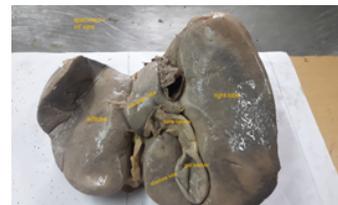
Liver is a wedge shaped largest gland of the body, it is situated under the right dome of diaphragm and mainly occupies the right hypochondrium and epigastric regions. It is divided into anatomical right and left lobes by attachment of falciform ligament, fissure for ligamentum venosum and fissure for ligamentum teres. The quadrate and caudate lobes are part of right lobe and are divided by a transverse fissure which contains porta hepatis (figure 1). The fossa for gallbladder is situated in the inferior surface of right lobe and fundus of gallbladder is situated beyond the inferior border of liver⁽¹⁾. Hilum of the liver or porta hepatis is situated in the inferior surface; it separates the quadrate and caudate lobes and transmits the blood vessels, nerves and lymphatic tissue into liver.

The quadrate lobe is visible on the inferior surface, appears somewhat rectangular and is bounded in front by inferior border, on the left by fissure for ligamentum teres, behind by porta hepatis and on right by fossa for gallbladder. The caudate lobe is visible on the posterior surface bounded on left by fissure for ligamentum venosum, below by porta hepatis and on right by groove for inferior venacava⁽²⁾.

Variations in the anatomy of human liver have been observed and are classified into congenital or acquired. The congenital changes in the organ are characterized by presence of accessory fissures, absence of normal fissures, presence of accessory lobes and absence of normal lobes.

A good knowledge of normal and variant livers is mandatory for safe surgical approaches and diagnostic imaging. The presence of accessory fissures and absence of normal fissures and presence of accessory lobes or absence of regular lobes might lead to confusion and wrong reporting during radiological examination of liver.

In the era of imaging and minimal invasive approaches, it is very essential for the radiologist and the operating surgeon to have a thorough knowledge about normal anatomy and the commonly occurring variations of liver⁽³⁾. Aim of the present study is to collect the information about the variations in the liver specimens collected in kakatiya medical college, Warangal. This study will help the clinicians, surgeons and radiologists during the diagnosis or surgeries of liver.



(Figure no 1)

MATERIALS AND METHODS:-

52 liver specimens were observed for this study in Department of Anatomy in Kakatiya Medical College Warangal. The liver specimens were collected during the routine dissections by I MBBS undergraduate students in the anatomy dissection hall during a period of 5 years that is from 2012 to 2016.

The livers which looked diseased or damaged are not included in the study. Livers from adult cadavers are collected from both female and male cadavers and from different age groups ranging from 45 to 70 years. Embalmed livers were studied in detail. The lobes of the liver that is right lobe, left lobe, caudate lobe and quadrate lobe were studied in detail, for the presence of accessory lobes and accessory fissures.

OBSERVATIONS AND RESULTS:-

52 livers are meticulously examined for any accessory lobes, sulci or fissures. The observations are recorded in tables as below. Out of 52 specimens the following morphological observations are noted:-

TABLE no 1: variations observed in this study

S no	Morphological features	No of livers	percentage
1	Normal features with normal lobes and fissures	34	61.53%
2	Accessory fissures over different lobes	15	28.84%
3	Thinning of left lobe	1	1.92%
4	Union of left lobe and quadrate lobe	4	7.6%
5	Accessory lobes different lobes	10	19%

TABLE no II- variations according to different lobes

Lobes	Accessory fissures	Accessory lobes	others
Right lobe	9 specimens 17%	1 specimen 1.9%	

Quadrata lobe	3 specimens 5.7%	5 specimens 9.6%	Continuous with left lobe 4 specimens 7.6%
Caudate lobe	4 specimens 7.6%	4 specimens 7.6%	Papillary process prominent in 2 specimens
Left lobe			Thinned out left lobe. Pons hepatis in 4specimens

Right lobe-

The accessory fissures are seen in the right lobe in 9 specimens in different areas (17%). These fissures had varied depth and length. Out of 9 specimens 2 specimens are seen with deep fissures on diaphragmatic surface (3.84%) (figure no 3) The accessory fissures present in the inferior surface in 7 specimens (13.4%) are more near duodenal impression (figure no 3). One fissure is seen between renal and colic impressions.

1. Accessory lobes are seen in 1 specimen inferior to the gall bladder near to the inferior border (figure No 2,3)



small accessory lobes seen inferior to the gall bladder fissure between the renal and colic impression

(Figure no 2)



accessory fissures are seen in right lobe on diaphragmatic surface



accessory fissures are seen in right lobe on the inferior surface in the duodenal impression.

(Figure no 3)

Left lobe:-

Left lobe joined with the quadrata lobe obliterating the fissure for ligamentum teres –PONS HEPATIS in 4 specimens.

1. The merging of left lobe with quadrata lobe varies from a fibrous connection to partial or complete fusion of two lobes.
2. Left lobe and right lobe are continuous without having fissure for ligamentum teres on lower border
3. Thin and elongated left lobe is seen in 1 observation(figure No 4)



Left lobe joined with the quadrata lobe obliterating the fissure for ligamentum teres



Thin and elongated left lobe



left lobe continous withthe right lobe

(figure No 4)

Quadrata lobe:-

1. Fissures were observed in 4 specimens. In one specimen 2 fissures are present in the quadrata lobe dividing it into 3 lobes. Both vertical and transvers fissures are seen
2. Accessory lobules were seen in 4 specimens. One accessory lobe is noticed in a specimen just below the porta hepatis
3. Connection between left lobe and quadrata lobe –pons hepatis is observed in 4 specimens. The fusion of two lobes varied from complete to partial.
4. Shapes of quadrata differed from rectangular to triangular. In one specimen very small quadrata lobe is noticed. (figure no 5)



vertical fissure in quadrata lobe



left lobe and quadrata lobe complete fusion



two fissures dividing lobe into 3 lobes

(figure No 5)

Caudate lobe:-

1. Fissures were seen in 4 specimens. Fissures are seen in both upper and lower parts of the lobe. (figure No 6)
2. Accessory lobes seen in 4 specimens. Bi lobed caudate lobe is seen in one specimen.
3. Papillary process seen in left lower angle. A fissure is seen dividing the lower border of caudate lobe.



accessory fissures in caudate lobe



accessory lobes seen in caudate lobe

Figure no 6

DISCUSSION

In the present study, it is found that liver present with accessory lobes in 19%specimens and accessory fissures in 30%. The maximum percentage of accessory fissures (13.4%) are seen in inferior surface of right lobe and 3.84% are seen in diaphragmatic surface of right lobe. Micheal et al reported the incidence of accessory fissures to be 12%in the antero superior surface of liver⁽⁴⁾. T Srikanth observed accessory fissures on diaphragmatic surface in 14 specimens out of 45. He observed accessory fissures in different regions of right lobe in 12

(26.66%) specimens and on left lobe in 2(4.44%)⁽⁵⁾

Macchi V et al observed the incidence of accessory fissures in 40% of their specimens mostly on right lobe. They stated that diaphragmatic sulci result from uneven growth of the hepatic parenchyma caused by variable resistance offered by different bundles of diaphragmatic muscles⁽⁶⁾.

S Saritha et al reported accessory fissures in different lobes of 15 livers (30%). The accessory fissures were 16% in right lobe and 2% in left lobe. They found accessory lobes in 8 livers⁽⁷⁾.

Joshi SD et al observed prominent vertical grooves on antero superior surface in 6% of their observations⁽⁸⁾.

According to Auh Yh et al the accessory hepatic fissures are potential sources of diagnostic errors during imaging. Any collection in these fissures may be mistaken for a hepatic cyst, hematoma or liver abscess⁽⁹⁾.

Shailaja et al in her study revealed accessory lobes in 6% specimens and accessory fissures in 24%⁽¹⁰⁾.

Khedekar Deepak N G, Hattangodi Shantha S have observed accessory lobes in 3 livers out of 50 specimens and accessory fissures in 21⁽¹¹⁾. Hussein Mutyaz et al stated in their observation that the accessory lobes are seen in 8 specimens out of 36. They found fissures on inferior surface in 4 (11.1%) specimens, on diaphragmatic surface in 2 (5.5%), on posterior surface in 1 and on right lateral surface in 1 specimen in north Indian population⁽¹²⁾.

Nayak BS., observed 55 livers, out of which found anomalies in 22 livers. He observed anomalies in lobes, fissures, shape and size of gall bladder. Additional lobes are seen in 5 livers (9.09%), additional fissures is found in one liver (1.81%)⁽¹³⁾.

Sunitha V and Neele Jayasree observed the morphological features of 58 liver specimens. Among these normal fissures and lobes are 24(41.37%), accessory fissures over different lobes are 31(53.44%)⁽²⁾. Dragica Jurkovicj observed 26 cadaveric liver specimens and stated that the most frequent accessory sulci and fissures are at the visceral surface of right lobe. He observed vertical grooves on diaphragmatic surface in 5 (19.23%)⁽¹⁴⁾.

Dr. Abhilasha Wahane and Dr. Charulatha Satpute studied 50 livers out of which 22 showed morphological variations. Accessory lobes were found in 8 cases (16%), accessory fissures and grooves were found in 10 specimens (20%)⁽¹⁵⁾.

In present study no accessory lobes or fissures are seen on left lobe of liver. It was observed that left lobe of liver joined with quadrate lobe by a segment of hepatic tissue connecting quadrate lobe over the fissure for ligamentum teres [Pons Hepatis] in 4 specimens and hence left and right lobes are joined together without fissure for ligamentum teres.

Joshi et al studied 90 formalin fixed livers, in which 30% showed pons hepatis of variable dimensions joining the quadrate and left lobes. In majority of these cases pons hepatis was bridging the upper third of fissure for ligamentum teres. In two, the pons completely bridged the fissure on inferior surface resulting in merging of the left and quadrate lobe⁽⁸⁾. Dr S Saritha et al observed pons hepatis joining the left lobe with quadrate lobe in 2 specimens (4%)⁽⁷⁾.

Ranjana Singh Arya et al studied 60 livers from cadavers of age ranging from 21 to 73 years. They observed either absence of fissure for ligamentum teres or bridging of tissue between quadrate and left lobe in 4 specimens (6.6%)⁽¹⁷⁾. Khedekar Deepak N et al observed interconnected left lobe and quadrate lobe with absence of fissure for ligamentum teres in 7 cases (14%), one case with absence of quadrate lobe⁽¹¹⁾. Vaibhav Vasudevarao Phad et al observed the abnormalities of quadrate lobe like Pons hepatis in 10 cases (12.5%)⁽¹⁸⁾. In present study caudate lobe shows fissures, accessory lobes and prominent papillary process. Nayak BS observed large papillary process of caudate lobe in 1 liver (1.89%)⁽¹³⁾. Joshi SD et al did an extensive survey on variations of the liver. They found notches along the inferior border of caudate lobe in 18% of his observations, a vertical fissure in 30% and prominent papillary process in 32%.

Dr. S. Saritha et al reported a notch along the inferior border of caudate lobe dividing it into caudate process and papillary process in 3 specimens (6%), they also reported a vertical fissure in one specimen dividing the caudate lobe into two caudate lobes and found prominent papillary process in 3 specimens⁽⁷⁾. Arora et al noted that a vertical fissure extending upwards from inferior border of caudate lobe in 7 specimens⁽¹⁹⁾.

Vaibhav Vasudeva rao phad et al observed morphological variations in caudate lobe in 24(30%) specimens of their observation and in paracaval portion in 8(10%) specimens. Enlargement of papillary process (spiegel's lobe or couinaud's segment) was seen in 4(5%). Notch or fissure separating the papillary process from rest of the caudate lobe was seen in 2(2.5%)⁽¹⁸⁾.

Sunitha V & Neele Jayasree observed that out of 31, 8 specimens showed accessory fissures and lobes in the caudate lobe. In one specimen they found a fissure between the caudate lobe and papillary process⁽²⁾.

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