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Assessment on the Presence of Accessory Grooves, Fissures and Lobes on the surface of Adult Human Liver - a Cadaveric Study in Manipuri Population

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Abstract

Background : Liver is wedge shaped and the largest gland in the body situated under the right dome of the diaphragm occupying the right hypochondriac and epigastric region. morphological variations of liver such as agenesis of lobes, deformed lobes, decrease in size of lobes, lobar atrophy, hypoplastic lobes, riedel's lobe, accessory fissures, accessory grooves and absences of segments etc. have been described by some authors. Therefore sound knowledge of these variations is necessary for surgical safety, hence the present study.

Methodology : A cross sectional study of a total of 35 formaline fixed adult human cadaveric liver was done in the Anatomy Department, Regional Institute of Medical sciences (RIMS), Imphal, India.

Results: The normal or wedged shaped liver constituted 51.42% whereas the rest i.e 48.57% showed variation in shape and size. Mini accessory lobes constituted about in 8.75%, absence for ligamentum teres in 2.85%, pons hepatis constituted 5.71%, bicornuate caudate lobe in 2.85%, accessory fissures in 28.57%, absence of quadrate lobe in 2.85%.

Conclusion: morphological variations observed were mostly in shape, accessory fissures, accessory lobes, bicornuate caudate lobe, absence of qaudrate lobe etc. Most commonly seen were accessory fissure on the four lobes of liver.

Keywords: liver, wedge, accessory lobes, fissures, pons hepatis

Introduction

Liver is the largest gland in the body occupying a vast portion of the upper abdominal cavity extending from the right hypochondriac, epigastric upto as far as the left hypochondrium. It is divided anatomically into right and left lobes by the line of attachment of falciform ligament anteriorly, fissure for ligamentum

teres inferiorly and fissure for ligamentum venosum posteriorly. The right anatomical lobe includes both the caudate and the quadrate lobe. Caudate and quadrate lobes are separated from each other by the porta hepatis which is the hilum of the liver and transmit blood vessels and nerves to the liver. Towards the left, the caudate and quadrate lobes are bounded by the groove for inferior vena cava and the gall bladder fossa, respectively[1].

Based on physiological classification, liver has eight segments, functional left lobe includes segment I, II, III and IV whereas functional right lobe includes segments V, VI, VII and VIII [2,3]. Morphological variations of liver can be either congenital or acquired. Congenital abnormalities include agenesis, atrophy or hypoplasia of lobes, accessory lobes, accessory fissures etc. The mini accessory lobe may be mistaken for a lymph node due to its small size and removed during surgeries. other anomalies like pons hepatis connecting the left lobe with the quadrate lobe[3]. Accessory fissures also maybe mistaken for a liver cyst, haematoma or abscess during imaging if there is collection of fluid in these fissures[4]. Acquired variations could be due to pressure given by the diaphragm, peritoneal ligaments and other organs[3]. Segments of the liver has been studied extensively, but few studies regarding the surface variations of the liver been done.

Knowledge of these morphological variations are important during operative and diagnostic procedures as clinically they may be asymptomatic and thereby misled the operative surgeons and diagnosis of disease too. These variations were observed very frequently during routine dissections in the department, hence the present study.

Materials and methods

The study was a cross sectional study conducted in the Department of Anatomy, RIMS, Imphal. A total of 35 formalin fixed normal looking livers were included in the study, the deformed livers were excluded from the study. The livers were collected from the routine dissection of the adult cadavers for the undergraduate medical teaching. The livers were then observed for any change in shape and size, presence of accessory lobes, accessory fissures, accessory grooves, pons hepatis etc. Photographs were taken and the results were compared and contrast with the findings of the previous workers and also classified according to netter's classification[18].

Results

In the study, the liver specimen revealed different shapes and sizes. The wedge shaped liver constituted 51.42%, followed by triangular (20%), irregular (11.42%), square (17.14%) shaped livers (table 1, fig.1). Further, the 17 livers showed not only variation in shape but also in terms of fissures, lobes and, grooves. The morphological variations of the study is shown in the table 2.

Pons hepatis of variable shape and size joining the left lobe with the quadrate lobe was seen in 2 specimens (5.71%) and it was found to bridged fissure for ligamentum teres completely (fig 2).

Mini Accessory lobe somewhat triangular in shape above the quadrate lobe was seen in 3 specimens (8.57%) fig 3. Absence of fissure for ligamentum teres was seen in 1 specimen (2.85%) fig. 2. Bicornuate caudate lobe seen in 1 specimen (2.85%) fig. 4. Absence of quadrate lobe seen in 1 specimen (2.85%) fig. 4 and pear shaped quadrate lobe in 1 specimen too (2.85%). Accessory fissures in different lobes of the liver were seen in 10 specimen fig (28.57%) fig. 3. The

liver specimens were also classified according to netters six types of liver variations (table 3).

Discussion

In the present study, accessory fissures of various shape, length, depth and number were seen in different lobes of the liver in 10 specimens (28.57%), whereas Haobam RS and Suganthy R in their study on 70 formalin fixed livers encountered accessory fissures on 57 specimens (81.4%)[5], Tsegaye M et al found additional fissures in 9 out of 33 livers (27.27%)[6]. Major fissures like accessory hepatic fissure can be single or multiple and do not extend beyond the upper part of the liver according to Joshi SD et al[7]. These accessory fissures were seen on right lobe, left lobe, caudate and quadrate lobe. Some of these fissures were long n deep whereas some were relatively short. Accessory hepatic fissures may lead to diagnostic errors during imaging as fluid collection in these fissures may be mistaken for a liver cyst, intrahepatic haematoma or liver abscess as mentioned by Auh et all in their study[4]. Use of Intra operative ultrasonography in liver surgery to determine the anatomical location and extent of the lesion were suggested by Maziotti et al[8].

Pons hepatis joining the left lobe with the quadrate lobe and bridges the fissure for ligamentum teres was observed in 2 specimens (5.71%). Joshi SD et al found 30% of pons hepatis out of 90 specimens and in majority of these cases, the pons hepatis was bridging the upper third of the fissure for liganentum teres and in one case, the pons was completely bridging the fissure on the inferior surface which also agrees with our findings[7]. Patil S et al also observed similar findings in 10% specimen out of 50 specimens in their study[3]

The different shapes of quadrate lobe encountered in the study was pear shaped as seen in only1 case (2.85%) and absence of quadrate lobe was also observed in 1 specimen (2.85%). A very narrow, buried or absent quadrate lobe may create a confusion to radiologists, as the fissure for ligamentum teres in such cases would be very near to margin of gall bladder[7]. Muktyaz H and Nema U also had similar finding in their study where they found absence of quadrate lobe in 1 case (2.4%)out of 41 cases[9].

Various shapes of caudate lobe encountered in the study was that of bicornuate, triangular and rectangular. Bicornuate caudate lobe with a large papillary process and a fissure separating the papillary process and the caudate process seen in 1 case (2.85%). Sahni et al also reported a variety of shapes of the caudate lobe[10]. The caudate lobe has been described to comprise two portions, joined by a narrow parenchymal bridge –the caudate isthmus. One is situated to the left of inferior vena cava, corresponding to the Spiegel's lobe or couinaud's segment. The second part extends in front of and to the right of the inferior vena cava. It also extends caudally as a caudate process which is termed as the paracaval portion[8]. Joshi et al observed prominent papillary process in 33% of the livers. An enlarged papillary process may mimic a pancreatic body mass, if it extends so far to the left that displaces the body of the stomach anteriorly[11]. Aktan et al observed an absence of caudate lobe in 7.41% of 54 liver specimens whereas in the present study we did not come across in any specimens[12].

The excessive development of liver results in formation of accessory lobes of liver which may carry the risk of torsion and these accessory lobes may lead to wrong diagnosis[6]. Fitzgerald et al as quoted by Tsegaye M et al have reported the presence of an additional lobe too leading to misdiagnosis as a omental lymphadenopathy[13]. Mini accessory lobe of different

shape above the quadrate lobe was seen in 3 specimens (8.57%) in the present study, Hussein Muktyaz et al found accessory lobes in 14.6% out of 41 specimens and Abhilasha W and Charulata S inn 16% out of 50 specimens[13].

Diaphragmatic grooves was seen in 1(2.85%) specimen in the study, higher incidences was reported by Macchi et al[14,15]. Joshi SD et al found in 6% of the liver. Diaphragmatic sulci result from uneven growth of the hapatic parenchyma caused by variable resistance offered by different bundles of the diaphragm muscle. These weak zones offer a lower resistance to external pressure of the diaphragm[14,15]. Normally, there is no other structure between the liver and diaphragm.

Table 1: Liver shape, number and percentage (n=35)

Shape	Number	%
Wedged	8	51.42%
Triangular	7	20.00%
Square	6	17.14%
Irregular	4	11.42%

*n=total number of specimens.

Table 2: Different morphological variations of liver

Morphological features	Number of specimens
Normal	18 (51.42%)
Mini accessory lobes	3 (8.75%)
Accessory fissures	10 (28.57%)
Pons hepatis connecting the left lobe to quadrate lobe	2 (5.71%)
Absence for fissure for ligamentum fissure	1 (2.85%)
Bicornuate caudate lobe	1 (2.85%)
Absence of quadrate lobe	1 (2.85%)
Pear Shaped quadrate lobe	1 (2.85%)

Table 3: Classification of liver according to Netters

Netter type	Number of specimen
Type 1 (very small lobe, deep costal impression)	1 (2.85%)
Type 2 (complete atrophy of left lobe)	-
Type 3 (transverse saddle like liver, relatively large left lobe)	-
Type 4 (tongue like process of right lobe)	1(2.85%)
Type 5 (very deep renal impression and costal constriction)	1 (2.85%)

Fig 1: Photograph showing different shapes of liver A) Wedged, B) Triangular, C) Square, D) Irregular

Fig 2: Photograph showing pons hepatis joining the left lobe with the quadrate lobe and also absence for fissure for ligamentum teres.

Fig. 3: Photograph showing mini accessory lobe above the quadrate lobe and accessory fissure in the right lobe

Fig. 4: Photograph showing bicornuate caudate lobe and absence of quadrate lobe.

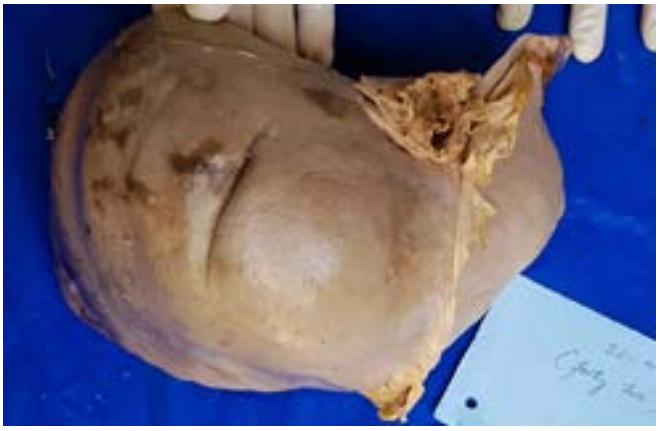

Fig. 5: Photograph showing diaphragmatic groove on the antero superior surface.

Conclusion

In the present study, accessory fissures of various shape, length, depth and number were seen in 10 specimens (28.57%), whereas Haobam RS and Suganthy R in their study on 70 formalin fixed livers encountered accessory fissures on 57 specimens (81.4%)[5], Tsegaye M et al found additional fissures in 9 out of 33 livers (27.27%)[6]. Major fissures like accessory hepatic fissure can be single or multiple and do not extend beyond the upper part of the liver according to Joshi SD et al[7]. These accessory fissures were seen on right lobe, left lobe, caudate and quadrate lobe. Some of these fissures were long n deep whereas some were relatively short. Accessory hepatic fissures

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