

Morphological Variations of Left Lobe of Liver

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ABSTRACT

Introduction: There occurs many kinds of congenital abnormalities of liver. With the advent of newer modalities of screening and the advancements in diagnosis and treatment it is imperative that we should have a detailed knowledge of various morphological changes of left lobe (LL) of liver.

Material and Methods: Eighty livers were utilized for the present study. The variant morphology of LL such as appendix of liver, flat and extended LL, atrophy or absence of some segments of LL were studied. The width of right lobe (RL) and LL were measured from the attachment of falciform ligament to the extreme points, along a horizontal line, as visualized on the anterior surface of right and left lobes of liver.

Results: The average width of RL was found to be 10.56 cms. and that of LL was 6.47cms. In 12.5% of livers the width of RL and LL lobes were equal; in 35% the width of LL was half that of RL; in 7.5% the width of LL was 1/3rd of the RL. In 3.85% the LL showed various shapes of extension, like spatular, leaf like, etc.; Appendix of LL of liver was seen in 27.5%. Atrophy of lateral segments of LL was found in 6.25% of livers.

Conclusion: Present findings may be of great significance to the hepatobiliary surgeons performing transplant surgeries and radiologists in the interpretation of USG and CT images.

Keywords: Appendix of Liver, Liver anomalies, Left Lobe, Shapes of Left Lobe

INTRODUCTION

While reviewing the literature one comes across many kinds of congenital abnormalities of liver, viz. agenesis of its lobe, absence of its segments, deformed lobes, lobar atrophy etc.¹ Absence or hypoplastic left lobe (LL) of the liver is more common than the right lobe (RL) of liver. Congenital agenesis of liver was first described by Heller in 1870.² At three months of gestation the liver almost fills the abdominal cavity.³ In the initial development of liver the right and the left lobes are equal in size but due to the growth of neighbouring organs on the left side, the LL regresses.²

An elongated LL of the liver is defined when the LL of the liver extends beyond the stomach to the left and / or reaches the superior pole of the spleen on CT image.⁴ Gastric volvulus is usually associated with defective development of LL of liver.⁵ Extensive deformities of left lobe of liver produces the symptoms which could be attributed to pressure and pulling causing pain in the epigastrium. Various workers have described extremely long LL - flat like a pancake, spatula like and lingular.⁶ Elongated LL may be misdiagnosed as distension of the splenic flexure of the colon, gastroptosis, hydatid cyst or sarcoma of liver.⁷ These elongated lobes may reach up to spleen and may be mistaken for splenomegaly.⁸ Variations in the morphology assumes greater significance

in diagnostic imaging and minimally invasive surgical approaches.⁸ Study was done to detect and know the various morphological changes of left lobe (LL) of liver.

MATERIAL AND METHODS

Eighty livers available in the department of anatomy, which were apparently free from any pathology, collected over a period of 4 years were utilized for the present study. Permission was obtained from the Institutional Ethical Committee for carrying out the present work. The gross morphology of the right and the left lobes was observed and emphasis was laid on the variant morphology of LL such as appendix of liver, flat and extended LL, atrophy or absence of some segments of LL. The width of RL and LL were measured from the attachment of falciform ligament to the extreme points, along a horizontal line, as visualized on the anterior surface of right and left lobes of liver (Fig.1). The observations were recorded by two observers independently to obviate any intra - observer bias or errors. The various anomalies found were recorded and photographed.

STATISTICAL ANALYSIS

Only descriptive statistics like mean and total percentages were done to interpret the results.

RESULTS

Width:

- The average width of RL was found to be 10.56 cms. (range 7.0 - 15.5 cms)
- The average width of LL was found to be 6.47cms. (range 2.9-11 cms)

Proportion of width of right and left lobes

- In 10 cases (12.5%) width of RL and LL were equal. (Fig. 2B)
- In 28 cases (35%) the width of LL was half that of RL.
- In 6 livers (7.5%) width of LL was 1/3rd of the RL. (Fig. 2A)
- In the remaining livers the ratio was very variable.

Enlarged left lobe (Fig. 3)

In 7 specimens (3.85%) the LL showed various shapes of

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extension leaf like; spatular; truncated pyramid/ wedge shaped and linguiform. The width of LL was found to be either equal or more than the width of RL of liver (Fig. 5A,5B). In some cases LL was prolonged beyond the stomach extending upto diaphragmatic surface of spleen. (Fig. 6A,6B)

Appendix of LL of liver (Fig. 4)

It was found in 22 cases (27.5%)

ATROPHY of lateral segments of LL (Fig. 2A)

In 5 livers (6.25%) only IV segment (Counoid's) was present and was parallel to the attachment of falciform ligament.

DISCUSSION

At three months of gestation, the liver almost fills the abdominal cavity and its LL is nearly as large as its right³,

but due to the development of neighboring organs on the left side, the left lobe regresses.² Veena et al. (2016) have described that the congenital absence or hypoplastic left lobe of liver is more common than the RL and these are more common in males.² In living persons it can be ascertained by MRI and CT scan. The anomalies related to excessive development of the liver lead to the formation of accessory lobes of liver which may carry the risk of torsion.⁶

Causes of atrophy of the LL can be attributed to obstruction of the left portal vein by a thrombus at birth and long standing severe malnutrition.⁹ The absence of the left lobe results in displacement of the gall bladder anteriorly towards the midline.¹⁰ The stomach may be hypermotile in the absence of LL of liver.² Aktan et al.¹ reported the absence of LL in 2.87%; absence of RL in 0.26% and absence of anterior

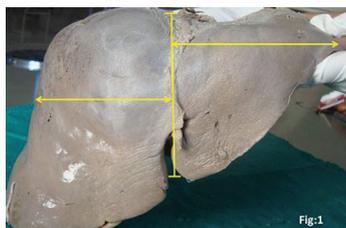


Figure-1: Shows method of measuring the width of the two lobes: vertical line denotes the attachment of falciform ligament, and the horizontal lines are drawn from this to the extreme point on the anterior surface of the two lobes.



Figure-2: (A) Shows that the left lobe is very small as compared to the right lobe and is in the form of rectangular mass of liver tissue parallel to the falciform ligament [segment-IV of Conouid's classification]. (B) The LL is quite large and the width of the two lobes are almost equal in proportion.

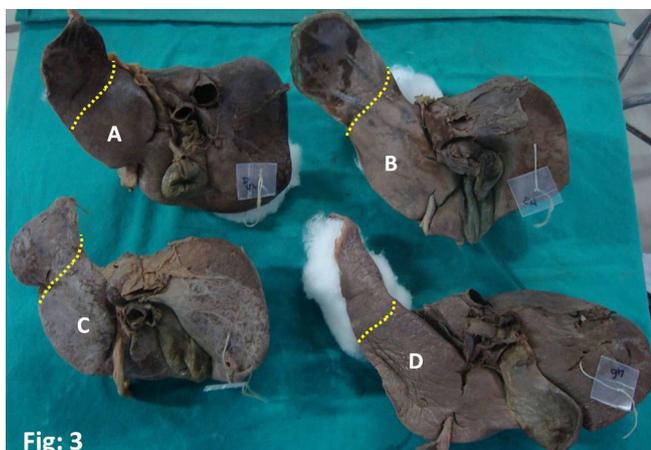


Figure-3: Elongated left lobe of liver showing various forms (A) leaf like (B) spatular; (C) truncated pyramid/ wedge shaped; (D) linguiform. The main mass of LL is demarcated from the extension by yellow dotted lines.

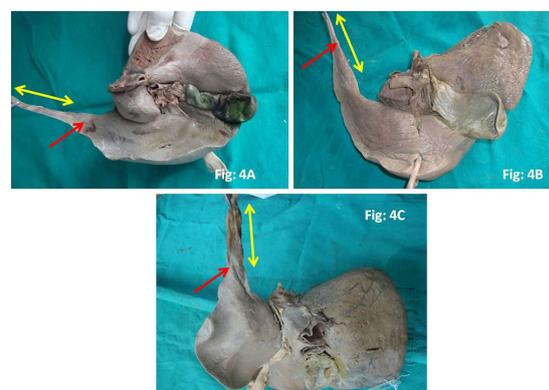


Figure-4: Shows appendix of liver:- In (A) and (C) the whole length of the appendix is fibrous and in (B) only its distal part is fibrous. Red arrow indicates the level of liver tissue. Yellow arrow indicates the complete extent of appendix

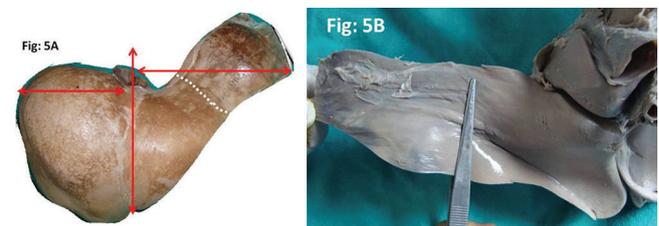


Figure-5: (A) Large spatular prolongation of left lobe; its width exceeds that of RL. (B) The curved part of the lingual extension of LL has been flattened to show its visceral surface.



Figure-6: (A) Liver specimen in situ showing enlarged leaf like extension of LL, viewed from the superior surface showing the relationship of LL with the stomach (St) and spleen (Sp). (B) Another specimen of liver seen in situ showing prolongation of the LL upto the spleen (Sp); dotted line demarcating the main mass of LL from its extension. The visceral surface of the extended LL is seen to cover the diaphragmatic surface of spleen like a hood. Stomach has been removed. P= pancreas.

segment of LL in 0.78%. In the present study the absence of LL was not seen, whereas, absence of II and III segment of LL was found in 6.25% cases (Fig. 2A).

Dragica et al.⁶ (2016) have quoted the works of different authors and have emphasized that there can be different types of LL: i) extremely long LL; ii) too flat like pancake; iii) lingular prolongation (spatular); and iv) enlargement of LL. The prolongation of the LL in the present study, was found in 8.75% (7 specimens) (Fig. 3A, B, C, D).

In our study the width of RL and LL were measured: a) It was found that RL was equal to LL in 10 cases (12.5%) (Fig. 2B); b) The LL was half the width of RL in 28 livers (35%); c) In 6 liver (7.5%) the LL was one third the width of the RL (Fig. 2A); and d) The proportion was variable in the remaining 36 livers (45%).

The proportion between the RL and LL has not been mentioned by any of the earlier workers. Gastric volvulus is usually associated with defective development of the left lobe of liver.¹¹ In case of congenital anomaly of left lobe there will be gastric volvulus and the congenital anomaly of right lobe may lead to development of portal hypertension.² Sangeeta et al.⁷ (2014) found small LL in 7.14%. In our study LL was 1/3 of RL in 7.5% livers, which is similar to their findings. In the present series in 10 livers (12.5%) both the lobes were equal in size which Sangeeta et al. have described as saddle like, with relatively large LL in 7.14%. An elongated left lobe of the liver is defined when the left lobe of the liver exceeds the stomach to the left and / or reaches the superior pole of the spleen on CT image.⁴ In their study tongue like projection (lingular) of LL was reported in 6 livers (8.5%), whereas, in our study it was found in 7 livers (8.75%). These findings of extension of LL observed in the liver studied from Karnataka⁷ and central India showed no difference in their incidence. Reviewing the literature we could not find any plausible explanation for the development of this anomaly. In the present study the hood like extension of left lobe reached beyond the stomach upto the diaphragmatic surface of spleen (Fig. 6A, 6B). Various workers have shown that this anomaly is associated with gastric volvulus and symptoms of pain, pressure and pulling in the epigastric region. The pertinent point that needs to be remembered is that the distal region of left lobe of the liver and the spleen are undetectable by ultrasound examination when scanning from subxiphoid area. These can be only partially visualized when scanning from the left flank through the spleen and the intercostal area. The presence of gas in the stomach, colon and lung impedes ultrasound transmission and imaging of the elongated left lobe of the liver located at higher position and medial to the spleen.

In the present study the incidence of appendix of liver was much higher i.e. in 22 cases (27.5%) (Fig. 4) compared to that reported by Sangeeta et al.⁷ in only 2.85%. In some cases the whole length of appendix was fibrous (Fig. 4A, 4C) whereas in others only the distal part was fibrous (Fig. 4B).

CONCLUSION

While reviewing the literature on the morphological

variations of liver, one finds an extensive amount of literature on accessory fissures and lobes, variations of lobes including its absence, presence of pons hepatis, etc.; but there is a paucity of literature on the anomalies of left lobe of liver. In the present study we have found and reported the incidence of the various types of left lobe. In 12.5% the width of RL and LL was equal and in the remaining the LL was smaller in size. In 8.75% livers, the LL had prolongation of various shapes. Appendix of liver was found in 27.5%. The presence of the elongated left lobe of the liver needs to be emphasized as not only it can be misinterpreted as subcapsular splenic hematoma, it may also cause misdiagnosis of focal lesions at ultrasound examination, as discussed. These findings may be of great significance to general surgeons, hepatobiliary surgeons including transplant surgeries and USG and CT interpretations by radiologists.

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