

ANOMALIES OF LIVER MORPHOLOGY: A STUDY ON CADAVERIC LIVER

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ABSTRACT

Background: liver is a largest gland in our body but congenital abnormalities of liver are rare. Hepatic anomalies can be due to defective development or due to excessive development of the liver.

Aims: to study various anomalies of liver morphology collected from cadavers.

Materials and methods: A total of 30 formalin fixed cadaveric livers (n=30), irrespective of the sex, were taken for this study in the Department of Anatomy, Silchar Medical College, Silchar and Gauhati Medical College, Guwahati, Assam. Four abnormal livers were found. These livers were then preserved and studied under day light.

Results: Four livers under study were examined and different types of morphological variations were observed among them.

Conclusion: Anomalies in liver morphology are important for radiologist to prevent confusion during imaging and also help surgeons to plan surgeries.

KEY WORDS: liver morphology, tongue like elongation, accessory fissures and lobes.

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BACKGROUND

The congenital malformations of liver are of interest, as they throw light on some important problems in the morphological anatomy of the gland [1]. The congenital abnormalities of human liver are rare [2] and they are rarer than almost any other organ of the body [1].

Liver develops from an endodermal evagination of the foregut and from septum transversum mesenchyme [3]. The embryological basis of the anomalies of liver morphology occurring in the course of organogenesis remains to be elucidated [4].

The congenital malformations of the liver include agenesis of the lobes, absence of segments, deformed lobes, decrease in lobe size, atrophy of the lobes and hypoplastic lobes [5]. Knowledge of hepatic morphology anomalies is important since they do not always remain clinically latent. A general review of hepatic anomalies can be divided into two categories, i.e., anomalies due to defective development and anomalies due to excessive development of the liver [4].

It is important to keep in mind the anomalies of liver during the preoperative diagnosis because it will be helpful for the surgeon in planning biliary surgery or a portosystemic anastomosis [6].

MATERIALS AND METHODS

A total of 30 formalin fixed cadaveric livers (n=30), irrespective of the sex, were taken for this study in the Department of Anatomy, Silchar Medical College, Silchar and Gauhati Medical College, Guwahati, Assam. These specimens belonged to cadavers of unknown origins. The study was conducted from July 2010 to Jun 2015. Four types of abnormal livers were found. The livers were taken out and preserved under 10% formalin for further study. The study was approved by the institutional ethics committee of the medical college and hospital.

On gross examination, colour, consistency and texture of the abnormal parts were studied and various parameters (length, breadth, thickness, weight) were measured under day light.

RESULTS AND OBSERVATIONS

Out of 30 livers, four types of abnormal livers were found.

Table 1: number and percentage of morphologically abnormal and normal livers.

Morphological normal and abnormal livers	Number of livers & the percentages	
Normal	24	80%
Tongue like projection of left lobe	3	10.01%
Fusion of quadrate lobe with left lobe	1	3.33%
A projection of left lobe towards quadrate lobe with accessory fissure on left lobe	1	3.33%
Accessory lobe, fissures & absence of gall bladder fossa with gall bladder.	1	3.33%
Total	30	100%

Three livers with tongue like elongated left lobe were numbered as 1, 2 and 3 (Figure 1, 2 and 3). The arbitrary points were taken at the base, middle, apex of the elongated parts, at the tuber omentale, at the upper end of the left lip of the groove for ligamentum venosum and at the lower end of the left lip of the groove for ligamentum teres hepatis. Various parameters were measured with tailor's measuring tape, vernier caliper and threads (figure 4, table 2 and 3). These three livers were also compared with normal livers

of similar size, shape, and weight (table 2). Tissues of elongated parts of the left lobes of each of the livers were taken for histological study under a light microscope after routine haematoxylin & eosin (H and E) staining (figure 5).

Table 2: showing various parameters of elongated left lobe of abnormal livers and left lobe of normal livers.

Measurements	Abnormal liver no.1	Abnormal liver no.2	Abnormal liver no.3	Measurements of left lobe of normal livers without any elongated part	
from upper end of left lip of groove for ligamentum venosum upto apex of elongated part (upto arbitrary apex on left lobe for normal liver)	10.7cm	13.9cm	10.5cm	6.7cm	6.8cm
from lower end of left lip of groove for ligamentum teres upto apex of elongated part (upto arbitrary apex on left lobe for normal liver)	17.5cm	24.3cm	16.8cm	14.7cm	12.2cm
from tuber omentale to apex of elongated part (upto arbitrary apex on left lobe for normal liver)	11.2cm	20.3cm	13cm	8.4cm	7.9cm
Weight	908.6 gm	1220.5 gm	570 gm	1253.7gm	922.4 gm

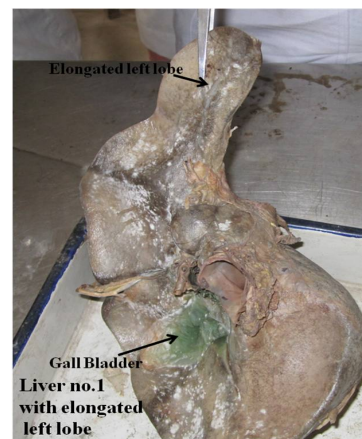
Table 3: Showing measurements of thickness of elongated parts of three abnormal livers.

Measurements of thickness of the elongated parts		Abnormal liver no.1	Abnormal liver no.2	Abnormal liver no.3
Thickness	at the base	0.6 cm	1.2 cm	0.8 cm
	at the middle	1 cm	1 cm	1 cm
	near the apex	0.4 cm	0.5 cm	0.4 cm

On histological examination under H and E staining, it was found that the elongated part of abnormal livers was liver tissue (figure no.5) and thus fibrous appendix of liver was excluded. Fibrous appendix of liver is a fibrous band at the left end of the adult left lobe which may appear as an atrophied remnant of the more extensive part of the left lobe found in children [7].

Other than the three livers with tongue like elongated left lobe, a liver was found with weight 1210 gm having fusion of quadrate and left lobe (Figure 6).

Fig. 1: showing liver no.1 with tongue like elongated left lobe.



Another liver of 1239 gm weight was found with a projected mass of 2 cm × 3 cm size from left lobe towards quadrate lobe (figure 7). There was an accessory fissure on left lobe (figure 7).

The fourth type of abnormal liver was found with weight 1310 gm having fissures on the right and left lobe. One accessory lobe was observed between porta hepatis above and quadrate lobe below. There was absence of gall bladder fossa and gall bladder (figure 8).

Fig. 2: showing liver no.2 with tongue like elongated left lobe.



Fig. 3: showing liver no.3 with tongue like elongated left lobe.



Fig. 4: showing measurements of elongated left lobe of abnormal livers and left lobe of normal livers with tailor's tape, vernier caliper and threads.



Fig. 5: photomicrograph of elongated part of abnormal liver no.1 showing liver tissue.

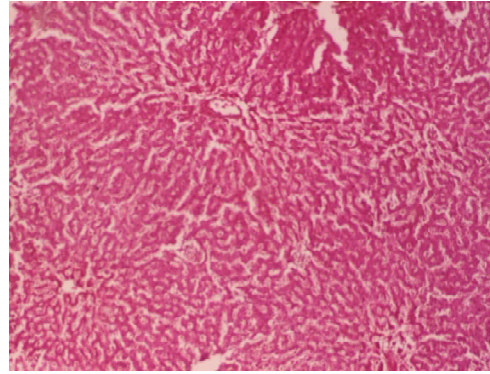


Fig. 6: showing liver with fusion of quadrate and left lobe.

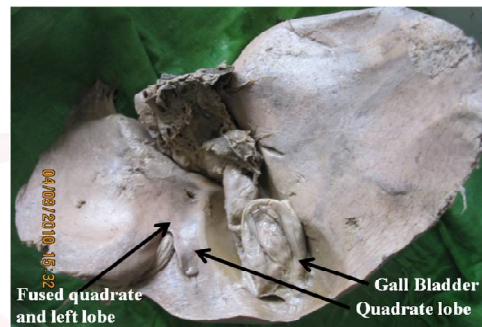


Fig. 7: showing liver with a projected mass (black arrow) from left lobe towards quadrate lobe with accessory fissure (red arrow) on left lobe.

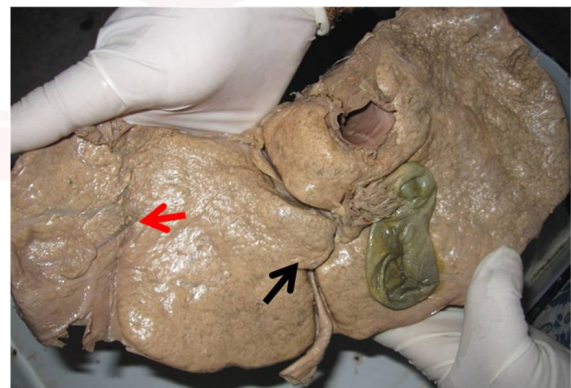
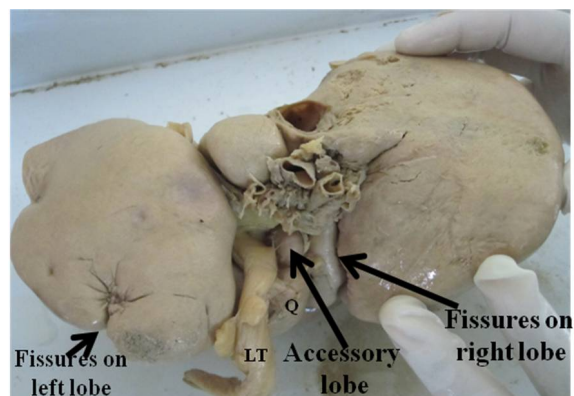


Fig. 8: showing liver with accessory fissures and accessory lobe. Both gall bladder fossa and gall bladder were absent. ('Q' for quadrate lobe and 'LT' for ligamentum teres).



DISCUSSION

The variations that have been observed in the anatomy of the human liver have been classified as congenital or acquired [8]. Congenital changes in the organ are characterized by the following aspects: a) lobes separated by glands (considered to be a congenital variation by some anatomists); b) atrophy at some locations in the parenchyma; c) presence of only one lobe; d) presence of multiple lobes, typically involving numerous divisions of the right lobe; e) small lobes; f) peduncular lobes; g) lobes without division; and h) accessory lobes. Acquired changes in liver morphology are represented by the following characteristic features: i) linguiform lobe ii) costal organ with very small left lobe iii) deep renal impressions and "corset" type constriction and iv) local inflammation of the organ or gallbladder [9].

Congenital changes in the form of an enlargement of the left lobe are greater than what may occur in the right [10]. According to Haaga et al [11], common normal variants in liver morphology include horizontal elongation of the lateral segment (Bismuth-Couinaud segment II) of the left hepatic lobe, which can extend into the left upper abdominal quadrant and eventually abut or even wrap around the splenic contour. This anatomic variant is more common in women than in men [11].

Tongue like elongation of left lobe of liver was reported by authors like Hammond LJ [10], Chiba S et al. [12], Dunlop DJ et al. [13], Sultana S et al. [14]. A recent study by Arya RS et al. [15] reported 15% liver (nine out of total 60 cadaveric livers) with tongue like elongation of left lobe whereas another study by Nayak BS et al. [16] reported 1.81% livers with extremely long left lobe. Defective development of the left hepatic lobe can lead to gastric volvulus. Conversely, defective development of the right lobe of liver either remains clinically latent or leads to portal hypertension [4].

Aktan ZA et al [2] in their study found 14.81% liver having fused left and quadrate lobe whereas 3.70% livers having absent quadrate lobe. In the present study, 3.33% livers have fused left and quadrate lobe (figure 6 and table 1). Nayak BS et al. [16] reported 1.81% livers with

absence of fissure for ligamentum teres and it was due to fused quadrate and left lobe of liver. Arya RS et al. [15] found 5% livers with fused quadrate and left lobe.

An Accessory lobe of the liver is an anatomical abnormality that is rarely seen and is mostly the result of embryonic heteroplasia [17,18]. There are two types of accessory lobe of the liver: an accessory lobe joined to normal hepatic tissue and a lobe that is completely separate [19]. In the present study, an accessory lobe (figure 8) was present between quadrate lobe and porta hepatis and joined to the normal hepatic tissue. An accessory lobe of the liver can also be classified as pedunculated or sessile [20]. Another liver with a projected mass from the left lobe (figure 7) was observed in the present study and the mass was a sessile accessory lobe of liver. Arya RS et al. [15] reported 6.6% livers with accessory lobes in their study and Wang C et al. [20] reported three cases with accessory lobes. Most patients with accessory lobes have no symptoms and are seldom diagnosed in the early stages [20]. Most accessory lobes are discovered unexpectedly during surgery or autopsy [20] but it has been suggested that removal of known accessory lobes should be considered because of the risk for torsion [21].

According to Auh et al. [22] the accessory hepatic fissures are potential sources of diagnostic errors during imaging. Any collection of fluid in these fissures may be mistaken for a liver cyst, intrahepatic haematoma or liver abscess. In the present study, one liver had accessory fissures on both right and left lobes (figure 8) and another liver had accessory fissure on the left lobe (figure 7). Vinnakota et al. [23] studied 54 liver specimens and found 10 livers with right lobe accessory fissures and six livers with left lobe accessory fissures. Mamatha Y et al. [24] found 10% livers with right and left lobe accessory fissures.

CONCLUSION

Anomalies in liver morphology are important for radiologist to prevent confusion during imaging and also help surgeons to plan surgeries.

Conflicts of Interests: None

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