

**MORPHOLOGICAL VARIATIONS OF LIVER****Sunita Bharati¹, Manisha Nakhate², Manisha Mishra³, Dipin Kumar Yadav⁴, Vivek Gupta⁵****Article History:** Received: 08.03.2023

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Abstract

Introduction: The liver is the largest organ secondary to the skin. It occupies most portion of the upper abdominal space. It accounts approximately 2% to 3% of total body weight for everyone. The liver has four lobes namely right, left, caudate, and quadrate, but based on physiological classification liver has eight segments. The liver is the vital organ without which the tissues of the body die from a lack of energy and nutrients. Major and minor grooves of the liver play a crucial role in hepatectomy as they are significant in the localization of the tumor. So Anatomical evaluation and a better surgical understanding of the liver are essential.

Aim: The present study aims to determine the gross anatomical variations of the liver.

Materials and Methods: Present morphological study was conducted on 60 formalin-fixed livers which were observed for the study in the Dept. of Anatomy, D.Y. Patil Medical College, Navi Mumbai, Maharashtra, India. Different variations in lobes, fissures, and accessory lobes, decrease in size of lobes, lobar atrophy, and any other variations on the surface of the livers were observed.

Results: Out of 60 livers studied; Abnormal fissures were present in-12(20%), absence of quadrate lobe 2(3.3%), Right lobe with projection (tortoise shape) 1(1.6%), saddle like with elongated left lobe of liver 2(3.3%), concavity on anterior surface 1(1.6%), hypertrophied caudate lobe 3(5%), right lobe 3(5%), and bilobed quadrate lobe 1(1.6%)

Conclusion: Knowledge of anatomical and morphological variations of the liver is important for anatomists, radiologists, and surgeons. Awareness of this variation will be helpful during imaging techniques and surgeries.

Keywords: Human liver, Anatomy, Variations.

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1. Introduction

The liver is the largest organ secondary to the skin. It occupies most portion of the upper abdominal space. It accounts for approximately 2% to 3% of total body weight for everyone. The liver has four lobes right, left, caudate, and quadrate, but based on physiological classification liver has eight segments. The right and left lobes are anteriorly separated by the attachment of the falciform ligament, posteriorly by the fissure for ligamentum venosum, and inferiorly by the fissure for ligamentum teres. On the left side, the caudate and quadrate lobes are bounded by the groove for the inferior vena cava and the fossa for the gall bladder. The liver is the vital organ without which the tissues of the body die from a lack of energy and nutrients. Major and minor grooves of the liver play a crucial role in hepatectomy as they are significant in the localization of the tumor. Liver imaging is

usually performed to search for primary or metastatic liver diseases. So Anatomical evaluation and a better surgical understanding of the liver are essential(1). Hence this study was conducted to observe the variations on the surface of the liver.

Aim: The present study aims to determine the gross anatomical variations of the liver.

2. Materials and Methods

Present morphological study was conducted on 60 formalin-fixed livers which were observed for the study in the Dept. of Anatomy, D.Y. Patil Medical College, Navi Mumbai, Maharashtra, India. Different variations in lobes, fissures, and accessory lobes, decrease in size of lobes, lobar atrophy, and any other variations on the surface of the livers were observed. Photographs of all morphological variations were taken.

Observations & Results:



Fig.1- Abnormal fissure



Fig.2- Liver with costal impressions



Fig.3- Elongated left lobe of liver with absence of quadrate lobe.



Fig.4- Right lobe with projection(tortoise shape).



Fig.5-concavity on anterior surface.



Fig.6-Enlarged right lobe & Hypoplastic left lobe.



Fig.7- Bilobed quadrate lobe.

Table No.1: Netter's classification of morphological variations of liver.

TYPES	Description
Type 1	Normal
Type 2	Very small left lobe, deep costal impressions
Type 3	Complete atrophy of left lobe
Type 4	Transverse saddle like liver, relatively large left lobe
Type 5	Tongue like process of right lobe
Type 6	Very deep renal impression and corset constriction
Type 7	Diaphragmatic grooves

Table No.2: **Morphological variation of Liver in present study**

Morphological variation of Liver	Number	Percentage
Normal	35	58.3%
small left lobe, absence of quadrate lobe , costal impressions	2	3.4%
Abnormal fissure right lobe	12	20%
saddle like with elongated left lobe of liver	2	3.4%
Right lobe with projection(tortoise shape)-	1	1.7%
concavity on anterior surface	1	1.7%
Enlarged caudate lobe	3	5%
Enlarged right lobe	3	5%
Bilobed quadrate lobe	1	1.7%

3. Results

Out of 60 livers studied; 35 –Normal, with variations in -25 Abnormal fissures were present in-12(20%Fig.1), costal impressions & absence of quadrate lobe- 2(3.3%)Fig.2, saddle-like with the elongated left lobe of liver-2(3.4%Fig.3), Right lobe with projection(tortoise shape)- 1(1.7% Fig.4), concavity on anterior surface-1(1.7% Fig.5), Enlarged caudate lobe-3(5%) & right lobe-3(5%Fig.6), Bilobed quadrate lobe-1(1.7%Fig.7)

4. Discussion

The human liver showed variations in its external appearance, lobes, and fissures which are considered as abnormality or anomalies. The knowledge of its abnormality becomes very important to clinicians, surgeons, and radiologists for minimizing the complications that it could build up during radiological diagnosis, hepatic interventions, and other surgical procedures. The abnormality may be high in the population which is not noticed; because they are usually asymptomatic(2) They may be diagnosed as accidental findings. Most of the morphological anomalies are either due to defective or excess development(3).

Considering the development of the Liver, Liver plates appear in the middle of 3rd week of development as a thickening of the caudal part of the foregut which grows to form hepatic bud which invaginates septum transversum(4).

As quoted by Wahane et al, The human liver morphological variations can be classified as congenital or acquired, the congenital can be due to a defect in development or due to excess growth during development. Excess growth during development leads to the occurrence of accessory lobes of the liver and this can pose wrong conclusions radiographically. In their study, wahane et al. studied 50 liver specimens and found accessory lobes and fissures in 16% and 20% respectively (5) In our study, the occurrence of abnormal fissures was observed in 12 of the 60 specimens studied, i.e, in 20 % of total specimens (type -3). The present study showed Accessory fissures in the right lobe in 20%. This study is per Kebe E. Obeten, et al who observed more fissures on the right lobe of the liver (6).

According to Netter's type-4 In the present study, 3.4% of the livers showed an elongated left lobe which is comparable with a study that revealed 7.10% (7). Whereas the higher incidence of the elongated left was also

recorded by Arya et al in their study reported the presence of an elongated left lobe in 15% of the livers(8). The lower incidence was also reported in 1.72%,(9) 3.30% and 4%(10) of the livers. Defective development of the left hepatic lobe can lead to gastric volvulus. Conversely, defective development of the right lobe of the liver either remains clinically latent or leads to portal hypertension (11).

According to Netter's type-2 higher incidence of costal impressions or diaphragmatic grooves was observed by Macchi et al and Auh et al in the present study which is 3.4%. According to Schafer and Symington and De Burtet it results from uneven growth of the hepatic parenchyma caused by variable resistance offered by different bundles of the diaphragm muscle(12).

5. Conclusion

Morphological variations of the liver could be developmental in origin or due to the pressure given by the diaphragm, peritoneal ligaments, and other organs in relation to the liver so developed during the lifetime of a person. Knowledge of anatomical and morphological variations of the liver is important for anatomists, radiologists, and surgeons. Awareness of this variation will be helpful during imaging techniques and surgeries.

6. References

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