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Original Research Article

MORPHOLOGICAL STUDY ON VARIATION OF EXTERNAL SURFACE OF LIVER

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ABSTRACT

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

Aims and objectives: The aim of the present study is to completely analyse the morphology of liver and it's variations. Studying about appropriate position and size of variation could be utilised by radiologists,surgeons,and anatomists.

Materials and methods: Embalmed liver specimens in the Dept of anatomy KIMS is used for the study.The liver lobes were studied in detail for accessory lobes and fissure.

Results: Out of 30 liver studied,fissures were noted in 18 (60%) livers. Elongated left lobe observed in two specimens(6.6%). Pons hepatis in 5 (13.3%)liver.Netter type 2 and 4 were observed in one (3.3%) and two(6.6%) respectively.In this study various morphological variations of liver were observed.Awareness of this variation will be helpful during imaging technique and surgeries.

KEY WORDS: Liver,Abdomen, Ponshepatis, Fissures, Caudate Lobe, Quadrate Lobe.

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INTRODUCTION

In the strangely beautiful dynamism of embryology,the liver appears as a tree that grows out of the virgin land of foregut in order to increase its metabolic and digestive functions [1].

Liver the largest internal organ in the body accounting for approximately 2 % to 3% of total body weight.Long mire [1] called liver as hostile organ because it welcomes malignant cells and sepsis so warmly because it is the first organ to be injured in blunt abdominal trauma.Liver is one of the first organ to develop in embryo and rapidly largest organ in foetus [1].

Based on external appearance four lobes right,left,quadrate,and caudate lobe. Demarcation if right and left lobe anteriorly along line of attachment of falciform ligament.Posteriorly along fissure for ligamentum Venosum and inferiorly along fissure for ligamentum teres. Quadrate lobe in front, Caudate lobe behind separated from each other by porta hepatis.

Towards left, caudate lobe and quadrate are bounded by groove for Inferior vena cava and gall bladder fossa respectively.The liver bud appears at the end of anterior gut endoderm in about twenty fifthday and erythropoiesis starts in seventh month of fetal period.During growth liver bud divides into two parts,the large part of the bud makes the liver,while the hepatic duct and small part of the bud makes gall bladder and cystic duct.

Impaired development of the left lobe of the liver may lead to gastric volvulus,problems in the right lobe of the liver leads to hypertension.

Accessory lobe of the liver if it is small in size it is important because it may be mistaken for lymph nodule.Information on the accessory fissure of the liver is important because accessory fissure may mimic liver pathological nodes in CT images. Procedure like laparoscopic hepatectomy and laparoscopic ablation of patient with hepatic tumor have been increasing recently [1].

In any operative procedure surgeons should have knowledge of hepatic anatomy.The major fissures are important landmarks for interpreting lobar anatomy and locating liver lesions. Hence knowledge regarding variations in liverlobe is essential for surgeons and radiologists,so as to prevent wrong interpretation in diagnosis.

Aims and objectives: The aim of the present study is to completely analyse the morphology of liver and it's variations. Studying about appropriate position and size of variation could be utilised by radiologists,surgeons,and anatomists.

MATERIALS AND METHODS

Thirty embalmed liver specimens in the Dept of anatomy KIMS is used for the study.The liver lobes were studied in detail for accessory lobes and fissure.

Table 1: Morphological variation of liver.

S.No	Variations	Number	Percentage
1	Fissure in right lobe	12	40
2	Fissure in left lobe	1	3.3
3	Fissure in caudate lobe	3	10
4	Fissure in quadratelobe	2	6.3
5	Groove in antero superior	6	20
6	Elongated left lobe	2	6.6
7	Pons hepatis	5	13.3
8	Reidels lobe	1	3.3

RESULTS

Fig. 1: Type 7 Netters classification,diaphragmatic fissures.

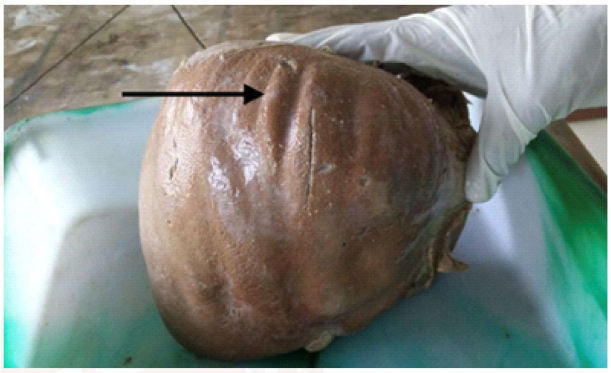


Fig. 2: Liver showing pons hepatis with elongated left lobe.

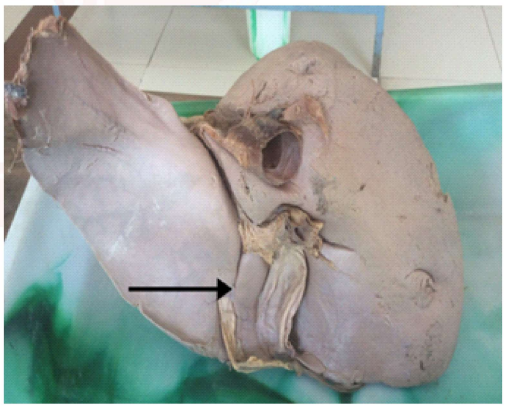


Fig. 3:liver with pons hepatis.

Out of 30 liver studied fissures of various sizes is noted in 18 specimens(60%).Accessory fissure present in right lobe in 40%,left lobe 3.3% and in quadrate lobe in 6.3%.Diaphragmatic fissure

seen in 6(20%) of liver(Fig1).Mostly fissure are seen in visceral surface.

Elongated left lobe Netters type 4 was observed in two specimen(6.6%). Netters type 2 liver that is small left lobe was seen in one specimen (3.3%). Caudate lobe bilobed in one specimen (3.3%) Fissure in Caudate lobe was noted in 3 (10%) specimen.

Totally in five specimens Pons hepatis 13.3% was seen.Among the five three specimens had liver tissue that is pons hepatis was seen connecting left lobe and quadrate lobe,so in three specimens no boundaries for quadrate lobe (Fig 2 and Fig 3).In another two specimens pons hepatis was seen in groove for inferior vena cava near the fossa for gall bladder.

DISCUSSION

Netters classification

Table 2: Netter's classification of Morphological variations of Liver.

Types	Description
Type1	Normal
Type2	Very small left lobe costal impression
Type3	Complete atrophy of left lobe
Type4	Transverse saddle like large left lobe
Type5	Tongue like process of right lobe
Type6	Deep renal impression and corset constriction
Type7	Diaphragmatic grooves

Table 3: Comparison of results:

Morphological features	Joshi et al [8]	R Seltzer et al [1]	Heena J Chaudhari et al [13]	Justin Chin, et al [12]	Present study
Accessory fissures in right lobe	30%	12.10%	10%	12.50%	40%
Accessory fissure caudate lobe	-	-	-	3.70%	10%
Pons hepatis	30%	9.70%	14%	3.50%	13.30%
Reidels lobe	-	-	-	1.25%	3.30%

Table 4: Comparison of morphological features of liver of Netters Classification.

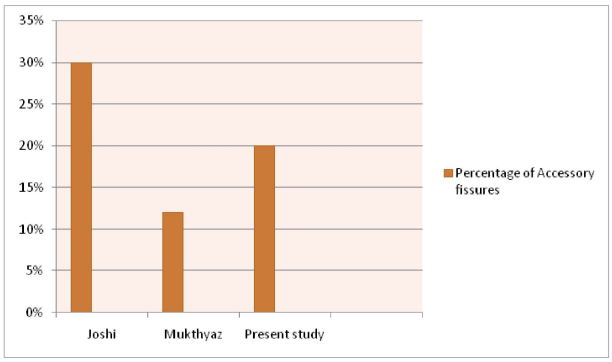
Netters classification	R Seltzer et al [1]	Kebe E. Obeten, et al [7]	Present study
Type 2	1.64%	3%	3.30%
Type4	21.30%	9%	6.60%

While comparing on basis of Netters classification Type2 ,small left lobe of liver,it is similar to the study done by Sangeetha.Type 4 ,large elongated left lobe in the present study is 6.6%,correlating well with the study of Sangeetha which is 9%.

Accessory fissure: The present study showed Accessory fissure in right lobe in 40%,left lobe 3%,caudate lobe in 10%.Fissure were more common in right lobe than left. This study is in accordance with Kebe E. Obeten, et al who observed more fissure on right lobe of liver.In the study done by Joshi et al [3] it was around 30%.Single liver in some animals like dog and pig has distinct lobules separated by strands of connective tissue.Sometimes in human liver shows this variation by reversion.

Comparative chart of accessory fissures from various study is given in chart 1.

Chart 1: Comparative chart for accessory fissures in right lobe.

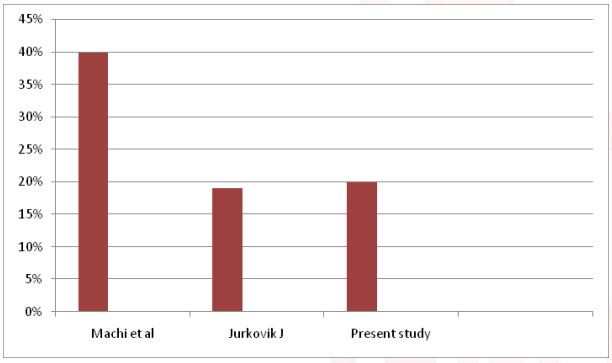


The accessory fissure is potential pitfall during ultrasonogram,CT or plain radiograph. Any collection of fluid in these fissures may be

mistaken by liver cyst,liver abscess. Implantation of peritoneally disseminated tumour cells into these spaces may mimic intraheptic focal lesions.Accessory fissure may also resemble macronodular liver in CT.

Variation in antero superior surface of liver:Liver with diaphragmatic impression Netter type 7 were seen in 20%. In the study done by Machi etal [3] found it to be 40%.Jurkovik j et al [3] observed to be 19.23% resembling this study.Chaudhari etal [12] observe to be 7.5%Comparative study is shown in chart 2.

Chart 2: Comparative study on fissures of anterosuperior surface of liver.



Diaphragmatic fissure could be due to inavagination of muscles of diaphragm into liver on costal surface.

Recent cast studies also shown that these represent portal fissures on surface..Machietal[9] has stated that these diaphragmatic fissure is a land mark for projection of portal fissures and of hepatic vein.

Variations of left lobe: Large tongue like projection of left lobe was noted in 6.6% In the study done by Sangeetha et al it was 8.75%.The presence of tongue like projection could be misinterpreted as subcapsular splenic hepatoma.

Reidel lobe: It is common variation associated with right lobe.Reidel lobe described by Corbin in 1830 and defined by Reidel in 1888 as round tumor in anterior side of liver. Justin chin [12]in his study prevalence of reidel lobe is 24%.

It may be congenital or acquired. Congenital origin is supported by possible defects in development of hepatic bud.Reidel lobe is mostly asymptomatic. Sometimes it may be symptomatic due to inflammation or torsion it may produce hypochondriac or epigastric pain.In the study done by Chaudarietal [13] it was around 1.25%.In the present study reidel lobe is found in one specimen (3.3%).

Pons hepatis: First described by Von haller in 1743.In the study done by J chin et al[11] found pons hepatis in 36%.clinical importance of pons heaptis is that metastatic hepatoma have been found to originate from pons heapttis as weel as harbouring site of peritoneal disseminated tumor cells.In the study by Patil et al [14] it was 10%, current study pons hepatis was found in 5 specimens (13.3%).Pons hepatis present over the inferior vena cava will also cause mechanical obstruction to blood flow.It also forms important landmark for cytoreduction surgery of liver.

CONCLUSION

In man liver is essential for survival.No artificial organ or equipment has capacity for compensation for absence of liver function.Asound knowledge of normal and variant is prerequisite for safe surgical approaches and diaganaostic images.Due to the advances in liver surgery like laparoscopic hepatectomy laproscopic thermal ablation for the patients with tumor these variations will be helpful. Knowledge of anatomical and morphological variations of liver is important for anatomists,radiologists and surgeons.

Conflicts of Interests: None

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