ORIGINAL RESEARCH PAPER
Volume-8 | Issue-9 | September - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

MORPHOLOGICAL VARIATION OF FORMALIN FIXED HUMAN CADAVERIC LIVER

Anatomy

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ABSTRACT

The liver is the largest gland in our body which help to synthesizes protein, detoxifies metabolites, and produces biochemicals essential for digestion. The purpose of this study was to determine the morphological variation of formalin fixed human cadaveric liver. Total 48 human liver specimens were studied in detail for the accessory fissure, diaphragmatic grooves, pons hepatis, accessory lobe, elongated left lobe, notches in border etc. in the department of Anatomy, KD medical college Mathura, U.P India. The liver was observed grossly and photographs were taken. The data observed was displayed in tabulated form. we observed 27 (56.25%) normal liver, 4 (8.33%) liver with large left lobe, 03 (6.25%) liver with diaphragmatic grooves, 12 (25%) of liver indicate accessory fissure in lobe i.e. right, left, caudate and quadrate lobe, 04 (8.33%) liver with Pons hepatis connecting left lobe of liver with quadrate lobe, 03(6.25%) liver indicate accessory lobe and 02 (4.16%) liver showed larger papillary process. The present study provides knowledge about morphological variation in liver hence this study useful for anatomist, surgeon for surgery, clinicians, radiologist for proper diagnosis and treatment. It also helps to differentiate congenital or acquired abnormalities of the liver.

KEYWORDS

Liver, Accessory Fissure, Accessory lobe, Pons hepatis

INTRODUCTION:-

The liver (Greek hepar) is the largest, accessory digestive gland consists of both exocrine (secretes bile) and endocrine (stores glycogen, plasma proteins, heparin). Liver bile helps in the emulsification of fat. The liver situated in the right hypochondrium, left hypochondrium, epigastric region below the diaphragm. The liver is wedge shaped, soft reddish brown colored highly vascular organ about 1200- 1500g in weight. The liver is large in children due to haematopoietic function during foetal life. The liver develop from hepatic bud (larger cranial part i.e. pars hepatica and smaller caudal part i.e. pars cyctica), septum transversum. The hepatocyte start secreting bile at about 12th week of IUL.[1] The lobes of the human liver are classify in two types they are anatomical lobe (the diaphragmatic surface divided into right and left lobe by the attachment of peritoneal fold i.e. falciform ligament were as visceral surface divided into right lobe, left lobe , quadrate lobe, caudate lobe by fissure and fossae i.e fissure for ligamentum teres, ligamentum venosum, porta hepatis, groove of inferior venacava and fossa for the gall bladder.) and physiological or functional lobes or true lobes (liver is divided by an imaginary line i.e. Cantlie's plane / line in to right and left lobe and the division is based on the distribution of branches of the bile duct, hepatic artery and portal vein).[2] Couinaud (1957) and Healy and Schroy (1953) explain widely acceptable nomenclature by its internal architecture of liver. According to nomenclature of couinaud, the hepatic segment are numbered from I to VIII (segment I to IV in functional left lobe and segment V to VIII in functional right lobe).[3,4]

Morphological variation of human liver may be congenital or acquired. The congenital abnormalities of liver consist of accessory fissure, atrophy or hypoplasia of lobes, accessory lobe, deformed lobe, agenesis etc. In 1870 Heller 1st describe the congenital agenesis of liver.[5] Acquired variation of liver may be due to pressure given by diaphragm, peritoneal ligament and related organ.[6] According to Netter's there were six type of liver variation.[18]

The aim of this study to describe the morphological variation of formalin fixed human cadaveric liver hence this study useful for clinicians, surgeon, physician, anatomist, radiologist for proper clinical diagnosis and treatment of disease.

MATERIAL AND METHODS:-

During dissection of abdomen for undergraduate student (MBBS) in middle aged Indian cadaver in the department of Anatomy, KD medical college Mathura, U.P India. The body was embalmed and preserved as standard procedure by injecting formalin based preservative (10% formalin) and stored in 7% formalin filled plastic tank and jar. A total 48 human middle age cadaveric liver were studied in detail for the accessory fissure, diaphragmatic grooves, pons hepatis, accessory lobe, elongated left lobe, notches in border etc. The liver associated with any external pathological changes, deformities excluded from this study. The data was analyzed in tabulated form.

RESULT:-

The present study was done on 48 formalin fixed human cadaveric liver in the department of Anatomy. Out of which 27(56.25) liver were normal in its morphological appearance [table 02] , 4(8.33%) liver founded relatively large left lobe which matched with netter's classification type 3 [table 01, figure 07], 03(6.25%) liver showed diaphragmatic grooves which matched with netter's classification type 6 [table 1, 2, figure 05], 12 (25%) of liver indicate accessory fissure in right lobe, left lobe, caudate lobe and quadrate lobe [table 02, figure 03, 06, 08] , 04 (8.33%) liver showed Pons hepatis connecting left lobe of liver [table 02, figure 09], 03(6.25%) liver indicate accessory lobe [table 02 , figure 02, 08,10] and 02 (4.16%) liver showed larger papillary process or long caudate process [table 2 , figure 04,10].

DISCUSSION:-

The liver is the largest gland involved in various metabolic activities of the body. Thorough knowledge about external morphological variation of liver is essential for anatomist, clinicians, surgeon, physician, radiologist etc.

This study were done on 48 formalin fixed human cadaveric liver in the department of Anatomy and we observed that 27 (56.25) liver were normal which correlated with the study of Aktan et.al .[7] Nagato, AC et.al .[8] ,SunithaVinnakota et.al .[9] , Sachin Patil et al.[11] Dr. Abhilasha Wahane et.al[12] , Dr k shashi kantha et.al.[16].

In our study 4(8.33%)liver founded relatively large left lobe which matched with Netter's classification type 3 and correlated with the study SunithaVinnakota et.al .[9]Sachin Patil et al.[11] Prabahita Baruah et.al.[13] Heena J Chaudhar Et.Al.[14].

In this study 03(6.25%)liver showed diaphragmatic grooves which coordinated with Netter's classification type 6 and correlated with the study Aktan et.al .[7] , Nagato, AC et.al .[8], heena J chaudhar et.al.[14] , Justin Chin et.al.[15].

In our study, 12 (25%) of liver indicate fissure in right lobe, left lobe, caudate lobe and quadrate lobe correlated with the study Dr. Abhilasha

Wahane et.al [12], Heena J Chaudhar Et.Al.[14] Justin Chin et.al.[15]

In this study, 4(8.33%) liver showed Pons hepatis connecting left lobe with quadrate lobe of liver which correlate with the study Sachin Patil et al.[11], Dr k shashi kantha et.al.[16].

In our study, 03(6.25%) liver indicate accessory lobe which correlate with the study of Sachin Patil et al.[11], Heena J chaudhar et.al.[14]

In this study, 02 (4.16%) liver showed larger papillary process or long caudate process which correlate with the study of Joshi S D[2].

In this study we also observed 01 (2.08%) liver without quadrate lobe (Fig. no 08).

Comparative study of morphological variation of liver among the various study in the world shown in table no 03.

CONCLUSION:-

This study revealed that the morphological variation of fissures, lobes, grooves, elongation of left lobe etc of liver is useful for anatomist, radiologist, clinicians, surgeon, and physician for proper clinical diagnosis, surgeries and treatment of disease.

Conflict Of Interest:-Nil

Acknowledgments: We would like to thanks the entire faculty, staffs, of department of anatomy who supported us during this study.

Table:-01. Variation Based On Netter's Classification		N[%]
Type 1	Very small left lobe , deep costal impressions	-
Type 2	Complete atrophy of left lobe	-
Type 3	Transverse saddle like liver, relatively large left lobe	4(8.33%)
Type 4	Tongue like process of right lobe	-
Type 5	Very deep renal impression and corset constriction	-
Type 6	Diaphragmatic grooves	03(6.25%)

Table:-02.Morphological characteristic present in this study	
VARIATION	N[%]
Normal	27 (56.25%)
Accessory Fissure in right lobe, left lobe , caudate lobe and quadrate lobe	12 (25%)
Diaphragmatic grooves	03 (6.25%)
Pons hepatis connecting left lobe of liver	04 (8.33%)
Accessory lobe	03 (6.25%)
Elongated left lobe	04 (8.33%)
Large papillary process or long caudate process	02 (4.16%)
Notches in border	04 (8.33%)

Table:-03.Comparative study of morphological variation of liver among the various study in the world

Studied By	year	No. of specimens	Normal	Accessory Fissures				Accessory lobe				Diaphragmatic Grooves	Elongated or hyperplasty of left lobe liver
				Rt.lobe	Lf. Lobe	Caudate lobe	Quadrate lobe	Rt.lobe	Lf. Lobe	Caudate lobe	Quadrate lobe		
Aktan et.al . [7]	2001	54	29 (53.70%)	-	-	-	2(3.70%)	-	-	-	-	-	-
Nagato, AC et.al . [8]	2011	61	26(42.62%)	-				-				4 (6.56%)	13(21.31%)
SunithaVinnakota et.al . [9]	2013	58	24(41.37%)	10(17.24%)	6(10.34%)	8(13.79%)	9(15.51%)	2(3.4%)	1(1.7%)	3(5.17%)	4(6.8%)	1(1.7%)	2(3.4%)
Mamatha et.al . [10]	2014	50	-	5 (10%)	6 (12%)	5 (10%)	-	-	-	-		6 (12%)	-
Sachin Patil et al.[11]	2014	50	28 (56 %	5 (10%)				5 (10%)				1(2%)	5 (10%)
Dr. Abhilasha Wahane et.al [12]	2015	50	28(56%)	10 (20%)				8 (16%)					2 (4%)
Prabahita Baruah et.al.[13]	2016	30	24 (80%)	1(3.3%)				1(3.3%)					3 (10.01%)
Heena J Chaudhar et.al.[14]	2017	80	14 (17.5 %)	10 (12.5 %)				3 (3.7%)				6 (7.5 %)	10 (12.5%)
Justin Chin et.al.[15]	2018	33	12(36.36%)	9(27.27%)				8(24.24%)				4(12.12%)	-
Dr k shashi kantha et.al.[16]	2018	52	34(61.53%)	9(17%)	-	4(7.6%)	3 (5.7%)	1(1.9%	-	4(7.6%)	5(9.6%)	-	1(1.9%)
Haobam Rajajee Sing.et.al.[17]	2019	70	-	36 (51.43%)	8(11.43%)	19(27.14%)	23(32.86%)	9(12.86%)				-	9(12.86%)
Present study	2019	48	27 (56.25%)	12(25%)	03 (6.25%)			03 (6.25%)				03 (6.25%)	04 (8.33%)

Fig no. 01 . Arrow a. indicate Pons Hepatis and arrow b. indicate fissure in rt. Lobe.

Fig no. 02. Arrow indicate Accessory lobe

(LL- left lobe,FLV- fissure for ligamentum venosum, CL- caudate lobe ,IVC- Inferior venacava, RL- right lobe , GB- gallbladder, QL-Quadrate lobe , FLT- fissure for ligamentum teres, LT- ligamentum teres, PH-portahepatis)

Fig no. 03. Arrow indicate fissure in left lobe and quadrate lobe

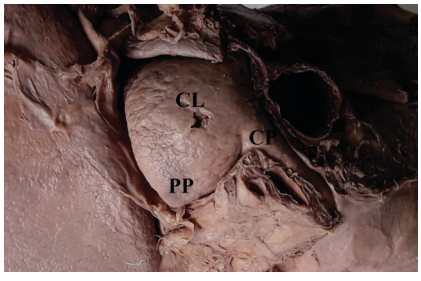

Fig no. 04. Large papillary process (PP)

Fig no. 05 Arrow indicate diaphragmatic grooves

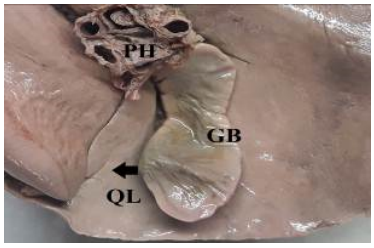

Fig no. 06. fissure in quadrate lobe (GB- gallbladder, QL- Quadrate lobe ,PH-portahepatis)

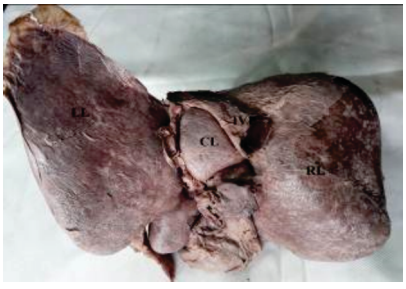

Fig no. 07 Elongated left lobe (LL- left lobe, CL- caudate lobe ,IVC- Inferior venacava, RL- right lobe, QL- Quadrate lobe , FLT- fissure for ligamentum teres, LT- ligamentum teres, PH- portahepatis)

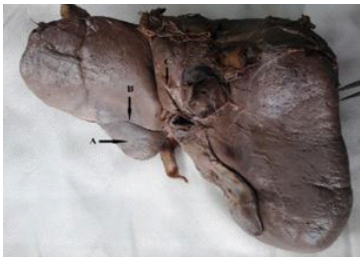

Fig no. 08. Arrow A. indicate accessary lobe and B. indicate fissure in left lobe. Liver without quadrate lobe.

Fig no.09.Pons Hepatis (PH) Connecting Left Lobe With Quadrate Lobe (LL- left lobe, CL- caudate lobe ,RL- right lobe , GB- gallbladder, QL- Quadrate lobe)

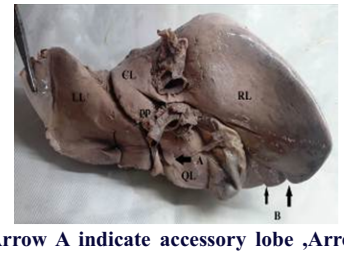

Fig no. 10.Arrow A indicate accessory lobe ,Arrow B indicate Notches in border ,PP indicate papillary process

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