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Assessment of Surface Variations of the Liver in Human Cadavers at Mewar Region of Rajasthan and its Clinical Implications

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ABSTRACT
Liver the biggest organ situated at "the upper right part of the abdomen", extending into the middle and a tiny section of the upper left part of the abdomen. As per "Couinaud classification the liver is divided into eight functional parts (I to VIII)". Less invasive surgical techniques and diagnostic imaging rely heavily on the liver's morphology. This work is performed to investigate the intricate anatomy of the liver. Aim of this investigation is to ascertain the "gross anatomical differences" of the "liver and their clinical and surgical consequences". A total of 80 liver specimens from the Anatomy Department at Pacific Medical College and Hospital in Udaipur were used for the investigation. Observations were made about the "morphological differences of the liver," including alterations in its magnitude and form "the existence of pons Varolii hepatis, accessory lobes and fissures". Photographs is engaged to record discrepancies. The acquired findings were then organised into a Table. In this work, we examined the several forms of morphological diversity in the liver. This information will undoubtedly assist radiologists in making more precise decisions when analysing various radiological pictures, eventually leading to a decrease in reporting errors. Liver, morphological variations, fissure, caudate lobe.

INTRODUCTION

The liver is the biggest organ in the abdomen, occupying the "right hypochondrium, epigastrium", and a little portion in the "left hypochondrium". Derived from the peritoneal and ligamentous connections of the surface[1]. The liver is partitioned into the right, left, "caudate and quadrate lobes". "The falciform ligament separates the right and left lobes anteriorly, whereas fissure for the ligamentum venosum and the fissure for the ligamentum teres divide them in the lower part." The Cantlie's line is an anatomical demarcation of the liver that partitions it into distinct left and right lobes. "It traverses the space located between the fossa for the gall bladder and the inferior vena cava on the diaphragmatic surface." It is in accordance with the primary hepatic vein. "The liver's hilum comprises the hepatic artery, portal vein and bile duct. The blood supply and biliary outflow in the liver follow a branching pattern", which originates from the lobes and subsequently divides to produce the liver's segments or sectors. "The Chouinard's propose that the liver may be divided into eight functional divisions, labelled as I-VIII. The division is determined by the arrangement of the portal venous system and the hepatic veins[2]." Previous studies have demonstrated that the hepatic artery and portal vein do not always branch in the same way outside of the liver. Three branches of the common hepatic artery the right gastric artery the right gastro-duodenal artery and the correct hepatic artery emerge from the celiac trunk. Blood supplies the right, left and quadrate lobes of the liver in that order, respectively, from the hepatic artery, which divides into the right, left and middle hepatic arteries. According to Michael, there are ten different kinds of extrahepatic arterial irregularities[3].

MATERIALS AND METHODS

This research is carried out at "Department of Anatomy and Department of Radiology, located at Pacific Medical College and Hospital" in Udaipur, with approval of the "Institutional Review Board". The research included observing and analysing the structural differences in the liver, as well as examining the way the "hepatic artery and portal vein diverge".

Gross anatomical variation: We used a total of 80 liver specimens from our section for the inquiry. The liver tissues were acquired via conventional dissection for healthcare student instruction and were kept in a 10% "formalin solution". Every liver seemed to be in a healthy state and had no discernible abnormalities. Upon examination the liver displayed several morphological modifications, including alterations in dimensions and configuration the existence of pons hepatis, additional "lobes and fissures". Photographs is kept to record discrepancies. Findings are then compiled into a table.

Morphological variations of the liver: A total of eighty livers were examined to analyse the morphological changes. Our study revealed several notable anatomical variations, including the "presence of accessory fissures, grooves on the liver surface, lobulations a conical-shaped right lobe a notched border an underdeveloped caudate process an abnormal papillary process with a fissure a fissure in the caudate lobe a bilobed caudate lobe a fissure in the quadrate lobe, a quadrate lobe with a tongue-like projection, a pons hepatis and the presence of an accessory lobe." The user's text is "[6]". The frequency of morphological differences in the liver have been recorded and organised in Table 1.

Among the 80 livers examined, 73 specimens (91.25%) had fissures of different sizes and orientations. Accessory fissure was seen in 39 specimens, accounting for 48.75% of the total, specifically on the right lobe. Accessory fissure was seen in 9 out of the total specimens, accounting for 11.25% of the cases. Notably, this fissure was also found on the left lobe. An accessory fissure was seen in the caudate lobe in 13.75% of cases and in the quadrate lobe in 17.5% of cases. On top of the fissures on the caudate and quadrate lobes, there were four more occurrences on the right lobe. Even though there were a handful of instances where the front upper surface had large fractures, most of the cracks were found in the inside. Individual cases of cracks on the anterosuperior surface were noted. (11.25%) or as numerous occurrences (3.75%). The superior surface of both livers exhibited irregularities caused by visceral impressions.

In addition to the fissures, 15 specimens (18.75%) had a conical-shaped right lobe. Out of the total number of specimens, 9 (11.25%) showed an elongated left lobe, also known as Beaver's lobe according to Netter's classification (type 4). One specimen had a liver with a Netter type 2 morphology, with a "tiny left lobe with prominent costal imprints". Multiple structural differences is detected in the lobe caudate, including the existence of a fissure. They observed the presence of undeveloped caudate processes in 2.5% of cases, as well as hypertrophied caudate processes in 2.5% and 4% of cases, oversized papillary processes in 4% of cases and underdeveloped papillary processes in 1.25% of cases. The caudate lobe exhibited bilobation in two instances. Out of the 14 liver specimens examined, 17.5% exhibited the existence of a crack in the "quadrate lobe". A "tongue-shaped protrusion" is

Table 1: Differences in liver morphology (n = 80)

Variations	Number	Percentage
"Fissures"		
"Fissures in right lobe"	39	48.75
"Fissures in left lobe"	09	11.25
"Fissures in caudate lobe"	11	13.75
"Fissures in quadrate lobe"	14	17.5
"Groove in the anterior surface"	09	11.25
"Lobulations in the anterior surface"	13	3.75
"Conical shaped right lobe"	15	18.75
"Notched border"	08	10
"Elongated left lobe/beaver's lobe"	09	11.25
"Underdeveloped caudate process"	02	02.5
"Hypertrophied caudate process"	02	02.5
"Abnormally upturn papillary process"	01	01.25
"Enlarged papillary process"	04	05
"Underdeveloped papillary process"	01	01.25
"Quadrate lobe with tongue like projection"	06	07.5
"Bilobed quadrate lobe"	05	06.25
"Pons hepatis"	17	21.25
"Accessory lobe"	10	12.5

Table 2: Comparison between other studies and present study showing in variations morphological feature of liver

Morphological features	Present study	Joshi SD *et al*. in	Muktyaz H and nema U in	Patil S *et al*.in	Nayak BS	Chaudhari *et al.*
Accessory Fissures	26.25	30	12.1	10	1.81	12.5
Accessory Fissures on caudate lobe	1.25	-	-	-	-	3.7
Superior and Inferior Quadrate Lobe	12.5	20	-	4	-	7.5
Pons hepatis connecting left lobe with quadrate lobe		30	-	10	-	1.25
Absence of fissure for ligamentum Teres	3.75	-	9.7	4	1.81	11.2
Riedel's lobe Present	-	-	-	-	-	1.25
Elongated left lobe present	6.25	-	-	-	1.81	12.5
Mini accessory lobe present	5	-	-	2	-	3.7
Large papillary Process	3.75	32	-	-	1.81	1.25

found in 6 out of 80 specimens, accounting for 7.5% of the Total. Additionally, a bilobed quadrate lobe was found in 5 specimens, representing 6.25% of the total. The presence of pons hepatis was observed in 17 specimens, accounting for 21.25% of the total. A notched border was seen in 8 specimens, accounting for 10% of the total. Accessory lobes were seen in 10 specimens, accounting for 12.5% of the total. These lobes were found either in the caudate lobe the quadrate lobe or in close proximity to these lobes. Thorough knowledge of the liver's anatomy and its different forms is essential for radiologists and surgeons in order to minimise iatrogenic complications during surgical interventions related to the hepatobiliary system.

DISCUSSIONS

A comparison between their findings and the results of the current investigation is shown in Table 2. Accessory fissures in the liver have been shown to exist via many investigations. The current investigation revealed the presence of additional "fissures in the right, left, caudate and quadrate lobes of the liver in 21 specimens," accounting for 26.25% of the total sample. There was a higher prevalence of fissures on the right side as opposed to the left side. This discovery aligns with the observations made by Sangeetha *et al*., who noted a higher number of "fissures on the right lobe of the liver". The current research found that supplementary fissures were more often identified on the visceral surface, consistent with the findings of Jurkovikj (2016) and Saritha (2015). The number 9. Table number 2 also has many more variations.

CONCLUSION

In this work, we examined the several forms of morphological diversity in the liver. This information will undoubtedly assist radiologists in making more precise decisions when comparing various radiological pictures, eventually leading to a decrease in reporting errors. Familiarity with these variables may enable "the interventional radiologist to decrease or prevent misinterpretations and consequent misdiagnosis, as well as assist the hepatobiliary surgeons in minimising iatrogenic consequences". Additionally, it would enable the surgeons to achieve enhanced and effective postoperative results.

Future scope: It is important to consider these variables in order to accurately diagnose the condition before surgery. This will aid the medical practitioner in strategizing operations on the caudate lobe of the liver. The presence of the papillose procedure of the "caudate lobe" on CT scans near and slightly below the porta hepatis might lead to misinterpretation. To prevent mistakes, it is crucial to thoroughly evaluate CT scans with respect to the unsophisticated architecture of the "caudate lobe", since this will provide a comprehensive understanding of the many variants.

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