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Original Research Article

To Evaluate the Differences in Gross Morphology and Histological Architecture in Cadaveric Liver Tissues, and to Establish a Correlation with the Developmental Stages during Intrauterine Life: A Morphometric Study

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Abstract

Aim: The aim of the present study was to assess the variations in gross morphology and any change in histological architecture in cadaveric liver specimens and correlate with development in intrauterine life.

Methods: 50 livers from adult human cadavers, fixed in 10% buffered formalin solution available in the Department of Anatomy, Nalanda Medical College and Hospital, Patna, Bihar, India were studied.

Results: Livers were examined on different occasions by two observers. The results obtained were compared and ratified. The distinct morphological characteristics observed were recorded on data sheets. On the basis of these descriptions, the organs were classified into ten groups. The present study showed an incidence of 28 specimens of type 1 (70%). Lingular process of left lobe categorized into three types: apical (1=2 specimen, 4%) conical (2 specimen; 4% and rounded (2 specimen; 4%).

Conclusion: Comprehensive delineations of typical and atypical liver morphologies may greatly enhance comprehension of the underlying factors contributing to these alterations, hence serving as an essential precursor for achieving positive surgical outcomes.

Keywords: Liver, Morphology, Histology, Lingula, Parenchyma, Fissure, Ligament.

Introduction

The caudate lobe is among the four distinct anatomical lobes that comprise the liver. The lobe is delimited on its left side by the fissure for the ligamentum venosum, on its inferior side by the porta hepatis, and on its right side by the groove for the inferior vena cava. In a superior manner, it extends towards the superior surface of the right upper end of the fissure for the ligamentum venosum. [1] The user's text is already academic in nature. The caudate lobe of the liver may be further split into several anatomical structures, namely Spiegel's lobe (comprising the caudate lobe proper and the papillary process), the caudate process, and the paracaval section located anterior to the inferior vena cava. [2] The user's text is too short to be rewritten academically. The caudate lobe exhibits anatomical connectivity with the right lobe of the liver via the caudate process, which traverses in a lateral manner between the portal vein and the inferior vena cava at the porta hepatis. The caudate process may exhibit elevation in some cases. The caudate lobe's medial inferior portion sometimes develops a papillary process that extends towards the left (and occasionally anteriorly) into the area of the superior recess of the omental bursa. Grooves or fissures may sometimes result in the separation of the caudate and papillary processes from the rest of the liver. [3] The user's text is too short to be rewritten academically.

The intricate nature of hepatic function and its significance in maintaining bodily homeostasis has prompted several anatomists to undertake comprehensive investigations into the physical characteristics of this organ. Despite the recent advancements in imaging techniques, such as computed tomography or nuclear magnetic resonance, which have greatly improved the evaluation of liver parenchyma [4], there is still value in conducting detailed studies of the

macroscopic anatomy of cadaveric livers. These studies can aid in the identification of significant anatomical variations. In several instances, these differences have facilitated researchers in comprehending distinct reactions to therapeutic interventions used in the management of hepatic disorders. The main fissures serve as significant reference points for the interpretation of lobar architecture and the identification of liver abnormalities. In the contemporary age characterized by advancements in imaging techniques and minimally invasive procedures, it is essential for both radiologists and operating surgeons to possess a comprehensive understanding of the architecture of this organ, as well as its often-seen variants. The observation of a wide range of changes in the lobes and fissures of the liver is often reported by anatomists. Despite the considerable amount of study conducted on the segmental architecture of the liver, there is a scarcity of studies that have specifically focused on the surface variations of this organ.

The objective of the current investigation was to evaluate the discrepancies in overall morphology and potential alterations in histological structure in liver specimens obtained from cadavers, and to establish a correlation with the developmental stages during intrauterine life.

Materials and Methods

50 livers from adult human cadavers, fixed in 10% buffered formalin solution available in the Department of Anatomy, Nalanda Medical College and Hospital, Patna, Bihar, India for one year were studied. Age and gender of these specimens were not known. The specimens looked apparently normal. Histological sections from cornu and lingular process (if present) and different areas from the lobes in other specimens were taken and processed by H and E staining. These were observed for any variations in architecture and cellular structure.

Results

Table 1: Different types of livers

Organ types	Characteristic features	Number	Frequency
Type 1	Normal liver	35	70
Type 2	Very small left lobe	1	2
Type 3	Transverse “saddle-like” liver	1	2
Type 4	Very deep renal impression	1	2
Type 5	Very deep costal impressions	1	2
Type 6	Diaphragmatic grooves	1	2
Type 7	Enlarged left lobe	1	2
Type 8	Lingular process of left lobe	5	10
Type 9	Bicornuate left lobe	2	4
Type 10	Unicornuate left lobe	2	4

Livers were examined on different occasions by two observers. The results obtained were compared and ratified. The distinct morphological characteristics observed were recorded on data sheets. On the basis of these descriptions, the organs were classified into ten groups. The present study showed an incidence of 28 specimens of type 1 (70%).

Table 2: Different types of lingular process of the left lobe

Type	Number	Frequency (%)
Apical	2	4
Conical	2	4
Round	2	4

Table 2 shows different shapes of lingular process of left lobe. They have been categorized into three types: apical (1=2 specimen, 4%) conical (2 specimen; 4% and rounded (2 specimen; 4%).

Discussion

The liver, which is the biggest organ in the abdominal cavity, has a distinctive wedge form. It mostly occupies the right hypochondrium and epigastrium regions, although it often extends into the left hypochondrium region, reaching as far as the left lateral line. During the process of human development from infancy to maturity, there is a significant and quick rise in the size of the liver. The dimensions of the liver are subject to variation based on factors such as gender, age, and physical stature. The role of the capsule in preserving the structural integrity of the liver is now considered to be insignificant. The liver performs several metabolic functions including homeostasis, nutrition, immunological responses, blood cleansing and purification, synthesis of plasma proteins, bile formation, and the metabolism of carbs, fats, and proteins. The liver plays a vital role in the survival of humans, since there now exists no prosthetic organ or technology capable of compensating for the loss of liver function. The location of haemopoiesis in the foetus has significant importance. [5] The user's text is too short to be rewritten academically. The categorization of functional divisions within adult livers is determined by the organization of their

vasculature, and many categories are now used. The liver is anatomically divided into two lobes by the Glissonian system, which is determined by the bifurcation of the portal vein into its left and right branches. On many occasions, two observers conducted examinations of livers. The collected findings were compared and validated. The data sheets were used to record the observed different morphological traits. Based on the provided descriptions, the organs were categorized into 10 distinct classes. The current investigation demonstrated an occurrence of 28 specimens classified as type 1, accounting for 70% of the total. The lingular process of the left lobe may be classified into three distinct types: apical, conical, and rounded. The apical type was seen in 1 out of 2 specimens, accounting for 4% of the total. The conical type was present in 2 specimens, representing 4% of the total, while the rounded type was also observed in 2 specimens, accounting for 4% of the total. The anatomical differences of the human liver have been categorized into congenital or acquired classifications. [6] Congenital abnormalities may be ascribed to the following factors: a) The existence of distinct lobes, which some anatomists consider to be a congenital variation. b) The occurrence of tissue degeneration in certain areas of the organ. c) The presence of a single lobe. d) The presence of multiple lobes, often characterized by numerous divisions (up to 16) in the right lobe. e) The presence of smaller lobes. f) Lobes that are connected by a peduncle. g) Lobes that lack any divisions. h) Additional lobes that are present alongside the primary lobes. The distinctive traits that signify acquired alterations in liver morphology are as follows: i) The presence of linguiform lobes. ii) The existence of a costal organ with a significantly reduced left lobe. iii) The presence of deep renal imprints. [7]

As per the findings of Grey and Williams, it has been shown that the right lobe tends to exhibit greater size and bulkiness in comparison to the left lobe. Based on this premise, the presence of two livers (4%) classified as type 7 may be regarded as a morphological anomaly due to the significant disparity in size between the left and right lobes. According to Bezerra ASA et al. [8], it has been proposed that the decrease in size of the right hepatic lobe and the subsequent enlargement of the left and caudate lobes might be attributed to pathogenic mechanisms seen in individuals with schistosomiasis. Based on the histological analysis, it was determined that all specimens exhibited normal characteristics as described in established histology textbooks. [9] While the literature does acknowledge the presence of diverse morphological kinds of the human liver, there is a limited number of research that have been conducted on this subject. Furthermore, there is a scarcity of thorough descriptions on the many types of anatomical variances. One possible explanation for this phenomenon might be attributed to a specific challenge faced in the current research pertaining to the classification of cadaveric supplies based on factors such as gender, age, and prior medical conditions, all of which have the potential to influence liver morphology. Certain morphological alterations seen during advanced imaging tests may be misleading and not indicative of genuine parenchymal lesions. These changes might instead be attributed to factors such as perfusion deficiencies, localized fatty infiltrations, or other sources. [4]

Conclusion

Although a variety of morphological variances in liver form were seen, histological analysis revealed that all specimens had normal characteristics. Therefore, based on the findings of this research, it may be inferred that these livers were functioning normally. One potential reason for the presence of significant abnormalities may be attributed to the embryological development of the organism. Comprehensive delineations of typical and atypical liver morphologies may greatly enhance comprehension of the underlying factors contributing to these alterations, hence serving as an essential precursor for achieving positive surgical outcomes. The avoidance of misunderstanding and misdiagnosis is beneficial for imaging professionals and surgeons as it enables them to effectively plan surgical treatments.

References

1. Dodds WJ, Erickson SJ, Taylor AJ, Lawson TL, Stewart ET. Caudate lobe of the liver: anatomy, embryology, and pathology. AJR. American journal of roentgenology. 1990 Jan; 154(1):87-93.
2. Murakami G, Hata F. Human liver caudate lobe and liver segment. Anatomical science international. 2002 Dec; 77:211-24.
3. Auh YH, Rosen A, Rubenstein WA, Engel IA, Whalen JP, Kazam E. CT of the papillary process of the caudate lobe of the liver. American journal of roentgenology. 1984 Mar 1;142(3):535-8.
4. Nagato AC, Silva MA, Trajano ET, Alves JN, Bandeira AC, Ferreira TA, Valença SD, Bezerra FS. Quantitative and morphological analyses of different types of human liver. Journal of Morphological Sciences. 2011;28 (4):275-9.
5. Standring S. Gray's Anatomy. 40th Edition. Churchill Livingstone: Elsevier; 2008.
6. Cantlie MA. On a new arrangement of the right and left lobes of the liver. Proceeding of

the anatomical Society of Great Britain and Ireland. 1898; 32:4-9.
7. Royer M. Figado, Vias Biliares e Pˆancreas. Rio de Janeiro: Guanabara Koogan; 1959.
8. Bezerra AS, D'ippolito G, Caldana RP, Cecin AO, Szejnfeld J. Avaliação hepática e esplênica por ressonância magnética em pacientes portadores de esquistossomose mansônica crônica. Radiologia Brasileira. 2004; 37:313-21.
9. Ross MH, Pawlina W. Cartilage. Histology: A Text and Atlas. Sixth ed. Philadelphia: Lippincott Williams & Wilkins. 2011:198-217.