Section: Anatomy

Original Research Article

A NEW PERSPECTIVE OF NETTER'S CLASSIFICATION FOR STUDY OF MORPHOLOGICAL VARIATIONS OF HUMAN CADAVERIC LIVER

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Abstract

Background: Insight of both normal and abnormal liver anatomy is essential during radiological examination and surgery. Its variations may be acquired or congenital. **Methods:** In this study, 50 embalmed livers were taken to observe morphology of lobes and classified as per Netter. **Results:** Observed normal livers were 14 (28%), while abnormal were 36 (72%) out of which 29 (58%) were according to Netter's classification while other types were accessory fissure on left lobe (2%), elongated left lobe (4%), appendix of left lobe (6%), absence of fissure for ligamentum teres (2%). **Conclusion:** We classified twenty-nine livers as per Netter's classification. The knowledge of such variation in the morphology of liver is important for Surgeons, Radiologists.

INTRODUCTION

Being one of the vital human organs, the liver has historically been the first choice of organ for scientific studies. Even though the segmental morphology of the liver has been extensively studied, few writers have sought to address external variances.[1] Very few research has divided these morphological variations into six kinds in accordance with Netter's Classification.[2] These anatomical variations are crucial in cases of laparoscopic evacuation or thermal ablation of the liver tumor. The major goal of this study was to identify the cadaveric liver variance as per Netter's classification.[3]

Table 1: Morphology of liver as per the Netter's classification

Type	Features
I	Very small left lobe with deep costal impressions
II	Complete atrophy of the left lobe of Liver
III	Transverse saddle shaped liver, relatively large left lobe of Liver
IV	Tongue like process of right lobe of Liver
V	Very deep impression of Kidney and corset constriction
VI	Presence of Diaphragmatic grooves

Aim of the Study

Study aimed at determining variations in morphology of cadaveric liver and categorizing those variations according to Netter classification into six types with their clinical and surgical importance.

Objectives

a) To determine morphological variations of human cadaveric liver.

b) To categorize these variations into six types on the basis of Liver's type as per Netter's classification.

MATERIALS AND METHODS

After receiving approval from the institutional ethical committee, the current study was conducted in the department of anatomy. 50 adult human cadavers' livers were removed during normal dissection for first-year MBBS students.

All lobes' morphological characteristics were examined and arranged according to Netter's classification.[3] Variations were recorded and captured on camera. From our study, we excluded livers with damage, cirrhosis, autopsy organs, and paediatric organs.

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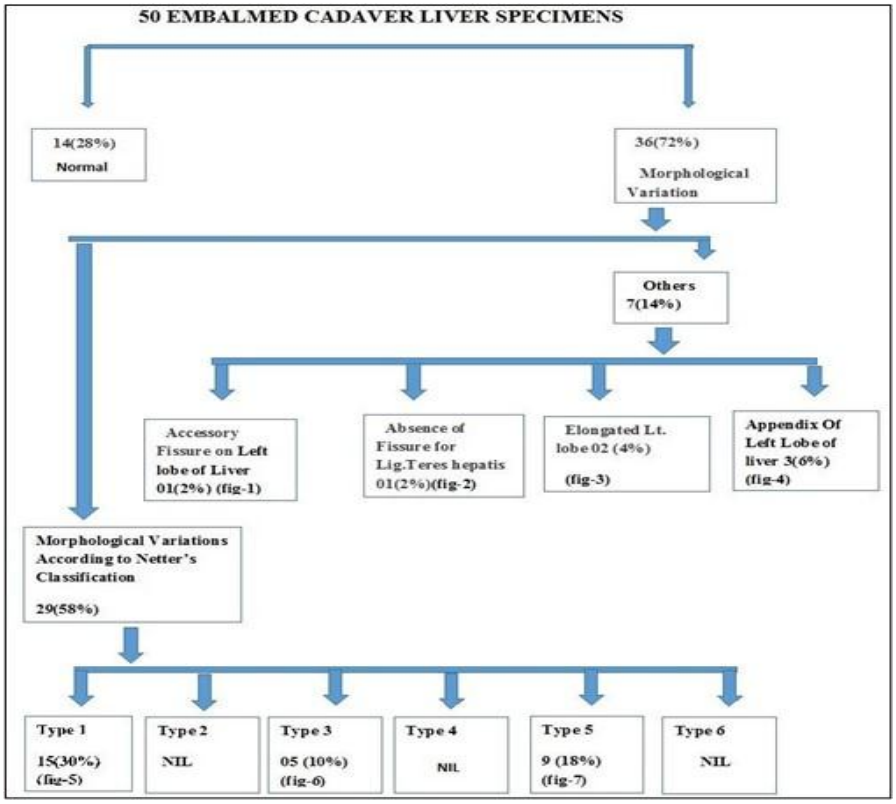

Figure 1: Distribution of liver specimens according to morphological variations and Netter's classification

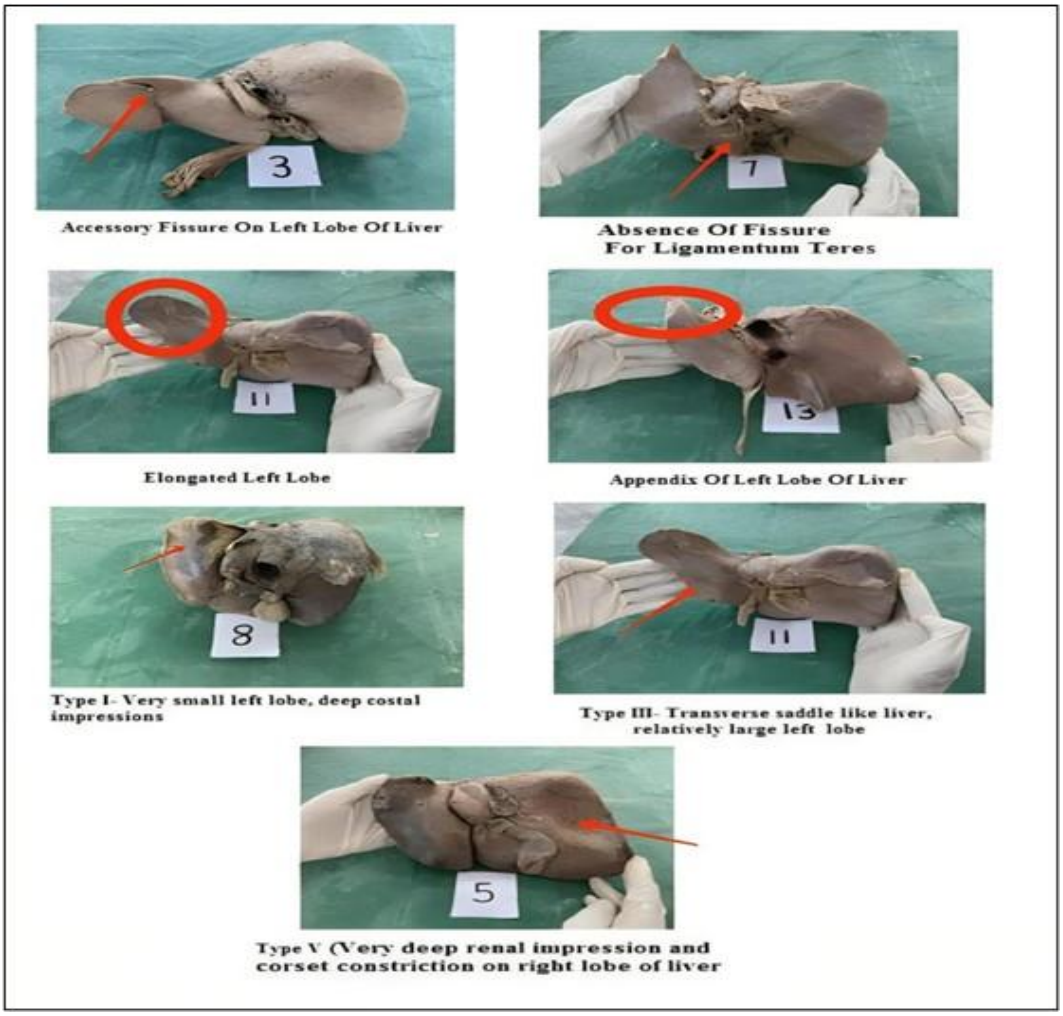

Figure 2: Images of abnormal livers as per Netter's classification

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RESULTS

Out of 50 samples used in our study, 14 livers (28%) showed normal exterior morphology, whereas 36 (72%) had aberrant forms, sizes, lobes, and fissures. Netter's classification made up 58% of the anomalies, and other categories made up 14%. The other abnormality types noted were an accessory fissure on the left lobe of liver in 1 (2%), absence of fissure for ligamentum teres in 1(2%), elongated left lobe in 2(4%) specimens. Netter's classification types observed in our study were: type –I in 15 (30%), type-V in 9 (18%), type –III in 5 (10%) samples. Type-II, type-IV and type –VI were not found in any of the liver specimens in our study (Figure 1& 2).

DISCUSSION

The liver's normal gross features include two lobes, four major fissures, an exterior surface with a smooth and sharp edge, and the right lobe making up around 65% of the overall volume.[4-6] The liver bud, also known as the hepatic diverticulum, forms in the fourth week of intrauterine life as an outgrowth of the foregut's endodermal epithelial layer. The most frequent developmental defects in the liver include lobe agenesis, segment absence, malformed lobes, smaller lobes, and lobe atrophy. It is primarily brought about by improper or excessive development, and these malformations are occasionally linked to anomalies of the diaphragm and the liver's suspensory machinery.[4] The lobar and segmental regions of the liver might occasionally have the most peculiar abnormalities. Recent research has revealed that certain prominent alterations observed during advanced imaging studies are pseudo-lesions brought on by perfusion deficiencies, localised fatty infiltrations, and other sources, rather than real parenchymatous lesions[6,7] The liver frequently exhibits morphological variations, which are typically asymptomatic and frequently go unrecognised.[8] In a study by Nayak BS[9] looking for the presence of aberrant shape, lobes, and fissures in fifty-five (55) formalin-fixed livers from southern Indian cadavers, 60% of the livers were normal, but 40% of the livers had revealed one or more deviations. In the current investigation, just 28% of the livers were deemed to be normal.

While Anbumani L et al[10] reported 3.30% and 6.60% respectively, Kebe E et al[11] detected 3% and 9% of the type-II and type-IV types of liver. As we didn't witness the earlier forms of liver, these findings conflict with those of our study. Type I, III, and V were observed in 30%, 10%, and 18% of cases in our investigation, compared to 8%, 8%, and 4% in Sangeeta A.[12] According to Singh HR et al[13], Chaudhari HJ et al[14], Joshi SD et al[15], Patil S et al[16], and Muktyaz H et al[17], the accessory fissure detected was 81.42%, 12.5%, 30%, and 12.1% respectively. In contrast to the authors above, we found less of this variation in our study—only 2%. Ravikiran H R and Ashwini NS[18] found an elongated left lobe in 17% of the livers they examined, but only 4% in our study. In their investigation, Srimani P. and Saha A [19]. observed morphological changes in the liver of 70.9%.

CONCLUSION

This study emphasizes the ongoing occurrence of alterations in the liver's surface. When preparing for and performing surgical procedures, surgeons and gastroenterologists must be aware of these distinctions because they are now crucial in cases involving laparoscopic removal or thermal ablation of liver tumours. Additionally, it aids radiologists in avoiding possible misdiagnoses and anatomists in discovering novel variations.

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REFERENCES

1. tandring S. Gray's Anatomy: The anatomical basis of clinical practice 40th ed. New York: Churchill Livingstone 2008; 3441-46.
2. Muktyaz H, Nema U. Morphological variations of liver lobes and its clinical significance in North Indian population. 2013;1(1):1-5.
3. Netter FH. Atlas of Human Anatomy. 2ed. New York:18GuilfordPress, 2000.
4. Daver GB, Bakhshi GD, Patil A, Ellur S, Jain M, Daver NG. Bifid liver in a patient with Diaphragmatic hernia. Indian J Gastroenterol.2005;24(1):27-28.
5. Meirelles GSP, G.D. Liver pseudo lesions in helical CT: pictorial essay. Radiol Bras. 2003;36: 229-35. AuhYH, Lim JH, Kim K W.
6. Gupta M, Sodhi L, Yadav TD. Morphology of liver. Indian Journal of Surgery. 2008 Feb; 70(1):3-7.7.
7. Meirelles GSP, D'Ippolito G. Liver pseudo lesions in helical CT: pictorial essay. *Radiol Bras.* 2003;36: 229–35.
8. Saritha S, RaniU, Gayatri P, Anjum A, Hima bindu N. A Spectrum of Morphological Variations in the human liver lobes and its Clinical importance; a Cadaveric Study. Jmscr. Jan.2016 Jan; 4(1).
9. Nayak BS. A study on the anomalies of liver in the south Indian cadavers. Int J Morphol 2013 Jun; 31(2):658-1.
10. Anbumani L, Pavazhak kurinji TN, Thamaraiselvi A. Morphological study on variation of external surface of liver. Int J Anat Res. 2020;8(2.2):7481-5.
11. Kebe E. Obeten, Saviour A. Odey, Gabriel Udo-Affah, Eluwa Ma. Effect Of Aqueous Extract Of Cassava (Manihot Esulenta) Leaf On The Morphology And Micro-Anatomy Of The Liver Of Wister Rats. Int J Anat Res 2017;5(3.1):4031-4035. DOI: 10.16965/ijar.2017.104.
12. Sangeetha A, Kumar SN. Morphological variations of the liver and its applied significance: A cadaveric study. Journal of Datta Meghe Institute of Medical Sciences University. 2021 Apr 1;16(2):303.
13. Singh HR, Rabi S. Study of morphological variations of liver in human. Translational Research in Anatomy. 2019 Mar 1;14:1-5.
14. Chaudhari HJ, Ravat MK, Vaniya VH, Bhedi AN. Morphological study of human liver and its surgical importance. Journal of Clinical and Diagnostic Research: JCDR. 2017 Jun;11(6):AC09.
15. Joshi SD, Joshi SS, Athavale SA. Some interesting observations on the surface features of the liver and their clinical implications. Singapore medical journal. 2009 Jul 1;50(7):715.

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16. Patil S, Sethi M, Kakar S. Morphological study of human liver and its surgical importance. Int J Anat Res. 2014;2(2):310-4.
17. Muktyaz H, Nema U, Suniti MR, Mahboobul H. Anatomical study of accessory sulci of liver and its clinical significance in North Indian population. Int J Med Health Sci. 2013 Apr;2(2):224-9.
18. Ravikiran HR, Ashwini NS. Morphological variations of liver in humans and its surgical relevance.
19. Srimani P, Saha A. Liver morphology: anatomical study about the outer aspects. Surgical and Radiologic Anatomy. 2020 Dec;42(12):1425-34.

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