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.1-4 Very few research has divided these morphological variations into six kinds in accordance with Netter’s Classification.5,6 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.7

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
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<tbody>
<tr>
<td>I</td>
<td>Very small left lobe with deep costal impressions</td>
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<tr>
<td>II</td>
<td>Complete atrophy of the left lobe of Liver</td>
</tr>
<tr>
<td>III</td>
<td>Transverse saddle shaped liver, relatively large left lobe of Liver</td>
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<tr>
<td>IV</td>
<td>Tongue like process of right lobe of Liver</td>
</tr>
<tr>
<td>V</td>
<td>Very deep impression of Kidney and corset constriction</td>
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<tr>
<td>VI</td>
<td>Presence of Diaphragmatic grooves</td>
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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. Variations were recorded and captured on camera. From our study, we excluded livers with damage, cirrhosis, autopsy organs, and paediatric organs.
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
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.14 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 15

The liver frequently exhibits morphological variations, which are typically asymptomatic and frequently go unrecognised. In a study by Nayak BS5 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 al10 reported 3.30% and 6.60% respectively, Kebe E et al11 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 al13, Chaudhari HJ et al14, Joshi SD et al15, Patel S et al16, and Muktyaz H et al17, 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 HR and Ashwini NS18 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.

Acknowledgments

Cadaver are considered as first teacher Anatomy and we are really thankful to all those who have donated their body.

REFERENCES


