

Research Article

Structural Variations in Cadaveric Liver and its Clinical Implications

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ABSTRACT

Introduction and Aim: The liver is an accessory organ of digestion located in abdomen. Morphological variations of liver are rare. The advancement in technology and diagnostic radiology emerged to appreciate the morphological features of liver. The current study aims at occurrence of accessory lobes, fissures, hypertrophied papillary and caudate process. The knowledge of these variations is helpful for radiologist and surgeon for various interventions.

Material and methods: The study was conducted on 50 adult formalin fixed human livers in the department of Anatomy. The morphological variations were noted, picturized and data was analyzed.

Results: Out of 50 livers, hypoplasia observed was 4%, accessory fissures were 4%, elongated left lobe was 2% and other variations were noted.

Conclusion: The knowledge of morphological variations is important for radiologist in diagnosis of liver disorders and to plan for porto- systemic shunt.

Keywords: Liver- Accessory lobes, Morphology, Caudate, Quadrate, Cadaveric liver, papillary process.

1. INTRODUCTION

Liver is an organ situated under the rib cage. It is related to ribs, costal cartilages of right side and domes of diaphragm. It extends to left side in contact with diaphragm, left costal cartilage up to left mammary line [1]. Abnormalities in liver morphology are rare, while congenital abnormalities include absence or presence of accessory lobes, fissures [2]. Impressions and supports of liver like ligaments, visceral organs present around may be the reason for acquired variations. The knowledge of these variations helps both radiologist and surgeons from misdiagnosis and to avoid unnecessary surgical complications [3]. According to Netter morphological variations are grouped into 7-types [4].

Surface morphology like accessory fissures, lobes, sulci, and processes are the commonly occurring variations. They play a vital role in locating liver lesions, give knowledge of lobar anatomy and help in minimal invasive

procedures. Due to enhancement in various imaging techniques which play vital role in keyhole surgeries [5, 6]. Gastric volvulus and portal hypertension are the defective developmental disorders of left and right lobes of liver [7]. Thorough understanding of such irregularities has to be known as they do not always remain clinically asymptomatic. The segmental anatomy of liver is extensively studied, unlike few studies are there regarding morphological variations. Hence the present study has been undertaken.

2. MATERIAL AND METHODS:

The study was carried out in the department of Anatomy. Abdomen was opened as per instructions in Cunningham's Manual of practical Anatomy [8]. Livers were carefully dissected from human adult cadavers during regular dissection by medical undergraduates. Specimens were preserved in 10% formalin. Morphological variations were observed on 50 embalmed cadaver livers. Resource constraints

and ethical considerations limited the sample size.

Inclusion criteria – Liver specimens without any macroscopic abnormalities were included.

Exclusion criteria – Hypertrophied livers and those damaged during dissection were excluded from study.

3. RESULTS:

In the present study, normal surfaces, fissures, lobes were observed in thirty-nine livers (78%) noticed without accessory lobes and hypertrophy. Sixteen liver specimens showed following morphological variations. All the variations were described in table-1 and labelled from Figure 1 to 8.

Table: I Various structural variation in liver

Variations	Number of livers	% observed variations
Livers with accessory fissures	02	4%
Livers with accessory lobes	04	8%
Elongated left lobe	02	4%
Elongated papillary process	01	2%
Hypertrophied caudate and papillary process	02	4%
Deep fissures on diaphragmatic surface	03	6%
Hypoplasia with deep visceral impressions	02	4%

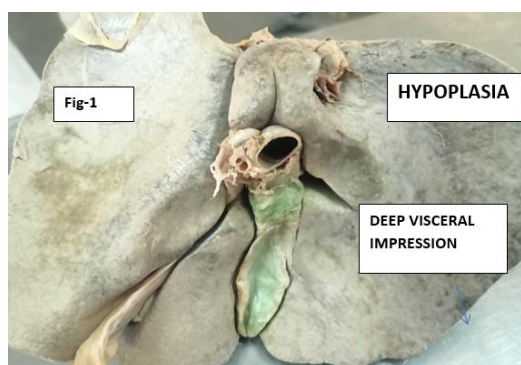


Figure. 1: Hypoplasia with deep visceral impression.

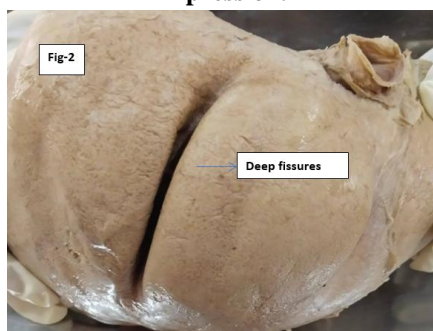


Figure. 2, 3, 4: Diaphragmatic surface with deep fissures

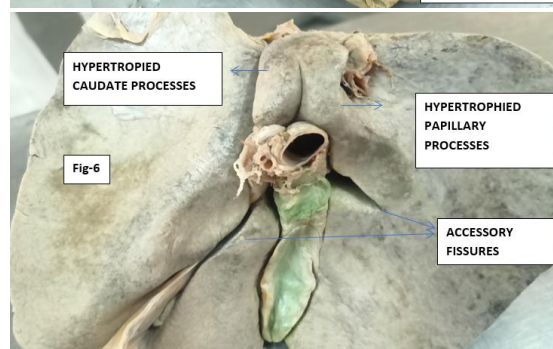


Figure. 5, 6: Accessory fissures with accessory lobe



Figure. 7: Elongated papillary processes

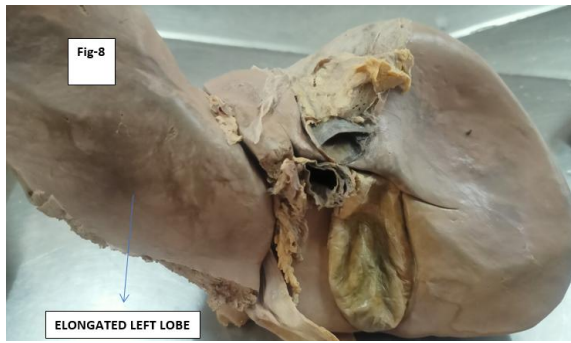


Figure. 8: Elongated saddle shaped left lobe

4. DISCUSSION:

Congenital abnormalities may be due to abnormal development or excessive development. The congenital abnormalities of liver are sometimes associated with abnormalities of diaphragm [7]. The structural variations may be symptomatic when they have an effect on biliary apparatus [9, 10]. They may also have symptoms in torsion and trauma [11]. Accessory fissures and lobes are commonly observed structural variations of liver [12]. In present study, 6% of livers showed deep accessory fissure on diaphragmatic surface which was less when compared to previous studies. The fissures on diaphragmatic surface may portray surface projection of portal and hepatic veins tributaries [13]. One of the other causes for accessory fissure could be invagination of musculature of diaphragm into liver [14]. The other cause of diaphragmatic fissures may be due to abnormal development of liver due to pressure of diaphragmatic muscle [15]. Recent studies in radiology suggest the formation of accessory fissures due to weak segments of hepatic tissue which are susceptible to variable pressure of diaphragm [16]. Sometimes the accessory fissures may result by the course of hepatic veins which could benefit for hepato-biliary surgeons [17]. In the present study a Rouviere's sulcus was observed in two liver specimens (Fig. 8) which occasionally guide to avoid bile duct injury in cholecystectomy [18, 19].

In 4% of livers accessory fissures were observed in caudate and quadrate lobes in our study. Number of accessory fissures of liver could be mistaken for pathological macro nodular liver on CT scan. Collection of fluid in fissures could

mimic hepatic cyst or liver abscesses [3, 14]. The accessory fissures can be diagnostic errors in CT scan.

In present study 8% of liver specimens showed small accessory lobes on their visceral surface (Fig. 5). In ultrasonography these accessory lobes may be mistaken for a small lymph node and could be removed accidentally during surgical procedures. Sometimes these accessory lobes may have a vascular pedicle which are susceptible to injury during surgical procedures leading to excessive haemorrhage into abdomen [2].

Accessory lobes are usually formed developmentally. This developmental error could be due to displacement of primitive remnants of liver or by remnants of mesoderm caused due to abnormal development of hepatic bud from terminal part of foregut [20]. Communication of hepatic parenchyma with liver, demarks between ectopic and accessory lobe [21]. Most of accessory lobes are asymptomatic but torsion in pedunculated form is commonest complication which needs immediate surgery. Among different variations in accessory lobe, Reidel's lobe is frequently seen [22].

Usually, accessory lobes are asymptomatic. Symptomatic accessory lobe observed was rare which may herniate into thorax causing significant consequences [23]. Accessory lobes of liver were mostly observed in the visceral surface of liver close to gallbladder [24]. In present study, 8% of liver specimens were observed to have accessory lobes in the inferior surface (Fig. 5). The most common accessory lobe is a Riedel's lobe which can be mistaken for a mass in abdomen in radiological procedures [25]. However, in the present study no Riedel's lobe was noticed.

Morphological variations of caudate lobe are usually common. In the present study hypertrophied caudate and papillary processes was noticed in 4% of specimens, which is in par with other authors. The awareness in morphology of caudate lobe is important in surgical resection of the same as a procedure for hepatocellular carcinoma [26]. The hypertrophied papillary

process towards left side may be mistaken for pancreatic mass [27].

In present study elongated left lobe was noticed in 4% of liver specimens which is coinciding with type-4 of several authors. However, the importance of this is not mentioned in the literature.

5. CONCLUSION:

Variations in hepatic morphology are usually asymptomatic. Present study showed few external variations. The grooves on diaphragmatic surface initiate projection of portal fissures. The knowledge of which plays an important role for portocaval anastomotic surgeries and segmental resection of liver. Most of the morphological variation of liver is embryological. But few may be due to impressions of related structures around it.

Present study throws light on variations like presence of accessory lobes, hypoplastic and elongated left lobe, fissures which will be helpful for avoiding complication in planning surgical procedures.

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CONFLICT OF INTRESET:

The authors have no conflicts of interest.

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