

Case Report

Accessory sulci and segmentation on the surface of the liver: a clinical pitfall

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ABSTRACT

Diaphragmatic surface of liver is usually smooth but sometimes it is well marked by the sulci or indentations. Sometimes these sulci were so deep to be termed as fissures as they divide the lobe of liver into different segments. We report the case of accessory sulci along the Anterosuperior surface of the right lobe associated with Reidel's lobe along the inferior border of the left lobe of same specimen. In another specimen, the sulci were so deep to be termed as fissures, which divides the caudate and quadrate lobe. Knowledge about the accessory sulci and lobes were necessary as they may appear as incidental finding during the laparoscopic examinations. Hence, it is very much promising to know about these sulci and lobes for hepatobiliary surgeons, anatomists and radiologists.

Keywords: Diaphragm, India, Liver, Segments, Sulci, Surgery

INTRODUCTION

Liver as a whole is more prone for variations may be in the form of accessory sulci, fissures or accessory lobe.¹⁻³ Accessory sulci more commonly were present on the anterosuperior surface of liver, but may extend or present on the posterior and inferior surface of liver.^{1,4} Presence of these sulci may be attributed by diaphragmatic musculature and to some extent by the pressure exerted by the surrounding ribs.^{5,6} Sometimes these accessory fissures were so deep to be termed as fissures. These fissures further divide the lobe of liver into smaller divisions.

Falciform ligament divides the anterior surface of liver into right and left anatomical lobes. On the visceral surface, the liver is divided into large right, left, caudate and quadrate lobe by fissure for ligamentum venosum and fissure for ligamentum teres hepatis. Surgically, the liver is divided into nine segments by the distribution of portal venous branches and location of hepatic veins in the parenchyma of the liver.² Knowledge of fissures is

imperative for performing the segmental resection of liver for various reasons such as hepatic carcinoma, cyst etc. There are three major fissures runs through the liver parenchyma named as main, right and left portal fissure, but were difficult to visualize on the surface of the liver.

These fissures consist of three main hepatic veins. Occasionally, accessory sulci were present on the surface of the anterosuperior surface of the right lobe of the liver. Rarely these accessory sulci were located in the caudate as well as quadrate lobe as in our case report. These sulci if present may be misleading during sonographic procedures and the hepatic imaging, mainly done for searching primary or metastatic liver diseases.³

Cross-sectional anatomy may vary during gross as well as many radiological procedures. Initially, it was thought that these sulci are autopsy artefacts but their presence was further shown in vivo. The presence of these sulci was attributed to the pressure from the surrounding ribs and diaphragm muscle in the developmental process.⁴

CASE REPORT

During routine dissection classes conducted for first-year MBBS students in the department of Anatomy, All India Institute of Medical Sciences, New Delhi, India, we encountered the presence of indentation or furrows on the anterosuperior surface of the right lobe of the liver in male cadaver aged 60 years and the division of caudate and quadrate lobe in female cadaver aged 55 years. The cadavers were donated to the institute and the cause of death was not known. The cadavers had no pathological lesions, traumatic signs, or surgical procedures in the right hypochondrium of the abdomen. Gall bladder appears to be normal in both cases. Bilateral lung anatomy was normal.

Case 1

Falciform ligament (FL) divided the surface of the liver into right and left anatomical lobe. Diaphragmatic sulci or indentations were two in number and lies to the right of inferior vena cava in the cadaver. The depth of these sulci varies approximately from 0.5 to 1 cm. Left lobe of liver appears to have the normal anatomical appearance. Except for the presence of a tongue-like an extension of the hepatic tissue along the inferior margin of the left lobe, named as Reidel's lobe. Dimensions were 2.5cm craniocaudally and 2cm in transverse diameter. Diaphragmatic muscle in relation to these accessory sulci showed hypertrophy (Figure 1).

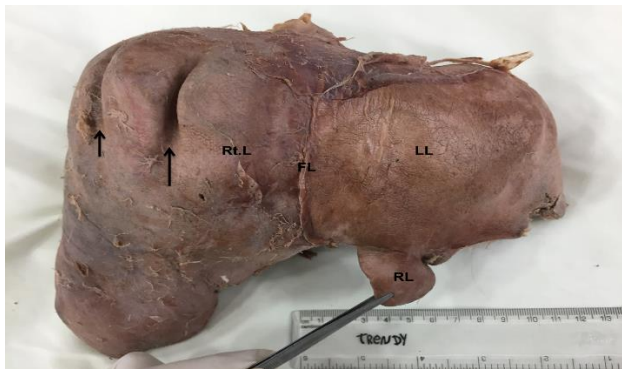


Figure 1: Photograph showing diaphragmatic sulci (marked by black arrows) and reidel's lobe (RL). Rt. L: Right lobe, FL: Falciform ligament, LL: Left lobe of liver.

Case II

Liver was examined for the posterior and inferior surface to identify the lobes of the liver. Right, and left lobes were identified. The caudate lobe was divided into two separate segments by the vertical fissure, which is about 2 cm deep. Anterior to the porta hepatis, the quadrate lobe of the liver was further divided into two separate segments by the horizontal fissure, which was about 1.5cm deep. Another small-differentiated segment on the right surface of the liver in relation to porta hepatis was present (Figure 2).

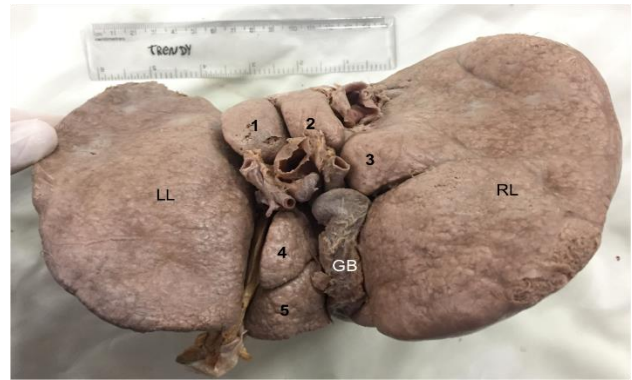


Figure 2: Photograph representing complete segmentation of the caudate lobe (1,2) by vertical fissure and quadrate lobe (4,5) by horizontal fissure and partial segment (3) on the right posterior surface of liver. LL: Left lobe of liver, RL: right lobe of liver, GB: gall bladder.

DISCUSSION

Developmentally the hepatic plate appears in the middle of the third week as a thickening of lower part of the foregut. Hepatic plate grows further to form hepatic bud or diverticulum, consists of rapidly dividing cells that invaginate septum transversum, which is mesodermal in nature. Induction for forming liver is by secretion of BMPs by the septum transversum and FGF2 by cardiac mesoderm.⁵ Accessory sulci are more common on the right lobe of the liver. The presence of these sulci had been known for a long time but their importance in clinical practice is still not known.⁶ These accessory sulci are more common on the anterosuperior surface of the right lobe of the liver, owing to the pressure from the surrounding viscera more because of ribs and diaphragmatic muscles. According to some authors, these sulci are derived from the uneven growth of the liver parenchyma caused by the variable resistance opposed by the different bundles of diaphragmatic muscles.⁷ In the present report, these sulci were two in number on the anterosuperior surface of right lobe with variable dimensions. The depth of these sulci may vary, depending upon the invagination of surrounding diaphragmatic muscles. On the contrary, diaphragmatic musculature also showed the hypertrophic muscle bundles.

Sonographic studies showed that these accessory sulci typically appear as echogenic structures, due to peritoneal and extraperitoneal fat. Hypoechogenicity may be demonstrated if these sulci are invaginated by the diaphragmatic muscles. These sulci may be the sites for collection of pus or ascitic fluid, which appears as echo free appearance.⁸ In few of the clinical scenarios, due to chronic lung diseases such as asthma or emphysema, diseased lung along with diaphragm may invaginate the parenchyma of the liver. In these cases, these sulci on the surface of the liver are termed as cough furrows.⁹ Another entity is "Corset Liver" which is due to the prolong application of tight corset with the purpose of

developing attractive figure and sometimes for orthopedic treatments for the correction of scoliosis, may lead to the development of such grooves on the surface of the liver.¹⁰

More recently, radiological and corrosion cast studies have correlated to the formation of sulci, to the weak zones of hepatic parenchyma, which offers less resistance to the external pressure of surrounding viscera including the diaphragm. According to some studies, these diaphragmatic sulci could represent a useful landmark for the surface projection of the portal fissures and of the hepatic veins and their tributaries running through them.⁷ According to Auh et al, the incidence of accessory sulci or fissures was about 25% on CT scans, with the depth of about 2cm or more in one-third cases.¹¹ These diaphragmatic sulci become more relevant clinically because any fluid collection in these sulci may appear as a liver cyst or intrahepatic hematoma. Sometimes disseminated or metastatic tumor cells may get entrapped in these sulci giving the appearance of an intrahepatic mass or focal lesions.¹² Such presence of accessory sulci and division of lobes were kept in mind when evaluating the patients with abdominal trauma because they may give a false impression of a liver laceration.¹³

Accessory lobe in present case report is Riedel's lobe in one of the cadaver, is clinically very important lobe resulting in misdiagnosis. Hence, it should always be considered in patients undergoing the cross-sectional studies. It may be a port of disease that might not be demonstrated until and unless the inferior border of the liver was examined.¹⁴ Sometimes these accessory lobes may hypertrophy with an incidence of 3.3%, with more prevalence in females.¹⁵

CONCLUSION

Accessory sulci on the different surfaces of the liver may sometimes become deep to form the fissures. These fissures may divide the lobe of the liver such as caudate and quadrate lobe in our case report. Sometimes, accessory lobes may project from the surface of the liver, clinically hampering the diagnosis. Hence the knowledge of such accessory fissures and lobe were very much promising to know for hepatobiliary surgeons, anatomists and radiologists.

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