

Riedel's Hepatic Lobe: an Anatomical and Radiology Description

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ABSTRACT

Introduction: Riedel's lobe consists of an anatomical variation defined by the vertical elongation of the right hepatic lobe due to hypertrophy of segments V and VI, thus forming a tongue-like projection that extends inferiorly beyond the inferior pole of the right kidney.

Case Report: In a 1.80 meters male glycerin cadaver with a 40 centimeters distance between the diaphragm muscle and the pubic symphysis, a liver was found in which the craniocaudal dimension of the right lobe was 20.5 centimeters, while the same dimension, in the left lobe, corresponded to 9 centimeters close to the falciform ligament. Regarding the horizontal dimension, in the right lobe, it was 8.5 centimeters, while in the left lobe, it measured 9 centimeters. The right lobe, extended vertically, exceeded the lower pole of the right kidney by 1 centimeter, while being only 10 centimeter distant from the anterior superior iliac spine. Conclusion: Riedel's hepatic lobe is a relatively prevalent and poorly understood anatomical variation. Knowledge of this variation is of fundamental importance, in addition to other situations, when raising differential diagnoses of palpable abdominal masses and findings on abdominal imaging.

Keywords: Liver; Gastroenterology; Radiology.

Introduction

The liver is an organ of the abdominal region that occupies most of the right hypochondrium and it extends into the epigastric region and into the medial part of the left hypochondrium¹. It is anatomically divided into four lobes, namely: right, left, quadrate and caudate (figure 1). However, from a functional and surgical perspective, it can be subdivided into eight segments (I, II, III, IV, V, VI, VII and VIII), as shown in figure 2.

There is, in the liver, an anatomical variation that, because it was described for the first time, in 1888, by the German surgeon Bernhard Moritz Carl Ludwig Riedel (1846-1916), received the eponym of "Riedel's lobe". This variation consists of vertical elongation of

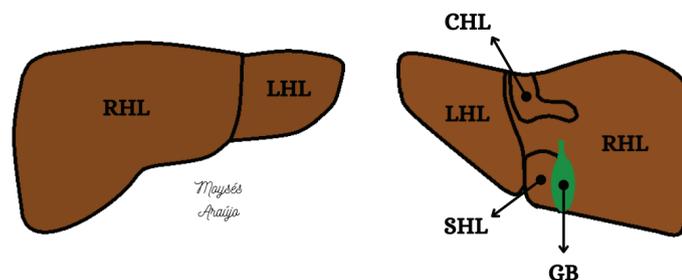


Figure 1. Anatomical division of the liver.

Source: Elaborated by the authors and illustrated by Moyses Araújo (2023).
Caption: RHL= right hepatic lobe; LHL= left hepatic lobe; CHL= caudate hepatic lobe; SHL= square hepatic lobe; GB= gallbladder.

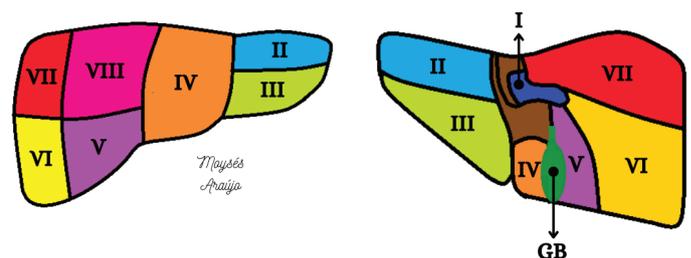


Figure 2. Functional and surgical division of the liver.

Source: Elaborated by the authors and illustrated by Moyses Araújo (2023).
Caption: GB = gallbladder.

the right lobe due to hypertrophy of segments V and VI, thus forming a tongue-like projection². In these cases, although the right lobe has a high craniocaudal diameter, the other liver dimensions are normal, and the histological analysis of the organ reveals a healthy parenchyma³.

Riedel's lobe is important in clinical practice, as it is part of the differential diagnosis of palpable masses on physical examination in the topography of the right abdominal region⁴. Furthermore, metastases or hepatocellular carcinomas

may, in some patients, arise in the lower portion of Riedel's lobe⁵. In addition, there are also reports of cases in which Riedel's lobe torsion occurred, whose therapeutic approaches were the performance of surgical resection⁶.

In this scenario, the purpose of this chapter is to carry out a case report of a

Riedel's hepatic lobe, found in a cadaver belonging to the Department of Morphology of a higher education institution located in Fortaleza-CE, and to carry out a discussion scientific about this anatomical variation.

Case Report

In a 1.80 meters male glycerin cadaver with a 40 centimeters (cm) distance between the diaphragm muscle and the pubic symphysis, a liver was found in which the craniocaudal dimension of the right lobe was 20.5 cm, while the same dimension, in the left lobe, corresponded to 9 cm close to the falciform ligament. Regarding the horizontal dimension, in the right lobe, it was 8.5 cm, while in the left lobe, it measured 9 cm (Table 1). The right lobe, extended vertically, exceeded the lower pole of the right kidney by 1 cm, while being only 10 cm distant from the anterior superior iliac spine (Figure 3).



Figure 3. Photograph of the liver with Riedel's hepatic lobe. Source: Photograph prepared by the authors from the collection of the Anatomy Amphitheater of the Department of Morphology of the Federal University of Ceará, Fortaleza/CE (2023).

Table 1. Data of the liver size of the cadaver studied.

Dimension (in cm)	Right Lobe	Left Lobe
Craniocaudal	20,5	9*
Horizontal	8,5	9

* Close to the falciform ligament

Discussion

In 1888, Riedel described this anatomical variation based on a study of 7 female patients who had palpable masses in the right hypochondrium, later confirmed intraoperatively⁷.

Riedel's lobe is an unusual morphological variation of hepatic lobulation, in which the inferior border of hepatic segments V and VI are projected caudally in a tongue-like shape to the right of the gallbladder, surpassing the inferior pole of the right kidney (Figure 4). The lobe is located just below the anterior abdominal wall and may lie anterior to the hepatic flexure or displace it caudally to the left⁸.

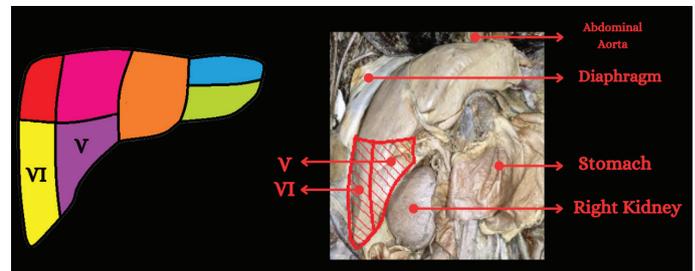


Figure 4. Comparison of the photograph of Riedel's lobe with the schematization of hypertrophy of segments V and VI. Source: Elaborated by the authors (2023).

Classifications were elaborated, in an anatomical prism, of these variations of the hepatic morphology, being the simplest one broadly defining 3 types: a) an accessory lobe adhered to the liver by means of a peduncle (pedunculated); b) small accessory lobe directly attached to the liver without a stem (sessile); c) ectopic liver, which is located outside the liver without connection with the parenchyma⁹. In this scenario, Riedel's lobe is an accessory hepatic lobe, usually sessile, but it can also be pedunculated, according to some literature¹⁰.

In addition, classification can also be based on biliary drainage and the presence or absence of a common capsule: (1) separate accessory lobe duct drains into an intrahepatic bile duct of the normal liver; (2) the separate accessory lobe duct drains into an extrahepatic bile duct from the normal liver and; (3) the accessory lobe and normal liver have a common capsule, and the bile duct of the accessory lobe drains into an extrahepatic duct¹¹⁻¹³.

From an epidemiological perspective, it is clear that the prevalence of Riedel's lobe differs greatly in the literature, ranging from 0.5% to 31%^{7,14-17}. Another inconstant characteristic is the prevalence according to biological sex, so that sources show a greater number in women than in men (4.5% to 19.4% in females vs. 2.1% to 6.1% in males male)^{15,16} while others do not see significant differences⁷. Notably, there are several definitions in the literature and there is a lack of standardization of diagnostic imaging criteria, which may explain these variable incidence rates, since most epidemiological studies are based on radiological series².

The origin of Riedel's lobe is currently little discussed, but there are theories from the 20th century that debate whether this anatomical variation is congenital or acquired⁵. The congenital origin is explained by a dysembryoplastic anomaly in the development of a hepatic bud during the embryological period, which can lead to the formation of accessory lobes, in infrahepatic positions⁴. On the other hand, Riedel defended the hypothesis that this variation is acquired by several factors, among them: the traction from adhesions to the adjacent colon, displacement by an enlarged gallbladder and by the constriction of tight corsets in women⁹.

As for this last theory, it should be noted that extrinsic compressions of the liver were called "corset liver syndrome". Thus, the "corset liver", characterized by a deep fibrous groove on the anterior aspect of the convexity of one of the two lobes, results from continuous compression of the liver by a corset, a belt or by a bone deformity¹⁸. Despite this, the corset liver is currently not categorized as a Riedel's lobe, but rather a finding of similar appearance¹³.

Furthermore, case analyzes propose that liver changes may be caused by age, by skeletal anomalies such as kyphoscoliosis (posterior and lateral deviation of the spine), by intraperitoneal or intrapelvic inflammation and by surgical interventions⁴. Accordingly, a study carried out at the Hospital and University of Cambridge with computed tomography images of 105 patients aged between 20 and 89 years

identified the influence of age and bone deformations in the diagnosis of Riedel's lobe⁷. In this context, it was discovered that the proportion of patients in which the hepatic border projected inferiorly to the costal margin was greater in the age group of 50 to 59 years. Furthermore, in this research, it was noticed that, although the craniocaudal extension of the liver was reduced with age, the proportion of people whose caudal part of the liver exceeds the costal margin increases. Thus, these results would be in line with the suspected relationship with skeletal degenerative changes.

Thus, it is noted that several factors may be linked primarily or secondarily to Riedel's lobe. However, although there are several theories that seek to understand the origin of Riedel's lobe, nowadays, there is still not enough data to prove the real cause of this atypical anatomical variation.

Regarding the diagnosis, it is evident that, due to its generally asymptomatic characteristic, Riedel's lobe, as well as the other accessory lobes, is often discovered incidentally, even in autopsies¹⁹. However, due to the increasing use of cross-sectional imaging modalities, the incidence of detection of accessory lobes of the liver has also increased²⁰. Thus, accessory liver tissue can be easily identified and characterized when computed tomography (TC) or nuclear magnetic resonance (NMR) of the abdomen is performed for related or unrelated clinical conditions (Figure 5)¹⁹. However, in cases where the diagnosis remains in

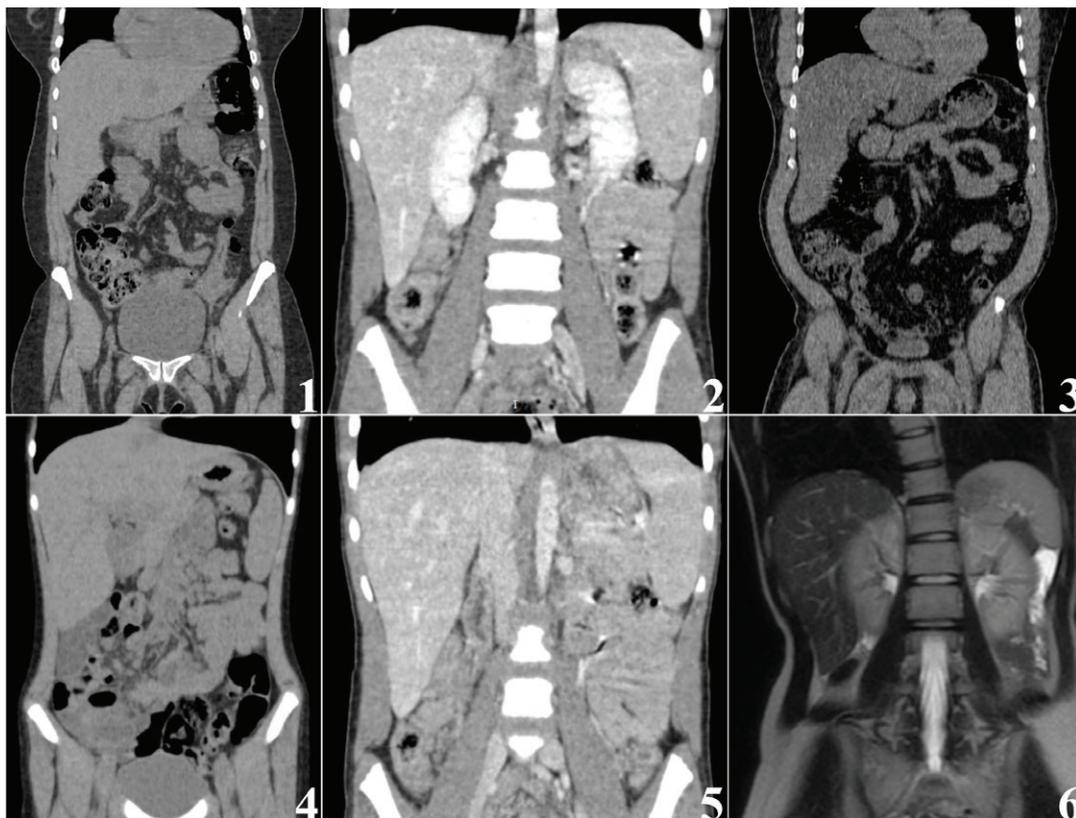


Figure 5. Riedel's lobe incidentally found in different patients through CT (images 1 to 5) and MRI (image 6). Source: Collection of Dr. João Bruno Oliveira Rocha (2023).

doubt, correlation with scintigraphy may help to arrive at a definitive diagnosis of the hepatic origin of the mass. NMR imaging with a hepatobiliary contrast agent can also make this diagnosis^{21,22}.

As for the clinical-surgical implications, it is important to point out that, as already described, Riedel's lobe is generally asymptomatic²⁰. However, in some cases, the presence of Riedel's lobe can trigger several clinical and surgical aspects. By way of illustration, an accessory lobe, and in particular Riedel's lobe, can simulate a mass in the right upper quadrant, with symptoms such as pain, vomiting, constipation, or bloating². In addition, the literature describes that Riedel's lobe has, as a differential diagnosis, several pathologies, including enlargement of the kidney or gallbladder, presence of liver tumor or other abdominal tumor (such as right colon or pancreatic tumor²³, appendicitis²⁴ and even hypertrophic pyloric stenosis²⁵.

Another clinical importance of Riedel's lobe lies in the fact that this variation enters the list of differential diagnoses for the causes of a palpable liver in unusual topographies, which also includes: deep diaphragmatic excursion, pulmonary emphysema, pleural effusion, congestive heart failure, liver cirrhosis, liver metastasis, among others⁴.

Furthermore, episodes of Riedel's lobe torsion have been described^{6,11,25,26}. Episodes of liver bleeding, extrinsic stomach compression²⁵ and even acute alithiatic cholecystitis already have been associated with Riedel's lobe²⁷.

It is worth emphasizing, regarding torsion, that this event usually occurs if Riedel's lobe is connected to

the liver by means of a fibrous sulcus that can suffer torsion, causing the patient to present with severe abdominal pain in the lower right quadrant, with leukocytosis, which mimic the clinical appearance of acute appendicitis²⁸.

Despite all the aforementioned implications, due to the rarity of this anatomical variation and the small number of cases described in the literature, there is no therapeutic algorithmic approach for Riedel's lobe²⁹.

Thus, we conclude that this work, whose objective was not to exhaust the subject, but rather to bring it to light due to the practical importance of this variation, seeks to elucidate and disseminate possible impacts related to this finding, which, in the vast majority of patients, is strictly benign, so that there can be reassurance about a conservative conduct in relation to individuals with this variation.

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Ethics Statement

The authors state that every effort was made to follow all local and international ethical guidelines and laws that pertain to the use of human cadaveric donors in anatomical research³⁰.

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