## CASE REPORT

# Incidentally Detected Riedel's Lobe of the Liver: A Case Report

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**Abstract**

Riedel's lobe is a rare anatomical variant of the liver characterised by a "tongue-like" extension of the right hepatic lobe downwards. In most cases, it is an incidental finding on imaging for other conditions. It is a benign variant but may be mistaken for a hepatic mass or hepatomegaly if not recognised.

A 71-year-old woman admitted with a six-day history of pain in the right iliac fossa, anorexia, and fever. Contrast-enhanced CT of the abdomen (CECT) while revealing a ruptured appendix showed an elongated right lobe of the liver extending inferiorly to the lower pole of the right kidney, measuring 20.0 cm in craniocaudal length, suggestive of Riedel's lobe. Apart from that, the liver was normal with no focal lesions or biliary abnormalities.

Riedel's lobe is a benign anatomic variant of the liver that needs to be differentiated from other liver lesions on medical imaging. Awareness of its typical CT appearance avoids confusion with hepatomegaly or hepatic masses and the need for unnecessary further investigation or inappropriate treatment. It additionally emphasises the utility of CECT in detecting incidental anatomical variations in patients presenting various abdominal pathologies.

**Keywords:** Riedel's lobe; liver; anatomical variation; incidental finding

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## Introduction

Liver is the largest internal organ in the human body, which occupies almost the entirety of the right hypochondrium and extends into the epigastrium and a small area of the left hypochondrium as well. Anatomically, it is divided into the right, left, caudate and quadrate lobes. However, it is functionally divided into 8 segments according to the Couinaud classification for surgical purposes (1).

Riedel's lobe is a benign anatomical variation of the liver first described by the German surgeon Bernhard Moritz Carl Ludwig Riedel (1846-1916) (2) (Figure 1**).** It is a vertical downward "tongue-like" projection of the liver caused by the caudal elongation of the right lobe due to the hypertrophy of segments 5 and 6 as a result of either congenital or acquired causes (2).

The prevalence of Riedel's lobe varies widely due to the lack of standardised diagnostic criteria, but it is believed to be more common in females. The current literature reports prevalence ranging from 0.5% to 31% (3,4). While Riedel's lobe is often an incidental finding, as in our patient, it can present as a palpable right abdominal mass and should be considered as a differential diagnosis. Despite the lack of widespread knowledge, it is important in clinical practice due to the formation of malignancies and the occurrence of torsion of the lobe. Although usually asymptomatic, recognition of Riedel's lobe is important because it may mimic hepatomegaly or an abdominal mass and may occasionally develop complications such as torsion.



***Figure 1: Bernhard Moritz Carl Ludwig Riedel (1846–1916), German surgeon who first described Riedel's lobe. Image source: Wikimedia Commons. Public domain.***

## Case Presentation

We report the case of a 71-year-old female who presented to the surgical care unit with a six-day history of gradual worsening right iliac fossa pain, which was associated with fever and loss of appetite. She had no history of chronic liver disease or malignancy. On examination, she was febrile and had tenderness and guarding over the right iliac fossa consistent with localised peritonitis. There were no other significant abdominal findings. Laboratory findings supported an acute inflammatory process.

Contrast-enhanced CT of the abdomen and pelvis was performed for suspected complicated appendicitis, which was confirmed on imaging.

As an incidental finding, CT demonstrated an incidental tongue-like inferior projection of the right hepatic lobe, consistent with Riedel's lobe. Coronal CT images showed that the elongated right hepatic lobe was situated lateral to the gallbladder fossa and extended

inferiorly beyond the lower pole of the right kidney. The lateral hepatic margin extended laterally to the hepatic flexure of the colon and projected approximately 8 cm below the right costal margin. The maximum craniocaudal length of the right hepatic lobe measured 20.0 cm **(**Figure 2 and 3**)**. The hepatic parenchyma showed homogeneous enhancement without suspicious focal lesions.

The liver margins were smooth, and there was no evidence of diffuse hepatomegaly, intrahepatic bile duct dilatation, or vascular abnormality. The portal and hepatic veins were patent.




***Figures 2: Coronal (a) and sagittal (b) contrast-enhanced CT image demonstrating the elongated right hepatic lobe extending inferiorly beyond the lower pole of the right kidney, with a maximum craniocaudal length of 20.0 cm, consistent with Riedel's lobe.***

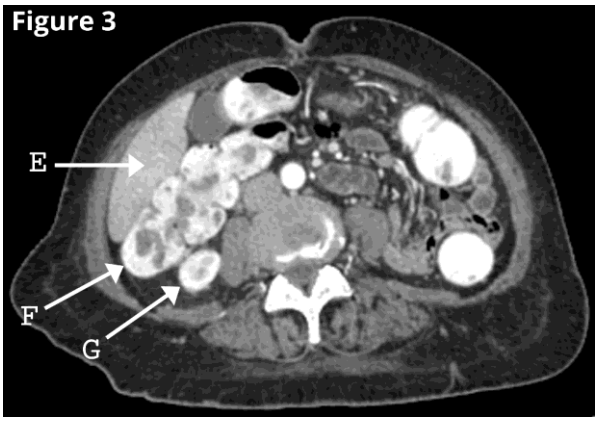



***Figure 3: Axial contrast-enhanced CT image demonstrating (E) the inferior margin of the elongated right hepatic lobe extending below the lower pole of the right kidney, characteristic of Riedel's lobe; (F) inferomedial displacement of the ascending colon by the elongated right hepatic lobe; and (G) the lower pole of the right kidney***

## Discussion

Riedel's lobe is a benign anatomical variation of the liver, consisting of a vertically downward-projecting "tongue-like" protrusion from the anterior edge of the hepatic lobe on the right side of the gallbladder. This is due to hypertrophy of segments V and VI of the liver (4). Riedel's lobe is located anterior to the hepatic flexure of the colon and may cause inferior and leftward displacement of the colon (4). Despite these anatomical arrangements, the rest of the morphology of the liver remains normal, as does the histology of Riedel’s lobe (5). It was first described by the German surgeon Bernhard Moritz Carl Ludwig Riedel, who documented the anomaly in seven female patients presenting with palpable abdominal masses (2).

The liver is the largest internal organ of the body, situated in the right hypochondrium and epigastrium (6). It is covered by a capsule (Glisson's capsule) except at the bare area where it is in direct contact with the

diaphragm. It has a small extension towards the left hypochondrium (6). It has 2 surfaces, the convex diaphragmatic surface and the irregular visceral surface. The liver is functionally divided into two lobes - right and left. The plane of division lies in the plane running through the gallbladder fossa and the groove for the IVC. This plane can be visualised radiologically by the middle hepatic vein, which lies directly within this plane (7). Each functional lobe is further subdivided into Couinaud segments, giving a total of eight functional segments (2). This classification is based on the vascular supply and biliary drainage (2). The caudate lobe is an independent segment belonging to both sides, and the quadrate lobe belongs to the left lobe. The remaining lobes arrange themselves around it in a counterclockwise pattern (7). Two theories have been proposed relating to the origin of Riedel's lobe: congenital theory and the acquired theory (2, 8). Between these two, the true origin of Riedel's lobe is still debated. Congenital theory suggests it is a dysmorphic anomaly in the embryological development of the hepatic bud. This would lead to the formation of accessory hepatic lobes in infrahepatic positions that would lead to the displacement of the primitive liver (2). It may also be caused by the persistence of the mesodermal septa during the rapid proliferation of the liver or the abnormal branching of the foregut diverticulum (9). Additionally, accessory hepatic lobes and a history of foregut malformations, such as omphalocele or gastroschisis, may lead to the development of Riedel's lobe. (10) The acquired theory, based on Riedel's first description of the variation, proposes that the tongue-like protrusion is due to traction exerted on the liver when it adheres to nearby structures (3, 8). In certain individuals predisposed to this condition, intraperitoneal or intrapelvic chronic inflammatory conditions may cause elongation of hepatic tissue (8). Skeletal changes, surgical interventions or displacement via an enlarged gallbladder may also contribute (2, 8).

Riedel's lobe is generally asymptomatic. It is usually an incidentally detected finding on imaging studies of the abdomen performed for other reasons. This anatomical variation should be recognised to avoid misdiagnosis as hepatomegaly or a hepatic mass and unnecessary investigations or interventions, as a palpable, non-tender mass in the right abdomen can be felt during examination of an individual with Riedel's lobe (11).

Torsion is a rare complication of Riedel's lobe and other conditions involving a lobe connected by a narrow pedicle, mesentery, or fibrous sulcus (11). Torsion may reduce blood flow, leading to tissue ischemia. The resulting pain localises to the lower right quadrant and may cause nausea, vomiting, bloating, and constipation (2, 11). Laboratory investigations may show elevated WBC counts, which, together with the site of pain from torsion, may incorrectly point towards acute appendicitis in certain cases (2). In this case, our patient was found to have a ruptured, inflamed appendix, which was the source of the right iliac fossa pain. Since most cases are asymptomatic, they do not require any surgical intervention or any active management. Given the risk of torsion, periodic surveillance is recommended.

As Riedel's lobe is composed of normal hepatic parenchyma, it is susceptible to the same pathological processes that affect the rest of the liver, including primary and secondary hepatic malignancies. Clinically, it may present as a palpable right upper abdominal mass and should be differentiated from true hepatomegaly caused by other pathological conditions such as hepatic steatosis, congestive hepatomegaly secondary to right-sided heart failure, liver abscesses, hepatocellular

carcinoma, and infiltrative haematological disorders. Recognition of this anatomical variant is therefore important to avoid unnecessary investigations and inappropriate management (8, 12).

Clinically suspected Riedel's lobe is initially assessed with non-invasive imaging, such as ultrasonography (USS). The lobe is assessed for cystic or vascular features when combined with Doppler examination (8). After USS, if a mass is identified, then cross-sectional imaging, such as CT or MRI, is performed to confirm the presence and features of the mass. CT and MRI are effective in clearly visualising the elongated tongue-like projection and ruling out other pathologies. MRI with hepatocyte-specific contrast agents can confirm that the Riedel's lobe is normal hepatic tissue by demonstrating hepatobiliary-phase enhancement similar to that of the remainder of the liver (13). Radiologists must be careful not to misidentify it with the beaver tail variant, which occurs when an elongated left lobe, typically segment II, extends past midline and wraps around the spleen (9). Presence of Riedel's lobe requires careful evaluation of the surrounding anatomy as well as the vascular supply and biliary drainage of the lobe before cholecystectomy or pancreaticoduodenectomy to minimise potential damage to these structures (9). This lobe is a viable hypertrophied source of tissue for a living-related hepatic transplant (8).

**Conclusion:**

The Riedel's lobe is an uncommon benign anatomical variation of the liver which is more commonly seen in females. While most cases are detected incidentally, it should be considered as a differential diagnosis for a patient presenting with right abdominal pain. Awareness of this condition, and thorough radiological knowledge of this variation is vital for correct diagnosis through radiological imaging and prevention of unnecessary surgery.

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**Availability of data and materials:** Acquired DICOM medical images during the current case report are available from the corresponding author upon reasonable request. The subject's identifying information was removed from the radiology images

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