



Abdominal Ultrasound
Chapter 5

THE SPLEEN



Niko Mayr

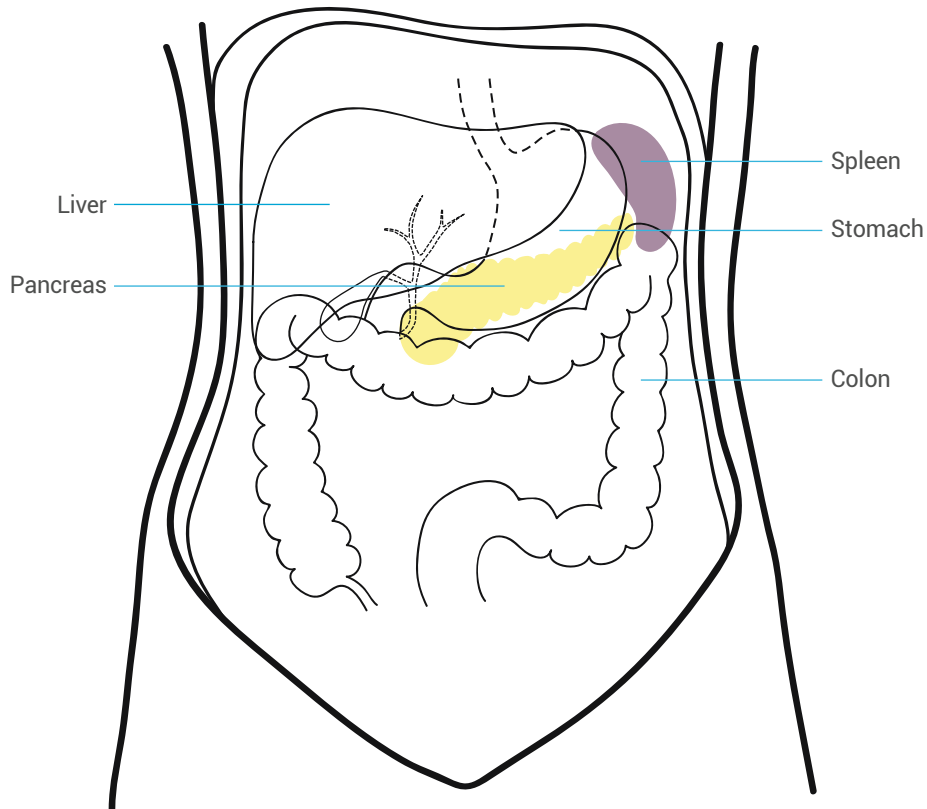
The Spleen

MASTERING ULTRASOUND ANATOMY

The spleen is located in the left hypochondriac region, right beneath the diaphragm.

Located to the left of, and behind the stomach, the spleen is bordered caudally by the left kidney and ventromedially by the pancreatic tail.

It is completely enveloped by a peritoneal sheath, and fixed to the left colonic fissure by the splenocolonic ligament and to the stomach by the gastrosplenic ligament.



The splenic artery branches off the celiac stem and enters the organ at the splenic hilum, right next to the pancreatic tail. The splenic vein collects the blood leaving the spleen through the splenic hilum.

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RECOGNIZING THE LANDMARKS

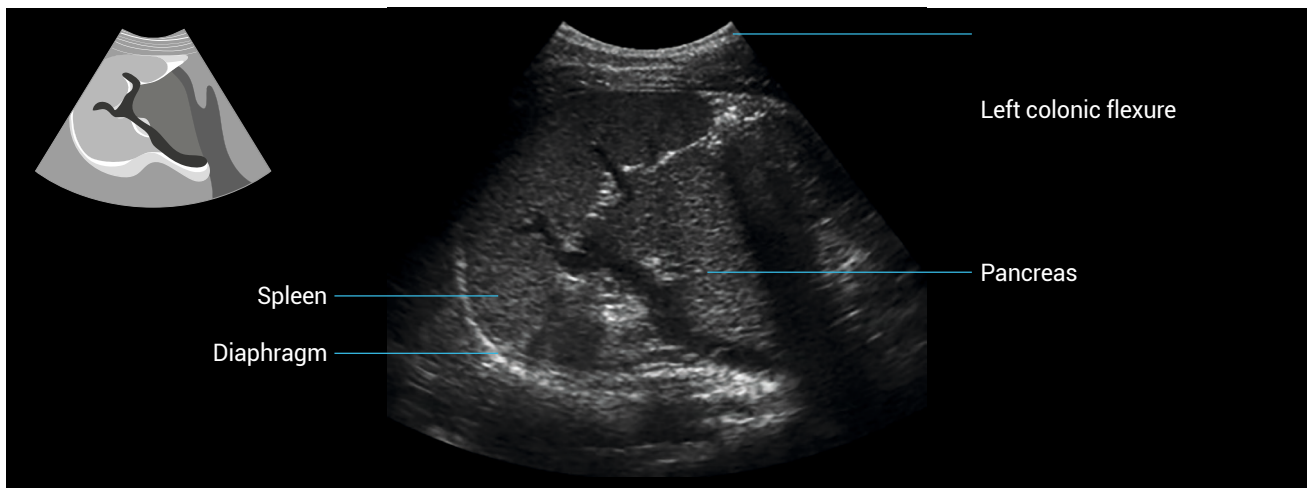
Splenic window—longitudinal

The standard ultrasound examination of the spleen is performed using a longitudinal section through the organ.

In this view, the spleen is bordered cranially by the diaphragm and caudally by the left colonic flexure and the left kidney. The tail of the pancreas sits in

the splenic hilum and is bordered by the stomach ventrally.

The most important landmark for identifying the long section of the spleen is the splenic vein, which is located cranial to the pancreatic tail.



The spleen may sometimes be difficult to visualize since the visibility of the spleen differs from patient to patient depending upon body mass, breathing, and the timing of the patient's last meal.

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HOW DO I DO IT?

Suggested algorithm for the ultrasound of the biliary system

1. Long section cut in the 9th or 10th intercostal space of the left thoracic wall
2. Spleen in transverse view (turn probe 90° to long section)
3. Landmarks: spleen long section, splenic vein in long section cranial to the pancreatic tail, left kidney, splenorenal recess



Important:
Always follow the same sequence!

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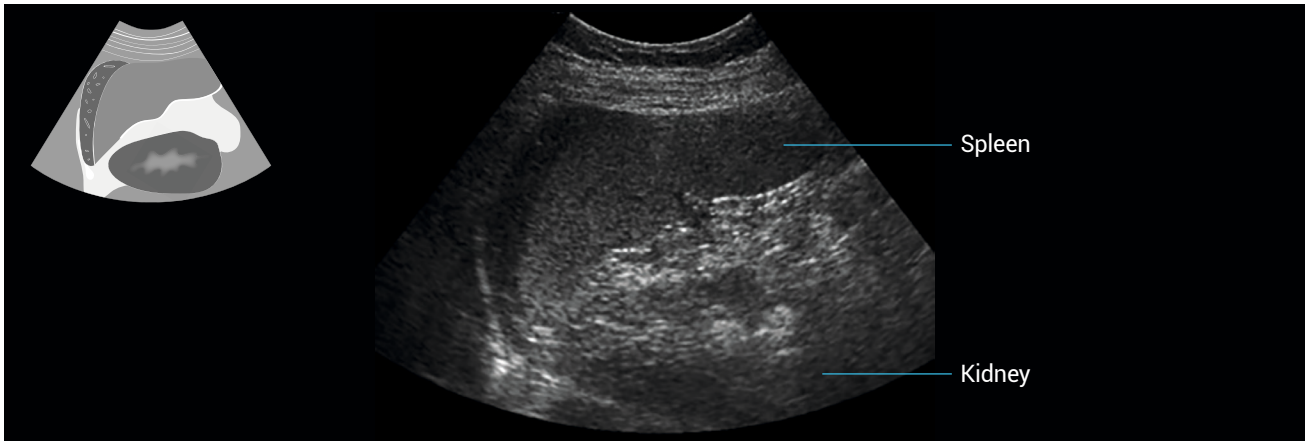
MEASURING SIZE AND IDENTIFYING VARIANTS

Measuring the spleen

The size of the spleen is best measured in the long section.

It is important that the hilar vessels of the spleen are visible when measuring the spleen since they

represent the organ center, which presents the maximum size and organ thickness in the long axis.



Splenomegaly

The size of the spleen differs depending on body size, age, and sex. It can range from 6–13 cm long and over 5 cm thick. The spleen is larger in children

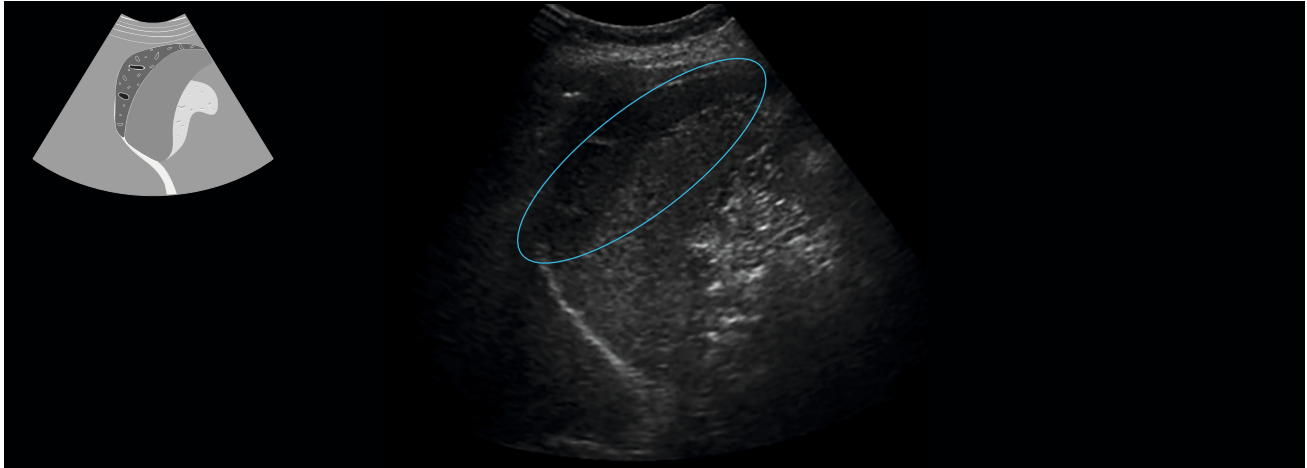
than in adults. Tall and slender people tend to have long, slim organs, while pyknic people show rather plump spleens.



Kissing phenomenon

In tall, slender people, particularly females, the liver can extend quite far toward the left epigastrium,

between the left diaphragm and the spleen—a finding known as the kissing phenomenon.



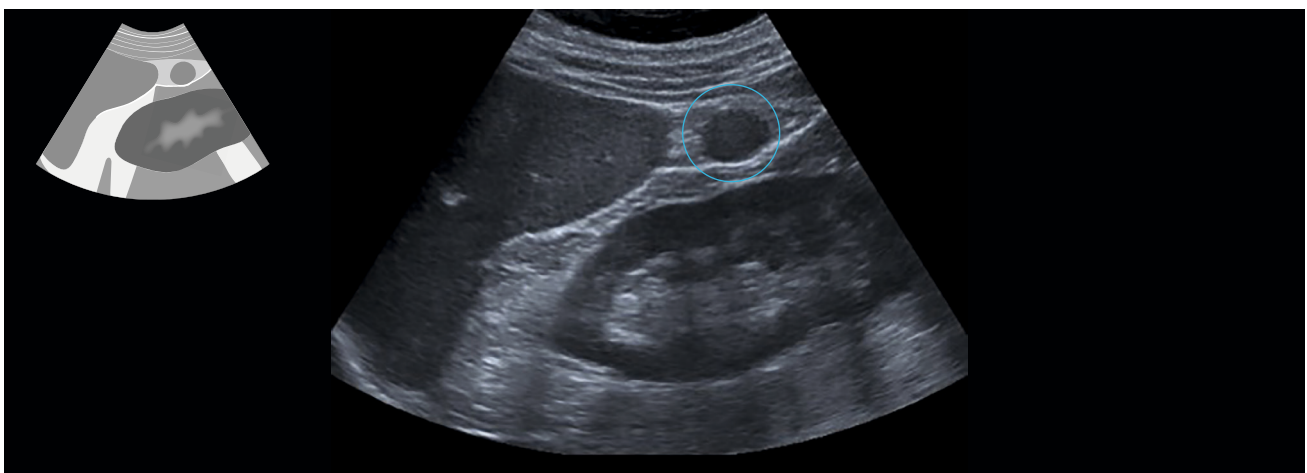
Splenunculus

Splenunculi are a typical incidental finding along the splenic hilum or on the caudal border of the spleen. Also known as supernumerary, accessory spleens or splenules, splenunculi are small nodules of spleen that are detached from the rest of the organ.

Since they are islands of splenic tissue, splenunculi resemble the same echogenicity as the spleen itself. They can be as large as 3 cm.

After splenic resection, splenunculi can grow and take over the normal functions of the spleen.

They are benign and asymptomatic; however, it is important to be able to distinguish them from more sinister pathology.



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INTERPRETING IMAGES OF TRAUMA

Splenic injury can occur after blunt or penetrating trauma or secondary to medical intervention (e.g., colonoscopy). The spleen is the most frequently injured organ after blunt trauma.

Patients may present with left upper quadrant / left chest pain, left shoulder tip pain (referred from diaphragmatic irritation) and signs of hypotension or shock.

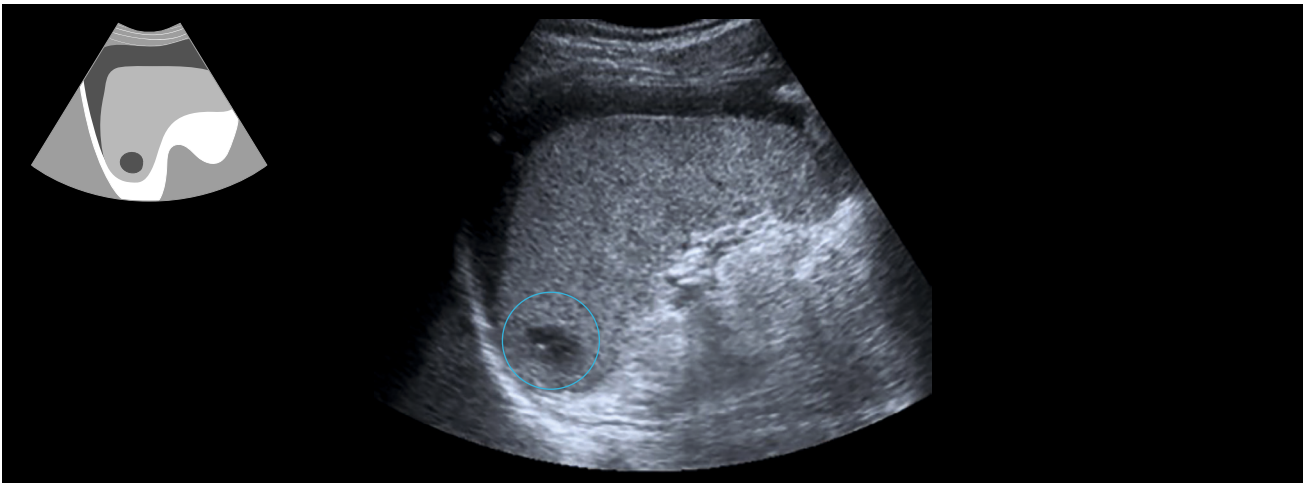
Types of splenic injury

- Laceration
- Hematoma: subcapsular (more common) or intraparenchymal
- Active hemorrhage
- Pseudoaneurysm or AV fistulas (in ~ 15% of splenic trauma)
- Splenic infarct (rare)

FAST scanning may be performed to determine the presence of free fluid. However the absence of free fluid does not rule out splenic injury.

Disruption to the splenic echotexture, indicating laceration, or hypoechoic regions representing hematoma, may be present.

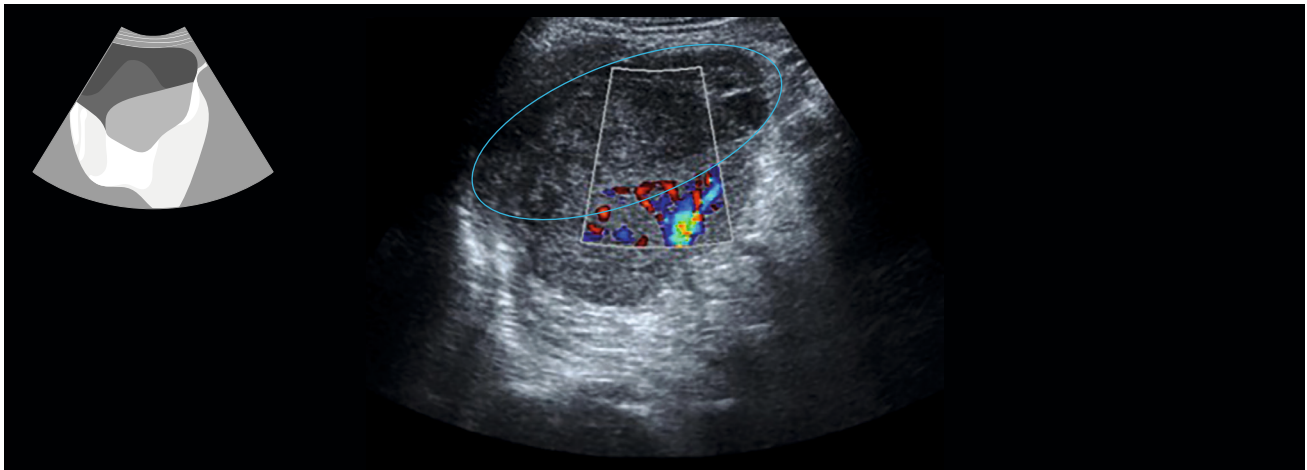
Hematoma



Splenic rupture

Splenic ruptures after blunt abdominal trauma are sometimes hard to visualize with ultrasound. The blood clotting that is found within the laceration can have the same echogenicity as splenic tissue. Since subcapsular hematomas can pose the same problem, the best way to distinguish between

splenic tissue, the laceration, and blood clotting is to use color Doppler. Spleen parenchyma is highly vascularized and it is possible to distinguish it from hematoma with the missing perfusion signal within the clot.



Active bleeding

Below is a contrast-enhanced ultrasound image of a subcapsular hematoma, showing active bleeding out of the splenic capsule, as indicated by the contrast media bubbling out of the spleen tissue.

echo with echobright color coding when perfusion with contrast media is present. Blood clots appear dark since they have no vascularization. The active bleeding can be seen with echobright bubbles flowing into the clot.

Contrast-enhanced ultrasound uses the principle of



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DIFFERENTIATING FOCAL LESIONS

Splenic cysts

Although they are fairly rare, splenic cysts are the most common focal lesion of the spleen. They may be primary (congenital) or secondary.

Primary splenic cysts

Congenital epidermoid splenic cysts, or primary splenic cysts, are lined by epithelium (true cyst) and are usually solitary. A genetic defect of mesothelial migration is considered the cause.

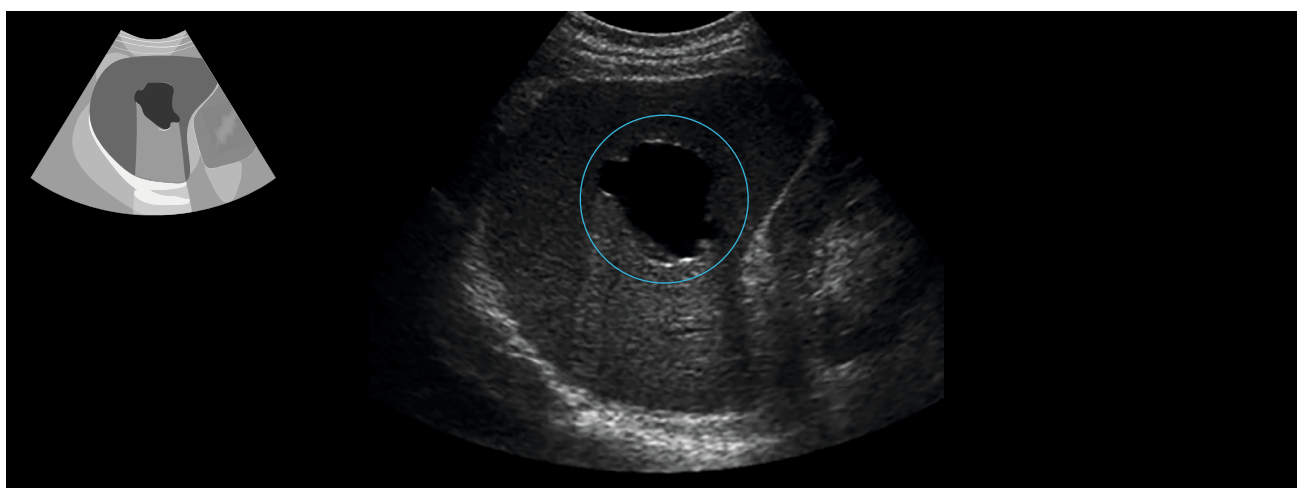
Primary splenic cysts are most common in children and young adults.

Gross pathology shows large cysts with glistening smooth walls. Wall calcification is uncommon (~ 15%), but wall trabeculations or septa are common (~ 85%).

Secondary splenic cysts

Secondary splenic cysts may be

- The end stage of trauma-induced splenic hematoma or splenic infarction with resultant liquefactive necrosis and cystic change. They are usually smaller than true cysts and contain debris and wall calcification (50%). Septa are uncommon.
- Pyogenic splenic abscesses .
- A complication of pancreatitis, such as pseudocyst or walled-off necrosis adjacent to the spleen.
- Pancreatic pseudocysts that extend beneath pancreatic tail to gain entry to the spleen via the splenic hilum and capsule.
- A hydatid cyst (very rare).

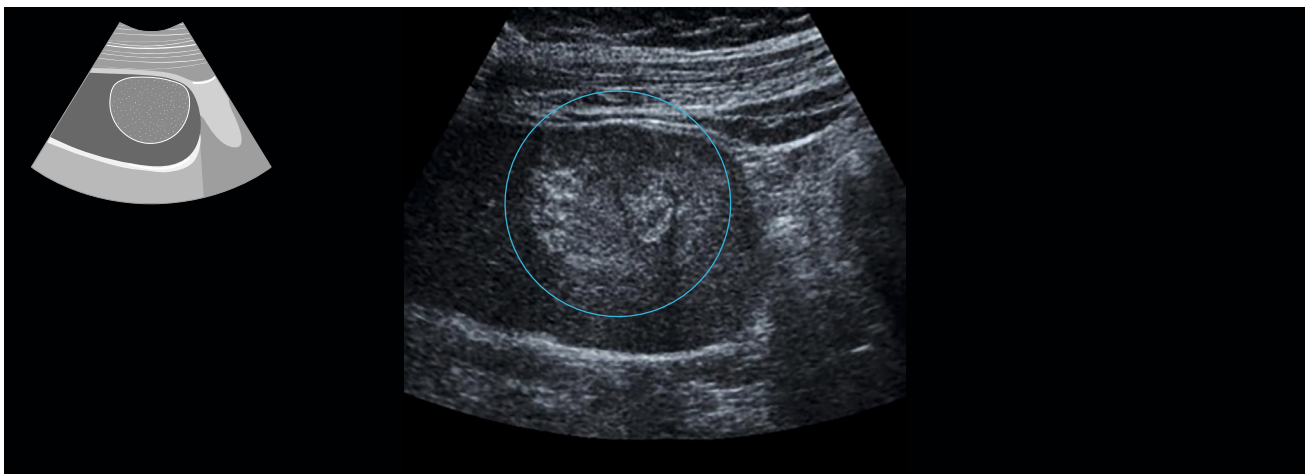


Splenic hemangioma

Splenic hemangiomas (also known as splenic venous malformations), while rare, are considered the second most common focal lesion involving the spleen. Most splenic hemangiomas are cavernous malformations, which can be found throughout the body.

Hemangiomas can have a variety of ultrasound appearances depending on their exact histological composition (i.e., hypoechoic, isoechoic, or hyperechoic). The dominant pattern is a homogeneous echotexture that is predominantly hyperechoic.

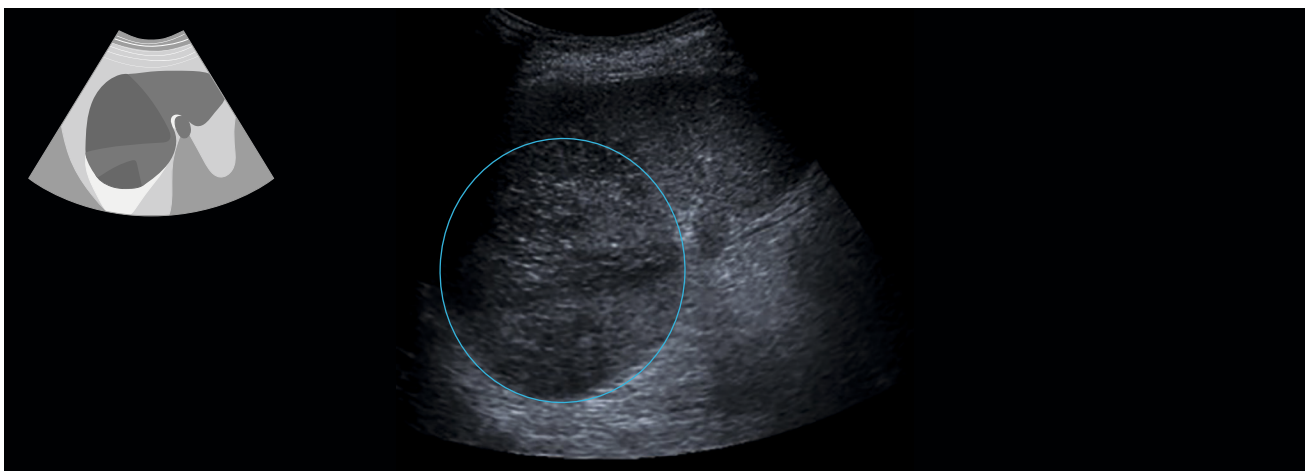
The vast majority are asymptomatic and are incidentally discovered. Occasionally, they may be associated with splenomegaly or abdominal pain.



Splenic infarction

Splenic infarction is a result of ischemia to the spleen, and in many cases requires no treatment. However, identification of the cause of infarction is essential. Splenic infarcts can occur due to a number of processes involving either the arterial supply, the spleen itself, or the venous drainage.

Patients with a splenic infarct may present with left upper quadrant pain, while others may present with diffuse abdominal pain. Splenic infarct may present with left upper quadrant pain. Some may have constitutional symptoms such as fever and chills.



The most common causes of splenic infarction

- Hematologic disorders
- Embolic events
- Pancreatitis
- Portal hypertension
- Blunt trauma

Infarcts are typically hypoechoic compared to the rest of the spleen, although acutely they may appear isoechoic, making them difficult to identify.

Splenic infarctions can appear in the following forms

- Wedge-shaped (classic)
- Round
- Irregularly shaped
- Smooth (uncommon)

During a contrast-enhanced ultrasound study, the infarction will never show vascularization while the normal spleen tissue shows a normal perfusion signal.

As the infarct matures, if it undergoes contraction and scarring it will appear as a hyperechoic region with retraction of the capsule. If liquefaction occurs, the area may be rounded and anechoic (a splenic pseudocyst).