

Splenic Infarction – US and CT imaging findings

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Learning objectives

The aim of the present poster is to review ultrasound (US) and computed tomography (CT) imaging findings in patients with a splenic infarction.

Background

Splenic infarction is one of the most common causes of focal splenic lesions and results from global or segmental parenchymal splenic ischemia and necrosis caused by a wide variety of diseases involving either the spleen itself, the arterial supply (splenic artery occlusion) or the venous drainage (splenic vein thrombosis).

Etiology:

Despite the vast etiological list (Figure 1), splenic infarcts mainly occur in patients with:

- Haematologic disorders (leukemia, lymphoma, sickle cell hemoglobinopathies, myelofibrosis, etc)
- Embolic conditions (infective endocarditis, atrial fibrillation, etc)

Clinical presentation:

Patients typically present with LUQ pain and constitutional symptoms such as fever, nausea, vomiting, malaise and chills. Up to one third of patients may be asymptomatic mainly due to small splenic infarcts.

Background

Splenic Infarction Etiology	
<ul style="list-style-type: none">• Haematologic disorders<ul style="list-style-type: none">• Leukemia• Lymphoma• Sickle cell hemoglobinopathies• Myelofibrosis• Hypercoagulable states	<ul style="list-style-type: none">• Anatomic causes<ul style="list-style-type: none">• Splenic torsion (wandering spleen)
<ul style="list-style-type: none">• Embolic conditions<ul style="list-style-type: none">• Infective endocarditis• Atrial fibrillation	<ul style="list-style-type: none">• Miscellaneous<ul style="list-style-type: none">• Abdominal surgery• Pancreatitis• Portal hypertension• Abdominal tumors involving splenic vessels

Figure 1 – Splenic infarction etiology list

Imaging Findings

Diagnostic pearls:

- Peripheral, wedge-shaped, nonenhancing/ hypoechoic splenic lesion in a patient with LUQ pain.

Extension:

- Segmental (polar or central location);
- Global (involving the entire spleen).

Morphology:

- Typical - peripheral wedge-shape;
- Atypical - Spherical lesions

Imaging Findings

Diagnostic pearls: Peripheral, wedge-shaped, nonenhancing/ hypoechoic splenic lesion in a patient with LUQ pain

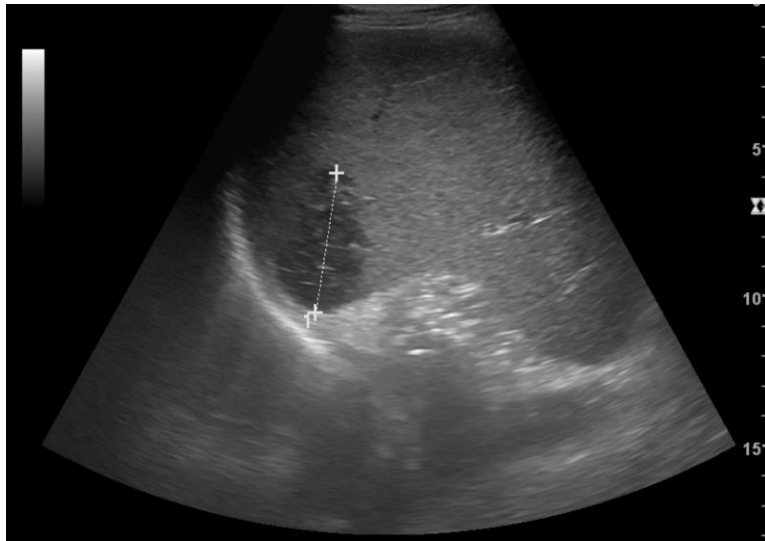


Figure 2 – Splenic infarct on US

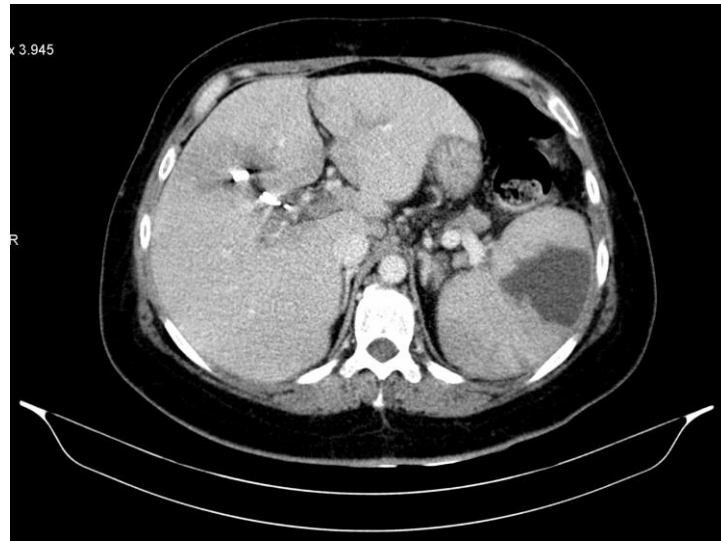


Figure 3 – Splenic infarct on CT

Imaging Findings

Extension: Segmental (polar or central location) vs global (involving the entire spleen)

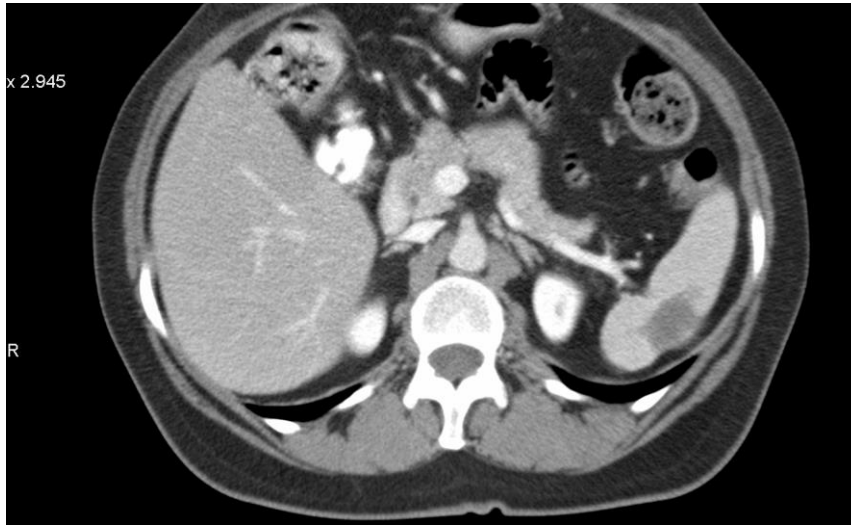


Figure 4 – Segmental splenic infarct

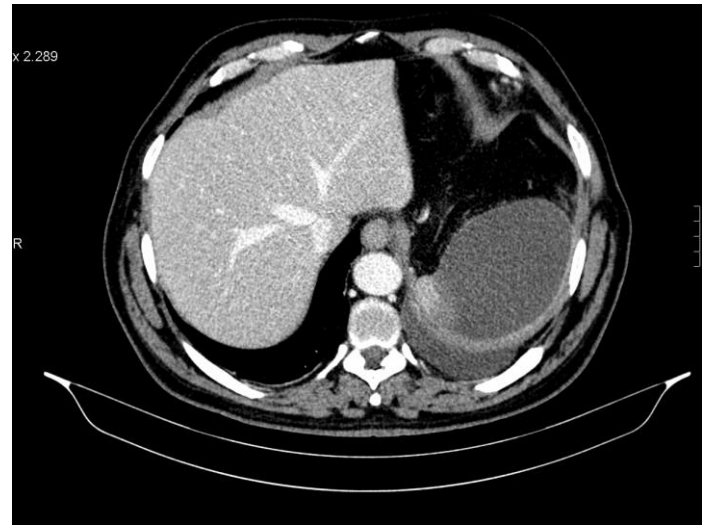


Figure 5 – Global splenic infarct

Imaging Findings

Ultrasound

Acute infarct:

- Typical findings - Peripheral, wedge-shaped, hypoechoic splenic lesion
- Atypical findings - spherical lesions in the center of the spleen
- The identification of the lesion suggests an ischemia of at least 24 hours;
- Bright band sign - reflective bright linear bands within hypoechoic splenic lesions. Useful sonographic sign of splenic infarction especially in lesions with atypical appearance.
- Color Doppler:
 - Avascular or hypovascular lesion
 - Splenic artery occlusion: no flow in part or all lumen
 - Splenic vein thrombosis: Nonvisualization or partial visualization of the vein \pm venous collaterals

Chronic infarct:

- Acute to chronic: the hypoechoic splenic lesions become progressively more echogenic as fibrosis develops over time;
- Infarct area atrophy, retraction and notching of the splenic capsule, \pm calcification;

Imaging Findings

Ultrasound

Acute infarct:

- Typical findings - Peripheral, wedge-shaped, hypoechoic splenic lesion;
- Atypical findings - spherical hypoechoic lesions in the center of the spleen;
- The identification of the lesion suggests an ischemia with at least 24 hours;

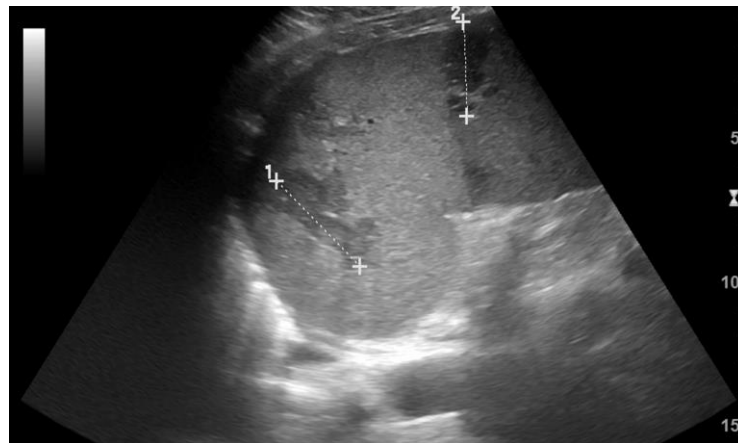


Figure 6 – Splenic infarct on US

Imaging Findings

Ultrasound

Acute infarct:

- Bright band sign - reflective bright linear bands within hypoechoic splenic lesions. Useful sonographic sign of splenic infarction especially in lesions with atypical appearance.

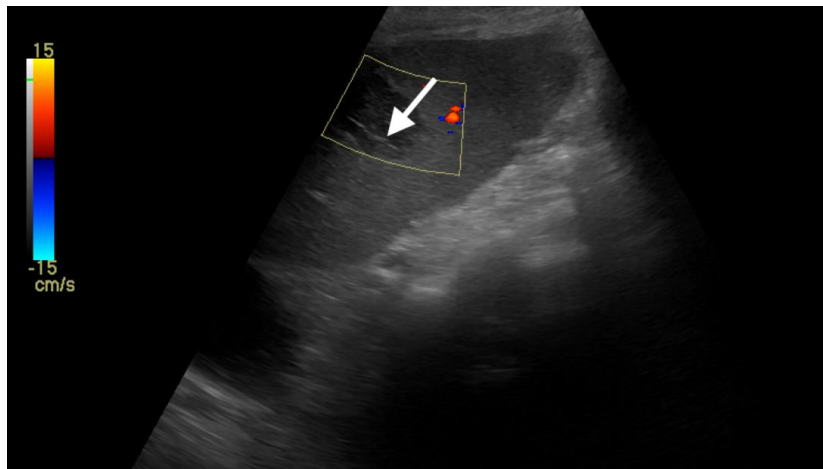


Figure 7 and 8 – Bright band sign (arrow) within splenic infarct areas

Imaging Findings

Ultrasound

Acute infarct:

- Color Doppler:
 - Avascular or hypovascular lesion
 - Splenic artery occlusion: no flow in part or all lumen
 - Splenic vein thrombosis: Nonvisualization or partial visualization of the vein \pm venous collaterals

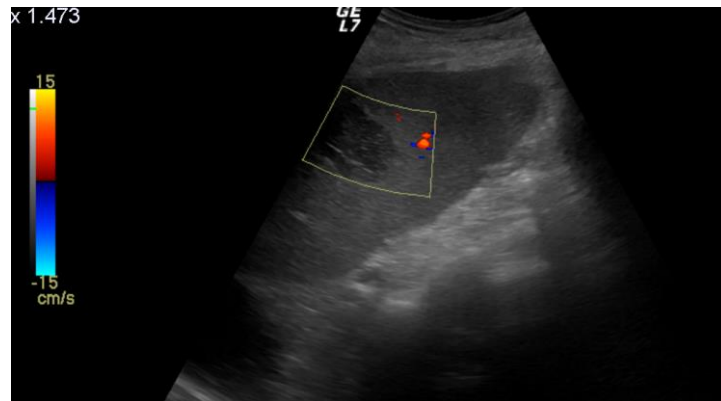


Figure 9 – Splenic infarct shown on US as an avascular hypoechoic splenic lesion.

Imaging Findings

CT Protocols

Noncontrast-Enhanced Computed Tomography (NECT)

- Infarcts may be difficult or impossible to identify;
- Spontaneously hyperdense areas may correspond to hemorrhagic transformation.

Contrast Enhanced Computed Tomography (NECT)

- Portal venous phase is preferable;
- Normal heterogeneous enhancement in arterial phase should not be confused with splenic infarcts.

Imaging Findings

CT

Acute infarct

- **Segmental:**
 - Typical findings: peripheral, wedge-shaped, nonenhancing splenic lesion;
 - Atypical findings: spherical lesions;
 - Multiple lesions are mostly caused by emboli;

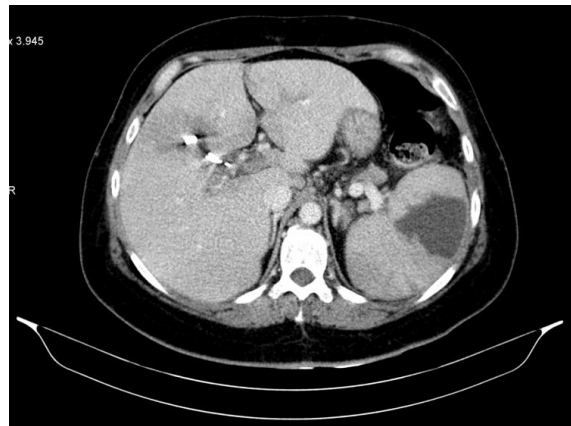


Figure 10 – Segmental splenic infarct

Imaging Findings

CT

Acute infarct

- **Segmental:**
- Mottled areas within infarct lesions may correspond to hemorrhage or still preserved splenic tissue.

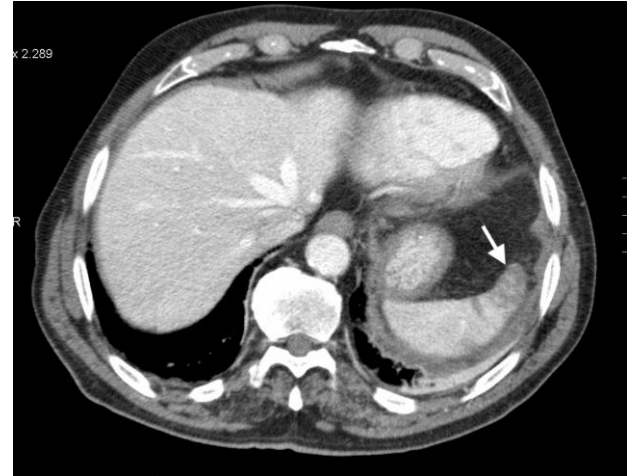


Figure 11 – Mottled area (arrow)
within a splenic infarct

Imaging Findings

CT

Acute infarct

- **Global:**
 - The entire spleen is hypo-enhancing;
 - Cortical rim sign – preserved enhancement of peripheral spleen due to maintained flow from capsular vessels.

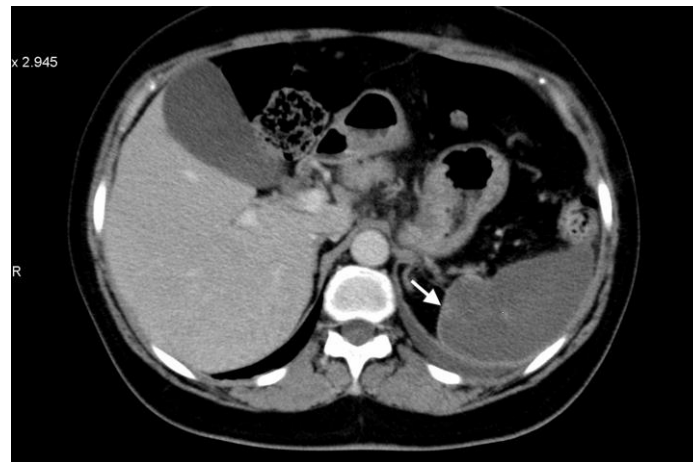


Figure 12 – Global splenic infarct with cortical rim sign (arrow)

Imaging Findings

CT

Complications (<20 % of patients)

- Splenic rupture
 - Suggested by the presence of surrounding hematoma or fluid
- Splenic abscess
 - Fluid collection with minimal peripheral contrast enhancement
 - ± Internal gas

Chronic infarct

- Infarct area atrophy, retraction and notching of the splenic capsule, ± calcification
- Compensatory hypertrophy of the remaining spleen may occur.

Conclusions

As splenic infarcts can be caused by a wide variety of diseases and it may present with different symptoms it is essential that radiologists correctly and systematically assess the splenic parenchyma so that this potentially dangerous disorder is not overlooked.

Although contrast enhanced computed tomography is nowadays considered the modality of choice if the diagnosis is suspected, ultrasound should not be overlooked as it is also highly sensitive to the diagnosis and widely available, safe and low-cost.

References

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