Spleen: unusual imaging findings

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Learning objectives

review the imaging findings in unusual disorders that affect spleen and the key imaging features that allow a specific diagnosis.

Background

The spleen has essentially a hematologic function, particularly lymphoid. It is involved in the regulation of the immune system regulation and degradation of blood cells.

A wide range of disease can produce splenic focal lesions.

The imaging appearance of solitary focal lesions varies from cystic to solid masses. The radiological diagnosis of splenic lesion is challenging as it includes multiple etiologies and radiological semiology deemed nonspecific.

Imaging findings OR Procedure details

1. Vascular disorders (polysplenia syndrome with congenital vascular disorder, spleen infraction),

spleen infraction

Infarcts are the most important causes of focal splenic defects which may be caused by embolic, hematologic or splenic vascular diseases.

The typical but infrequent image of the infarct is a triangle of well defined borders with the apex in the splenic hilus and the base in the splenic capsule.

These lesions may also be visualized as circular, multinodular lesions with indistinct borders.

Infarcts may completely heal within a month or may result in contour defects or pseudocysts.

Congenital variations and anomalies

Congenital absence of the spleen is known as asplenia (Ivemark syndrome) and presence of more than one spleen is known as polysplenia syndrome.
Both situations are quite rare and associated with multiple system and organ anomalies including the liver in the first place, and even the inferior vena cava.

Accessory spleen and wandering spleen are commonly encountered.

Accessory spleen is mostly located in the hilum.

Wandering spleen is due to the laxity of the splenic ligament and may present as a soft tissue mass in the abdomen.

Such variations are recognized through their same density or signal intensity with the spleen.

2. inflammatory and infectious disease (abcess, hydatid cyst)

2.1. Bacterial Abscess

A pyogenic abscess is a localized collection of pus that most commonly is caused by the hematogenous spread of infection (75% of cases). Other causes include penetrating trauma, postoperative condition and prior splenic infarction.

They can be single or multiple.

Imaging findings:

**US:** poorly defined hypoechoic or anechoic masses. If gas has formed within the abscess, high echogenicity associated with distal "dirty" shadowing can be seen.

**CT:** most reliable technique. It shows a more well-defined (low attenuated) lesion than is typically shown on US images. No internal contrast enhancement is evident. Peripheral contrast enhancement is a typical, however not constant, feature like in hepatic ones. The presence of gas in an intrasplenic collection is diagnostic for an abscess, although the majority of splenic abscesses do not contain air.

One of the typical findings of infection sequela is splenic parenchymal calcifications.

**MR:** lesion of fluid signal intensity, with low signal intensity on T1-weighted images and high signal intensity on T2-weighted images. There is minimal peripheral enhancement when the capsule develops.

2.2. - Hydatid cyst

Caused by *Echinococcus granulosus*.

Commonly seen in endemic areas.
Concurrent liver cysts are frequently present.

They may show ring calcification or high CT values like intracystic debris, hydatid sand and inflammatory cells.

Hydatid cysts are often encountered in Middle Eastern countries including Turkey and may be diagnosed in some cases by contrast enhancement of the cyst walls and septations. A hypointense peripheral rim may be visualized around hydatid cysts on MR imaging studies.

A cystic lesion with wall calcification in a patient from an endemic area and who has positive serologic findings most likely represents hydatid disease.

3. benign tumors (hemangioma, cysts)

3.1. Cystic lesions

Cysts are the most frequent benign lesions of the spleen.

They develop mostly secondary to trauma, infections and infarction and are called pseudocysts.

They can be divided in two categories:

- primary (true) cyst, which possess a cellular lining, and
- secondary (false) cysts, which have no cellular lining.

The primary cysts are either nonparasitic (epidermoid or congenital) or parasitic (echinococcal).

Secondary or false cysts are presumed to result from either unrecognized trauma, previous infarction, or infection of the spleen.

Posttraumatic cysts account for 80% of all splenic cysts.

- PRIMARY CYSTS

  • Congenital Or Epidermoid Cyst

The most common non-parasitic splenic cysts in the literature (25%).
Classically occurs in young (<20 years) but sometimes up to 40 years

Often bulky as longtime asymptomatic.

Classically in the upper pole, subcapsular and solitaire.

Imaging findings:

**US:** well-defined, anechoic, posterior reinforcement.

**CT:** spherical, well-defined cystic lesions with attenuation equal to that of water, a thin or imperceptible wall, and no rim enhancement.

Thin walls (2/3 cases) with possible discrete contrast enhancement, calcified wall (1/3 case)

**MR:** well-defined rounded mass with signal intensity equal to that of water with both T1- and T2-weighted sequences.

Cystic: hyperintense T2 franc, Iso or hyperintense T1 (hemorrhage, proteins)

Enhancement of the wall + / - partitions (> CT)

- **Lymphangiomas**

Rare adult, pediatric cases: lymphangiomatosis (reaching multi visceral)

Splenic lymphangiomas tend to occur in subcapsular locations, reflecting the anatomic distribution of splenic lymphatics. Thin-walled subcapsular or parenchymal cysts have been described, as well as global splenic enlargement by a diffusely infiltrating lesion. Mural or septal calcifications may be present.

- **CT:** homogeneous multiseptate cystic mass with enhancing septa, mural or septal calcification

- **MRI:** MR signal features are determined by the proteinaceous content: T1W hyperintense (rich in protein) and high hyperT2;

- **Hydatid cyst (see above)**

- **FALSE CYST**

Appearance is similar to true cyst at US, CT and MR.
Usually they are smaller than true splenic cysts and sometimes they show eggshell calcifications of the wall.

The diagnosis of a false cyst should be favored if there is a clear history of trauma, spleen infraction or infection, if the patient is older than the fourth decade, if there is a hematoma elsewhere in the spleen, or if the cyst wall is calcified.

Hemangiomas, metastases and abscesses are lesions that should be considered in the differential diagnoses of cystic lesions.

**3.2. Benign solid lesions**

- **Inflammatory pseudotumor (PTI)**

Uncommon entity with debated etiology, characterized by a mixture of inflammatory cells and a component of myofibroblastic spindle cells.

Needs to be distinguished from the follicular dendritic cell tumor and the inflammatory myofibroblastic tumor.

Their definitive diagnosis is difficult to achieve without surgical excision and anato.

This is because of its imaging findings are not specific. Knowledge of this entity by the radiologist is important and must be considered in case of asymptomatic splenic mass without particular clinical context.

The ultrasonography, CT or MRI can show either a single mass of the spleen, the major axis varies from 0.5 to 12.5 cm or multiple nodules embedded in the splenic parenchyma.

**US:** it is usually a hypoechoic heterogeneous lesion with more or less distinct limits.

**CT:** The presence of hypodense central stellar area relative to a fibrous plaque is very suggestive but not specific of PTI.

**MRI:** better study of the internal structure of PTI and its locoregional extension to move towards its benign nature.

Generally shows radial images in hyposignal T2 corresponded to sclerotic alterations.

Gadolinium and dynamic study: there is a centripetal enhancement and progressive early and late filling (fibrous stroma).

The center may be not enhanced by Gado, due to hemorrhagic and necrotic alterations.
- Hemangioma

Primary tumors are rarely encountered lesions of the spleen, where hemangioma is the most frequent benign tumor.

**CT:** smooth contours with iso- to hypodense appearance.

Capillary types enhance homogeneously unlike the cavernous types have heterogeneous enhancement.

Hemangiomas demonstrate mostly nodular enhancement in the liver and circular enhancement in the spleen in the early phase.


Among the primary and secondary tumors of the spleen, lymphoma, metastases, angiosarcoma, leiomyosarcoma and fibrosarcoma may be mentioned.

**metastasis**

Presence of metastasis in the spleen is a rare occurrence, which usually is secondary to hematogeneous spread in malignant melanoma, gynecologic malignancies, breast, lung, and stomach cancers.

Splenic metastases present as solid or cystic lesions which enhance homogeneously or non-homogeneously on CT. If necrotic or hemorrhagic changes occur, they are visualized as hyperintense nodules on T2 weighted MR imaging studies. In the absence of such changes, difficulties arise in the demonstration of metastases on MR imaging and differentiation from lymphoma.

**Lymphoma**

Lymphoma may be visualized as a solitary or multifocal mass, splenomegaly or diffuse infiltration on CT.

On MR imaging, differentiation of the normal parenchyma from infiltration is difficult. Despite this, loss of normal heterogeneity in the early phase and presence of focal hypo-/hyperintense regions may help diagnosis in lymphoma surveillance cases.

5. Splenomegaly

The basic radiological finding in many diseases of the spleen is an increase in the size of the organ.
Although spleen shows a wide range of variation regarding size, craniocaudal length of more than 15 cm and a spleen that is seen anterior to the mid-axillary line and/or contact with the liver are considered abnormal.

Another method that has proved valuable in the evaluation of splenic volume is multiplication of the lengths in all three dimensions. This value, which grossly correlates linearly with the organ weight, ranges from 160 to 440 in healthy individuals.

Images for this section:

![Fig. 1: abdominal CT SPLEEN INFRACEMENT](image)

Fig. 1: abdominal CT SPLEEN INFRACTION
Fig. 4: abdominal CT accessory spleen
**Fig. 2:** abdominal CT RIGHT SIDED POLYSPLENIA

**Fig. 3:** abdominal CT LEFT SIDED POLYSPLENIA
Fig. 5: abdominal CT splenic abcess
Fig. 6: abdominal CT splenic hydatid cyst

Fig. 7: abdominal CT splenic cystic lymphangioma
Fig. 9: abdominal CT splenic metastasis (endometrial tumor)
Fig. 8: Inflammatory pseudotumor on MRI
Fig. 10: abdominal CT SPLENIC METASTASIS (ovarian tumor)
Conclusion

A various group of pathologic conditions can affect the spleen.

- Cystic and solid lesions of spleen are rare.

- Ultrasound and CT are the two examinations of choice; MRI is useful in case of angioma and to study the cyst walls.

- Epidermoid cysts are characteristic imaging.

- Other cysts in 75% of cases are hydatid cysts most often to justify splenectomy.

- Primary tumors are rare, generally large.

- Splenic metastases occur in the context of disseminated disease in general.

- In cases of uncertainty face to an isolated splenic image, a biopsy is indicated for diagnostic.

- Imaging diagnosis allows to avoid unnecessary splenectomy and preserve immune function of the spleen.

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Personal Information