Splenic Cystic Lesions - Differential Diagnosis

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Learning objectives

To review the spectrum of cystic lesions of the spleen, with the corresponding epidemiology, pathology and imaging features.

To illustrate their characteristic imaging features regarding the differential diagnosis, when possible.

Background

Cystic lesions of the spleen are rare, occurring less often than in other abdominal viscera [1].

Most are benign and found incidentally at radiologic examination. Occasionally, they may become symptomatic, causing a left upper quadrant painful mass, by the extrinsic mass effect on adjacent organs or, less commonly, by developing complication features of hemorrhage, rupture, or superimposed infection, these usually coursing with fever and inflammatory laboratory parameters, being effectively treated by splenectomy [2, 3] or by percutaneous fine-needle aspiration and drainage in selected cases [4].

In addition to "splenic cysts", there is a range of other lesions with a predominantly cystic appearance, which etiology may be congenital, inflammatory, posttraumatic, vascular or neoplastic [6, 7].

"SPLENIC CYSTS"

The lesions commonly designated as "splenic cysts" include the "true" and the "false" or posttraumatic ones, which can only be definitely differentiated by the microscopic demonstration of the existence or lack of a cellular epithelial lining.

"True" cysts, epithelium-lined, are rare and might be nonparasitic and congenital (epidermoid), or have a parasitic origin, almost solely echinococcal (hydatid). Hydatid cysts are very uncommon in the spleen and mostly caused by Echinococcus granulosus. They are three layered structures, with an outer wall of reactive parenchyma (pericyst), a middle acellular laminated membrane (ectocyst) and an inner germinative layer, where
the larval stage of the parasite is produced and from which the "daughter cysts" are formed.

"False" cysts, by far the most frequent ones, are non-epithelium-lined lesions often associated with trauma, including the called **pseudocysts**, which are composed of localized areas of inflammatory and reparative fibroblastic changes. [2, 3, 5, 6, 8]

**OTHER NONNEOPLASTIC SPLENIC CYSTIC LESIONS**

**Pyogenic Abscess**

Besides the possible superinfection of a prior existing splenic cyst, localized pus collections with necrotic tissue can form in splenic parenchyma, mostly by the hematogenous spread of a systemic infection (75%), but also by penetrating trauma (15%) or prior splenic infarction (10%) [2, 3, 6, 8]. Their frequency has partially been increasing because of the rising number of people with immunocompromised systems, whether secondarily to chemotherapy treatments, drug abuse or acquired immunodeficiency syndrome [5].

They are non-capsulated structures, which might progressively involve the surrounding tissue and sometimes rupture to subcapsular or perisplenic spaces [3, 6].

**Infarction**

Splenic infarction is usually due to involvement of splenic vessels by atherosclerosis, tumor, pancreatitis, systemic emboli or sickle disease, splenomegaly being a predisposing factor to thrombosis of the sinusoids. They can be asymptomatic or present with local pain. Superimposed infection easily occurs. [5, 6, 8]

**Hematoma**

Splenic hematomas, which may present with local pain, consist of extravasated blood within the parenchyma or between the border of the spleen and its capsule. They often occur in a traumatic context [2, 3, 6, 9], the spleen being the most frequently injured intraperitoneal organ in blunt abdominal trauma, sometimes resulting in frank splenic laceration [3]. Anticoagulation therapy is another potential cause [6, 9].
NEOPLASTIC SPLENIC CYSTIC LESIONS

BENIGN

Hemangioma

Although very rare, hemangioma is the most common primary neoplasm of the spleen [3, 5, 6, 8, 10], with a reported prevalence of 0.3-14% [10]. Pathologically, the lesion consists of endothelial-lined, blood-filled spaces of varying size, cystic areas with serous or hemorrhagic contents being much more common in splenic hemangiomas than in hepatic ones [6]. Most are single, small and asymptomatic, unless they rupture or grow enough to cause splenomegaly, resulting in pain and, less frequently, in coagulopathy [3].

Lymphangioma

Lymphangioma is another rare vascular tumor similar to hemangioma, although filled with lymph instead of erythrocytes, also being asymptomatic in most of cases [2, 3, 6].

MALIGNANT

Lymphoma

Spleen, as the largest lymphoid organ in the body, is frequently involved in lymphomas [3, 5, 6, 8, 9], either Hodgkin or non-Hodgkin, these being the most common malignant splenic neoplasms, mainly as a manifestation of a systemic disease instead of a primary one [3, 6, 9]. Clinical manifestations include fever, left upper quadrant pain and splenomegaly [6].

They may become cystic due to massive internal necrosis and, occasionally, get secondarily infected resulting in abscess formation [6].

Metastases

Metastatic involvement of the spleen occurs in only 7% of patients with widespread malignancy, melanoma being the source of 50% of cases [8] and breast adenocarcinoma the second most common origin [12]. They usually become symptomatic only when large.
Their cystic transformation is frequent [5, 6, 8] due to rapid growth with autoinfarction and/or internal necrosis [6].

**Imaging findings OR Procedure details**

From our institution's database, we have selected the most characteristic cases of splenic cystic lesions, some of them confirmed by pathological examination. For each kind of lesion, imaging features are presented and correlated with the findings reported in the available literature, which are resumed in table 1 at the end of this section, regarding their number, the appearance of their wall and the presence or absence of septa and peripheral calcifications.

"**SPLENIC CYSTS**"

Both epidermoid and pseudocysts are usually simple spherical cystic lesions in imaging, with an imperceptible wall [5, 4-6], the pseudocysts being more likely to present peripheral calcifications, internal debris and, sometimes, a thicker wall [6].
Fig. 1: US scan of a patient, who presented with left upper quadrant pain, revealed a rounded large (14 cm) cystic unilocular mass, with non-pure content.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 2: Unenhanced CT scan of the same patient as in figure 1, confirmed the imperceptible wall and low-attenuation content of the lesion. Both studies were suggestive of an epidermoid cyst, which was later confirmed by pathological examination.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 3: Contrast-enhanced CT scan of a patient, who had had an acute pancreatitis diagnosed six weeks earlier, later complicated by peripancreatic fluid collections formation, showed two rounded, well-defined, capsulated cystic masses, one in the pancreas’ tail and the other in the spleen, corresponding to pseudocysts.

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Fig. 4: Another "false" cyst detected in a patient who had had a blunt abdominal trauma one month earlier, its wall being thinner than that of the lesion shown in figure 3, since a shorter period of time had passed since the lesion had begun to form.

References: Hospital Center of Occidental Lisbon - Lisboa/PT

Hydatid cysts are typically thick-enhancing-walled cysts with ring-like peripheral calcifications and inner "daughter cysts" at Computed Tomography (CT), which walls produce a septated appearance at Ultrasonography (US) [2, 3-6].
Fig. 5: Primary splenic hydatidosis in a 24-year-old woman, who underwent imaging examinations because of pain in the left hypochondrium and a palpable mass. US scan showed a solitary complex cystic lesion in the spleen, with "daughter" cysts within it.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 6: The same lesion as in figure 5 at contrast-enhanced CT, appeared as a low-attenuation mass with "daughter" cysts within it.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 7: Note the incipient calcification of the hydatid cyst's wall described in figures 5 and 6.

References: Hospital Center of Occidental Lisbon - Lisboa/PT

OTHER NONNEOPLASTIC SPLENIC CYSTIC LESIONS

Pyogenic Abscess

Abscesses appear as single or multiple cystic lesions, which walls may be irregular and thickened, eventually containing fluid-fluid or air-fluid levels, although air is absent in the majority of cases. At CT, the most reliable method for their detection, the wall may enhance with contrast medium if a capsule has developed. [5, 6, 8]
Fig. 8: The spleen of a septic patient replaced by a low-attenuation and slightly heterogeneous mass, with enhancing wall at contrast-enhanced CT, representing the complete liquefactive necrosis of the organ due to infarction followed by superimposed infection.

References: Hospital Center of Occidental Lisbon - Lisboa/PT

Infarction

Occasionally, splenic infarctions might be cystic, especially in the subacute phase and when liquefactive necrosis occurs [6]. Typically, they present as wedge-shaped peripheral areas, hypoechoogenic at US and of low attenuation at CT, with no enhancement after contrast administration [5, 6, 8, 9]. Initially they have an increased
volume due to edema, progressively becoming more rounded and better delineated and, finally, a fibrotic parenchymal defect [5, 6, 8].

**Fig. 9:** Splenic infarct in a 56-year-old patient with chronic hepatic disease (CHD) and splenomegaly. Contrast-enhanced CT revealed a nonenhancing hypodense area, wedge-shaped and of fluid attenuation in its left portion, representing hemorrhagic necrotic tissue.

**References:** Hospital Center of Occidental Lisbon - Lisboa/PT
**Fig. 10:** Note the subcapsular fluid-fluid level in the inferior half of the spleen, adjacent to the infarcted area described in figure 9, corresponding to subcapsular hemorrhage, which suggests a higher risk of rupture. The lobulated contour of the liver is due to CHD.

**References:** Hospital Center of Occidental Lisbon - Lisboa/PT

**Hematoma**

Splenic hematomas are usually identified as subcapsular crescentic or lenticular, well demarcated areas causing some flattening of the normally convex border of the spleen, which are hypoechogenic at US, spontaneously hyperdense and nonenhancing, respectively at unenhanced and contrast-enhanced CT [3, 6, 9].
Fig. 11: Splenic subcapsular hematoma after a blunt abdominal trauma. Contrast-enhanced CT showed a lenticular non-enhancing area of low-attenuation along the posterior margin of the spleen with indentation of its border, which is normally convex. References: Hospital Center of Occidental Lisbon - Lisboa/PT

NEOPLASTIC SPLENIC CYSTIC LESIONS

BENIGN

Hemangioma

Splenic hemangiomas’ appearance in imaging examinations range from predominantly solid, to mixed, to purely cystic.

Solid areas demonstrate a delayed centripetal nodular enhancement at contrast-enhanced CT [3, 5, 6, 8] and might show blood flow at colour-Doppler [11]. Scattered punctate or peripheral curvilinear calcifications might be present [3, 6, 8].
Fig. 12: Splenic hemangioma incidentally detected at an US scan in an asymptomatic patient, seen as a large multiloculated anechogenic lesion with posterior acoustic enhancement.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 13: A contrast-enhanced CT scan of the same patient as in figure 13, showed the multiloculated cystic lesion with enhancing septa and a small focus of calcification in its right posterolateral wall.

References: Hospital Center of Occidental Lisbon - Lisboa/PT

Lymphangioma

Lymphangiomas of the spleen may present as uni or multilocular sharply margined cysts, with a thin wall, sometimes with marginal linear calcifications. They appear as hypoechoogenic masses, frequently septated and with occasional internal debris at US, and do not enhance at contrast-enhanced CT [3, 6].

MALIGNANT

Lymphoma
Splenic lymphomatous involvement might have three basic pathological patterns with correspondent imaging features:

(a) **infiltrative**, seen as splenomegaly without definite focal lesions;

(b) **miliary**, with small (< 2 cm) scattered nodules, sometimes markedly hypoechogetic resembling cyst, but without acoustic enhancement at US; CT appearance is multifocal low-attenuation lesions, which do not enhance after contrast administration;

(c) **massive**, showing a solitary or multiple large lymphomatous mass with similar imaging characteristics to those of the military nodules. [5, 6, 8]

Greater accuracy in the diagnosis may be obtained by demonstrating adenopathy in splenic hilum [3].

![Image](image_url)

**Fig. 14**: Marginal zone B-cell non-Hodgkin lymphoma in a 71-year-old man, who underwent elective splenectomy because of severe thrombocytopenia, due to hypersplenism. The previous CT scan showed a solitary well-delineated round lesion of low attenuation in the upper pole of the spleen, which did not enhance after contrast.
administration. This lesion, proved to correspond to the lymphomatous mass in pathological examination, mimicked a splenic cyst.

**References:** Hospital Center of Occidental Lisbon - Lisboa/PT

**Metastases**

Splenic metastases usually appear as cystic ill-defined nodules, frequently with internal debris at US and some degree of peripheral enhancement at CT after contrast administration [6, 8]. Sometimes they have internal septa, which also enhance [6, 13].

![Figure 15](image-url): Multiple splenic cystic metastases of breast adenocarcinoma in a 87-year-old woman, seen as small low-attenuation nodules with irregular contours, one of those septated.

**References:** Hospital Center of Occidental Lisbon - Lisboa/PT
Fig. 16: A coronal slice of the same CT scan as in figure 16, shows how numerous the metastases are. Note the slight enhancement of their wall after contrast administration.

References: Hospital Center of Occidental Lisbon - Lisboa/PT
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Images for this section:

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Conclusion

Although differential diagnosis of splenic cystic lesions by imaging is difficult, because of the overlap of their radiologic findings, it can be somewhat narrowed by evaluating the imaging characteristics.

Furthermore, their prompt and accurate diagnosis is helpful in surgical planning and in prevention of further expansion with potential complications.

References

Personal Information