Spleen ultrasound - radiologic pathologic correlation

Poster No.: C-0927
Congress: ECR 2012
Type: Educational Exhibit
Authors: I. Ferreira¹, A. B. Ramos², S. Magalhães², M. Certo²; ¹PT, ²Porto/PT
Keywords: Spleen, Abdomen, Ultrasound, CT, Diagnostic procedure, Infection, Trauma, Pathology
DOI: 10.1594/ecr2012/C-0927

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Learning objectives

Abdominal ultrasound should include the visualization of the spleen. Despite being an organ with limited pathology, its evaluation has pronounced importance in lymphoproliferative diseases and abdominal traumas such as those related to road accidents.

This work intends to be a comprehensive review of spleen pathologies, demonstrating their ultrasound characteristics, and correlating these features with pathologic and microbiologic findings.

Background

Spleen is located in the upper left quadrant of the abdomen, being protected by the 9th to 11th ribs; it has important anatomic relationships with stomach, pancreas, colon and left kidney.

Spleen assessment with ultrasound is usually easy and abnormalities are frequently obvious.

For the present work we considered several patients who had undergone splenectomy or splenic biopsy. We retrospectively reviewed their ultrasound examinations.

However, some cases included in this exhibit were selected based on unequivocal radiologic diagnosis of spleen alterations.

Other imaging techniques will be presented when relevant.

Imaging findings OR Procedure details

1 - Congenital anomalies and normal variants

Congenital asplenia and polysplenia are extremely rare conditions (no case in our institution in the last 5 years) and they are often associated with other development abnormalities. On the contrary, accessory spleens are frequent (20-30%) and easy to diagnose. They usually appear on the splenic hilum, have a small size, and have the same echogenicity of the spleen. Differential diagnosis can include: lesions on the tail of pancreas, metastatic abdominal implants and lymph nodes, among others.
The complex development of spleen can originate a variety of shapes and positions. It is common to find a lobule of splenic tissue that extends medially from the posterior portion of the spleen to lie anteriorly to the upper pole of the left kidney [1], which can be mistaken with a splenic mass Fig. 1 on page 5.

2 - Splenomegaly

The normal size of the spleen is variable according to several authors, being 13 cm the more consensual length.

Splenomegaly is, undoubtedly, the most common anomaly of spleen found in our Hospital population. A long list of diseases can cause this condition: viral infections, bacterial infections, hematopoietic and metabolic disorders, among others. According to our experience, portal hypertension due to cirrhosis is the most frequent cause Fig. 2 on page 5. No etiology can be established by ultrasound findings, but varices and hepatic changes point to portal hypertension while association with multiple adenopathies suggests lymphoproliferative disease.

3 - Cystic lesions

Cysts in the spleen are uncommon. They are classified as simple or complex according to ultrasound and CT criteria. To be considered simple, a cyst must meet all the CT and ultrasound criteria of a simple cyst, this is an anechoic lesion, with a thin wall at ultrasound examination; hypodense lesions with a thin wall and no contrast enhancement at CT.

The etiology of cystic lesions is wide: congenital, traumatic, inflammatory and neoplastic Fig. 3 on page 6. A full clinical history is useful in distinguishing its nature, particularly in traumatic cysts. The country of origin or the place of living can be important as well because hydatid disease is endemic in some regions.

4 - Traumatic disorders

The spleen is the most commonly ruptured intra-abdominal organ in the setting of trauma, being particularly susceptible to injury after blunt trauma [2]. Although CT has already proved to be the best examination to evaluate patients with splenic trauma, in our institution we start with abdominal ultrasound, reserving CT for those patients with abnormal ultrasound findings or those with other clinical features which benefit from CT characterization.
Common findings are free intraperitoneal fluid, if the capsule had been damaged; and intraparenchymal or subcapsular changes if the capsule remains intact Fig. 4 on page 7.

5 - Infections

Most splenic abscesses are associated with the haematogenous spread of infections such as endocarditis, pneumonia and urinary tract infections. They can also be associated to infarction or trauma [3] and can be a complication of an abdominal surgery.

Their incidence is still low, but it is increasing, accompanying the growth of the HIV infection and of the immunosuppression related to transplanted patients, for example.

Healed splenic granulomas are frequently found, while active tuberculosis is rarely seen. We evaluated a single case of active tuberculosis, presented as a cystic lesion, which represented a tuberculous abscess in an HIV+ patient Fig. 5 on page 8.

6 - Vascular abnormalities

Splenic infarction is a frequent cause of splenic lesion since there is no anastomosis between the arterial branches. Causes include arterial emboli such as in sickle cell anaemia, Gaucher disease, hematologic malignancies, cardiac emboli, torsion, collagen vascular disease, and portal hypertension [2].

Typical ultrasound findings include a peripheral, wedge-shaped and hypoechoic lesion [4,5] Fig. 6 on page 9. As the infarction area becomes older it will appear more hyperechoic as a consequence of fibrosis [6].

7 - Neoplasms

Undoubtedly, lymphomas are the most frequent primary tumours in the spleen. Patients can complaint of upper left quadrant abdominal pain, but constitutional symptoms as asthenia, weight loss and fever are usually present. Leukaemia involvement is also frequent. They have been described four different patterns of lymphoma involvement, according to diffuse or nodular involvement. In the presence of nodular lesions they are typically hypoechoic and hypovascular [7] Fig. 7 on page 10.

Primary angiosarcoma is extremely rare and has a very bad prognosis (no cases evaluated in our Institution).
Metastatic spleen disease is unusual, being frequently caused by haematogenous dissemination, since there are no lymphatic afferents. Secondary lesions in the spleen without other organs involvement are extremely rare [6].

The most common primary tumours are: breast, lung and melanoma Fig. 8 on page 11. Direct invasion can occur from adjacent organs.

8 - Others

Splenic calcifications are frequently found and are usually related to healed granulomas Fig. 9 on page 12. There is no need to follow-up these calcifications.

Gamna-Gandy bodies are fibro-siderotic nodules, seen in the ultrasound as multiple small hyperechoic foci Fig. 9 on page 12. In their presence, the diagnosis of congestive splenomegaly, sickle cell anemia and hemochromatosis should be considered.

Splenic sarcoidosis is rare, particularly in patients without pulmonary disease. It usually presents with nodular involvement, and splenomegaly is often an associated feature.

Images for this section:

![Image 1](image1.jpg)

Figure 1: A - Ultrasound showing an accessory spleen, with all typical features: small round shape, near the hilum and with the same echogenicity of the spleen. B – Lobule of splenic tissue simulating a renal mass. This is a normal anatomic variant.

Fig. 1
Figure 2: A- Ultrasound showing Splenomegaly – note that it was impossible to adequately measure all spleen. B – CT from the same patient with homogeneous splenomegaly (30cm).

Fig. 2
Figure 3: A – Primary congenital (epidermoid) cyst in an asymptomatic patient. It is possible to observe thin and regular cyst walls with anechoic content. B – Huge splenic cyst, with dense and heterogeneous content, in a 40 years-old man. It was resected and pathology pointed to traumatic cyst – pseudocyst. A relationship with a prior car accident, 20 years before, was established. C: Spleen ultrasound showing a complex cystic lesion. Aspiration cytology presented features of follicular lymphoma.

Fig. 3
Figure 4: A – Perisplenic hematoma: it is possible to observe free fluid surrounding the spleen as well as heterogeneity of the lower pole. B – Intraparenchymal hematoma: there is hyperechogenicity of the inner areas of the spleen as a result of parenchymatous haemorrhage. C – Subcapsular hematoma: it is, sometimes, difficult to distinguish between subcapsular and perisplenic fluid, but the crescent form and contour regularity can help, since these are typical features of subcapsular ones.

Fig. 4
Figure 5: A - Triangular hypoechoic area, confirmed to be an abscess. B – Abscess as a complication of a previous splenic infarction. C – Cystic lesion in a patient with HIV infection. There were no calcified granulomas. Microbiology studies confirmed the diagnosis of tuberculosis.

Fig. 5
Figure 6: A – Infarction of the lower pole of the spleen, with all characteristic features: peripheral, hypoechoic, wedge-shaped lesion. B – Extensive infarction area. C – Less frequent aspect of infarction, with the cystic area representing necrotic tissue.
Figure 7: A - Nodular lesions of different sizes in the spleen, proved to be a follicular lymphoma. B – Massive splenomegaly with multiple hypoechoic areas in a patient with non-Hodgkin lymphoma. C – Small nodular lesion in a patient with acute myeloid leukaemia.

Fig. 7
Figure 8 – Metastatic lesions in the spleen. A: Metastatic nodule from a lung cancer, with “bull’s eye” appearance. This appearance is also seen in fungal infection. B: Metastases in the splenic hilum from a pancreatic tumour.

Fig. 8
Figure 9: A – Calcified granuloma. B – Gamna-Gandy bodies in a patient with hemochromatosis. C – Diffuse nodular involvement of the spleen by sarcoidosis. D – Heterogeneity of the spleen, with a nodule in the lower pole, in a patient with sarcoidosis.

Fig. 9
Conclusion

Ultrasound is usually the first imaging modality to study the spleen. This organ is frequently affected in trauma, lymphoproliferative diseases and secondarily to other diseases such as portal hypertension, hematologic disorders and infections, making ultrasound an important orientation tool for every patient management.

Personal Information

References


