Various Targets in the Abdomen (Spleen, Adrenals, Pancreas, Lymph Nodes)

10

Some disparate abdominal organs are collected in this chapter.

Our 5-MHz microconvex probe is sufficient for this investigation in the critically ill.

Spleen

Spleen analysis is rarely of interest in the critically ill. Splenic rupture yields hemoperitoneum, which is much more relevant to detect than splenic laceration. Splenic abscess can be clinically occult. It typically shows a hypoechoic mass within the parenchyma (Fig.10.1). In rare cases, the abscess can be isoechoic to the spleen, and only a thin edema border, usually hypoechoic, allows the diagnosis (Fig. 10.2). In other cases, the spleen appears enlarged without a distinctive feature (Fig. 10.3). Hemorrhagic splenic suppuration accompanying stercoral peritonitis can yield a hypoechoic enlarged spleen with fluid-like areas and hyperechoic points caused by microbial gas (Fig. 10.4). The spleen can be discretely heterogeneous, not to say normal, in genuine fulminant tuberculous miliaries (Fig. 10.5).

Some (rare) academicians still think that the diagnosis of splenomegaly is clinical. This is a fair thought, but we should give a chance to challenging patients (obese, etc.). A normal spleen can be partly hidden by air (lung and bowel), but an enlarged spleen is easily diagnosed. The homogeneous or heterogeneous pattern of the parenchyma can be appraised (Fig. 10.6). Splenomegaly creates an acoustic window making the analysis of many organs accessible: diaphragm, adrenals, kidney, stomach, and aorta.

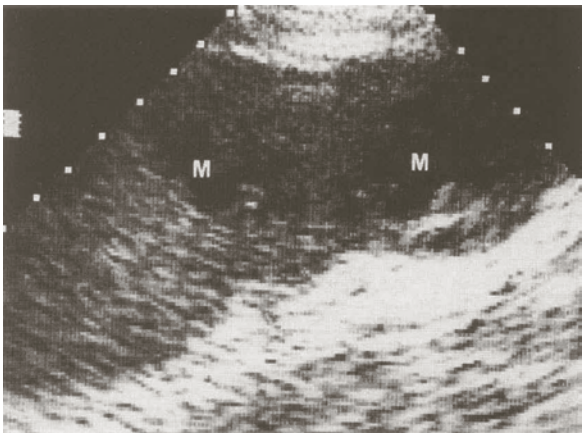

Fig. 10.1 Splenic abscess. Hypoechoic images (*M*) within an enlarged spleen. The ultrasound-guided tap revealed pus with *Staphylococcus* in this 48-year-old male with endocarditis

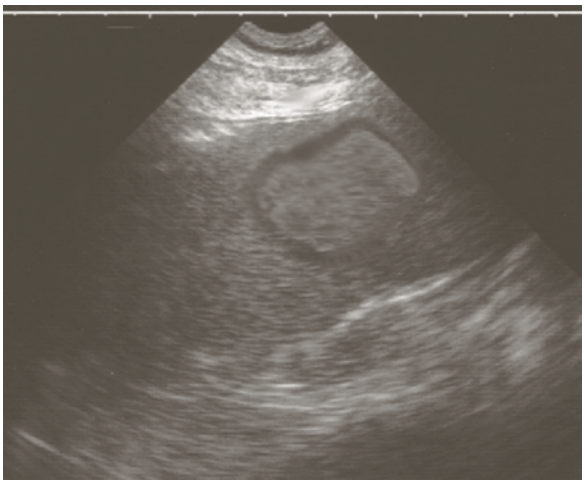

Fig. 10.2 Splenic abscess. This one is isoechoic to the spleen, with just a fine peripheral stripe. Septic shock in a 68-year-old female who had had cold abdominal surgery 1 month before, and without focal clinical signs at the time of the examination

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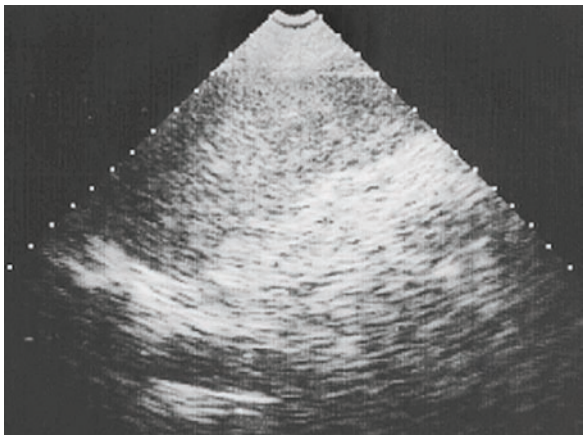

Fig. 10.3 Splenic abscess. This spleen was considered homogeneous using ultrasound, whereas CT revealed an abscess. In these cases, especially in plethoric, poorly echoic patients, the low echogenicity of the image should be recognized and considered as a limitation, in order to request other imaging modalities

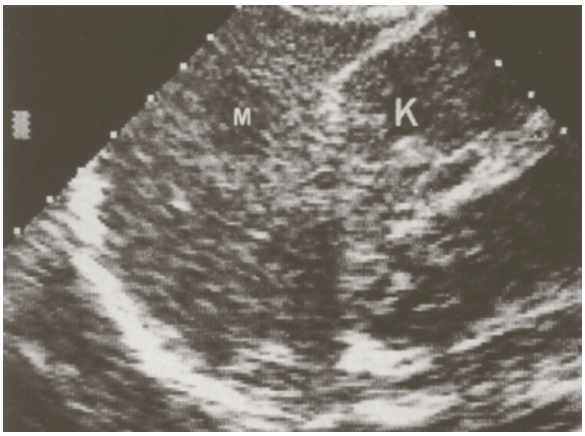

Fig. 10.5 Miliary. This spleen has normal dimensions and quasi-normal echostructure, except for some mildly hypoechoic areas (*M*). An experienced eye – or here a retrospective lecture – was able to see a mildly granulose pattern of the parenchyma. Autopsy of this young man with septic shock revealed diffuse tuberculous miliary, including the spleen. Longitudinal scan. *K* left kidney

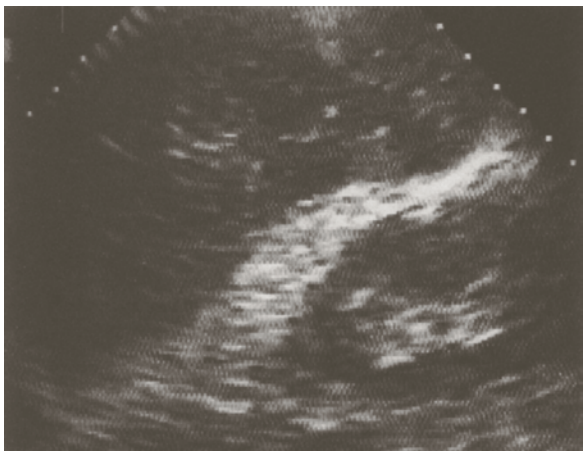

Fig. 10.4 Hypoechoic and heterogeneous splenomegaly in a septic patient. Surgery revealed stercoral peritonitis with hemorrhagic suppuration of the spleen

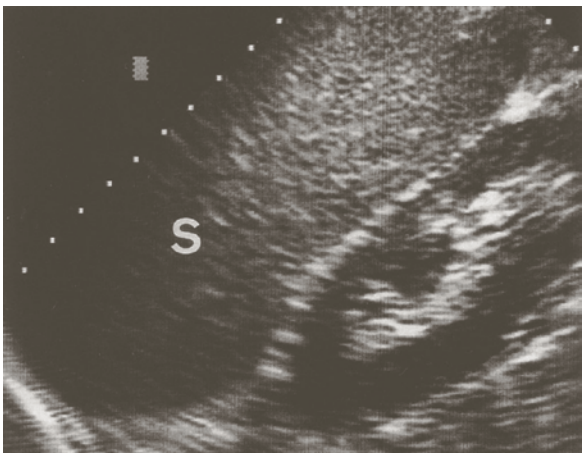

Fig. 10.6 Splenomegaly. This homogeneous 16-cm long spleen (*S*) covers the kidney. Longitudinal scan of the left hypochondrium

Perisplenic effusion (see Fig. 5.3), a traumatic rupture of the spleen (irregular intraparenchymatous image, with capsular hematoma), and a splenic infarction (regular pyramidal hypoechoic image) can be diagnosed (Fig. 10.7). More relevant in daily practice is the possibility of locating the spleen before any left thoracentesis (see Fig. 15.6 page 134).

Splenic artery rupture, although rare, is really a diagnosis for beginners. It basically yields a peritoneal effusion, prompting immediate laparotomy in a shocked patient with abdominal pain.

Interventional ultrasound at the spleen can be envisaged. Percutaneous drainage of splenic abscesses is an alternative to surgery [1–3]. The mortality of a splenic abscess without invasive therapy is 100%. After surgery, the mortality is 7.8% [4]. After percutaneous procedures, in spite of hemorrhageous or infectious complications, the mortality is only 2.4% [3]. Some authors propose a simple therapeutic aspiration with an 18-gauge needle as a first line of treatment. Antibiotics can possibly be injected in situ [3]. With a 21-gauge needle, we could diagnose

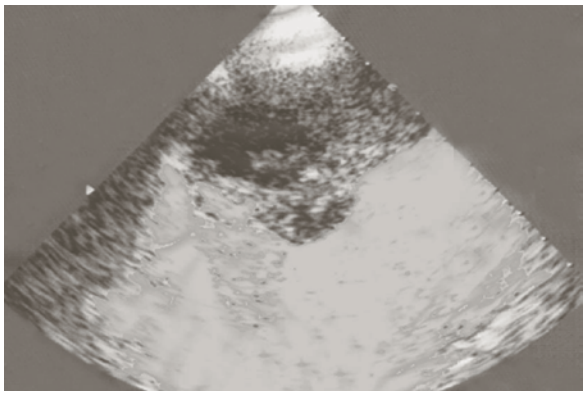

Fig. 10.7 Splenic infarction. Roughly pyramidal hypoechoic image with peripheral base. Image quality also typical from a cardiac machine with phased-array probe

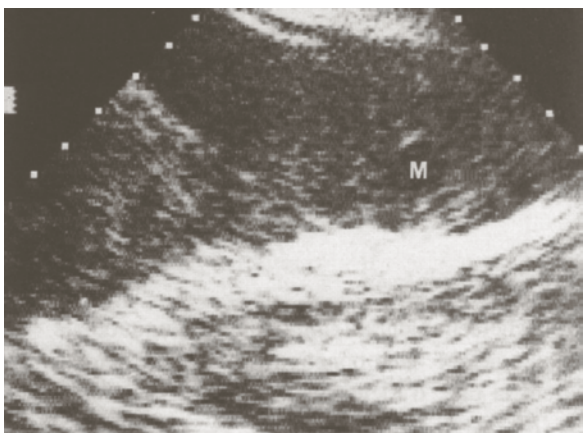

Fig. 10.8 Sequel of Fig. 10.1 after evacuation of the abscess. The target is significantly reduced

Staphylococcus abscess (Fig. 10.1) and subsequently aspirate it (Fig. 10.8) without hemorrhagic or infectious complications.

Adrenals

Imaging the adrenals in emergency situations may appear of limited value, yet it is a potential target. Some intensivists believe that corticosteroid therapy can be useful in selected cases of septic shock, whilst others do not. For the former, we propose a simple approach that requires some skill: bedside visual analysis of the adrenals. The reward will be, if carefully validated, the possibility of detecting anomalies that are able to prompt corticosteroid therapy in adequate setting. The adrenal, surrounded by fat covering the kidney, is usually not visible, but the adrenal space is clearly delimited (see Fig. 4.8 page 30 or Fig. 5.3 page 34). A nice routine would be to systematically look at the adrenal area when looking at the kidneys in whole-body examinations. Ultrasound signs of the acute adrenal failure have been described insufficiently in the literature. In the case of bilateral hemorrhagic necrosis, an echoic mass has been described [5, 6].

In a patient admitted for severe hypertensive crisis, the search for an adrenal mass will make an argument for an endocrine origin. Pheochromocytoma can yield a voluminous mass.

Pancreas

Not too much energy should be devoted to this organ by the intensivist who has not full mastery of priority targets (lungs, veins, basic heart, etc.). Experts in imaging should be liberally called in this setting. For those who cannot benefit from these experts 24/24, here are basic notions. The 17-cm range of our probe is sufficient for analyzing this retroperitoneal organ. Precisely localized using the vascular landmarks (see Fig. 4.3 page 28), it can be hard to detect when there is meteorism [7]. In favorable cases, gas collections can be mobilized, the stomach can be filled with fluid in order to create an acoustic window. The gland appears, and the main pancreatic duct and the bile ducts can be observed (Fig. 10.9).

Acute pancreatitis is a familiar field for radiologists [8]. The organ has usually increased size, with a hypoechoic heterogeneous pattern. Necrotic roads can be observed in the peripancreatic space (Fig. 10.10) or at a distance. Rarely, the pattern seems normal [9]. CT is usually indicated in first-line investigations for the positive diagnosis of acute pancreatitis (the Balthazar score currently enriching Ranson or Glasgow scores). Ultrasound is interesting for monitoring after an initial CT. Iterative ultrasound scans detect the appearance of fluid within the pancreas, surrounding it, or from a distance. A collection can be simple necrosis or infectious abscess (Fig. 10.11). Ultrasound can answer the question by tapping the collection, provided there is no

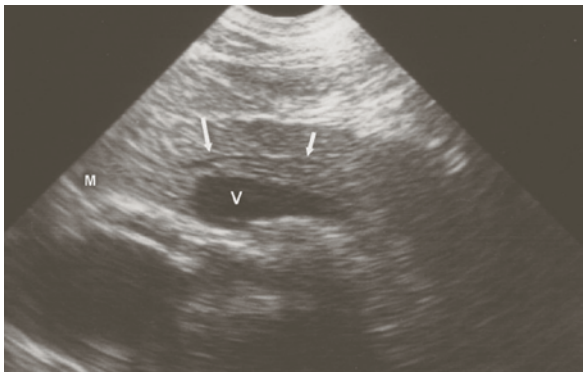

Fig. 10.9 Normal pancreas. In this transverse epigastric scan, the parenchyma is perfectly identified, homogeneous, with a well-defined main pancreatic duct (*arrows*), end of the common bile duct (*M*) and confluence of the portal and mesenteric superior veins (*V*)

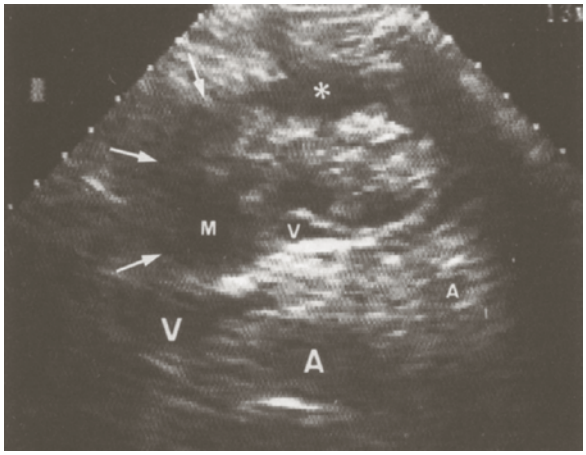

Fig. 10.10 Hemorrhagic necrotizing acute pancreatitis. The head and body of the pancreas are enlarged (*arrows*) and heterogeneous. Hypoechoic collections can be distinguished within the head (*M*), and anterior to the body in the pancreatic space (*asterisk*). *A* aorta, *small A* superior mesenteric artery, *V* inferior vena cava, *v* splenic vein. Transverse scan

bowel or vascular interposition, and provided a false aneurism is ruled out (see Chap. 25 page 255). An evacuation procedure requires large, invasive material since the collection can contain large debris. Some authors recommend surgery for central collections, and percutaneous procedures for peripheral ones [10]. Venous thrombosis (splenic or superior mesenteric veins) is accessible (see Fig. 6.17 page 50). False aneurysms (mainly at the superior mesenteric artery) can be detected. The detection of strategically located gallstones is probably the field of CT.

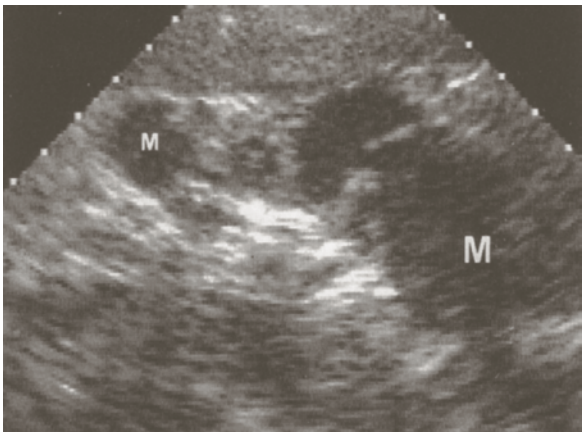

Fig. 10.11 Hemorrhagic necrotizing acute pancreatitis, transverse scan. The pancreas was identified only using the vascular landmarks (not featuring at this level). Numerous hypoechoic collections along the head (*m*) and the body (*M*)

A pancreatic pseudocyst produces a well-defined, anechoic image with a thin, regular wall. Echoes within this image suggest superinfection.

One word about CT – not always a magic wand. We heard of an interesting story of abdominal pain in a 45-year-old man without history, where CT, immediately performed, classified the patient in grade E pancreatitis. Everything was clear, from the hemoglobin – which was low (normal for a haemorrhagic pancreatitis), the enzymes – which were not elevated (precisely indicating some extremely severe cases), the patient's state – which worsened hour after hour in the ICU: there was an academic explanation for each of these points. The only test which was lacking in the file was an ultrasound, which was not performed in the ER. This man was eventually saved thanks to a laparotomy, decided in the face of extreme hemodynamic instability (fortunately in open hours), and the finding of a ruptured splenic arteric aneurism. A basic sonointensivist would have performed routine ultrasound 1 min after physical examination, would have found fluid in the abdomen (which was shown also by CT, but CT had labeled the patient as having pancreatitis, making doctors afraid of inserting a needle – the infernal machine closed with subtlety on this patient) would not have feared to puncture it, and would have found blood, prompting for immediate surgical management. This is not a rare story, because it has one common point with countless others: they can all have a rendezvous with a critical care physician. In our institution,

we see two or three times a month one of these rarities, which are, using critical ultrasound, immediately defused (see the endnote of Chap. 29 page 279).

Enlarged Lymph Nodes

The diagnosis raises no difficulty: round or egg-shaped, tissular mass, located along vascular axes (see Fig. 12.3 page 90). They can sometimes create acute obstructions (respiratory tract, bile tract). Usually, such findings are not of interest in the critically ill, but should be kept in mind for the post-intensive period. Among the multitude of uses of general ultrasound in the non-critical subject, early detection of pathologic lymph nodes is a promising field.

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