CONTINUING EDUCATION PROGRAM: FOCUS. . .

Imaging in infections of the left iliac fossa

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KEYWORDS
Abdomen; Colon; Diverticulum; Abscess; Uterine tubes

Abstract The main organs in the left iliac fossa are the descending colon, sigmoid colon and, in women, internal reproductive organs. An infection of the left iliac fossa must lead the clinician firstly to suspect diverticulitis of the sigmoid colon in older patients and salpingitis in women of childbearing age. Other less common aetiologies are possible (inflammatory or infectious colitis, epiploic appendagitis, abscess of the psoas, pyelonephritis, renal abscess, etc.). Sonography as a first-line investigation may lead to diagnosis (especially in gynaecological disease), but a CT scan with intravenous injection of an iodine-containing contrast medium will allow for a full assessment of disease spread, and complications of sigmoid colitis or its differential diagnoses (abscess, fistula, perforation) to be investigated. It can also be used to guide percutaneous drainage or fine-needle aspiration for microbiology investigations.

Anatomy of the left iliac fossa

The left iliac fossa corresponds to the anatomical region of the left colon and the left ovary in women. The descending colon extends from the splenic flexure to the sigmoid colon. It is located deep in the left lumbar fossa and left iliac fossa, continuing vertically at an oblique angle anteriorly. It is covered by the peritoneum except for its posterior surface, which is connected to the posterior abdominal wall by the descending colon mesentery. In the left iliac fossa, the back of the descending colon meets the iliopsoas muscles and the lumbar quadrates muscle. Anteriorly, it is covered by the coils of the small intestine. Laterally, it delineates the left paracolic gutter where it meets the abdominal wall. The sigmoid colon follows on from the descending colon and continues to the rectum. It is situated in the pelvis, forming a curve with a varying shape depending on its length. It
is mobile, surrounded by peritoneum and held in place by the sigmoid mesocolon (a double fold of peritoneum with its apex at the left common iliac artery). In front it meets the bladder, the uterus, the ovary, the uterine tube and the left broad ligament. It meets the rectum behind and the loops of the small intestine and the greater omentum above.

The lower pole of the left kidney is surrounded by fatty and cellular tissue, and meets the psoas muscle behind, the descending colon mesentery and the coils of the jejunum. The ureter follows a vertical and medial course as far as the superior aperture of the pelvis where it crosses over the iliac vessels before joining the bladder, following a concave curve in front and inside. The ureter is retroperitoneal becoming extraperitoneal in its pelvic section.

Located in the ovarian fossa (which is intraperitoneal), the ovary is mobile and held in place by several suspending ligaments, as well as by the mesovarium (which joins the ovary and the posterior fold of the broad ligament).

Continuing from the uterine horn, the uterine tube is a mobile conduit situated in the mesosalpinx that lies in place due to its continuity with the uterus, the mesosalpinx and the ovarian fimbria (which links the end of the uterine tube to the ovary). Through the mesosalpinx, it meets the coils of the small intestine, the greater omentum and the sigmoid colon at its isthmus, as well as the sigmoid mesocolon and sigmoid colon at its ampulla and infundibulum.

**Radiology techniques**

The French Health Authority (HAS) recommendations from 2009 no longer find any place for plain film radiography in the investigation of left iliac fossa infections, with the possible exception of when looking for a radiodense foreign body (endoluminal foreign body, testotloma).

Sonography is a quick and dynamic examination without exposure to radiation that is readily available and can be done at the patient’s bedside. Although it performs only mediocly in obese patients, sonography is often the first-line diagnostic investigation used, especially in gynaecological pathologies.

Computed tomography (CT) is usually the reference investigation in the exploration of a left iliac fossa infection. It is carried out after intravenous injection of an iodine-containing contrast medium in the venous-phase acquisition (70–80 seconds). A study without contrast injection and an arterial-phase acquisition may be useful depending on the aetiology suspected. Oral administration of a contrast medium can be discussed depending on the indication. This is done using water or water-soluble products.

MRI is not a first line examination, especially in cases of sepsis, but because it does not emit radiation it may still form part of the investigations of some aetologies in young patients, such as chronic inflammatory colitis or when the psoas muscle is affected.

If a patient presents with fever and pain in the left iliac fossa the clinician’s first suspicion should be a gastrointestinal cause in older subjects and a gynaecological cause in women of reproductive age.

**Gastrointestinal aetiologies**

**Sigmoid diverticulitis**

This is the most common aetiology. A sonogram can be done if there is any doubt over diagnosis. This would be looking for any non-specific thickening of the sigmoid muscularis and any adjacent abscess (a collection of fluid with multiple hyperechoic air spaces, which can be depressed when moving a catheter past). Although the diagnostic performances of both sonography and CT scanning are statistically comparable, sonography is less capable of assessing differential diagnoses [1]. An abdominal and pelvic CT scan therefore remains the reference examination, with 99% sensitivity and specificity [2]. It must be carried out very soon (in the first 72 hours) after treatment with antibiotics has been started, so that symptoms are not masked. It is done using an intravenous injection of an iodine-containing contrast medium, but some authors suggest that a low dose acquisition without contrast injection presents the same sensitivity and specificity as a normal dose acquisition with contrast [3]. Oral administration of the contrast medium makes it easier to assess wall thickening or a small, contained gastrointestinal perforation. CT scanning demonstrates localised thickening around the sigmoid colon, rounded images of diverticula, and infiltration of the fatty tissue surrounding the colon. It can also identify complications: peridiverticular abscess of the sigmoid colon (Fig. 1a, b) or at distant sites (liver, psoas, flanks), fistulae, especially colovesical (clinically suspected where there is pneumaturia or fecaluria) or colovaginal fistulae (faecal discharge), mesenteric vein thrombophlebitis, a perforation, gas in the portal system or the mesentery and finally obstructions. All necessary investigations for diverticular disease can be done using CT scanning and it can guide the chosen treatment, especially percutaneous drainage of an isolated abscess larger than 5 cm [4]. The complications of diverticulitis of the sigmoid colon (abscess, perforation) are factors that cause conservative treatment to fail [5]. They lead to an indication for deferred surgery, once the episode of infection has been treated and after a subsequent follow-up coloscopy, which will be looking for any underlying neoplasm that can often be misdiagnosed on imaging in the acute phase.

**Less common aetiologies**

**Diverticular disease of the small intestine**

Diverticula in the small intestine, especially in the jejunum, are rare and may complicate 6 to 10% of cases. Jejunum diverticulitis can clinically mimic left colonic diverticulitis. The two diagnoses can be distinguished on a CT scan.

**Colitis**

Patients generally present symptoms across the area, but they can sometimes be localised to the left iliac fossa when only the rectosigmoid colon is involved. A fine slice CT scan with both oral and intravenous administration of a contrast medium is recommended. A distinction is made between inflammatory, infectious and iatrogenic colitis [6]. Crohn’s disease rarely leads to symptoms on the left and presents as asymmetric and non-continuous thickening, with
pseudodiverticula of the antimesenteric wall and ulceration. Haemorrhagic rectocolitis always affects at least the rectum appearing as symmetrical and continuous thickening with mucosal hyperemia (halo sign). Both of these types may be associated with infiltration of the surrounding fatty tissue and sometimes ascites. If a patient presents fever, then they should be investigated for a fistula (Crohn’s disease) or an abscess. Infectious colitis is diagnosed based on clinical examination and laboratory testing, and sometimes also on a coloscopy with biopsies. Symptomatology seen on imaging is not specific and combines wall thickening with infiltration of fatty tissue and ascites. Left-sided presentations should lead to a suspicion of intestinal amebiasis (schistosomiasis), shigellosis or venereal disease (herpes, syphilis, gonorrhoea, etc.). Acute iatrogenic colitis is usually due to antibiotics. The main form is pseudomembranous colitis caused by Clostridium difficile. Although cases of iatrogenic colitis are often pancolitis, isolated thickening can be seen in the rectosigmoid colon walls along with oedema, hyperemia and polypoid protrusion (target sign, accordion sign), infiltration of fatty tissue and ascites [7].

Foreign body
A foreign body in the sigmoid colon or a textiloma can lead to febrile symptoms and pain in the left iliac fossa. A plain film radiograph demonstrates radiodense foreign bodies, but they are better detected and localised on a CT scan (Fig. 4).

Gynaecological aetiologies
Gynaecological infections usually begin in the lower genitonal tracts (vagina, cervix), then ascend to the endometrium (endometritis) followed by the uterine tubes (salpingitis). Tubo-ovarian abscesses complicate 30% of cases of acute salpingitis. Sonography is the first-line investigation for diagnosis. Nonetheless, CT scanning is often useful to assess disease spread, and investigate complications or differential

Left-sided appendicitis
This is described in association with intestinal malrotation or a complete situs inversus (Fig. 2). Ninety-five cases have been reported in the literature [8]. Protracted diagnosing may lead to a CT scan being carried out on which the symptomatology of the principal diagnosis and its complications are the same as it is when right-sided.

Epiploic appendagitis
In rare cases patients present a clinical picture of fever. This is an ischaemic infarction of an epiploic fimbria due to torsion or spontaneous thrombosis of its central drainage vein. It is principally diagnosed on a CT scan and appears as a 5 cm mass made up of infiltrated fatty tissue, centred around a hyperdense nodule (venous thrombosis), that adheres to the anterior surface of the sigmoid colon with the wall often remaining intact [9] (Fig. 3).
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Figure 3. Left-sided epiploic appendagitis. An oval mass to the anterior surface of the descending colon which is normal, with infiltration of the adjacent fatty tissue (red arrow).

Figure 5. Bilateral salpingitis complicated by tubo-ovarian abscesses (red arrows: collections with multiple septations, thick enhanced walls, and a bubble of gas on the right).

diagnoses. Sonography demonstrates a lateral uterine mass that can be hypoechoic or heterogeneous, with multiple septations, thick walls and fluid effusion of the rectouterine pouch. The presence of gas (hyperechoic) is an indicator of abscess. CT scanning can precisely reveal this symptomatology (Fig. 5) if there is any doubt about the diagnosis (radiation is to be avoided in the often young women who present this disease) and highlights an anterior displacement of the mesosalpinx, a thickening of the uterosacral ligaments, and rectosigmoid or ureteral involvement [10,11]. The combination of a pelvic abscess with an intrauterine device must cause the clinician to suspect pelvic actinomycosis. Infection with *Actinomyces israelii* progresses slowly and can mimic a pelvic tumour. CT scanning is indispensable to assess disease spread and to guide fine-needle aspiration for microbiology, meaning that a positive diagnosis can be given after a longer period of culture growth.

Fever and pain in the left iliac fossa in a post-partum woman suggests endometriosis or pelvic thrombophlebitis. Endometriosis complicates 2–3% vaginal deliveries and approximately 14% of caesarean sections. Sonography may be normal or it may demonstrate a thickened and heterogeneous endometrium, with intracavity fluid or intrauterine gas [12]. Septic thrombosis of the ovarian vein is rare (0.05–0.17% of births) and localised exclusively to the left side in only 6% of cases (Fig. 6). This is a potentially fatal complication due to the risk of septic pulmonary embolism. Sonography has low sensitivity and CT scanning shows a

Figure 4. Foreign body (needle) in the sigmoid colon, complicated by a gastrointestinal perforation (extra-colonic bubbles of gas).

Figure 6. Septic thrombophlebitis of the left ovarian vein continuing to the left renal vein (an intravascular hypodensity and wall enhancement, infiltration of adjacent fatty tissue).
dilated and hypodense ovarian vein, with contrast uptake showing ring enhancement [13].

Muscle and urinary system aetiologies

Abscesses of the iliopsoas muscle are rare, and may be idiopathic or secondary, due to haematogenous spread or contiguous spread from the kidneys (pyelonephritis with abscess), gastrointestinal system ( sigmoid colitis, Crohn’s disease) or bones (septic arthritis, tuberculous or pyogenic spondylitis, osteomyelitis). CT scanning demonstrates enlarged muscle, containing a hypodense fluid collection with thick walls and indistinct borders, that sometimes has multiple loculations, and infiltration of adjacent fatty tissue [14]. A hematoma can be distinguished from a tumour based on the clinical context, gas-fluid level within the lesion, or the presence of air bubbles [15]. The treatment is percutaneous drainage and a course of suitable antibiotics (Fig. 7a, b).

Left-sided renal colic can present as fever and pain in the iliac fossa. A very high or a persistent fever against a background of correctly treated acute pyelonephritis must lead the clinician to suspect a renal or perirenal abscess. This may be suspected on sonography, but confirmed by a CT scan with contrast medium, which shows a hypodense mass with distinct borders, a thick and irregular wall or a pseudocapsule containing fluid or sometimes gas (Fig. 8). The adjacent renal parenchyma shows decreased attenuation on early acquisitions and appears as enhancement on delayed phase studies. Fatty tissue around the kidneys is often infiltrated, and this can lead to true perirenal collections of septic fluid [16].

Conclusion

In conclusion, the main infectious pathologies of the left iliac fossa are sigmoid colon diverticulitis and acute salpingitis. Although sonography is an excellent first-line imaging investigation for gynaecological pathologies, a CT scan with contrast medium remains the reference investigation for exploring other diagnoses and for guiding any interventional radiological procedure.

**TAKE-HOME MESSAGES**

- The most common aetiology for left iliac fossa infection in older patients is sigmoid colon diverticulitis and salpingitis in women of childbearing age.
- Sonography can be used as a first-line investigation, especially for clinical pictures of gynaecological disease.
- CT scanning with intravenous injection of a contrast medium is the reference examination and it allows clinicians to make a diagnosis, assess disease spread and look for complications of inflamed sigmoid colon or its differential diagnoses.
- A CT scan can guide interventional radiology procedures, in particular percutaneous drainage or fine-needle aspiration for microbiology investigations.
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Clinical case

History of the illness

An 87-year-old female, with no medical history of note, was admitted to hospital as an emergency for an abscess, with crepitation, of the left iliac fossa and inguinal region. A CT scan was carried out with intravenous injection of an iodine-containing contrast medium prior to surgery (Fig. 9a–d).

Questions

1. What anatomical variation might be seen on the CT scan?
2. What would be your suggested diagnosis?

Answers

1. The caecum is in an atypical position in the left iliac fossa (Fig. 9a) and the superior mesenteric vein is to the left of the superior mesenteric artery (Fig. 9b) enabling the diagnosis of a common mesentery-type intestinal malrotation to be maintained. Malrotation is a congenital abnormality present in approximately 0.2% of births. The incidence in adults is not known, since malrotation is often asymptomatic.
2. The symptomatology consists of the presence of a tubulated structure within a left inguinal hernia, that is perforated (gas bubbles in the intra-hernial fatty tissue that has been infiltrated) and abscessed (fluid and gas collection) (Fig. 9c, d). Diverticula are present throughout the colon, although there is no evidence of diverticulitis. In a woman with no surgical history and with a common mesentery intestinal malrotation, diagnosis leans toward complicated appendicitis with an inguinal hernia. The diagnosis of perforated necrotic appendicitis was confirmed on surgical intervention. At a follow-up appointment one month later, the patient had fully recovered.
Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References
