PICTORIAL ESSAY Abdominal Imaging

Not only appendicitis! Transabdominal ultrasound detects a variety of pathology in the iliac fossae

Ioannis Melissovas[1], Demosthenes D Cokkinos[1], Eleni G Antypa[1], Gerassimos Roumbos[2]
[1]*Radiology Department, Evangelismos Hospital, Athens, Greece*
[2]*CT-MR Department, Evangelismos Hospital, Athens, Greece*

SUBMISSION: 28/12/2020 - ACCEPTANCE: 30/5/2021

ABSTRACT

Patients presenting with iliac fossae pain are common cases in Emergency Departments. The clinical picture for a wide variation of pathologies is often non-specific and encompasses a wide differential diagnosis, resulting in a diagnostic dilemma. Ultrasound (US) is usually the first imaging examination to be performed. Its use for diagnosing acute appendicitis has already been proved, however it is also useful for most of the pathological entities in this area. US is practical, safe, cheap and plays an important role in the recognition, diagnosis and monitoring of many gastrointestinal and gynaecological diseases located in the iliac fossae. In this pictorial essay, we present cases in which US was used to diagnose appendicitis, Crohn's disease, diverticulitis, pelvic abscess, epiploic appendagitis, inguinal hernia, intussusception, pelvic congestion syndrome, ovarian torsion, haemorrhagic ovarian cyst, ectopic pregnancy, iliac fossa haematoma, mesenteric adenitis, Meckel's diverticulum complications, omental infarction and ileocaecal tuberculosis. We focus on highlighting the use of US for imaging pathology in the iliac fossae and assess its role in comparison to plain radiographs, computed tomography and magnetic resonance, when these modalities are performed.

KEY WORDS

Iliac fossae; Ultrasound; Appendicitis; CT; CEUS

CORRESPONDING AUTHOR, GUARANTOR

Corresponding author: Ioannis Melissovas, Radiology Department, Evangelismos Hospital, 45-47 Ypsilantou, 10676 Athens, Greece, Email: jmelissovas@gmail.com
Guarantor: Demosthenes Cokkinos, Radiology Department, Evangelismos Hospital, 45-47 Ypsilantou, 10676 Athens, Greece, Email: demoscokkinos@gmail.com

Introduction

A wide range of pathology is located in the iliac fossae. The differential diagnosis is wide. Computed tomography (CT) with the injection of contrast agent is the gold standard imaging method, although it has drawbacks with regard to associated ionising radiation [1, 2]. Magnetic resonance (MR) is also commonly used, particularly in children and pregnant women, since it has no radiation, but its availability is more limited than CT [3]. Ultrasound (US) is an imaging technique which allows real-time examination, on-spot clinical decision in emergency situations, without ionising radiation [4]. It is widely available, non-invasive, cheap, safe, reapetable and can be performed at any time [5]. The technique presents some challenges compared to examining solid abdominal organs. In order to maximise the possibility of detecting abnormal findings, both high- and low frequency probes have to be used. Compression also needs to be applied in order to move overlying bowel loops, but this can be difficult when the patient is in pain. Limitations include patient obesity or overlying bowel gas that can make visualisation of the intestines difficult [6]. In this review, we present sonographic appearances of cases associated with a number of pathological conditions located in the iliac fossae.

1. Appendicitis

On US the normal appendix appears as a blind-ending tubular structure, which arises from the posteromedial part of the caecum. It has a thin wall, can be compressed when subjected to pressure, normally measuring up to 4 mm (diameter) x 8 cm (length) [7]. When its lumen is obstructed, the result is inflammation (appendicitis). Sonographic examination is performed with the application of increasing pressure over the region of maximal tenderness in the right iliac fossa with a high-frequency transducer. On US acute appendicitis appears as an enlarged, non-compressible appendix with a transverse diameter $\geq$6 mm **(Fig. 1)**. When the probe is pressed over the right iliac fossa, the patient is typically under pain. Peri-appendiceal echogenic inflammatory fat changes or free fluid locally can also be seen [8, 9]. An echogenic appendicolith with posterior acoustic shadow is a specific feature but is not seen in all cases. The problem however is that, quite often, the appendix cannot be visualised in adult patients, especially if they are not very thin. Therefore, a negative US examination cannot rule out acute appendicitis, since US, due to lower sensitivity in comparison to CT and operator-dependent variability, may result in a high rate of false negative diagnoses [10]. If the patient is not treated promptly, complications (rupture, abscess etc) may evolve **(Fig. 2)**.

2. Crohn's disease

Crohn's disease is a type of inflammatory bowel disease (IBD) that can affect any segment of the gastrointestinal tract from mouth to anus, although the terminal ileum and colon are the locations most commonly affected [11]. It shows no gender predominance. Transabdominal US may reveal small or large bowel wall thickening (over 3-4 mm), possibly with aphthous ulcers.

However, the latter lesions, together with small pseudopolyps, may be overlooked on US examination, as they do not cause bowel wall thickening [12].

The affected segments may appear rigid with loss of peristalsis. The five concentric alternating hyperechoic and hypoechoic layers of the bowel wall (the hyperechoic central layer corresponds to the submucosa and the hypoechoic external layer corresponds to the muscularis propria) appear more prominent due to transmural inflammation and oedema. Bowel wall hyperaemia can be observed on Doppler US. On CEUS, rich enhancement of the bowel wall, presented as quantitative measurement of bowel wall vascularity **(Fig. 3)** is an an indication of increased inflammatory activity. On the contray, during periods of remission contrast enhancement is less prominent [13]. An echogenic circumferential layer outside of the bowel wall represents fibrofatty proliferation, due to current inflammation. Mesenteric lymphadenopathy or free intraperitoneal fluid can also be seen [14], while complications, such as luminal stenosis/obstruction, fistulae **(Fig. 4)** or abscesses can be occasionally detected [15].

3. Diverticulitis

Diverticulitis is a gastrointestinal disease characterised by inflammation of abnormal external pouches (diverticula) which may develop due to increased pressure in the wall of the large intestine. Since the descending colon and the sigmoid are narrower than the ascending and transverse colon (and, as a result, with higher pressure values), diverticula are more often seen in the left side of the abdomen. In left-sided diverticular disease, diverticula are usually pseudodiverticula, while right-sided diverticula tend to be true diverticula, containing all colonic layers [16]. CT is considered as the "gold standard" imaging modality for diagnosing and staging acute diverticulitis, but dedicated

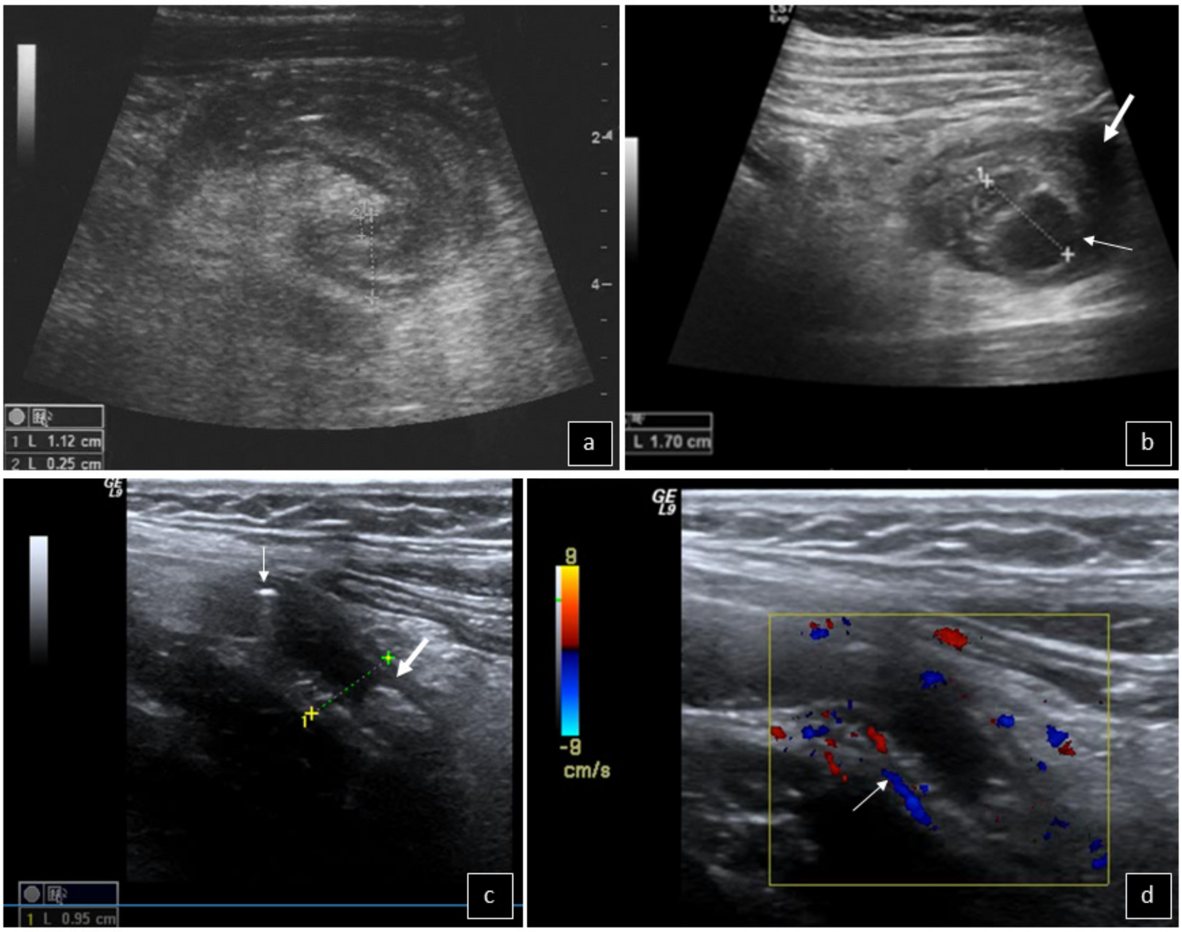

Fig. 1. Different cases of appendicitis: ***a.*** *Increased transverse diameter (1.1 cm) and thickened wall (0.25 cm),* ***b.*** *Loss of integrity (thin arrow) and fluid collection (thick arrow) due to rupture,* ***c.*** *Dilatation (0.95 cm), gas focus (thin arrow) and faecolith (thick arrow),* ***d.*** *Increased blood flow in the appendiceal wall (arrow) on colour Doppler.*

US examinations may also be able for confident characterisation [17]. Both low frequency curved (3.5–5.0 MHz) and high frequency linear (5.0 –12.0 MHz) transducers need to be used in order to detect the lesions. Higher frequency probes are more appropriate for imaging the large bowel wall in detail, identifying its typical haustral pattern [18]. On US diverticula are seen as bowel outpouchings, with some amount of acoustic shadow due to gas or feces **(Fig. 5)**. Other findings include echogenic, non-compressible fat due to inflammation of surrounding fat planes and thickened bowel wall (>4 mm). A circumbscribed collection may refer to an abscess, due to complicated diverticulitis, and requires further imaging with CT [19].

4. Pelvic abscess

A pelvic abscess is an organised collection of pus in the pelvis. Usual locations include the pouch of Douglas, Fallopian tube, ovary, or tissues adjacent to the uterus. Aetiologic factors include pelvic inflammatory disease (tubo-ovarian abscess), appendicitis, diverticulitis, IBD, pelvic actinomycosis. It may also be iatrogenic, occuring as a complication after an operation and can evolve into a life-threatening condition. Signs and symptoms include pelvic pain, fever and leukocytosis.

On US abscesses appear as space-occupying lesions with mixed echogenity. In the initial stage, when large quantities of puss have not accumulated yet, abscesses may appear echogenic, resembling haematomas or pelvic cellulitis that can spread to parametrial tissues [20]. Later on, the internal part, containing pus, is echopoor, possibly with debris or septa. The wall is thick and irregular. On colour Doppler examination and on CEUS, the abscess wall shows increased blood flow due to hyperaemia, while the internal part does not show any perfusion **(Fig. 6)**. Echo-

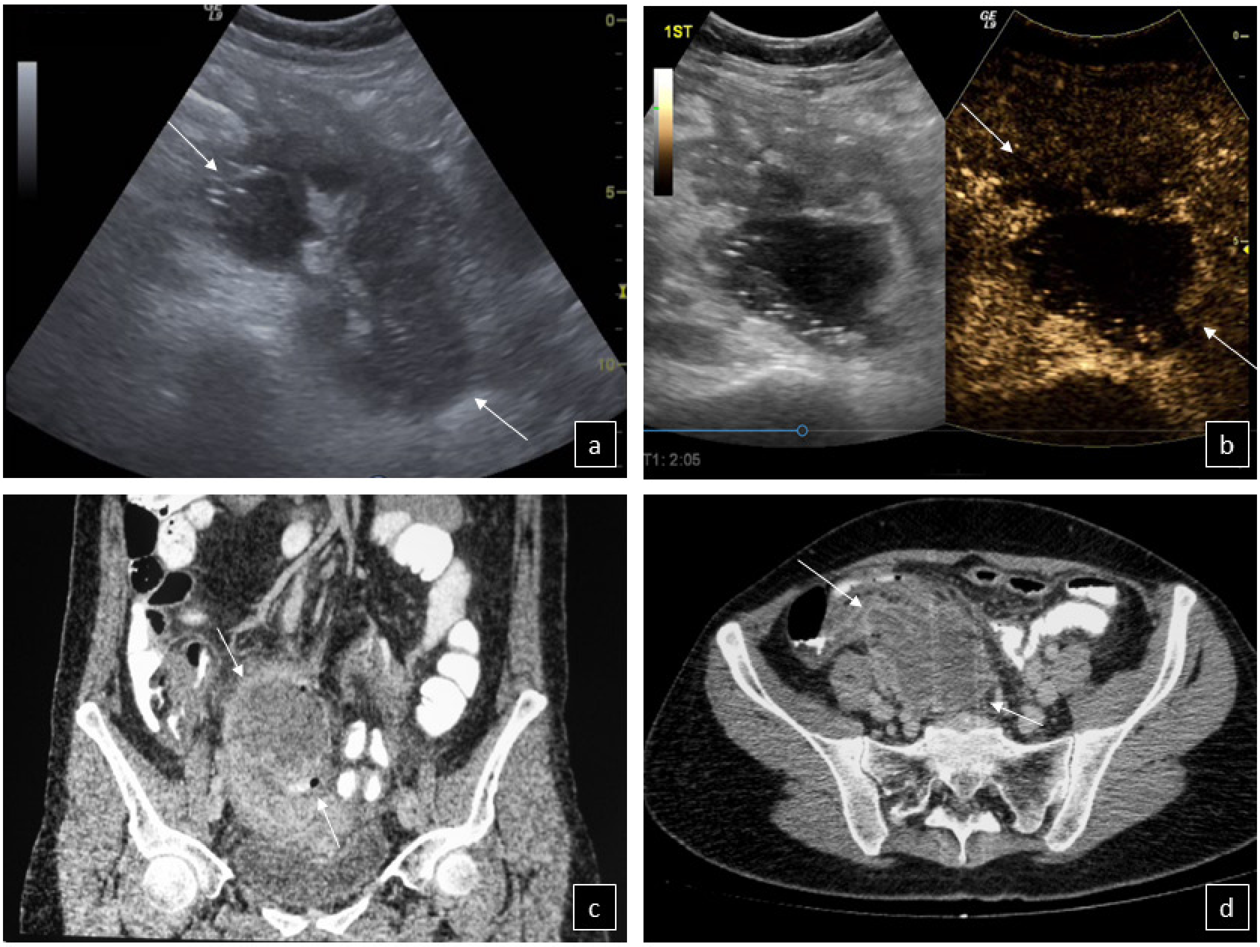

Fig. 2. Appendiceal rupture abscess: A 41 years female patient presented in another hospital with high fever and right iliac fossa pain and was treated for constipation, without any imaging examinations performed. Five days later she presented in our hospital with worsened symptoms and poor general condition. On B-mode US a mixed echogenicity lesion is noted in the right iliac fossa (between arrows in ***a****). On CEUS the lesion shows only peripheral enhancement, while the content does not enhance (between arrows in* ***b****). These findings are suggestive of an abscess, which was confirmed on CT (between arrows in* ***c, d****). Operation revealed an abscess secondary to appendiceal rupture.*

genic foci due to gas production are characteristic but not mandatory findings.

5. Epiploic appendagitis

Epiploic appendagitis is a rare self-limiting ischaemic/inflammatory process involving the epiploic appendages of the large bowel. These are normal outpouchings of peritoneal fat on the anti-mesenteric surface of the colon, 1-2 cm thick and 2-5 cm long. Ischaemic infarction of the epiploic appendage may either be primary or secondary to adjacent pathology [21], caused by torsion or spontaneous thrombosis of the appendage central draining vein (primary) or by dissemination of neighbouring inflammation (secondary). It can be seen in patients initially suspected with diverticulitis (2-7%) or appendicitis (0.3-1%) [22]. US evaluation reveals a rounded, non-compressible, echogenic lesion, typically 2-4 cm in diameter, without internal vascularity, surrounded by a subtle echopoor halo **(Fig. 7)**. CT is the imaging modality of choice, showing an ovoid pericolic lesion with fat density surrounded by a 2-3 mm hyperattenuating rim (corresponding to the echopoor halo on US), due to inflamed visceral peritoneal covering. A central hyperattenuating "dot sign" represents engorged or thrombosed central vessels, haemorrhage or fibrosis, but is not pathognomonic.

6. Inguinal hernia

An inguinal hernia is a protrusion of abdominal content

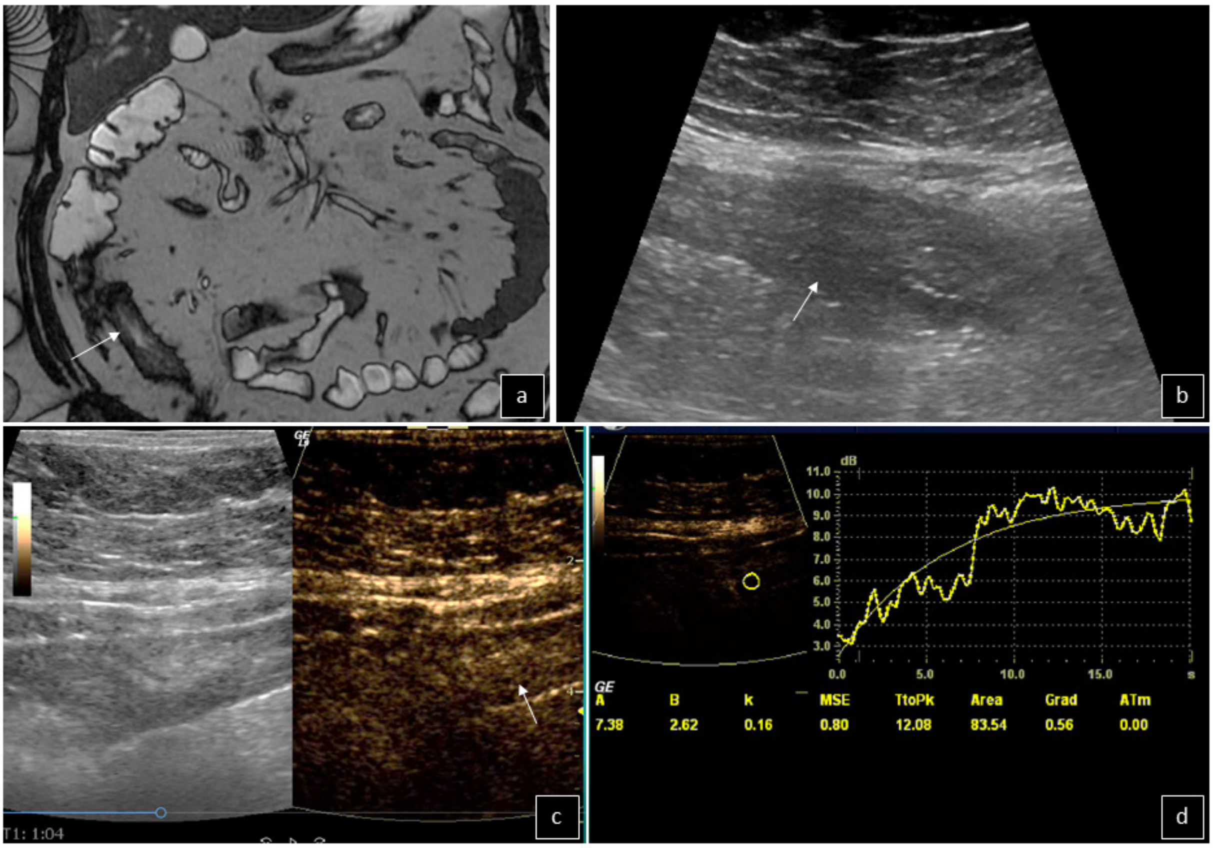

Fig. 3. *Crohn's disease: Thickened terminal ileus wall is noted on MRI (arrow in **a**) and on B-mode US (arrow in **b**). On CEUS the wall shows increased enhancement (arrow in **c**). Quantitative measurement of bowel wall vascularity is consistent with increased inflammatory activity **(d)**.*

through the inguinal canal [1]. It is usually more evident during exercise, deep inspiration and coughing and subsides in the supine position. Hernias are more common on the right side and in male patients. Inguinal hernias are divided into two types, direct and indirect, depending on the location in relationship to the inferior epigastric vessels. A direct hernia is less common, located medially to the inferior epigastric vessels, protruding through a weakness in the inguinal canal, usually through a defect in the Hesselbach triangle. An indirect hernia is more common, located laterally to the inferior epigastric vessels, protruding through the deep inguinal ring, anteriorly to the spermatic cord in men or following the round ligament in women [23]. Physical examination is usually sufficient for diagnosing an inguinal hernia and defining its type. When in doubt, US can image the hernia sac and its possible changes during supine or standing position, coughing and Valsalva maneuver. Sonographic examination can image the hernia's content: fat, omentum or bowel loops. It is important to rule out strangulation and ischaemia of potential intestinal loops inside the hernia sac. Thus, blood perfusion in the bowel wall should be assessed [24], especially venous, since veins are more easily compressed compared to arteries **(Figs. 8, 9)**. If ischaemia is seen, prompt surgical intervention is needed.

7. Intussusception

Intussusception occurs when part of the gastrointestinal tract enters abnormally like a telescope into an adjacent distal segment. It is the commonest cause of intestinal obstruction in young children [25], usually caused by hypertrophic lymphoid tissue due to infection. Intussusception is also seen in adults [26], usually secondary to a focal lesion that acts as a lead point, more commonly malignant in the large bowel and benign in the small bowel [27]. Although intussusceptions can be located at any point in the ileum or colon, the most common type in children is ileocolic (>75%), where a segment of terminal ileum enters the caecum [7]. If intussusception is not promptly diagnosed and

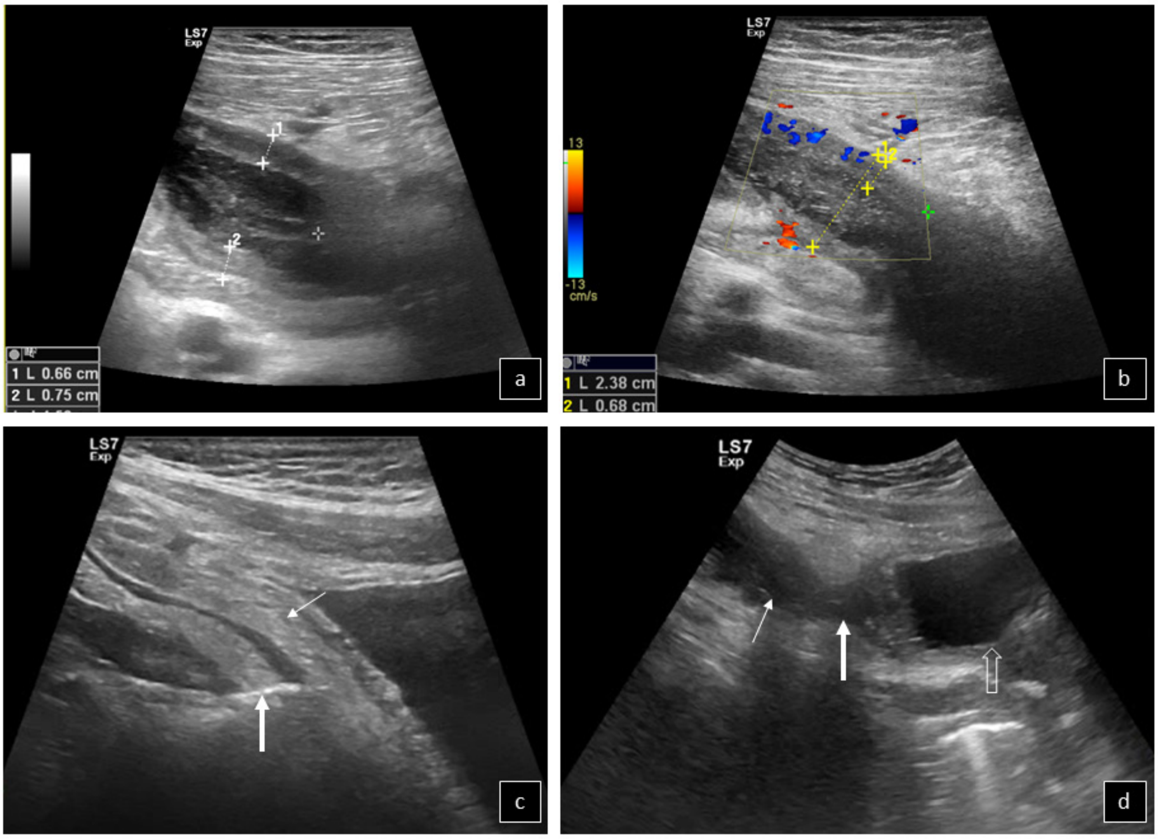

Fig. 4. Different cases of Crohn's disease: ***a.*** *Thickened wall (0.75 cm) of small bowel loop.* ***b.*** *Thickened wall (0.68 cm) and marginal diameter (2.38 cm) of small bowel loop.* ***c.*** *Thickened wall (thin arrow) and enteroenteric fistula (thick arrow) between adjacent small bowel loops.* ***d.*** *Oedematous bowel loop and enterovesical fistula (thick arrow) between bowel (thin arrow) and urinary bladder (open arrow).*

treated, it can lead to intestinal necrosis, sepsis, or even death [28]. US is very useful for diagnosis, both in children and in adults. The classical sonographic finding is the "target" or "bull's eye" or "doughnut" sign **(Fig. 10)**, which is highly suggestive of intussusception. It is formed by the oedematous wall of the intusscipiens (the part of the bowel that receives the loop), around the intussuceptum (the part of the bowel that passes into another loop) and represents concentric alternating echogenic and echopoor layers: mucosa and muscularis are echogenic and submucosa echopoor. Occasionally, this finding may mimick a kidney (pseudokidney sign). Sonographic findings suggestive of ileocolic over small bowel intussusception include a diameter of the mesenteric fat core which is larger than the outer wall thickness, a larger diameter of the intussusception mass (2.6 cm vs. 1.4 cm, standard deviation 0.4) or lymph nodes contained inside the intussusception itself [29].

8. Pelvic congestion syndrome

Pelvic congestion syndrome is an underdiagnosed clinical entity, defined as chronic pelvic pain for more than 6 months, in association with pelvic varicose veins in the pelvis of premenopausal women [30]. Its most probable aetiology is retrograde blood perfusion through incompetent valves in the ovarian veins, causing their dilatation and increased flow. It may initially occur or increase during pregnancy and presents with pain in the pelvis, legs or lower back. US is the first line imaging modality for the diagnosis for pelvic congestion syndrome, detecting multiple dilated structures representing the ovarian veins around the uterus and ovaries **(Fig. 11)** with venous blood Doppler signal. Dilated arcuate vein in the myometrium can be seen communicating between bilateral pelvic varicose veins. The veins' diameter exceeds 4 mm, while blood flow is slow, with a velocity of about 3 cm/sec. Transvaginal US can confirm findings that are suggested on abdom-

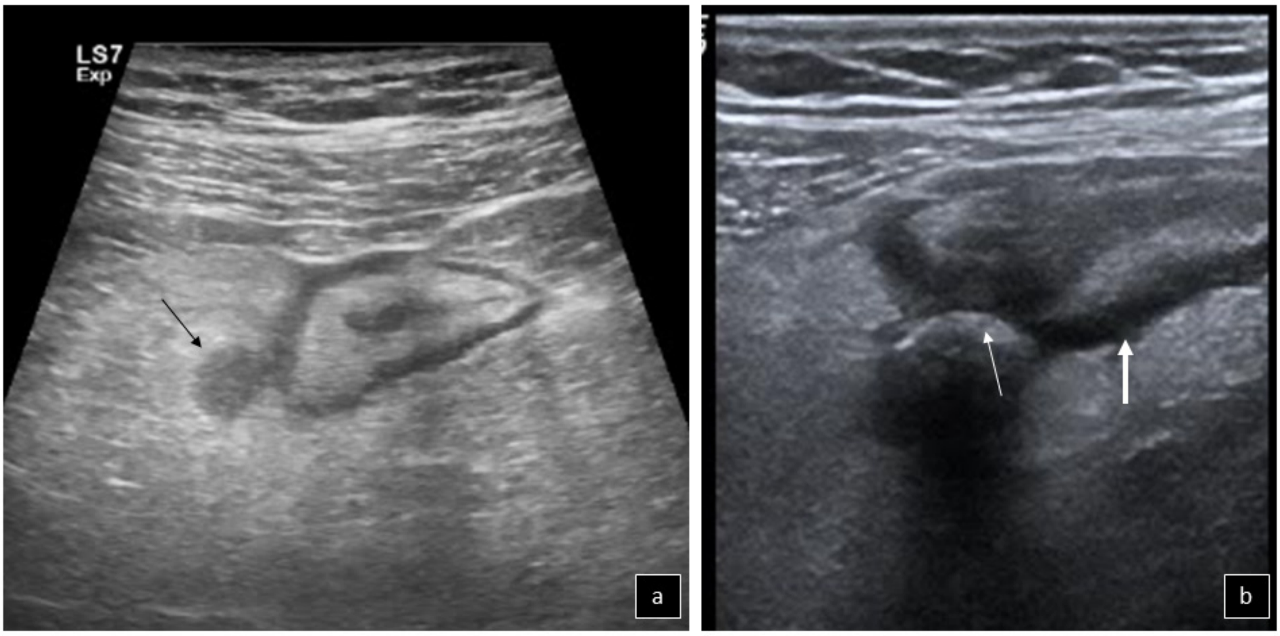

*Fig. 5. Different cases of diverticula: **a.** A round lesion (arrow) is seen outpouching from a bowel loop) in the left iliac fossa. The bowel wall is thick and oedematous due to inflammation, **b.** A diverticulum with an echogenic faecolith (thin arrow) is noted adjacent to a left iliac fossa bowel loop. The bowel wall is thickened (thick arrow) due to inflammation.*

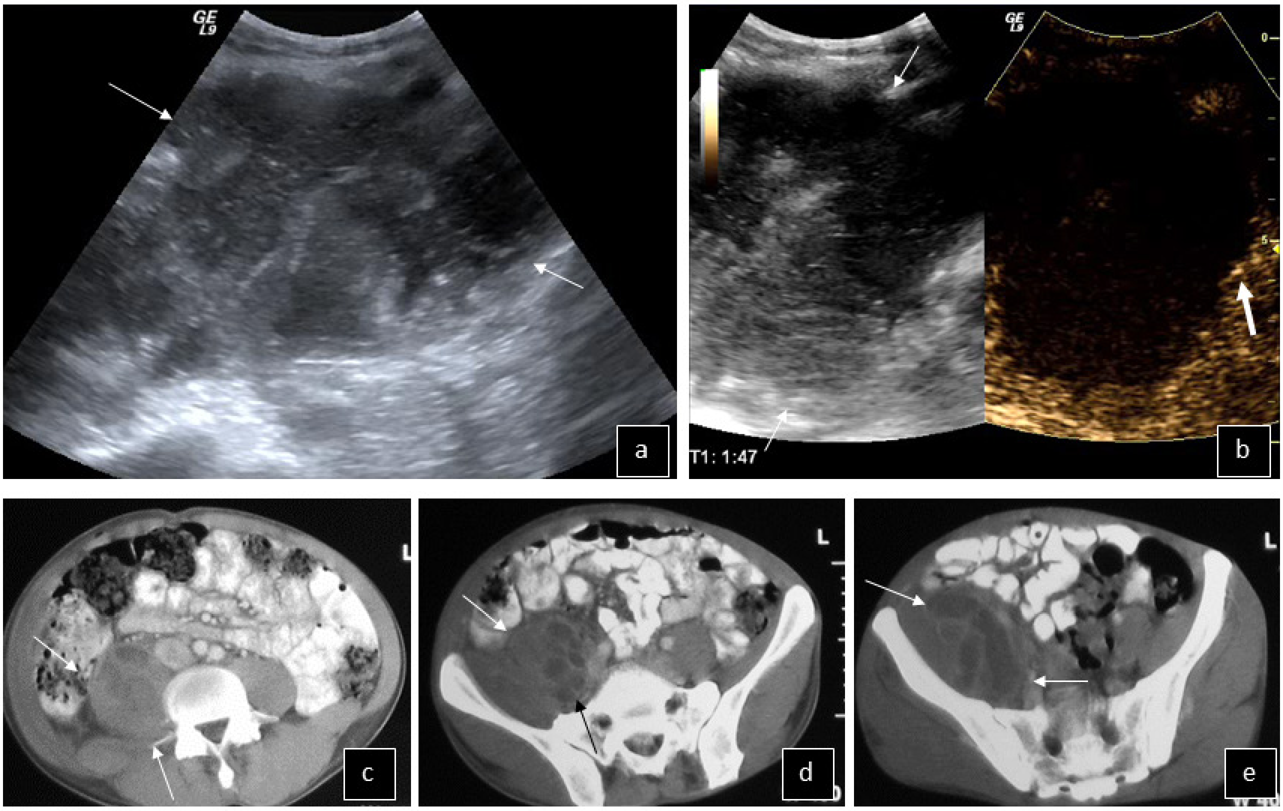

*Fig. 6. Iliopsoas muscle abscess in an intravenous drug user: A mixed echogenicity lesion (between arrows) is seen in the right iliac fossa on B-mode US **(a)**. On CEUS **(b)** only the periphery of the lesion enhances (thick arrow), while the infectious content shows no uptake. Findings of iliopsoas muscle abscess are confirmed on CECT (between arrows in **c, d, e**).*

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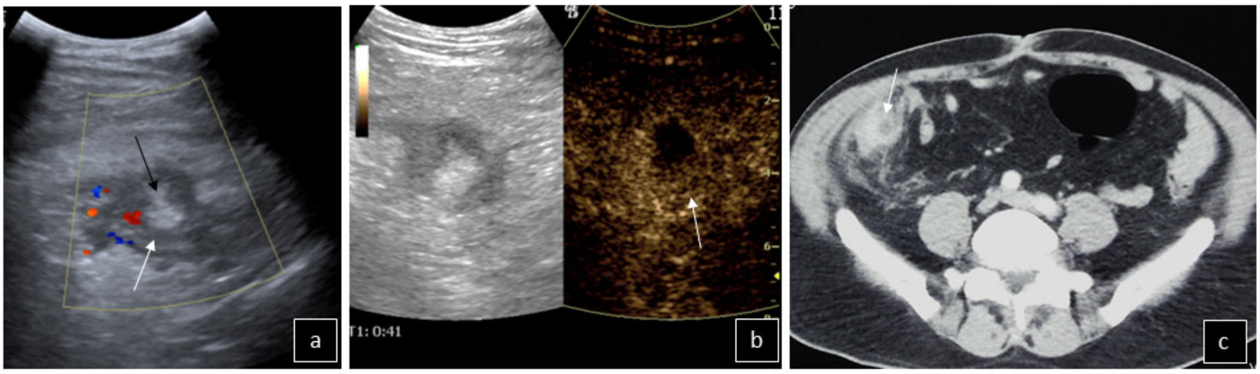

Fig. 7. Epiploic appendagitis: A mixed echogenicity lesion is noted on colour Doppler US ***(a)*** *in the right iliac fossa. It shows increased peripheral flow and a hypoechoic halo (white arrow), representing inflamed visceral peritoneal covering, surrounding central echognic fat (black arrow). On CEUS the lesion's periphery shows rich enhancement (arrow in* ***b****). CECT confirms findings and a central hyperattenuating "dot sign", due to engorged central vessels (arrow in* ***c****).*

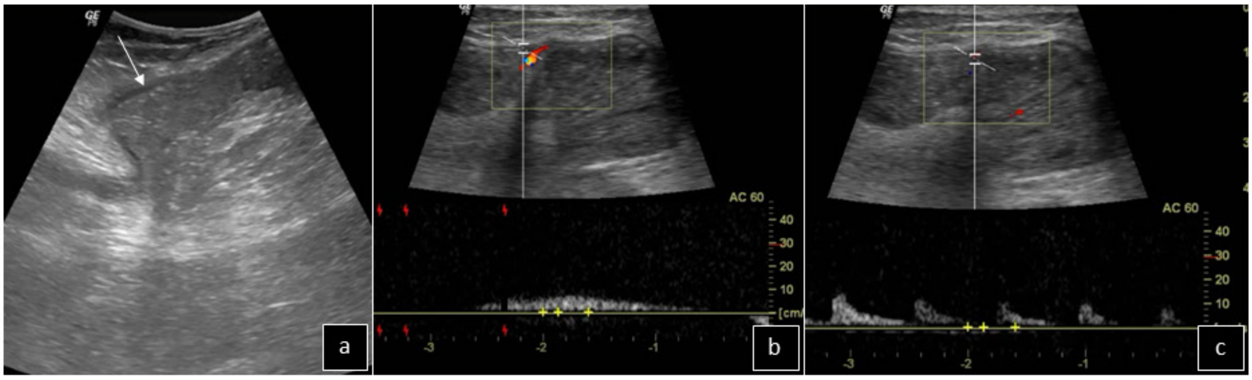

Fig. 8. *Different cases of inguinal hernias:* ***a.*** *A small bowel loop (white arrow) is seen inside hernia's sac.* ***b, c.*** *Inguinal hernia containing multiple bowel loops. Venous* ***(b)*** *and arterial* ***(c)*** *blood flow is still present in the bowel wall vessels.*

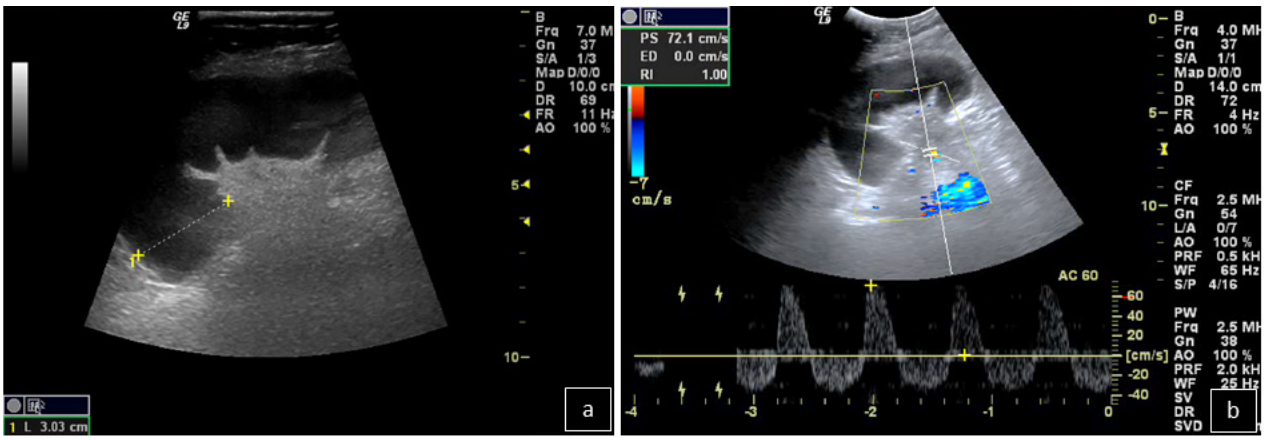

Fig. 9. *Inguinal hernia containing a dilated small bowel loop* ***(a)****. Venous blood flow is compromised due to strangulation. Blood flow enters and exits through the loop's feeding arteries, which show to-and-fro circulation* ***(b)****.*

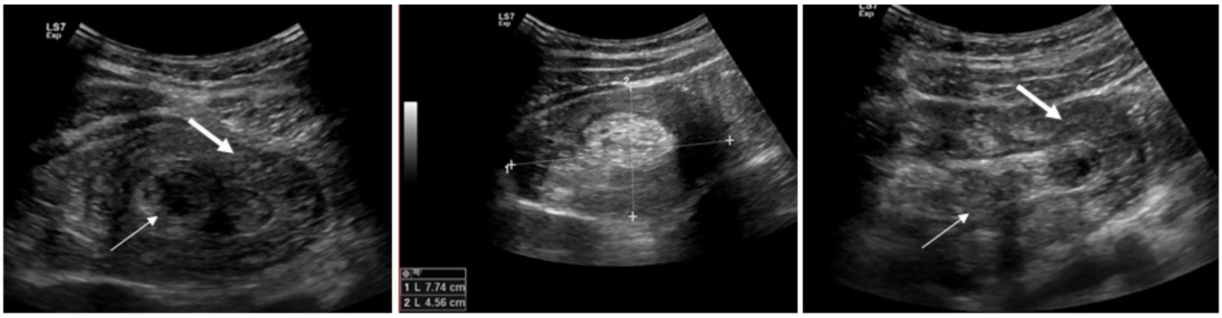

***Fig. 10.** Intussusception with evident intussuceptum (first bowel loop, passing into another loop-thin arrow) entering the intusscipiens (second bowel loop, receiving the first loop-thick arrow) and characteristic "doughnut" sign (between calipers in middle image).*

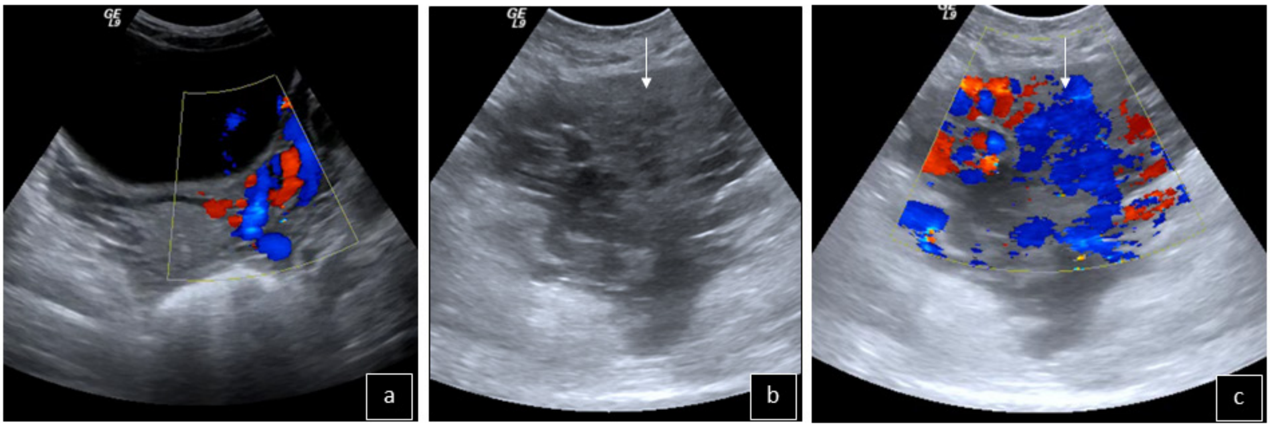

***Fig. 11.** Different cases of pelvic congestion syndrome: **a.** Serpiginous blood vessels with increased flow are seen next to the left ovary on colour Doppler US. **b, c.** Serpiginous veins are present in both ovaries, extending to the uterus (arrows) on B-mode (b) and colour Doppler (c) US.*

inal ultrasound [25].

9. Ovarian torsion

Ovarian torsion is a rotation of the ovary and part of the Fallopian tube on the supplying vascular pedicle [7]. It can be intermittent or sustained and may cause venous, arterial and lymphatic stasis. It is considered a gynaecological emergency, requiring prompt surgery in order to avoid ovarian necrosis. The high mobility of the ovaries is the pathophysiological cause in children however torsion may be associated with an ovarian cystic or solid mass, which acts as a lead point **(Fig. 12)**. On US the ovary is uniformly enlarged, with a diameter of >4 cm. It contains multiple small ovarian follicles which are peripherally located, due to the ovary's congestion. However, this sonographic finding, although specific, is not very sensitive. Free pelvic fluid can be seen in >80% of cases but this too is a non-specific finding. Doppler technique is not as useful as one would imagine: findings are widely variable, from absent or poor venous flow, absent arterial flow (a, less common, sign of poor prognosis), absent or reversed diastolic flow, or even normal vascularity. The latter finding can be seen in intermittent torsion [31] and therefore cannot rule out ovarian torsion completely. The "whirlpool" sign represents the twisted vascular pedicle of the ovary and is a definitive sonographic sign of torsion.

10. Haemorrhagic ovarian cyst

Haemorrhagic ovarian cysts (HOCs) are seen when bleeding occurs inside a corpus luteum, folliccular or other functional ovarian cyst. Patients usually complain of sudden pelvic pain, but may also be asymptomatic. In this case, the HOC is an incidental finding on a routine pelvic sonographic examination [32]. HOCs usually resolve spontaneously within 8 weeks of their initial diagnosis, therefore a repeat US scan is the usual way of follow-up. The most typ-

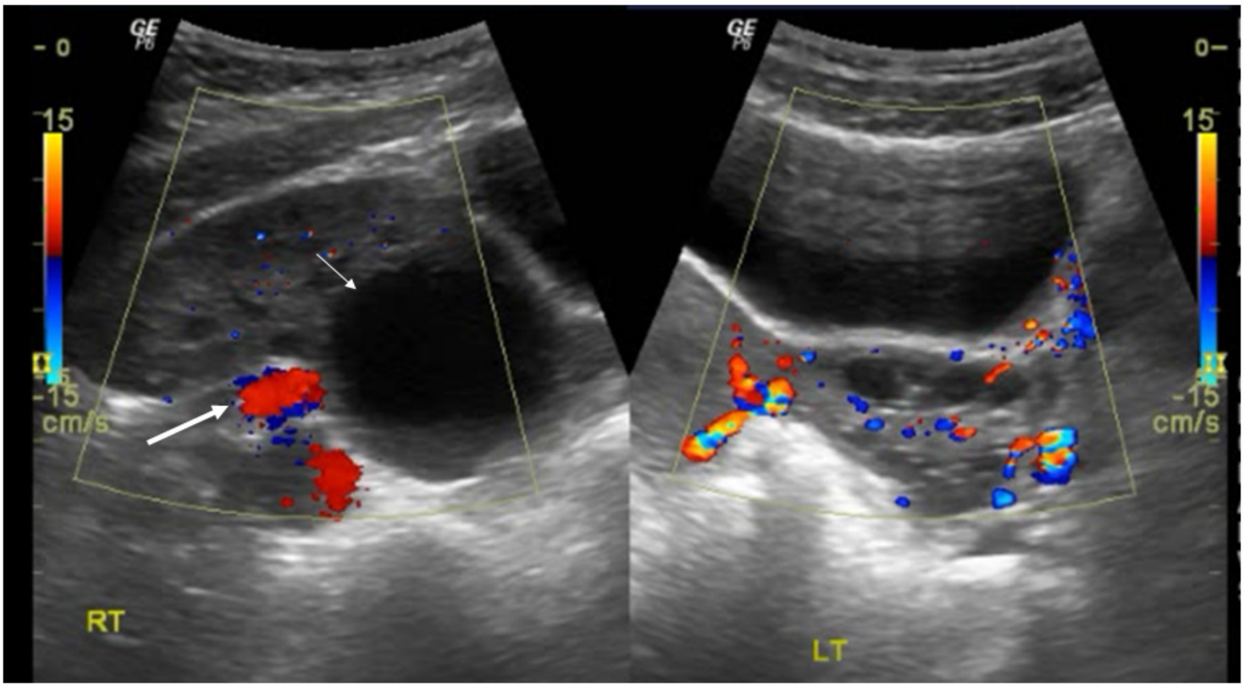

Fig. 12. *Ovarian torsion: The right ovary (RT) is enlarged with reduced blood flow. A cyst (thin arrow) is present. The "whirlpool" sign (thick arrow) is seen next to it. The left ovary (LT) is normal.*

ical appearance of HOCs on US is a single unilateral cyst in the ovary, containing internal echoes but no Doppler flow. Lace-like reticular echoes are often detected in the acute stage, while clots may adhere to the cyst's thin wall mimicking papillary projections or a nodule **(Fig. 13)**, without however any blood flow on Doppler imaging [7, 33]. Posterior acoustic enhancement, as in all cystic lesions, may also be observed. In order to differentiate a HOC from a solid ovarian tumour, CEUS is very useful: internal echoes with no enhancement are suggestive of a HOC **(Fig. 14)**. If enhacement is seen, a solid lesion is mostly probable. Cysts with a typical HOC appearance should be to followed-up with US or MRI after 6-12 weeks if the cyst is more than 5 cm in diameter in pre-menopausal patients or at any size if the patient is perimenopausal [32].

11. Ectopic pregnancy

The term "ectopic" originates from the Greek word "ektopos", which means "out of place" [34]. An ectopic pregnancy is caused by implantation of a developing blastocyst at a site other than the endometrium. It is the major cause of maternal deaths during the first trimester of pregnancy. It is associated with high morbidity and mortality, due to risk for rupture and life-threatening haemorrhage [35]. If a woman of childbearing age presents with abdominal pain, adnexal mass or abnormal bleeding, ectopic pregnancy should be included in the differential diagnosis. In most cases, the location of ectopic implantation is within a Fallopian tube. However, implantation can also occur in the ovary, abdominal cavity, fibrotic scar from previous surgery and cervix [34, 35]. If a pregnancy test is found to be positive, US should initially demonstrate the presence or absence of a normal intrauterine pregnancy. In any case, confirmation of an intrauterine pregnancy virtually rules out the possibility of an ectopic pregnancy [7, 36]. However, sonographic diagnosis of ectopic pregnancy should rely on the identification of an adnexal mass instead of an absence of gestational sac inside the uterus. Findings supporting this diagnosis are an inhomogeneous extrauterine mass (usually in the Fallopian tube, known as the "blob sign", an empty gestational sac in the Fallopian tube, known as the "bagel sign", and free fluid in the pelvis. On colour Doppler, a hypervascular ring in the ovary, known as the "ring of fire", representing the corpus luteum, is a helpful sign but not diagnostic of ectopic pregnancy [34]. Although indentifying cardiac pulses due to a living foetus outside of the uterus is not possible in the majority of the cases, occasionally this may be observed **(Fig. 15)**.

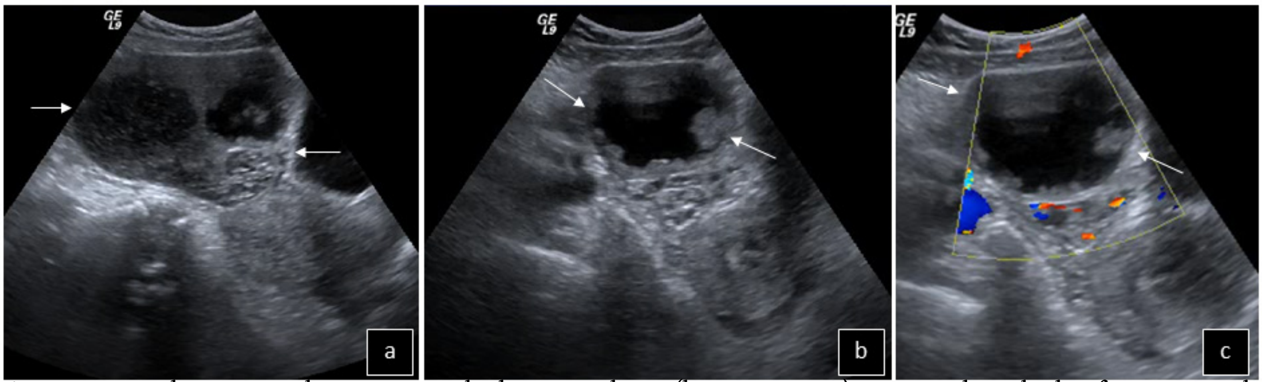

Fig. 13. *Haemorrhagic corpus luteum: A mixed echogenicity lesion (between arrows) is seen in the right iliac fossa on B-mode **(a, b)** and colour Doppler **(c)** US. It shows nodular wall and no perfusion.*

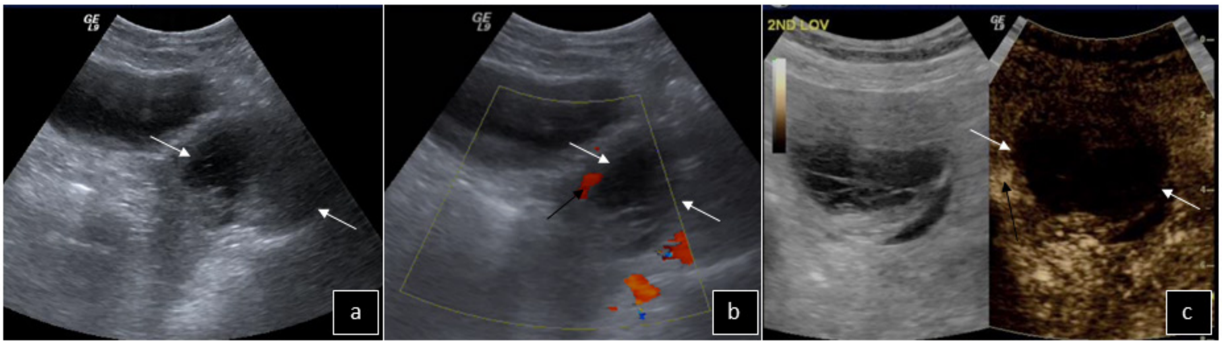

Fig. 14. *Haemorrhagic ovarian cyst: A mixed echogenicity lesion (between white arrows) is seen in the left ovary on B-mode **(a)** and power Doppler **(b)** US. Intraovarian perfusion (black arrow in **b**) is present. This perfusion is confirmed on CEUS (black arrow in **c**) but no enhancement of the cyst (between white arrows) is noted. Therefore, the lesion is not a solid mass but a haemorrhagic cyst.*

12. Iliac fossa haematoma

Haematomas in the iliac fossae are usually related to the psoas muscles. Clinical presentation includes pain or swelling, constipation, urinary symptoms, fever, femoral neuropathy due to femoral nerve compression, as well as signs related to blood loss (tachycardia, hypotension, decreased haemoglobin level [37]). Its causes include haemophilia, anticoagulation, atherosclerosis, trauma (including surgical operation or biopsy), abdominal aorta aneurysm pathology (rupture, repair, endoleak), tumour and inflammatory disease.

On US, haematomas in the acute phase appear echopoor. When chronic, they may show septa and calcifications. On CT the psoas muscle appears enlarged, with acute blood present hyperdense, possibly with a fluid-fluid level, while chronic haematomas may appear similar to psoas abscesses. On MRI, appearance depends on the age of haematoma (acute, subacute, chronic).

13. Mesenteric adenitis

Mesenteric adenitis is an inflammatory entity of the mesenteric lymph nodes of the pelvis, usually in the right lower quadrant. It is more common in children and adolescents than adults. Its symptoms are very similar to acute appendicitis and diagnosis often depends on a rule out basis of other pathologies. Its aetiology includes Yersinia enterocolitica, viruses, Helicobacter jejuni, Campylobacter jejuni, Salmonella spp., Shigella spp. and Mycobacterium tuberculosis [38], which enter the lymph nodes through intestinal lymphatics and then multiply in the nodes which enlarge. Mesenteric adenitis may also evolve secondarily to ileocolitis in infants and young children.

On US and CT typical findings include three or more tender enlarged (short-axis diameter >5 mm) lymph nodes, clustered in the right lower abdominal quadrant, anterior to the psoas muscle or in the mesentery [38-40]. Wall thickening of the ileus or the caecum may also be seen.

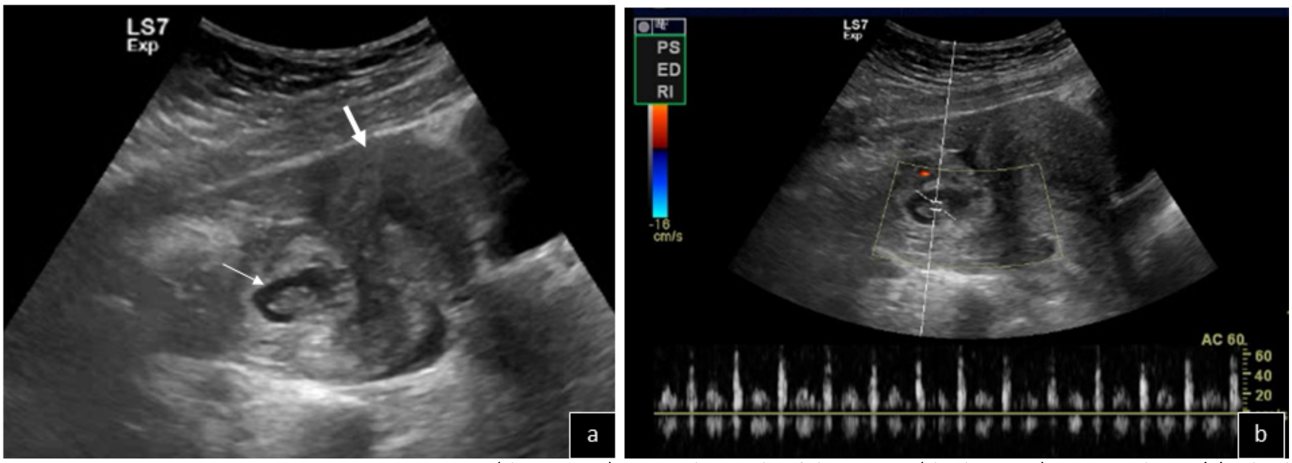

Fig. 15. *Extrauterine pregnancy: A gestation sac (thin arrow) is noted outside of the uterus (thick arrow) on B-mode US* ***(a)****. Fluid is also seen. Foetal cardiac function is present on spectral Doppler US* ***(b)****.*

The appendix is not enlarged.

14. Meckel's diverticulum complications

Meckel diverticulum is a congenital diverticulum caused by fibrous degeneration of the umbilical end of the omphalomesenteric duct in the distal ileum. Although it may be asymptomatic, complications may occur [41-43], especially in the setting of Crohn's disease: gastrointestinal haemorrhage, small-bowel obstruction, volvulus, intussusception, internal hernia caused by attachment of the diverticulum to the umbilicus, Littre hernia where the diverticulum is located inside a hernia, inflammation (Meckel diverticulitis), perforation or neoplasm evolution may be seen. US can detect the Meckel diverticulum as a blind-ending loop connected to the small bowel and its complications.

15. Omental infarction

This is a rare cause of acute abdomen due to vascular compromise of the greater omentum, secondary to surgery, trauma and inflammation. Its symptoms are usually non-specific or it may present with right iliac pain. It can be more common in patients with intense exercise (e.g. Marathon runners) due to reduced omental perfusion. It is more commonly noted in the right lower quadrant, medial to the ascending colon. Perfusion is diminished along the part of the greater omentum, occasionaly due to kinking of the veins in the pelvis. In some cases, the omentum may twist on itself, with omental torsion with decreased arterial and venous perfusion. If no torsion exists, the infarction is defined as primary idiopathic segmental infarction [44].

On US, omental infarction appears as an echogenic area in the omental fat in the right lower quadrant (primary omental infarction) or at the site of initial insult (secondary omental infarction), usually larger than 5 cm, contrary to epiploic appendagitis which is smaller [45]. CT may show focal fat stranding with a hyperdense halo and swirling omental vessels due to torsion.

16. Ileocecal tuberculosis

This is the commonest location of tuberculosis in the gastrointestinal tract. There are three morphological types: ulcerative, hypertrophic and ulcerohypertrophic. US findings are non-specific and may include thickening of the caecal wall and lymphadenopathy. **R**

Conclusion

The iliac fossae are a location of various pathological conditions. Transabdominal US, through a systematic approach, is able to detect useful imaging findings in order to aid in prompt diagnosis and treatment. CT and transvaginal US are reserved for cases where confirmation is needed, especially when imminent surgical intervention is mandatory. **R**

Funding

This project did not receive any specific funding.

Conflict of interest

The authors declared no conflicts of interest.

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Ready - Made Citation

Melissovas I, Cokkinos DD, Antypa EG, Roumbos G. Not only appendicitis! Transabdominal ultrasound detects a variety of pathology in the iliac fossae. *Hell J Radiol* 2021; 6(3): 26-39.