Differential diagnosis of right lower quadrant pain in women, beyond appendicitis

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Learning objectives

To illustrate the normal anatomy and describe different radiological signs of acute pathology with ultrasonography (US) and CT of the right lower quadrant in healthy women.

Background

Healthy women’s right lower quadrant anatomy is complex and is influenced by hormonal and physical changes. Therefore it is important to take into consideration different pathologies depending on patients age.

US is the first choice diagnosis technique in right lower quadrant pathology, that uses no radiation, is repeatable, affordable, available and offers real time images.

However sometimes complementary CT may be necessary if the patient is critically ill, offers bad US transmission (obesity, perforation, ileum...) or when deep pelvical pathology is suspected.

Findings and procedure details

In this exhibit we will review retrospectively US and CT diagnostic clues from our data base studies, of fertile and postmenopausal women with right lower quadrant pathology. (Figure 1 and figure 2).

A. BOWEL DISEASE:

A1. APPENDIX PATHOLOGY:

ACUTE APPENDICITIS

Acute appendiceal inflammation is due to lumen obstruction and superimposed infection. It often manifests as abdominal right lower quadrant pain (RLQP), fever, nausea, vomiting, diarrhea, and leukocytosis in most cases.

Radiological findings:
**Ultrasonography (US):** Distended appendix (over 6 mm in diameter), circumferential wall thickening, incompressibility and local fat trabeculation are seen. Sometimes appendicolith can be depicted, whereas Doppler US may reveal appendiceal hyperemia. (Figure 3).

**Contrast enhanced CT (CECT):** Appendix distended lumen (over 6 mm in diameter), with enhancing wall and wall thickening. Increased attenuation of mesenteric fat with free periappendiceal fluid related to contiguity inflammatory changes. Appendicolith may be present. (Figure 4).

Complications:

CECT: ruptured appendix and appendicular abscess formation: thick-walled mass with fluid attenuation and with anfractuous morphology that may contain air bubbles inside (abscesses). Appendix is may be seen with a very irregular morphology or absent. (Figure 5).

**APPENDICEAL MUOCOCELE**

It is defined as chronic cystic distension of the appendiceal lumen due to mucin accumulation. Usually asymptomatic, but if symptoms are present, it may manifests as swelling and RLQP.

**Radiological findings:**

**US:** Cystic tubular structure, with low-level echoes or dense mucoid material inside. Echogenic surrounding inflamed fat is seen in acute obstructive type and in inflamed or perforated mucocele.

**CECT:**

Uninflamed mucocele: relaxed and mucinous content (liquid) inside the appendix. Up to 50% of patients associate wall calcification and mild increased of mesenteric fat attenuation.

Inflamed or infected mucocele: air bubbles inside appendiceal lumen and mild increased of mesenteric fat attenuation. (Figure 6).

**APPENDICEAL DIVERTICULITIS**

Acquired small bowel diverticula are much less frequent than colonic diverticula. Although pathogenesis is not well understood, increased intraluminal pressure by proximal appendiceal obstruction is purposed. Clinical manifestations are often more insidious than in acute appendicitis.
Radiological findings:

US: Diffuse appendiceal wall thickening with occasional mild surrounding fat stranding.

CECT: Appendix diverticulum appears as a rounded outgrowth margin adjacent to appendix, which may contain fluid, air or particulate material. If inflammation occurs, diffuse wall thickening and increased wall enhancement with local inflammatory changes are seen (inflammation of appendix may be seen secondary to contiguous inflammatory changes).

A.2. MECKEL DIVERTICULUM PATHOLOGY:

It is the remnant of the omphalomesenteric duct, that does not obliterate during embryonic growth. It is located in the antimesenteric border of ileum at approximately 100 cm from the ileocecal valve.

Meckel diverticulum can be diffusely inflammed, intussuspected, obstructed (luminal obstruction by enterolith or foreign body) and/or perforated. Occasionaly it may contain ectopic gastric mucosa, and therefore cause bleeding.

Radiological findings:

Inflammation of Meckel diverticulum:

US: A thick-walled tubular structure with hyperemic bowel loops in right lower quadrant and surrounding fat stranding.

CECT: Tubular structure with wall thickening and ending in blind pouch with local inflammation, extraluminal gas or areas of contrast extravasation (at the diverticulum neck - bleeding). Sometimes enterolith can be seen as a cause of the luminal obstruction of the diverticulum. (Figure 7).

A.3. SMALL AND LARGE BOWEL DISEASE:

EPIPLEOIC APPENDAGITIS

It is the acute inflammation or infection of the omental appendix. In 35% of cases it stands in ileocecal region or ascending colon, manifesting with RLQP.

Radiological findings:

US: Solid, hyperechoic and ovoid mass, which is not compressible, adherent to colonic wall, surrounded by hypoechoic ring corresponding to increased density ring on CT.
**CECT:** Oval fat density image, with enhanced peripheral rim. A central point of high density corresponding to the central vessels congested or thrombosed, that may even correspond to core areas of hemorrhage or fibrosis. Increased attenuation in the mesenteric fat and engorgement of the mesenteric vessels in relation to local inflammatory changes are also observed. (Figure 8).

**OMENTAL INFARCT**

It is a rare cause of abdominal pain, secondary to interruption of blood supply due to torsion or venous thrombosis of omental vessels. It is usually located between anterior abdominal wall and ascending or transverse colon.

**Radiological findings:**

**US:** Triangular or wedge-shaped or oval image, hyperechoic and deep to anterior abdominal wall, typically right upper quadrant, and without Doppler signal.

**CECT:** Solitary oval or triangular image with fat heterogeneous density, sharp edges, sometimes with whorled pattern of concentric linear fat stranding. (Figure 9).

Epiploic appendagitis and omental infarction have similar radiological findings, but both are treated with supportive measures, this distinction has no practical significance.

**RIGHT COLONIC AND ILEAL DIVERTICULITIS**

Ileal diverticula are less frequent than colon diverticula and unusual site of inflammation. They are usually multiple and located in terminal ileum, at approximately 7.5 cm from the ileocecal valve. When they are inflamed they simulate acute appendicitis.

Colon diverticula are more common than those of the small intestine, especially at rectum-sigma junction. However they may be located in cecum and ascending colon, and may manifest clinically as RLQP when they are inflamed.

**Radiological findings:**

**US:** Echogenic focus from colon wall with acoustic shadow represents the diverticulum, with concentric mural thickening of the intestinal loop and surrounding fat stranding. (Figure 10).

**CECT:** Diverticulitis is displayed as a circumferential wall thickening of the ileum or colonic wall related to an isolated or multiple diverticulum, with local increased mesenteric fat attenuation usually located in the area of maximum inflammation. Vermiform appendix appears with standard features.

Both may be complicated by perforation, bleeding or intestinal obstruction.
CROHN DISEASE

Disease of unknown etiology characterized by transmural inflammation of the gastrointestinal tract.

Radiological findings:

US: Mural thickening, abscesses or fistulas.

CECT:

- ACUTE PHASE: Intestinal wall thickening of discontinuous segments. Hyperenhancement is distributed as an inner ring (corresponding to inflamed mucosa), hypodense middle ring (submucosal edema) and outer ring with soft tissue density (serous layer).

The "comb sign" (engorgement of the mesenteric vessels), increased attenuation in the mesenteric fat and lymphadenopathy (under 1 cm) are frequently observed.

- CHRONIC PHASE: Intestinal luminal narrowing with or without retrograde dilated loops, intestinal layer walls differentiation is lost (although the submucosa fat can proliferate and preserve the difference between layers). Fistulas and abscesses may be seen. (Figures 11 and figure 12).

INFECTIOUS ENTEROCOLITIS

It is a relatively common intestinal infection that can affect the small bowel, colon or both. Clinically it may mimick acute appendicitis, especially with Yersinia enterocolitica, Campylobacter jejuni and Salmonella enteritidis infections.

Radiological findings:

US: Mural thickening of the ileon wall and reactive adenopathy.

CECT: No specific findings. It can be seen as circumferential wall thickening of the terminal ileum, homogeneous enhancement and an adjacent lymph node. (Figure 13).

MESENTERIC ADENITIS

Benign inflammation of the mesenteric lymph nodes in response to a viral infection. It can manifest as acute appendicitis in children and young adults.

Radiological findings:
US: Numerous RLQ or diffuse mesenteric enlarged lymph nodes (# 5 mm) with normal appendix ileal or ileocolonic wall thickening and mild surrounding fat stranding.

CECT: More than 3 mesenteric lymph nodes in the RLQ with a minimum short diameter of 5 mm. They usually locate superficially to the right psoas muscle, with preserved appendiceal. Ileocolonic wall thickening is may be seen.

INTUSSUPECTION

It is the introduction of a bowel segment (together with adjacent mesentery), inside the lumen of another adjacent bowel distal segment. Although it is a rare entity in adults, increasing use of US and CT has increased its diagnosis.

In children it is usually idiopathic, but in adults it is usually secondary to an underlying disease state that can act as head of intussusception. Clinically, it can manifest as intermittent colic pain with nausea and vomiting in connection with intestinal obstruction.

Radiological findings:

US: "Target sign" axial image: from outside to inside: external hypoechoic ring (intestinal wall segment containing the intussusception), medium hyperechoic ring (space between intussusception and the segment that contains fat and mesenteric vessels) and internal hypoechoic ring (wall segment of invaginated intestine).

Ultrasound, " pseudokidney sign": longitudinal image: multiple hypo-hyperechoic parallel lines.

CECT: " Target sign": axial CT: from outside to inside: external high-attenuation ring (intestinal wall segment containing the intussusception), medium low-attenuation ring (space between intussusception and the segment that contains fat and mesenteric vessels) and internal high attenuation ring (wall segment of invaginated intestine).

(ISCHEMIC COLITIS)

It is the most common manifestation of ischemic injury of the gastrointestinal tract. It is secondary to occlusive (80%) or non occlusive (20%) vascular pathology. The isolated right colon involvement is less frequent than the isolated involvement of the left colon, but its incidence has increased particularly in elderly patients with non-occlusive forms, due to low systemic flow states or secondary to vasoconstriction drug use.

It usually manifests as mild to moderate RLQP, sometimes preceded by constipation, and contrary to what happens in isolated involvement of the left colon, does not associate rectal bleeding. It is a risk of severe disease.
Radiological findings:

**US:** Hypoechoic bowel wall thickening, sometimes without arterial flow in colon wall.

**CECT:**

- Early stages: it can be displayed like enhanced-mucosa wall regarding hyperemia and hemorrhagic phenomena and wall thickening by submucosal edema.

- If the condition of ischemia persists: decreased bowel loops enhancement and dilatation of theme will be observed.

- In more advanced stages: intramural gas or gas in the portal vein or in mesenteric vessels, which corresponds with the development of infarction.

- Signs of pneumoperitoneum (perforation loop) are pathognomonic of transmural necrosis loop.

(Figure 15).

**CECAL VOLVULUS**

It is a rare disease seen in patients who have an abnormally mobile blind due to congenital or acquired abnormal fixation to the posterior parietal peritoneum.

Clinically it is manifested by constant abdominal pain and cramping in the right iliac fossa, associating abdominal bloating, constipation, nausea and vomiting, with resultant intestinal obstruction.

**Radiological findings:**

**CECT:** distended and ectopic volvulus, with the swirl of the mesenteric vessels by twisting them. Thickening of the cecal wall and pneumatosis intestinalis and increased density of mesenteric fat, relative to signs of complication. (Figure 16).

**STRANGULATED HERNIA**

This is the herniated intestinal loop ischemia because of the absence of vascular supply. Usually it has an important systemic manifestation, like vomiting, abdominal pain with bloating and it can reach a significant shock effect.

**Radiological findings:**

**US:** Hernia with bowel content. It,s good to use Doppler-US to see the presence or absence of blood flow.
**CECT**: Alteration of parietal enhancement herniated loop, signs of intestinal obstruction, engorgement of the mesenteric vessels, increased attenuation in the mesenteric fat and ascites. (Figure 17).

**B. GYNECOLOGICAL PATHOLOGY:**

**B.1. UTERINE PATHOLOGY:**

**UTERINE MYOMA**

It is the most common benign tumor of the genital tract. Most often they occur in perimenopausal women, with hypertension, diabetes, obesity or nulliparity. They can be intramural, subserosal or submucosal. Among the latter: Type 0 (totally intracavitary), 1 (more than 50% intracavitary) or 2 (less than 50% intracavitary). The most common are intramural, followed by subserosal and submucosal. (Figure 18).

Usually asymptomatic in 60% of cases, and if it is presented by pain, we must discard complication (degeneration, bleeding or torsion) or compression of adjacent structures.

**Radiological findings:**

- **UNCOMPLICATED MYOMA:**

**US**: Hypoechoic mass, but it can be isoechoic, or hyperechoic compared to normal myometrium. Calcification with posterior acoustic shadowing.

**CECT**: Uterus with poorly defined contours, homogeneous enhancement masses initially hypodense compared to myometrium.

- **COMPLICATED MYOMA**: Different radiological findings.

**US**: Heterogeneous mass, with hyaline degeneration (typically hypoechoic), cystic degeneration (anechoic areas with posterior acoustic enhancement), hemorrhagic degeneration (cystic hypoechoic areas with posterior acoustic enhancement).

**CECT**: Enlarged uterus diffusely; hyaline degeneration (most frequently decreased contrast enhancement mass), cystic and necrosis areas (no enhancement), areas of infarction and sometimes superinfected (air bubbles within the myoma).

- **RUPTURE OF COMPLICATED MYOMA**: complicated myoma with intra-abdominal high-density free fluid. Increased enhancement of the peritoneum in connection with signs of peritonitis may occur. Sometimes it is possible to display interruption or discontinuity fibroid wall, (direct sign of rupture).

(Figure 19).
HEMATOMETRA

It is the accumulation of menstrual blood in the uterus or uterine lochia not evacuated through the uterine cervix. This is caused by mechanical obstruction to the flow of blood through the cervix, by congenital gynecological procedures or processes that obliterated the cervix.

It is the dilatation of the uterine cavity, demonstrably by physical examination and ultrasound. In more severe cases hematosalpinx and hemoperitoneum may occur and infection of the uterine contents (pyometra).

Radiological findings:

US and CT: distended uterus with heterogeneous content. (Figure 20).

B.2. OVARIAN PATHOLOGY:

OVARIAN CYST

They are the most common ovarian masses. A functional ovarian cyst is caused when the ovulation of a dominant follicle does not occur. Simple cysts are usually asymptomatic and are diagnosed as an incidental finding.

If they manifest like pain, they can be enlarged, with a hemorrhagic complication or cyst rupture.

Radiological findings:

-SIMPLE CYST: In ultrasound it is an unilocular anechoic cyst, less than 3 cm in diameter, with wall less than 3 m, with posterior-acoustic enhancement, and Doppler signal is not observed.

-COMPLICATED - HEMORRHAGIC CYST: It has various forms of presentation depending on the developmental stage in which it is. In ultrasound it is displayed as a cyst with internal echoes inside (echogenic focus suggesting the presence of a clot - the most typical), with thick walls and partitions. In CECT it is seen as a cyst walls having increased enhancement after administration of intravenous contrast and high-enhanced content. (Figure 21).

- RUPTURE OF COMPLICATED CYST: interruption or discontinuity of the cyst wall and increased intra-abdominal free fluid density (direct sign of rupture). (Figure 22).
OVARIAN TORSION

It is defined as the rotation of the ovary and / or ovarian tube, (over 67% there is an ovarian and tube torsion concomitant), through its suspensory ligament, causing blockage of the vascular pedicle. It is usually associated with the existence of a cyst or a tumor, in most cases benign, especially it is related to the mature cystic teratoma. It occurs most often in women of reproductive age.

The clinic is nonspecific, including symptoms such as severe abdominal quadrants lower pain (right or left depending on which ovary is affected), the presence of a palpable mass, peritoneal irritation, nausea or vomiting. In some cases it has been observed intermittent pain, which makes diagnostic suspicion more difficult.

Radiological findings:

**US:** enlarged ovary (> 4 cm), usually located in the upper midline uterine fundus, "sign of necklace of pearls or beads necklace" (multiple cysts on the periphery of the ovary), a mass near the twisted ovary, pelvic free fluid and torsion of the vascular pedicle.

**Doppler ultrasound:** in 93% of cases it is seen as decreased flow or absence of it. The viability of the ovary is marked by the presence or absence of central venous flow (existence of central venous flow: viable; absence of central venous flow: nonviable). The absence of flow in the vascular pedicle also suggests lack of viability of the ovary.

(Figure 23).

**CECT:** enlarged ovary, ovarian mass midline, rotated to the contralateral side of the affected ovary and uterus rotated to the twisted ovary. Wall thickening of the ovarian mass, thickening of the tube, cystic structures in the periphery of the ovary and ascites.

TUMORS

Ovarian tumors are classified according to the source of the original tumor: epithelial, germ cells, stromal and metastatic.

Clinically they manifest as pain, bloating and palpation of an abdominal mass. Most are diagnosed late, with extension and diffuse peritoneal ascites.

Suspicion: postmenopausal women with ascites and abdominal mass.
Radiological findings:

-SEROUS: benign serous cystadenoma:

**US**: Adnexal cystic image without papillary projections, although there may be a thin wall irregularities or septa inside the cavity.

**CECT**: Uni or multilocular cystic mass of homogeneous density, thin wall and septa, without vegetation inside or outside the cavity.

-MUCINOUS: CECT: Benign mucinous cystadenoma: multilocular cystic mass with thin wall and septa, with liquid content of different densities, without vegetation inside or outside the cavity. They are usually larger than the serous tumor.

Malignant epithelial tumors: high density mass with soft tissue necrosis, with thickening of the wall, papillary intralesional projection, ascites, peritoneal implants, pelvic wall invasion or lymph nodes. (Figure 24).

-MATURE TERATOMA:

**US**: Diffuse or partially echogenic adnexal image, with posterior acoustic shadow by the presence of hair or tooth intralesional mass, it can only be seen the surface edge of the lesion ("sign of the tip of the iceberg"). Projected bulge inside the sebaceous cyst content, (hair or teeth - Rokitansky nodule) with fluid-fluid levels without Doppler signal (no internal vascularization). It can be present multiple thin bands within the teratoma caused by the presence of hair ("dot-dash pattern or dermoid mesh").

**CECT**: Various presentations. From a pure cyst, to a mixed lesion with hair follicles, muscle or gland content inside, or it can even be presented as a mass composed predominantly of fat. The presence of a cyst with fat density and wall calcification is diagnostic of mature cystic teratoma. There is often a protrusion which projects into the cyst cavity (Rokitansky nodule- hair bulge or tooth). Complications: torsion, rupture or malignant degeneration.

(Figures 25 and figure 26).

ENDOMETRIOMA

Endometriosis is the presence of ectopic endometrial tissue. The most common location is the ovary, producing endometriomas. It is a disease clinically characterized by dysmenorrhea, dyspareunia, acyclic pain, dysuria and dyschezia. Acute signs are often related to bleeding complication.

Radiological findings:
US: Cystic mass with diffuse echoes in decline areas, although it may be presented as a solid appearance, internal thick septa, and liquid-liquid or liquid-debris levels.

CT: It is not the most useful imaging technique to evaluate patients with endometriosis, because the endometrial tissue infiltration can simulate a malignancy. One of the findings that can help in a minority of cases is increasing enhancement floating clot inside of cystic cavities.

(Figure 27).

B.3. PELVIC INFLAMMATORY DISEASE (PID):

It is the infection of upper genital tract ascending from the cervix and extending endometrium, fallopian tubes and ovaries. It can produce pelviperitonitis and even hepatic impairment (perihepatitis, pelvic abscess ...). Gonococcus and Chlamydia trachomatis are the most frequently involved microorganisms. It often happens as a sexually transmitted disease in young patients with multiple sexual partners and predominantly clinically it is presented as pain, vaginal discharge and fever.

Radiological findings:

US:

Fallopian tube thickening, distension of it, enlarge ovaries with indistinct margins and cysts.

Increased echogenicity of pelvic fat.

Echogenic debris within fallopian tube and wall thickening with increased echogenicity (pyosalpinx).

Complex adnexal mass, (ovary not recognizable) and components of pyosalpinx (tubo-ovarian abscess).

CECT:

Cervicitis: thickening of the cervix, increase endocervical enhancement and signs of inflammation at the pericervical area.

Endometritis: thickening of the endometrial wall, that can be displayed with increased enhancement of its walls and endometrial liquid.

Light pelvic edema: thickening of the uterosacral ligaments and increased attenuation of mesenteric fat.
Salpingitis: thickening of the tubes with associated inflammatory changes. Increased thickening of the tubes, which can be viewed with increased enhancement and full of dense liquid with liquid-debris level (pyosalpinx).

Oophoritis: enlargement of the ovaries or polycystic aspect of them.

Free fluid in pelvis.

Tubo-ovarian abscess: collections increased enhancement and thickening of its walls, heterogeneous content with debris, septa, and bubbles of gas.

Involvement of other structures: Fitz-Hugh-Curtis, intestinal obstruction, gallbladder wall thickening or thrombophlebitis of the pelvic vessels.

(Figure 28).

**C. MISCELLANEOUS:**

**C.1. UROLOGICAL PATHOLOGY:**

**RENAL COLIC**

It is a sudden pain of great intensity that is usually caused by a ureteral stone. This is usually a flank pain, accompanied by nausea, vomiting and positive fist percussion. In many cases, the pain may radiate to the right lower quadrant in the presence of right ureteral stones, so it is important to think about this entity with the presence of this kind of pain.

Radiological findings:

**US and CT:** Ureteral stone (direct sign), renal enlargement, hydronephrosis and hydrourete (indirect signs).

**US:** perinephric bands (lines of increased density in the perirenal fat), a visible ureteral wall or "ring sign" (urethritis) and the ureteral stone.

(Figure 29).

**C.2. VASCULAR DISEASE:**

**OVARIAN VEIN THROMBOSIS**

This is a medical emergency that usually occurs in puerperal state, also related to hypercoagulable states, trauma (especially pelvic), complications of pelvic inflammatory disease, recent surgery or tumors treated with chemotherapy.
In 80-90% of cases it affects the right ovarian vein and usually presents with fever and pain in the right abdomen, so it is also an entity that it has to be discarded if a patient has a RLQP, especially with risk factors.

Its main differential diagnoses are appendicitis, hydro / pyosalpinx and hydrourereter.

Radiological findings:

**US:** increased ovarian vein in size, with echoes inside, not compressible. Doppler study: partial or total absence of flow.

**NECT:** hyperdense along ovarian vein linear image with / without accompanying signs of inflammation.

**CECT:** increased diameter of the ovarian vein, with a filling defect contrast inside.

Both imaging techniques can visualize the ipsilateral ovary edematous and / or thickened. (Figure 30).

**C.3. SOFT TISSUE PATHOLOGY:**

**VASCULAR MALFORMATION IN SOFT TISSUE**

These are abnormalities of embryonic development in the vascular system and are usually located on the head and neck (40%), trunk (20%) and limbs (40%).

They may not be apparent until they are large and may appear as small well circumscribed spots to become masses that can compromise the patient’s life.

They usually manifest as a soft mass, compressible, which can cause pain and swelling and have a high recurrence.

Radiographic findings:

**US:** hypoechoic, heterogeneous nodule, cystic complex in subcutaneous tissue.

**Ultrasound Doppler:** a pattern of high flow (arteriovenous malformations or mixed) or bass pattern (venous capillaries, lymphatic or mixed).

They can have thrombi or dystrophic calcifications as phleboliths.

(Figure 31).

**ROUND LIGAMENT CYST**
The round ligament is a result of normal obliteration of peritoneal-vaginal canal. The closing of it begins just before birth, in the uppermost part and continues downwardly. If this normal closing does not occur, we will not talk about round ligament, but we will talk about the Nuck canal.

The cyst of the round ligament, also called Nuck cyst or female hydrocele, is the accumulation of fluid in the peritoneal-vaginal canal permeable.

Clinically it is presented as an inguinal mass, which can cause pain in that area or in its vicinity. It is irreducible, without inflammatory signs and without modification to Valsalva maneuvers.

It may be complicated by bleeding, infection or high growth with peritoneal extension, and they can then aggravate the clinic.

Radiographic findings

**US:** Cystic image, lateral to the pubic bone, which does not communicate with the peritoneum and remains unchanged with the Valsalva maneuver. With ultrasound it can be ruled out a strangulated inguinal hernia.

**CECT:** Few cases have been reported. Rounded and smooth image with no enhancement after contrast. Unilocular cystic image in inguinal region and reaching the labia. Displaying a pedicle extending to the peritoneal cavity through the inguinal canal is suggestive but may not be displayed.

(Figure 33).
Fig. 1

References: NETTER
RIGHT LOWER QUADRANT PAIN IN WOMEN

A. BOWEL DISEASE:

- A.1 Pathology of the appendix
- A.2 Meckel diverticulum pathology
- A.3 Small and large bowel disease

B. GYNECOLOGICAL PATHOLOGY:

- B.1 Uterine pathology
- B.2 Ovarian pathology
- B.3 Pelvic inflammatory disease (PID)

C. MISCELLANEOUS:

- C.1 Urological pathology
- C.2 Vascular disease
- C.3 Soft tissue pathology

Figure 2

Fig. 2

References: - TOLEDO/ES
ACUTE APPENDICITIS (ultrasonography)

Figure 3: 14 years-old woman with RLQP and leukocytosis.

Abdominal ultrasonography: A and B: distended appendix (7 mm), with wall thickening and local trabeculation of fat.; C: reactive adenopathy (pink arrow).

Fig. 3
References: - TOLEDO/ES
ACUTE APPENDICITIS (CT)

Figure 4: 55-years-old woman with RLQP, fever and leukocytosis.

NECT: A: thickening of the tip of the appendix (green arrow) and local increased attenuation in the mesenteric fat (yellow arrow); B: appendicolith (pink arrow).

Fig. 4
References: - TOLEDO/ES
COMPPLICATED ACUTE APPENDICITIS WITH APPENDICEAL ABSCESS WITH PERIHEPATIC EXTENSION

Figure 5: 82-years old woman with acute abdominal clinic.

CECT, portal phase: A: axial-CT, appendiceal abscess (yellow arrow), wall thickening of the blind (green arrow), increased attenuation in the mesenteric fat and engorgement of mesenteric vessels. Appendix is not seen. B and C: axial-CT and coronal-CT respectively, peri and subhepatic collection with air bubbles inside, regarding abscess (pink arrow).

Fig. 5

References: - TOLEDO/ES
APPENDICEAL MUCOCELE SUPERINFECTED

Figure 6: 81-years-old woman with a mass in RLQ and abdominal pain. Acute abdomen.

CECT, late phase. A: axial CT, mucocele output from the caecum. B: axial CT, mucocele linear calcification in its periphery; C: coronal CT, small air bubbles inside the mucocele. D: surgical specimen.

Fig. 6
References: - TOLEDO/ES
Fig. 7

References: - TOLEDO/ES

**MECKEL’S DIVERTICULITIS**

Figure 7: 85-years old woman with RLQP, which persists with treatment.

NECT: A, B and C, axial-CT, sagittal-CT and coronal-CT, respectively. Inflamed diverticulum (green arrow), increased attenuation in the mesenteric fat (yellow arrow), enterolith (pink arrow).
Figure 8: 30-years-old woman with RLQP and slight signs of peritoneal irritation.

NECT: A and B: axial-CT, C: sagital-CT. Oval fat density image with enhanced periphery and with a central point of high density, which corresponds to epiploic appendagitis (yellow circle), with local inflammatory signs (pink arrow).

Fig. 8
References: - TOLEDO/ES
RIGHT OMental INFARCT

Figure 9: 48-years-old woman with RLQP.

Axial-NECT: Solitary oval image, with fat heterogeneous density and with whorled pattern of concentric linear fat stranding, which corresponds to omental infarction (yellow circle).

Fig. 9
References: - TOLEDO/ES
RIGHT COLONIC DIVERTICULITIS

Figure 10: Abdominal ultrasonography: echogenic focus from colon wall with acoustic shadow represents the diverticulum (yellow arrow), with concentric mural thickening of the intestinal loop (pink arrow) and surrounding fat stranding.

Fig. 10

References: - TOLEDO/ES
CROHN DISEASE (acute phase)

Figure 11: 20-years-old woman with Crohn disease with abdominal pain and fever.

CECT, portal phase and oral contrast: A and B axial-CT, C and D coronal-CT. Concentric wall thickening of the cecum and terminal ileum (yellow arrow), vermiform appendix wall thickening by inflammatory changes by contiguity and increased attenuation in the mesenteric fat (pink arrow), parietal concentric thickening of the right colon (green arrow) and engorgement of mesenteric vessels (purple arrow).

Fig. 11

References: - TOLEDO/ES
Fig. 12

References: - TOLEDO/ES
**INFECTION ENTEROCOLITIS**

**Figure 13**: 44-year-old woman with RLQ pain.

Axial-CECT and oral contrast:
- Wall thickening of the terminal ileum (yellow arrow), terminal ileon output from the blind (green arrow), increased attenuation in the mesenteric fat and engorgement of the mesenteric vessels, corresponding to inflammatory signs (image B).

**Fig. 13**

*References*: TOLEDO/ES
Fig. 14

References: - TOLEDO/ES
Figure 15: 76-years-old woman with abdominal pain.

Axial-CECT, portal phase. Dilated right and transverse colon and enhanced walls with intramural gas (yellow arrows), free fluid (pink arrow) and increased attenuation in the local mesenteric fat (green arrow).

Fig. 15

References: - TOLEDO/ES
Fig. 16

References: - TOLEDO/ES
Fig. 17

References: - TOLEDO/ES
Fig. 18

References: - TOLEDO/ES
Figure 19. Puerperal 35-years-old woman with abdominal pain, predominantly in the pelvis and RLQ.

A and B: abdominal ultrasonography: free hyperechoic intraabdominal fluid, with wall thickening of intestinal bowel loops, with no peristalsis.

C and D: CECT, portal phase, coronal-CT and axial-CT respectively, some myomas with low-attenuation content and discontinuity of the wall of one of them (pink arrow), high-density free fluid (yellow arrow), slight increase peritoneum enhancement relative to signs of peritonitis (green arrow).

**Fig. 19**

**References:** - TOLEDO/ES
HEMATOMETRA

Figure 20: 14-years-old woman with RLQ pain and leukocytosis. Suspicion of acute appendicitis.

Abdominal ultrasonography: distended uterus with heterogeneous content.

Fig. 20

References: - TOLEDO/ES
Figure 21. 42-years-old woman with RLQP.

Abdominal ultrasonography: nodular image, localized at the right ovary side, corresponding to right ovary, which is enlarged, with well-defined contours, without vascularization, multiple septa and heterogeneous content.

Fig. 21

References: - TOLEDO/ES
Figure 22: 31-years-old woman with abdominal pain.

Abdominal ultrasonography: A: cystic heteroechoic image in right ovary, with thick walls and intern septa, suggestive of bleeding/complicated cyst; B: cystic heteroechoic image in the left ovary, with thick walls and discontinuity of it, suggestive of hemorrhagic cyst rupture.

Fig. 22
References: - TOLEDO/ES
RIGHT OVARIAN TORSION

Figure 23: 28-years-old woman with refractory RLQP.

Abdominal ultrasonography: A: enlarged ovary; B: “sign of necklace of pearls”; C: intraabdominal fluid.

Fig. 23
References: - TOLEDO/ES
SEROUS CYSTADENOCARCINOMA OF THE RIGHT OVARY

Figure 24: 46-years-old woman with abdominal fullness, increased abdominal perimeter and abdominal pain.

A and B abdominal ultrasonography: big cystic mass with echoes and some septa inside, with cystic loculations on its posterior face and a strong pole with heterogeneous echogenicity.

C: Axial-CECT, portal phase: big cystic intraabdominal mass, well-defined, with a thickening wall in the posterior side and a enhanced solid and intralesional component.

Fig. 24
References: - TOLEDO/ES
Figure 25: 53-year-old woman with constitutional syndrome during 15 days, ascites, abdominal pain, especially in RLQ and fever.

CECT, portal phase, A: CT-axial, B: CT-coronal. Oval imagen in right adnexal theoretical situation, predominantly cystic, with fat (green arrow), and liquid content (purple arrow), calcifications (pink arrow) and high density ascites (green asterisc).

Fig. 25

References: - TOLEDO/ES
MATURE CYSTIC TERATOMA OF RIGHT OVARY AND PYOSALPINX

Figure 26: 49-years-old woman with RLQP and suspicion of acute appendicitis.

A and B: abdominal ultrasonography: complex cystic image and thickening of the right tube (pink arrow), with signs of inflammation. Sign of the tip of the iceberg (blue arrow).

C and D: CECT-axial, portal phase: right adnexal mass, well-defined, encapsulated with complex content (fat, liquid and a tooth), with rounded morphology (image D). Increased thickening of the right tube, which can be viewed with increased enhancement and full of dense liquid (pink-arrow: pyosalpinx). Local inflammatory changes (yellow arrow).

Fig. 26
References: - TOLEDO/ES
RIGHT OVARIAN ENDOMETRIOMA

![Fig. 27: 37-years-old woman, with several RLQP.](image)

A: abdominal ultrasonography: cystic images in theoretical location of the right ovary, one of theses with diffuse echoes in declining areas, doing a fluid-debris level (pink arrow).

B: CECT-axial, portal phase: cystic images in theoretical location right ovary.

Fig. 27

References: - TOLEDO/ES
PELVIC INFLAMMATORY DISEASE WITH RIGHT TUBO-OVARIAN ABSCESS

Figure 28: 38-years-old woman, with RLQP, fever, vomiting and leukocytosis.

CECT: A: axial-CT, B: sagittal-CT, portal phase; C: axial-CT late phase. Right tubo-ovarian abscess (pink circle), and right hydronephrosis caused by entrapment of the distal ureter because of the abscess (yellow arrow).

Fig. 28
References: - TOLEDO/ES
RENAL COLIC: Right ureterohydronephrosis with a ureteral stone

Figure 29: Middle-aged woman with right colic pain.
Abdominal ultrasonography: right ureterohydronephrosis, caused by obstructive urolithiasis in proximal ureter.

Fig. 29
References: - TOLEDO/ES
OVARIAN VEIN THROMBOSIS

Figure 30: 30-years-old puerperal woman, with RLCP and fever.
A and B: Abdominal ultrasonography. A: inferior vena cava with echoes inside, compatible with thrombus; B: Doppler ultrasonography, shows the right ovarian vein without Doppler signal (no blood flow), incompressible and with increased diameter, compatible with thrombus inside.
C, D and E: Coronal CECT, late phase. C: left ovarian vein thrombosis; D: right ovarian vein thrombosis; E: inferior vena cava thrombosis (yellow arrows).

Fig. 30
References: - TOLEDO/ES
Figure 31: Middle-aged woman with right colic pain.

Abdominal ultrasonography: hypoechoic nodular image, complex cystic appearance, in subcutaneous tissue of the right inguinal region, with marked doppler signal inside, (image C), with Valsalva maneuver.

Fig. 31

References: - TOLEDO/ES
Conclusion

There is a wide differential diagnosis in the acute pathology of the right lower quadrant in women, so it's crucial to know the complex anatomy and take into account the age of the patient to get a correct diagnosis. We will use the ultrasonography and the CT, because they are effective and rapid diagnostic techniques, which can give us a good characterization of the acute pathology in this localization.
Personal information

References

