PICTORIAL REVIEW / Gastrointestinal imaging

Digestive diseases mimicking primary gynecological diseases or with secondary gynecological manifestations

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Abstract A wide range of gastrointestinal diseases may spread to and involve genital organs by different pathways. These pathways result in extension of the pathological process into the extraperitoneal spaces and between the extra- and intraperitoneal spaces. These communications occur either via mesenteries and ligaments or via the posterior parietal peritoneum. Thus, infectious, inflammatory or tumoral digestive diseases can extend into the pelvic organs and present with a misleading clinical picture and/or radiological features, showing the complexity of pelvic diseases in women. This article reviews, illustrates and discusses these different presentations and provides certain clues to help reach a definite diagnosis.

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The origin of most pelvic lesions in women is the genital organs. However, these lesions may also originate from other anatomical entities, in particular, the gastrointestinal tract, which should systematically be investigated in these cases.

Indeed, gastrointestinal tumors or diseases may present as primary gynaecological diseases because of their location or extension to genital organs, their proximity, or via numerous pathways of communication.

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The clinicoradiological picture of gastrointestinal diseases may be misleading: pelvic pain and fever, with or without a mass, a pelvic mass without fever, pelvic ascites, or even vaginal discharge in the case of fistulas. Imaging plays an important role in determining the etiology of these cases. The aim of this article was to discuss and illustrate diseases which should be considered in the presence of the most frequent radioclinical pictures: appendicular abscess, diverticulitis of the rectosigmoid with abscess, or an episode of Crohn’s disease should be considered in the presence of pelvic pain and fever, while appendiceal mucocele, GIST or an ovarian tumor may be considered for a non-febrile pelvic mass and pseudomyxoma peritonei or peritoneal tuberculosis in the presence of low volume pelvic ascites and finally rectosigmoid carcinoma, anal canal carcinoma, fistulized diverticulitis or complicated Crohn’s disease in the presence of intestinal–genital tract fistula.

**Anatomical update**

The abdominopelvic cavity includes an intraperitoneal, extraperitoneal and subperitoneal space.

The so-called “intraperitoneal” organs are covered by the visceral peritoneum alone. They are therefore outside the peritoneal cavity itself, which is between the visceral and parietal fascias. The peritoneal reflection is the anatomical junction between these two fasciae. It corresponds to the mesenteries, ligaments and omenta, and called the subperitoneal space, which communicate with the intraperitoneal and retroperitoneal spaces [1].

Organs are either intraperitoneal or primarily retroperitoneal (located behind the posterior parietal peritoneum, such as the kidneys, the ureter, the adrenal glands and the blood vessels), or secondarily retroperitoneal, covered with posterior parietal peritoneum on their anterior side, and attached to the posterior wall by fascia (the duodenum and pancreas are attached by Treitz fascia, the ascending and descending colon with the colic flexure are attached by the right and left Toldt fascia). The only organs located in the peritoneal cavity that are not covered with peritoneum are the ovaries.

**Abdominopelvic communications**

There are two main pathways.

**Extraperitoneal communications**

( *retroperitoneal* extraperitoneal pelvis)

The three retroperitoneal spaces meet at the inferior end of the pararenal and lateroconal fascia, which is called the combined interfascial plane [2].

These communicate with the infrarenal space (infracanal region), which extends into the pelvis along the anterolateral walls of the psoas muscle in continuity with the perivesicular retroperitoneal and presacral spaces.

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**Intra-extraperitoneal communications**

These communications are subperitoneal or pass by the posterior parietal peritoneum.

**Communication by subperitoneal pathway**

Extraperitoneal inflammatory processes are spread by a subperitoneal conduit across the mesentery to the wall of the intraperitoneal digestive tract [3].

This may cause thickening of the gastrointestinal tract walls without mucosal lesions, as for example, in the case of secondary injury to the colic flexure in acute pancreatitis.

On the other hand, inflammatory gastrointestinal processes may also extend to the genital organs: an ovarian abscess, for example, can be a complication of diverticulitis of the sigmoid colon.

The proximity of these anatomical structures explains the classic case of right tubo-ovarian involvement in appendicular diseases, and left tubo-ovarian involvement in sigmoid colon or rectal diseases.

The tumoral process is also spread via the mesentery, with initial parietal involvement along the border of the mesentery colon (mesocolon) or the mesentery of the involved digestive tract.

The broad ligaments are also a common pathway from the extraperitoneal pelvic space (uterus, ascending and descending colon or appendix, in particular) to the intraperitoneal space (ovaries) and vice versa. Indeed, the sigmoid mesocolon communicates with the posterior sigmoid colon or the upper rectum and the round ligaments (part of the broad ligament); the base of the caecum and the inferior and lateral part of the root of mesentery communicates with the broad ligament to the right.

**Communication across the posterior parietal peritoneum**

Although the posterior parietal peritoneum is an airtight barrier, defects have been described, which explain the communication between the retroperitoneum and the intraperitoneal space [4].

**Gastrointestinal diseases with gynaecological manifestations**

**Pelvic pain with fever (pelviperitonitis) with or without a pelvic mass**

**Appendicular abscess**

Appendicular abscess, in particular when it is at the pelvic tip or when the appendix is in the pelvic position, can present in the form of a right latero-uterine abscess with thick contrast-enhanced walls surrounded by marked inflammatory infiltrate of adjacent fat. The appendix is difficult to visualize and is often enlarged, with a thick wall [5,6] (Fig. 1). The abscess can be difficult to differentiate from a tubo-ovarian abscess, especially since the clinicobiological presentations are similar.
The presence of extraluminal air, the identification of a normal homolateral ovary, and inflammatory thickening of the caecal wall are further signs suggesting a diagnosis of appendicular abscess (Fig. 2). On the other hand, thickening of the rectosigmoid wall, with serpiginous fluid-filled images, a multiloculated abscess and thickening of the mesosalpinx pushed forward by the mass suggests a diagnosis of tubo-ovarian abscess.

A retrospective series of 48 patients presenting with tubo-ovarian abscess compared to 80 with appendicular abscess (including 24 peri-appendicular) evaluated on CT scan with 12 imaging criteria showed that 92% of these abscesses were correctly diagnosed.

The ovary was only identified in 2% of the patients with tubo-ovarian abscess. Paradoxically the appendix was only identified in 54.2% of the cases of tubo-ovarian abscess while it was visible in 85% of the cases of appendicular abscess [5].

It should also be noted that the previously described pathways of infection could explain why actual cases of tubo-ovarian abscess secondary to acute appendicitis can be found [7].

**Diverticulitis with abscess**

The classic complications of acute diverticulitis of the colon, whether it is of the sigmoid colon or not, include perforated diverticular disease with the development of an abscess and/or communication between the digestive tract and the adjacent organs, and will be seen further on. Adnexal involvement can be difficult to diagnose, especially when the symptoms are not specific.

On CT scan, adnexal extension of diverticulitis of the colon may not be visible because of extensive pelvic inflammation and can be confused with pericolonic abscess. Furthermore, a left lateropelvic diverticular abscess can mimic a primary tubo-ovarian abscess, resulting in unnecessary surgery, classically a unilateral salpingo-oohysterectomy.

All patients with diverticulitis complicated by adnexal involvement present with the typical symptoms of diverticulitis of the colon (parietal thickening and pericolonic fat) [8]. Extra-gastrointestinal gas with increased adnexal volume is found in most patients. On the other hand, only patients with a fistula present with a gas-filled adnexal abscess. In these cases, the presence of an adnexal collection of gas is a highly sensitive and specific sign suggesting a diverticular abscess with fistula [8].
On the other hand, the presence of serpiginous images associated with anterior compression of a thickened meso- alpinx suggests a primary tubo-ovarian abscess.

Crohn’s disease
Crohn’s disease, which may affect the loops of the small bowel in the pelvic basin, can also be the cause of febrile pelvic pain syndromes. The diagnosis is easy to make on CT scan or MRI in the presence of inflammatory thickening [9] of the wall of one or several pelvic loops of the small bowel with obstruction of the mesenteric vessels and possible collections and/or fistula.

Moreover, but rarely, a direct ascending inflammatory extension of the rectocolonic granulomatous inflammatory process to the fallopian tube and the ovary may occur (Fig. 3) [10].

Non-febrile pelvic masses
A careful analysis of signs, even if they are not always specific, can help determine whether the origin of a pelvic mass is ovarian or extra-ovarian by identifying the relationship of the mass with the pelvic structures, in particular, the ovarian parenchyma, the suspensory ligament and the ovarian vein and on the other hand, the effect of the mass on the ureters [11].

An ovarian mass presents as an image surrounded by a stretched and compressed ovarian parenchyma that can be identified thanks to visualization of the follicles.

Thus, if the suspensory ligament is visible, the ovarian mass appears to be in continuity with it as well as with the ovarian vein.

Finally, an ovarian mass usually pushes the ureter back or posterolaterally.

Extra-ovarian masses
Appendiceal mucocele
Appendiceal mucocele is a dilatation of the appendix due to accumulation of mucus (Fig. 4), which is usually found in woman (mean age 55 years) [12].

It is usually discovered incidentally.

The causes of mucocele may be, from less to more severe: non-tumoral obstruction of the appendicular lumen, epithelial villous hyperplasia, mucinous cystadenoma or a mucinous cystadenocarcinoma.

It can present as a palpable mass in the right iliac fossa, non-specific functional gastrointestinal and urinary symptoms or be revealed by a complication: acute intestinal intussusception, torsion, extrinsic compression of a neighbouring organ (hydronephrosis) or even acute appendicitis. It is essential to make the differential diagnosis with a right ovarian cystic lesion to prevent dissemination of the tumor due to spontaneous perioperative rupture.

CT scan shows a fluid collection that may be relatively dense.

Diagnosis is based on identification of caecal communication with the lesion, its cylindrical shape and the presence of thin parietal calcifications. Diagnosis can be difficult when the mucocele is voluminous and dipping into the pelvis.

GIST
A GIST of the small intestine can mimic an ovarian lesion if it is located in the pelvis because of frequent exoluminal development and necrotic-hemorrhagic debris. In rare cases, the debris may be extensive and be mistaken for an ovarian cystic tumor [11]. Identification of the above-mentioned features, in particular, normal ovaries and a pedicle linking the lesion to the organ of origin should help make the diagnosis [13].

Ovarian masses
Ovarian metastases
Ovarian metastases correspond to approximately 6–7% of ovarian tumors.

The three most frequent primary locations of secondary ovarian involvement are the stomach, the colon and the breast.

The pathways of metastatic dissemination vary, and are important to investigate.

Indeed, a voluminous peritoneal carcinomatosis associated with a secondary ovarian lesion without visceral metastases should suggest peritoneal dissemination with implants on the ovarian surface, which could potentially be an indication for radical treatment (disease which is still limited to the peritoneum) by tumor reduction surgery associated with adjuvant chemotherapy.

Krukenberg (Fig. 5) tumors, secondary ovarian tumors described historically in gastric lesions correspond to independent, mucin secreting, signet ring cell metastases. They are associated with primary colon cancer in 65% of the cases [14] and are the main cause of difficulty diagnosing primary from secondary lesions.

Although they are not highly specific, the classic features suggesting secondary lesions in the literature [14] include a bilateral, unilocular tumor, with mainly solid contents, with a cystic component that is proportional to the size of the lesion (in related to necrotic or hemorrhagic debris).

Also, a cystic secondary lesion is often associated with primary colon cancer, or more rarely pancreatic cancer [15].
Digestive diseases with gynecological manifestations

Figure 4. Appendiceal mucocele incidentally discovered in a 48-year-old woman. Contrast-enhanced axial (a) and coronal (b) CT scan show a right cystic latero-uterine mass with thin septations and parietal calcifications (long arrow) next to the bladder. Diagnosis is made due to the close relationship of the mass and the caecum (short arrow).

Figure 5. Ovarian metastases in a 58-year-old woman treated for sigmoid colon mucinous adenocarcinoma. Contrast-enhanced axial CT scan: unilocular bilateral mass with mixed content and enhancing thick wall (arrows).

In a study performed in 110 malignant ovarian tumors including 86 primary tumors and 24 secondary lesions, evaluation of the diagnostic criteria (locularity, thick wall, parietal nodule, septa and solid content) on MRI, ultrasound and CT scan, only showed one criteria with discriminant value, which was multilocularity. This was mainly found in primary tumors and on ultrasound or MRI with 37% of multi-locular primary ovarian cancers compared to 12% metastases on ultrasound and respectively 74% versus 36% on MRI [16].

Pelvic ascites

Pseudomyxoma peritonea

Pseudomyxoma peritonea is a very rare gelatinous disease of the peritoneum associated with gelatinous peritoneal collections and disseminated mucinous peritoneal implants.

It is due to spontaneous perioperative rupture of an appendicular mucocele.

Presentation of this disease on X-ray is identical to a primary ovarian tumor, such as mucinous cystadenocarcinoma with peritoneal carcinosis (Fig. 6), associated peritoneal collections, peritoneal nodules and infiltration of the greater omentum.

Nevertheless, there are several radiological signs suggesting pseudomyxoma peritonea [12]: the specificity of liver involvement ("scalloping"), septations in the peritoneal effusion, the predominance of lesions on the greater omentum and the peritoneum of the diaphragm and finally, especially, a mass of liquid or tissue originating from the appendix.

The best technique to evaluate extension is MRI, with T2-weighted contrast-enhanced images, which are more sensitive for the detection of mucine than CT.

Ascites can also be differentiated from mucine by visualization of septations with enhancement of septations and nodules after contrast injection.

The differential diagnosis with peritoneal carcinosis is absolutely essential because of the difference in management. Indeed, radical surgery is indicated for pseudomyxoma with resection of the entire involved peritoneal surface by loop electrosurgical excision associated with intraperitoneal chemotherapy.

Tuberculosis peritonitis

Tuberculosis peritonitis is the primary location of abdominal tuberculosis and concerns 1—2% of all locations of tuberculosis.

This form, which is hematogenous or secondary to a lymph node rupture, mainly involves the intestines, the peritoneum, the omentum, the liver and the spleen, but also the genital organs (Fig. 7).

Genital involvement includes the ovary with the development of a solid or heterogenous, cystic multiloculated mass, or it may result in pyosalpinx.

The clinical presentation includes non-specific symptoms associated with an abominopelvic mass with ascites and increased CA 125.

Radiological signs are not highly specific: peritoneal effusion, infiltration of the greater omentum and the mesentery, peritoneal thickening and classically, calcification of mesenteric nodules.

Nevertheless, certain symptoms suggest tuberculosis peritonitis [17], such as septations of the collection, the presence of mesenteric macronodules (> 5 mm), regular thickening of the parietal peritoneum (as opposed
Figure 6. Pseudomyxoma due to ruptured appendiceal mucocele (mucinous cystadenoma) in a 64-year-old woman presenting with small bowel obstruction. a: contrast-enhanced axial CT scan: appendicular cystic mass with thin calcifications in the right iliac fossa (arrow); b: contrast-enhanced axial CT scan: pseudomyxoma mimicking peritoneal carcinomatosis with intraperitoneal fluid (long arrow) and fluid in the pouch of Douglas (short arrow) responsible for small bowel obstruction (full arrow).

Figure 7. Peritoneal tuberculosis mimicking a peritoneal carcinosis with right adnexal involvement in a 35-year-old woman. Contrast-enhanced axial CT scan (a): cystic mass of the right ovary (thin arrow), pelvic peritoneal nodules (thick arrows) and peritoneal fat infiltration (full arrow). Contrast-enhanced axial CT scan (b): peritoneal nodules (arrows).

to irregular thickening of the greater omentum during carcinomatosis), splenomegaly with splenic calcifications, ileocaecal involvement associated with retroperitoneal and peripancreatic adenomegaly. Despite these suggestive criteria, the diagnosis is histological. An ultrasound guided biopsy or celioscopy should therefore be performed in case of suspected peritoneal tuberculosis.

Digestive fistula in the urogenital tract

Rectosigmoid carcinoma

Because of the retroperitoneal position of part of the colon, the intraperitoneal position of the sigmoid colon and the anatomical proximity of the pelvic organs, ovarian (Fig. 8) or uterine (Fig. 9) fistula can develop from perforated colorectal cancers.

Anal canal carcinoma

Locoregional extension of anal canal cancers can be the source of vaginal involvement by direct extension (stage T4 on the TNM classification), or by rectovaginal fistula, which may be either spontaneous or secondary to radiotherapy (within two years after treatment).

Figure 8. Sigmoid colonic mucinous cancer with perforation in the peritoneum and in the right ovary in a 56-year-old woman. Pelvic axial MRI with fat-suppressed gadolinium-enhanced T1-weighted image shows circumferential wall thickening of the upper rectum (thick arrow) and sigmoid colon as well as an enhanced right ovarian mass (thin arrow).

Diverticulitis with secondary fistula

Fistula secondary to diverticular sigmoiditis can be colovesicular, colovaginal, colocolonic, colocutaneous or coloadnexal.

Colovaginal fistulas are the most frequent (Fig. 10), and much more frequent than adnexal fistulas (Fig. 11).

These colovaginal fistulas are easy to diagnose both clinically (vaginal discharge of fecal material) and on imaging.
Crohn's disease

Fistula involving the genital tract (the vagina especially but also the uterus, ovaries or vulva) is classic but rare in Crohn's disease.

Ano-rectal-vaginal fistulae (Figs. 12 and 13) are the most frequent, and best evaluated by MRI [18].

The tract of the fistula is seen as a hyperintense signal on T2-weighted images, and fat saturation is recommended to increase sensitivity of detection of the tract (sign of inflammation) or of collections.

After gadolinium injection, the fistula presents as a hypo-intense signal with contrast-enhanced borders. These fistulas are often difficult to identify and thin slices should
be obtained along the axis and perpendicular to the axis of the anal canal.

**Conclusion**

Because of their location, digestive diseases, in particular in the pelvic region, can mimic numerous gynecological diseases.

Moreover, the many routes of communication between the intraperitoneal organs and the subperitoneal pelvis explain the frequency of secondary gynaecological involvement in gastrointestinal lesions.

In the presence of gynaecological involvement, the search for an underlying gastrointestinal disease should first be performed by imaging because of the important implications for appropriate management.

**Disclosure of interest**

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

**References**


