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CASE REPORT

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Illustrative case series of intra-abdominal abscesses - a radiological viewpoint

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Abstract

Intra-abdominal abscesses (IAA) may commonly arise following complicated gastrointestinal tract infections and, on occasion, from infections within the urinary system. Many of these IAA arise as a consequence of post-surgical complications. These abscesses have a substantial risk of morbidity and mortality. It is crucial to diagnose and treat them to minimise these adverse outcomes promptly. Radiological modalities play a vital role in diagnosing, localising, and detecting associated complications of IAA, as sometimes other investigations can be less reliable and non-specific. Radiological techniques such as ultrasound scans (USS), contrast-enhanced computed tomography (CECT), and even magnetic resonance imaging (MRI) are immensely helpful in diagnosing these conditions. These imaging tools guide clinicians in determining the most appropriate patient management strategies. In this article, we compile a case series involving tubo-ovarian abscess, appendicular abscess, diverticular abscess and infected walled-off pancreatic necrosis, delineating characteristic radiological features which aid in their diagnosis.

Keywords: intra-abdominal abscesses, tubo-ovarian abscess, appendicular abscess, diverticular abscess, infected walled-off pancreatic necrosis

Introduction

Abscesses are localised collections of pus buried in a tissue, an organ, or a confined space. They are one of the morphological forms of acute inflammation.(1) Abscesses can occur in any site of the body, including the brain, soft tissues, lungs, and intra-abdominal and pelvic organs.(2) Intra-abdominal abscesses (IAA) are classified as intraperitoneal vs retroperitoneal, spontaneous vs post-operative and primary vs secondary.(3) IAA commonly arise following infections of the gastrointestinal tract and occasionally following infections from the urinary system. Post-surgical IAA account for about 70% of IAA.(4) Intra-abdominal infections are likely to get complicated by spreading beyond the primary organ of infection, forming abscesses. Abscesses commonly occur in patients with comorbidities such as diabetes mellitus, intravenous drug abuse and immunosuppression, including those with HIV infection.(5-8) IAA have a substantial risk of increased morbidity and mortality. Hence, a high index of suspicion, close follow-up and improved methods for early diagnosis are mandatory.(9) In the prompt diagnostic workup, radiological modalities such as ultrasound scans (USS), contrast-enhanced computed tomography (CECT) and magnetic resonance imaging (MRI) are vital.(9) Four such cases of intra-abdominal abscesses are described in this article, paying particular attention to characteristic radiological features in the diagnosis.

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Case 1

A 43-year-old woman presented with pelvic discomfort, fever and reduced appetite persisting for three weeks. She also reported vaginal discharge and pain during intercourse over the preceding two weeks. The physical assessment identified a tender, cystic mass about 6 cm in size in the left adnexa, with notable cervical motion tenderness. Laboratory analysis revealed elevated inflammatory markers, including a c-reactive protein (CRP) of 62 mg/dL. Ultrasound imaging detected a well-defined cystic lesion containing dense material, corroborated by contrast-enhanced computed tomography (CECT) findings (Figures 1a and 1b), which confirmed a unilocular fluid collection adjacent to the uterus. She underwent a laparoscopic hysterectomy with bilateral salpingo-oophorectomy and adhesiolysis, followed by intravenous and oral antibiotics with full recovery.

Case 2

A 35-year-old woman presented with six days of high fever, right lower abdominal pain, nausea and vomiting. Examination revealed fever and right iliac fossa tenderness with guarding. Laboratory findings showed a neutrophil leukocytosis and CRP of 82 mg/dL. Ultrasonography (USG) demonstrated a localised fluid collection, confirmed on CT as an 8.7 cm x 6.4 cm x 6.2 cm thick-walled abscess with gas locules adjacent to the caecum (Figures 2a and 2b). The abscess was drained via an ultrasound-guided pigtail catheter and intravenous antibiotics were given. She recovered fully and was discharged on day six with oral antibiotics. An interval appendicectomy was performed seven months later.

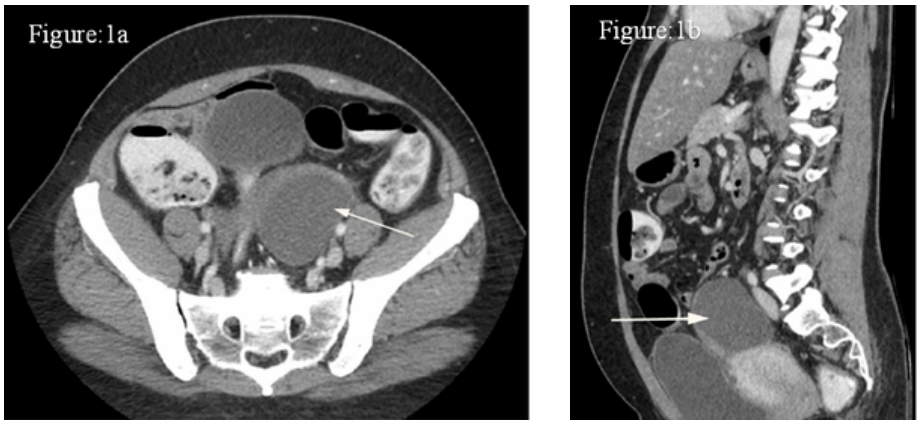

Figure 1a and 1b. Axial and sagittal contrast-enhanced CT scan of the abdomen revealing a left-sided moderate size tubo-ovarian abscess (white arrows) with a small amount of pelvic free fluid.

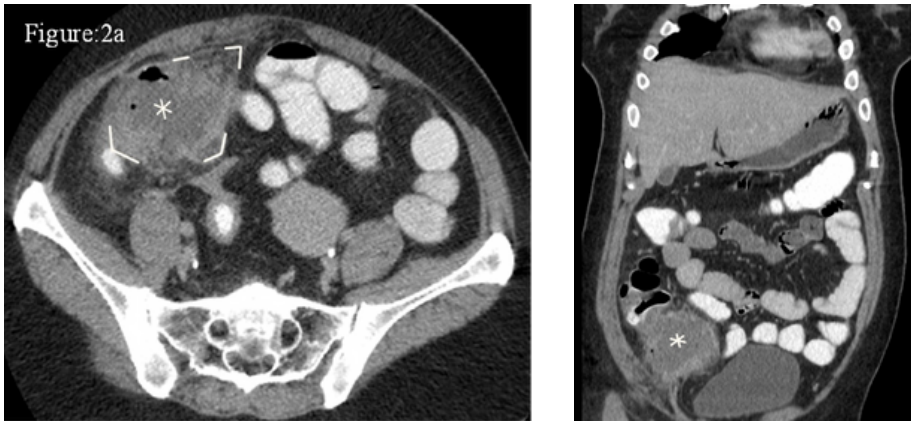

Figure 2a and 2b. Axial and sagittal contrast CT scan of the abdomen demonstrating a moderate-size appendicular abscess (asterisk)

Case 3

A 62-year-old man presented with one week of left lower quadrant pain, low-grade fever and altered bowel habits. Examination revealed localised tenderness without guarding. Laboratory findings showed leukocytosis, mild anaemia and elevated CRP (69.2 mg/dL). Ultrasound revealed a small pelvic fluid collection near the sigmoid colon with inflamed perilesional fat. CECT with rectal contrast confirmed a pericolic abscess (1.0 cm × 1.3 cm × 1.5 cm) and sigmoid wall thickening (Figures 3a and 3b), consistent with diverticulitis (Hinchey classification, stage Ib). He was treated conservatively with intravenous antibiotics and made a full recovery within a week.

Case 4

A 42-year-old man with alcohol abuse and uncontrolled diabetes presented with generalised abdominal pain, high fever and weight loss. He had a history of recurrent pancreatitis. Examination revealed hypotension, abdominal guarding, and tenderness. Laboratory findings showed leukocytosis, thrombocytosis, and mild amylase elevation. USG and CECT showed multiple intercommunicating fluid collections near the pancreatic tail with gas locules and air-fluid levels, consistent with infected walled-off pancreatic necrosis (WOPN) (Figures 4a, 4b). He underwent ultrasound-guided aspiration, saline irrigation, and pigtail drainage, and made a full recovery after an extended stay in the intensive care unit and a surgical ward.

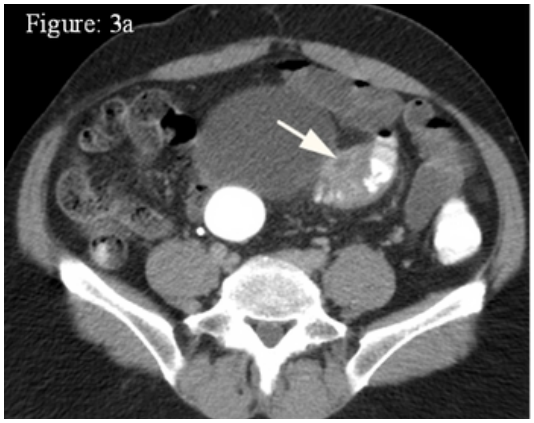

Figure 3a and 3b - Axial and sagittal contrast-enhanced axial CT scans of the abdomen showing a mesosigmoid diverticular abscess (Hinchey classification, stage Ib) (white arrows). The inflammatory mass appears adherent the urinary bladder wall.

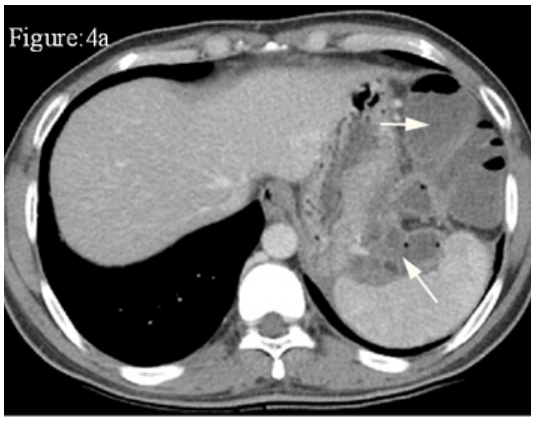

Figure 4a and 4b - Axial and sagittal contrast-enhanced axial CT scans of the abdomen show an ill-defined intercommunicating infected pancreatic pseudocyst at the splenic hilar region (white arrows) extending superiorly and inferiorly

Discussion

IAA are diverse and carry high mortality and morbidity if timely diagnosis and treatment are not instituted.(4,9) However, clinical features and basic blood investigations are nonspecific and imaging plays a pivotal role in their diagnosis.(4,10,11) In addition, image-guided interventions enable microbiological sampling for definitive aetiological diagnosis with a specific ABST pattern directing targeted antibiotic therapy.(12)

Tubo-ovarian abscess:

A tubo-ovarian abscess (TOA) is a complex pelvic inflammatory disease typically seen in premenopausal women, resulting from ascending polymicrobial infection from the upper genital tract.(13,14) It presents as a walled-off inflammatory mass involving the fallopian tube and ovary.(14)

Transvaginal (TVS) or transabdominal ultrasound is the preferred first-line imaging modality due to its availability, non-invasiveness, and high sensitivity (93%) and specificity (98%).(14,15) USG typically shows a complex adnexal cystic mass with thick, irregular walls and coarse internal echoes, often representing pus with cellular debris. The transvaginal examination may better delineate the lesions and exhibit pelvic tenderness over the affected adnexal area.(16)

In uncertain or complex presentations, CECT is valuable, particularly when ultrasound findings are equivocal, or complications are suspected. CECT may reveal unilocular or multilocular cystic lesions with heterogeneous content, thickened walls, and perilesional fat stranding.(17,18) Internal gas locules are rare but reliable indicators for TOA.(19) Identifying a pus-filled fallopian tube with an enhanced thick wall facilitates distinguishing TOA from a neoplastic lesion or endometrioma.

Magnetic Resonance Imaging (MRI) offers superior soft-tissue characterisation and can differentiate TOA from other adnexal masses, such as endometriomas and dermoid cysts. On MRI, TOAs generally appear hypointense on T1-weighted and hyperintense on T2-weighted sequences, with restricted diffusion on DWI and intense wall enhancement with gadolinium.(19)

Laparoscopy remains the gold standard for diagnosis and treatment, especially when image-guided drainage is not feasible. In our case, surgery was preferred due to poor access to percutaneous intervention, and the patient recovered fully postoperatively.

Appendicular abscess:

An appendiceal abscess (AA) is a localised inflammatory collection that typically develops following perforation in acute appendicitis, occurring in 2–6% of cases.(20,21) Diagnosis primarily relies on USG and CECT. Ultrasonography is often the first-line imaging modality, particularly in resource-limited settings, paediatric populations and during pregnancy, with reported sensitivity ranging from 56–94% and specificity from 47–95%.(22) Typical sonographic findings include an ill-defined hypoechoic fluid collection with internal debris, thickened walls and surrounding echogenic fat.(22) Additional findings may include communication between the abscess and the appendiceal lumen, air within the appendiceal wall and decreased or absent tenderness with transducer compression.(23)

CECT offers superior diagnostic accuracy, with a sensitivity of 98–100% and specificity of 91–99%.(24) It clearly defines the abscess as a thick-walled fluid collection in the right iliac fossa, often containing gas locules or appendicoliths.(24) CECT is also superior in evaluating complications such as periappendiceal adhesions, fat stranding, and mass effect on adjacent bowel loops.(25)

For abscesses larger than 4 cm, image-guided percutaneous drainage (e.g., pigtail catheter placement) is preferred over immediate surgical intervention. This approach reduces overall costs and postpones surgery in critically ill patients.(26) It also facilitates delayed, elective interval appendectomy, as illustrated in the case presented.

Diverticular abscesses:

Diverticular abscesses (DA) are localised inflammatory collections that develop adjacent to the colon as a complication of diverticulitis.(27) Clinical examination and laboratory findings are significantly inaccurate in defining many aspects of diverticular disease. Therefore, imaging plays a crucial role in the detection and characterisation of DA.(28)

Historically, barium enema was used in diagnosis, but it has poor sensitivity and specificity compared to modern imaging techniques and is not recommended in acute settings.(28,29) Ultrasonography, being non-invasive, accessible, and

free of radiation, is particularly valuable in younger individuals and premenopausal women. It also assists in image-guided therapeutic procedures and ongoing monitoring.(30) On ultrasound, DA often appears as a fluid-filled cystic structure with internal echogenic debris and scattered air locules, usually positioned near the site of maximal tenderness.(30)

CECT, particularly with rectal contrast, remains the preferred modality for diagnosing diverticulitis and associated abscesses. It offers excellent sensitivity (up to 97%) and near-perfect specificity (approaching 100%).(31) In addition to confirming the diagnosis, CECT allows for disease staging. The modified Hinchey classification, proposed by Kaiser et al. in 2005, categorises disease severity based on CECT findings and serves both prognostic and therapeutic purposes.(32) Building on this, Sartelli et al. introduced a simplified CT-based system in 2015 that considers patient comorbidities and clinical stability to guide treatment.(33)

According to this model, diverticular abscesses under 4 cm can be managed with antibiotics, while image-guided percutaneous drainage is recommended for abscesses more than 4 cm. A surgical approach is proposed for more complicated cases such as those with pneumoperitoneum.(33)

MRI, though less frequently used, can be helpful in specific situations, especially for younger patients or those requiring repeated imaging. It has shown a sensitivity of 94% and specificity of 88% for diagnosing acute diverticulitis, with higher accuracy observed in younger individuals.(34)

Infected walled-off pancreatic necrosis:

The revised Atlanta classification provides a clearer framework for differentiating complications of acute pancreatitis, including acute peripancreatic fluid collections, pancreatic pseudocysts, acute necrotic collections and walled-off pancreatic necrosis (WOPN).(35) Cross-sectional imaging based on this new classification avoids the confusion in terminology used over the last 20 years.(36) Pancreatic pseudocysts (PPC) are defined as localised, enzyme-rich fluid collections encased in a fibrous wall without epithelial lining, typically occurring in 10–20% of patients following acute pancreatitis.(37) Walled-off pancreatic necrosis is an encapsulated pancreatic or peripancreatic collection containing necrotic tissue debris and occurs in 1–9% of patients with acute pancreatitis.(38) While both sterile and infected collections can occur, infection is more frequently associated with necrotic collections.(39) Infected WOPN is linked to a substantial risk in mortality, estimated between 30% and 39%, highlighting the importance of early detection and appropriate intervention.(40) Apart from deteriorating signs of infection, objective assessment of the collection with imaging is vital. An ongoing infection due to gas-forming organisms can be suspected if gas locules or air-fluid levels are seen on CECT. However, the presence of gas-forming organisms can be reliably obtained using fine needle aspiration (FNA) of the collections and cultures of organisms. Imaging features more suggestive of WOPN than PPC include larger lesion size, irregular or thickened walls, fat-density debris, multiple septations and pancreatic tissue irregularities.(41) Necrotic components of the infected collection are better identified on ultrasonography and T2W MRI than on CECT.(41) Ultrasonography and CECT are essential during guided FNA and inserting an image-guided pigtail catheter where indicated.(42)

In the case discussed here, multiple interconnecting collections with dense internal debris and gas were detected. The diagnosis was confirmed through ultrasound-guided FNA, and the patient was successfully treated with active aspiration and passive pigtail catheter drainage.

The presented cases demonstrate the critical role of choosing appropriate imaging techniques tailored to specific clinical situations. Key considerations include disease complexity and resource availability. Table 1 summarises the advantages and common applications of ultrasound, CT and MRI in evaluating different intra-abdominal abscesses.

Conclusion

In conclusion, ultrasonography serves a crucial role as the primary imaging modality in diagnosing a variety of intra-abdominal abscesses. CECT abdomen and MRI better characterise the diagnosis. Imaging-guided interventions in intra-abdominal abscesses play an essential role in managing these patients, which significantly reduces the morbidity and mortality.

Declarations

Author contributions:
SRS -formulated the concept, designed the review, conducted the literature review, and wrote and edited the manuscript. PDA -literature review and contributed to manuscript writing. All authors read and approved the final manuscript.

Table 1. Comparative radiological evaluation of intra-abdominal abscesses, modalities strengths and clinical applications

Features	USS Advantages	CT Advantages	MRI Advantages	Typical Use Case
Tubo-ovarian abscess(TOA)	First-line for adnexal evaluation; 93% sensitivity and 98% specificity; transvaginal USS enhances detection	Better for complex cases (multilocular abscesses, gas locules, fat stranding). Enhanced walls and septations are well visualised.	Superior tissue characterisation. Distinguishes TOA from endometrioma.DWI shows diffusion restriction	Start with USS; CT if inconclusive; MRI for equivocal cases or differentiation from endometrioma
Appendicular Abscess	The initial modality (56–94% sensitivity); identifies fluid collections, and echogenic fat. Low-cost, portable.	Gold standard and 98-100% sensitivity and 91–99% specificity.It shows wall enhancement, gas locules, and appendicoliths.	Limited to pediatric/pregnant patients where radiation avoidance is critical.	USS first in resource-limited settings.CT for confirmation and guided drainage.
Diverticular Abscess	Non-invasive; good in young or premenopausal patients; used in follow-up.Shows pericolic collections with debris	Imaging of choice; sensitivity up to 97%, specificity 100%; allows Hinchey staging; detects distant abscesses, fistulae, or perforation.	Emerging role (94% sensitivity)Useful for characterisation; better in younger patientsor repeated imaging needs.	CT is first-line; USS for follow-up, radiation-sensitive cases, staging or drainage.
Infected Walled-off pancreatic necrosis	Detects internal debris, guides drainage; and identifies septations better than CT.Bedside utility in ICU setup.	Best for confirming gas locules, extent, and differentiating pseudocyst vs necrosis	Best for necrotic tissue characterisation; no radiation; excellent for follow-up	CT for initial diagnosis and interventional planning; MRI for complex or equivocal cases

Declarations

Conflicts of interest:
The authors declare that they have no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics approval:
This radiology review did not require ethical approval as it involved a retrospective analysis and reviewing of existing patient investigations and records, with all patient identifiers carefully removed to ensure anonymity; additionally, all DICOM images were de-identified and are available upon reasonable request, upholding privacy and confidentiality standards.

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References

1. Kumar V, Abbas AK, Aster JC. Robbins Basic Pathology. 10th ed. Kumar V, Abbas AK, Aster JC, editors. Philadelphia, PA: Elsevier - Health Sciences Division; 2021.
2. Zammitt N, Sandilands E. Essentials of Kumar and clark's clinical medicine. 7th ed. London, England: Elsevier Health Sciences; 2021.
3. Schein M. Management of intra-abdominal abscesses. In: Holzheimer RG, Mannick JA, editors. Surgical Treatment: Evidence-Based and Problem-Oriented. Munich: Zuckschwerdt; 2001.
4. Mehta NY, Lotfollahzadeh S, Copelin II EL. Abdominal Abscess. [Updated 2022 Dec 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK519573/
5. Leite NP, Pereira JM, Cunha R, et al. CT evaluation of appendicitis and its complications: imaging techniques and key diagnostic findings. In Presented at the 2004 Dec 6
6. Caraiani C, Yi D, Petresc B, Dietrich C. Indications for abdominal imaging: When and what to choose?. Journal of ultrasonography. 2020 Apr 1;20(80):43-54.
7. Liu J, Zhang L, Pan J, et al. Risk Factors and Molecular Epidemiology of Complicated Intra-Abdominal Infections with Carbapenem-Resistant Enterobacteriaceae: A Multicenter Study in China. J Infect Dis. 2020;221(Suppl 2):S156-S163. doi:10.1093/infdis/jiz574
8. Tartaglia D, Fatucchi LM, Mazzoni A, et al. Risk factors for intra-abdominal abscess following laparoscopic appendectomy for acute appendicitis: a retrospective cohort study on 2076 patients. Updates Surg 72, 1175–1180 (2020). https://doi.org/10.1007/s13304-020-00749-y
9. Hardy MA, Yang C. How to Diagnose and Manage Acute Abdomen and Intra-Abdominal Infections in Low- and Middle-Income Countries. In: Hardy, M.A., Hochman, B.R. (eds) Global Surgery. Springer, Cham (2023).https://doi.org/10.1007/978-3-031-28127-3_27
10. Adhikari S, Blaivas M, Lyon M. Role of bedside transvaginal ultrasonography in the diagnosis of tubo-ovarian abscess in the emergency department. J Emerg Med. 2008 May;34(4):429-33.
11. Bonomo RA, Tamma PD, Abrahamian FM, et al. 2024 Clinical practice guideline update by the Infectious Diseases Society of America on complicated intra-abdominal infections: diagnostic imaging of suspected acute intra-abdominal abscess in adults, children, and pregnant people. Clin Infect Dis. 2024;79(Suppl 3)–S117. doi:10.1093/cid/ciae351.
12. Sirinek KR. Diagnosis and treatment of intra-abdominal abscesses. Surgical infections. 2000 Apr 1;1(1):31-8.
13. Munro K, Gharaibeh A, Nagabushanam S, et al. Diagnosis and management of tubo-ovarian abscesses. The Obstetrician & Gynaecologist. 2018 Jan;20(1):11-9.
14. Chappell CA, Wiesenfeld HC. Pathogenesis, diagnosis, and management of severe pelvic inflammatory disease and tuboovarian abscess. Clinical obstetrics and gynecology. 2012 Dec 1;55(4):893-903.
15. Lambert MJ, Villa M. Gynecologic ultrasound in emergency medicine. Emergency Medicine Clinics. 2004 Aug 1;22(3):683-96.
16. Velcani A, Conklin P, Specht N. Sonographic features of tubo-ovarian abscess mimicking an endometrioma and review of cystic adnexal masses. Journal of Radiology Case Reports. 2010;4(2):9.
17. Krivak TC, Cooksey C, Propst AM. Tubo-ovarian abscess: diagnosis, medical and surgical management. Comprehensive therapy. 2004 Jun;30:93-100.
18. Eo H, Choi HJ, Kim SH, et al. Differentiation of tuboovarian abscess from endometriosis: CT indicators. Journal of the Korean Radiological Society. 2005 Oct 1;53(4):273-7.
19. Foti PV, Tonolini M, Costanzo V, et al. Cross-sectional imaging of acute gynaecologic disorders: CT and MRI findings with differential diagnosis-part II: uterine emergencies and pelvic inflammatory disease. Insights Imaging. 2019 Dec 20;10(1):118.
20. Kobayashi S, Makizumi R, Nakahara K, et al. Appendiceal abscesses reduced in size by drainage of pus from the appendiceal orifice during colonoscopy: A Report of Three Cases. Case Reports in Gastroenterology. 2014 Dec 1;8(3):364-70.
21. Andersson RE, Petzold MG. Nonsurgical treatment of appendiceal abscess or phlegmon: a systematic review and meta-analysis. Annals of surgery. 2007 Nov 1;246(5):741-8.
22. Akingboye AA, Mahmood F, Zaman S, et al. Early versus delayed (interval) appendicectomy for the management of appendicular abscess and phlegmon: a systematic review and meta-analysis. Langenbecks Arch Surg. 2021 Aug;406(5):1341-1351.
23. Abu-Yousef MM. Ultrasonography of the right lower quadrant. Ultrasound Quarterly. 2001 Dec 1;17(4):211-25.
24. Lane MJ, Liu DM, Huynh MD, et al. Suspected acute appendicitis: nonenhanced helical CT in 300 consecutive patients. Radiology. 1999 Nov;213(2):341-6.
25. Hopkins KL, Patrick LE, Ball TI. Imaging findings of perforative appendicitis: a pictorial review. Pediatr Radiol. 2001 Mar;31(3):173-9.
26. Macari M, Balthazar EJ. The acute right lower quadrant: CT evaluation. Radiologic Clinics. 2003 Nov 1;41(6):1117-36.
27. McCafferty MH, Roth L, Jorden J. Current management of diverticulitis. Am Surg. 2008 Nov;74(11):1041-9.
28. Tursi A, Scarpignato C, Strate LL, et al. Colonic diverticular disease. Nat Rev Dis Primers. 2020 Mar 26;6(1):20.
29. Andeweg CS, Wegdam JA, Groenewoud J, et al. Toward an evidence-based step-up approach in diagnosing diverticulitis. Scand J Gastroenterol. 2014 Jul;49(7):775-84
30. Mazzei MA, Cioffi Squitieri N, Guerrini S, et al. Sigmoid diverticulitis: US findings. Critical Ultrasound Journal. 2013 Dec;5(1):1-7.
31. Jacobs DO. Diverticulitis. New England Journal of Medicine. 2007 Nov 15;357(20):2057-66.
32. Kaiser AM, Jiang JK, Lake JP, et al. The management of complicated diverticulitis and the role of computed tomography. Official journal of the American College of Gastroenterology| ACG. 2005 Apr 1;100(4):910-7.
33. Sartelli M, Moore FA, Ansaloni L, et al. A proposal for a CT driven classification of left colon acute diverticulitis. World journal of emergency surgery. 2015 Dec;10(1):1-1.

34. Heverhagen JT, Sitter H, Zielke A, et al. Prospective evaluation of the value of magnetic resonance imaging in suspected acute sigmoid diverticulitis. Diseases of the colon & rectum. 2008 Dec;51:1810-5.
35. Banks PA, Bollen TL, Dervenis C, et al. Acute Pancreatitis Classification Working Group. Classification of acute pancreatitis--2012: revision of the Atlanta classification and definitions by international consensus. Gut. 2013 Jan;62(1):102-11.
36. Memiş A, Parildar M. Interventional radiological treatment in complications of pancreatitis. Eur J Radiol. 2002 Sep;43(3):219-28.
37. Stamatakos M, Stefanaki C, Kontzoglou K, et al. Walled-off pancreatic necrosis. World Journal of Gastroenterology: WJG. 2010 Apr 4;16(14):1707.
38. Foster BR, Jensen KK, Bakis G, et al. Revised Atlanta Classification for Acute Pancreatitis: A Pictorial Essay. Radiographics. 2016 May-Jun;36(3):675-87.
39. Bugiantella W, Rondelli F, Boni M, et al. Necrotizing pancreatitis: A review of the interventions. International journal of surgery. 2016 Apr 1;28:S163-71.
40. Zhao K, Adam SZ, Keswani RN, et al. Acute pancreatitis: revised Atlanta classification and the role of cross-sectional imaging. American Journal of Roentgenology. 2015 Jul;205(1):W32-41.
41. Türkvatan A, Erden A, Türkoğlu MA, et al. Imaging of acute pancreatitis and its complications. Part 2: complications of acute pancreatitis. Diagnostic and Interventional Imaging. 2015 Feb 1;96(2):161-9.
42. Sion MK, Davis KA. Step-up approach for the management of pancreatic necrosis: a review of the literature. Trauma surgery & acute care open. 2019 May 1;4(1):e000308.

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