Surgery 197 (2026) 110383

Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Imaging-guided classification and diagnostic pathways for appendiceal abscesses: Results from the 2025 Italian Society of Research in Surgery/Italian Society of Emergency and Trauma Surgery consensus conference

Roberto Cirocchi, MD, PhD[a], Matteo Matteucci, MD[b,*], Antonia Rizzuto, MD[c], Giovanni Alemanno, MD[d], Massimiliano Allegritti, MD[e], Lana Al-Sabe, MD[f], Gabriele Anania, MD[g], Nikolaos-Achilleas Arkoudis, MD[h], Marco Assenza, MD[i], Paolo Aurello, MD[i], Francesco Barberini, MD[a], Maria Irene Bellini, MD, PhD[i], Alan Biloslavo, MD[j], Carlo Boselli, MD[a], Gioia Brachini, MD, PhD[i], Francesco Brucchi, MD[k], Diletta Cassini, MD[l], Isaac Cheruiyot, MD[m], Bruno Cirillo, MD, PhD[i], Federico Coccolini, MD[n], Mario Corona, MD[o], Piero Covarelli, MD[a], Valerio Cozza, MD[p], Daniele Crocetti, MD[i], Justin Davies, MD, PhD[q], Gunjan Desai, MD[r], Saurabh Dixit, MD[s], Alessandro Gemini, MD[t], Alessio Giordano, MD[d], Akinfemi Akingboye, MD[u,v], Weihua Gong, MD[w], Salvatore Guarino, MD[x], Ahmed H.I. Helmy, MD[y], Sara Lauricella, MD[z], Augusto Lauro, MD, PhD[i], Gianluca Mascianà, MD[aa], Luca Properzi, MD[a], Alessandra Panarese, MD[ab], Mauro Podda, MD[ac], Georgi Popivanov, MD[ad], Paolo Prosperi, MD[d], Camilo Ramírez-Giraldo, MD[ae], Dario Tartaglia, MD[n], Jacopo Tesei, MD[e], Luca Tomassini, MD[af], Samuele Vaccari, MD[ag], Vipul D. Yagnik, MD[ah], Xiaonan Xiang, MD[ai], Michelangelo Miccini, MD[i], Vito Cantisani, MD[o], Diego Mariani, MD[aj], Mauro Zago, MD[ak], Giulio Illuminati, MD[i], Giuseppe Nigri, MD[i], Paolo Sapienza, MD, PhD[i], Andrea Mingoli, MD, PhD[i], Paolo Bruzzone, MD, PhD[i], Vito D'Andrea, MD, PhD[i], Antonio Pesce, MD, PhD[al]

[a] *Department of Medicine and Surgery, University of Perugia, Perugia, Italy*
[b] *Department of Medicine and General Surgery, University of Milan, Milan, Italy*
[c] *Department of Medical and Surgical Sciences, Magna Graecia University of Catanzaro, Catanzaro, Italy*
[d] *Emergency Surgery Unit, Careggi University Hospital, Florence, Italy*
[e] *Interventional Radiology Unit, Santa Maria Hospital, Terni, Italy*
[f] *Department of General Surgery, School of Medicine, The University of Jordan, Amman, Jordan*
[g] *Department of Medical Science, University of Ferrara, Ferrara, Italy*
[h] *Research Unit of Radiology and Medical Imaging, National and Kapodistrian University of Athens, Athens, Greece*
[i] *Department of Surgery, Policlinico Umberto I, Sapienza University of Rome, Rome, Italy*
[j] *Emergency Surgery Section, Cattinara University Hospital, Trieste, Italy*
[k] *Division of General Surgery, IRCCS IstitutoAuxologico Italiano, Milan, Italy*
[l] *Unit of General Surgery, Sesto San Giovanni Hospital, ASST Nord Milano, Sesto San Giovanni, Italy*
[m] *Faculty of Health Sciences, University of Nairobi, Nairobi, Kenya*
[n] *General and Emergency Surgery, University Hospital of Pisa, Pisa, Italy*
[o] *Department of Radiology, Policlinico Umberto I, Sapienza University of Rome, Rome, Italy*
[p] *Emergency Surgery and Trauma Unit, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy*
[q] *Cambridge Colorectal Unit, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom*
[r] *Department of General Surgery, Lilavati Hospital and Research Centre, Mumbai, Maharashtra, India*
[s] *Highland Care Multispeciality Hospital, New Delhi, India*
[t] *Department of Digestive and Emergency Surgery, Santa Maria Hospital, Terni, Italy*
[u] *The Dudley Group NHS Foundation Trust, Dudley, United Kingdom*

* Corresponding author: Matteo Matteucci, Department of General Surgery, University of Milan, Via Festa del Perdono, 7, 20122, Milan, Italy.
E-mail address: matteo.matteucci@unimi.it

https://doi.org/10.1016/j.surg.2026.110383
0039-6060/© 2026 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

[v] College of Health and Life Science, Aston University Birmingham, Birmingham, United Kingdom
[w] Department of Surgery, Second Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China
[x] Department of General Surgery, IRCCS MultiMedica, Sesto San Giovanni, Italy
[y] Department of General Surgery, School of Medicine, New Giza University, Giza, Egypt
[z] Department of Surgery, Fondazione IRCCS Istituto Nazionale dei Tumori, Milan, Italy
[aa] Colorectal Surgery Clinical and Research Unit, Surgery Center, Fondazione Policlinico Universitario Campus Bio-Medico, Campus Bio-Medico University of Rome, Rome, Italy
[ab] Department of Biotechnological and Applied Clinical Sciences, University of L'Aquila, L'Aquila, Italy
[ac] Department of Surgical Sciences, University of Cagliari, Cagliari, Italy
[ad] Military Medical Academy, Department of Surgery, Sofia, Bulgaria
[ae] Hospital Universitario Mayor–Méderi, Bogotá, Colombia
[af] School of Advanced Studies, University of Camerino, Camerino, Italy
[ag] Emergency Surgery Unit, Department of General Surgery, Bentivoglio Hospital, AUSL Bologna, Bentivoglio, Italy
[ah] Department of Surgery, Banas Medical College and Research Institute, Palanpur, Gujarat, India
[ai] Department of Colorectal Surgery, Sir Run Run Shaw Hospital, Zhejiang University School of Medicine, Hangzhou, China
[aj] Department of General Surgery, Legnano Hospital, Legnano, Italy
[ak] Department of General Surgery, A. Manzoni Hospital, Lecco, Italy
[al] Department of Surgery, Ferrara, Italy

ARTICLE INFO

Article history:
Accepted 29 May 2026
Available online 6 June 2026

ABSTRACT

Background: Imaging plays a pivotal role in the diagnosis and stratification of appendiceal abscess, a distinct phenotype of complicated appendicitis. Persistent heterogeneity in anatomic terminology, radiological grading, and diagnostic pathways continues to hinder reproducibility, clinical decision-making, and cross-study comparability. A standardized, imaging-centered framework integrating reproducible anatomic descriptors, validated severity grading, and evidence-based imaging strategies is therefore urgently needed.

Methods: Under the auspices of the Italian Society of Research in Surgery and the Italian Society of Emergency and Trauma Surgery, a multidisciplinary expert panel conducted a 4-round modified Delphi process, culminating in an in-person consensus conference held in Rome on November 6, 2025. Statements were iteratively refined through anonymous voting, achieving predefined thresholds for consensus (≥80%) and strong consensus (≥95%).

Results: The panel endorsed (1) mandatory anatomotopographic classification of appendiceal abscess (pelvic, mesenteric, retrocecal/retrocolic, and anterior with abdominal wall involvement); (2) adoption of the Jeffrey radiological grading system (grades 1–3: phlegmon/small abscess ≤3 cm; well-circumscribed abscess >3 cm; and extensive/poorly defined with multicompartment extension); and (3) structured imaging recommendations. These include contrast-enhanced computed tomography as the reference modality in adults, with selective use in suspected malignancy, particularly in patients >50–55 years, ultrasound-first/magnetic resonance imaging–second pathways during pregnancy, and symptom-driven follow-up after conservative management.

Conclusion: This consensus establishes a unified and imaging-guided diagnostic framework that harmonizes anatomotopographic localization with reproducible radiological stratification and pathway-oriented recommendations. Standardized definitions and structured reporting are expected to reduce practice variability, enhance interpretative consistency, and enable reliable cross-institutional and cross-study comparisons. These statements complement, rather than replace, clinical judgment and are aligned with recent international updates, including the 2025 World Society of Emergency Surgery Jerusalem Guidelines. Prospective multicenter validation is warranted to assess their impact on clinical outcomes, drainage success, recurrence prediction, and the prognostic performance of the integrated anatomotopographic-Jeffrey approach.

© 2026 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Introduction

Appendiceal abscess represents a distinct clinical phenotype of complicated appendicitis, typically resulting from a contained perforation with localized suppuration. Daily diagnostic and therapeutic decision-making relies predominantly on imaging-based recognition and stratification, which translate underlying pathologic processes into reproducible radiological patterns.[1,2]

Cross-sectional imaging, primarily contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI), enables precise characterization of abscess morphology, extent, and anatomic relationships, thereby guiding risk stratification and subsequent management. However, substantial variability persists in the use of anatomic descriptors, radiological grading systems, and diagnostic algorithms for appendiceal abscess. This heterogeneity also complicates differentiation between appendiceal abscess and related inflammatory entities such as periappendiceal phlegmon, with direct implications for clinical decision-making, including the choice between nonoperative management with percutaneous drainage and surgical intervention.[1–3] Foundational radiological studies have long highlighted the interpretive complexity of inflammatory changes and the potential overlap between phlegmon, abscess, and mimicking conditions.[4,5] More recent evidence confirms that specific imaging features, such as abscess diameter >3–5 cm, poorly defined margins, extraluminal appendicolith, and retroperitoneal or multicompartment extension, are strong predictors of conservative treatment failure, need for repeated percutaneous drainage, or progression to surgical intervention.[1,2,6] These findings underscore the urgent need for a standardized, imaging-centered classification and diagnostic framework.

Ultrasound (US) remains an essential component of radiation-sparing diagnostic pathways and serves as the first-line modality

in pregnancy; however, its performance is inherently operator dependent and frequently limited by bowel gas or patient habitus. On the other hand, contrast-enhanced CT provides superior diagnostic accuracy in most adults, allowing comprehensive evaluation of inflammatory complications and reliable differentiation from alternative right-lower-quadrant pathologies.[2] MRI acts as a valuable second-line modality, particularly during pregnancy or when US findings are inconclusive, offering excellent soft-tissue contrast without ionizing radiation. Together, these modalities constitute the cornerstone of contemporary imaging pathways for suspected appendiceal abscess and its complications, in alignment with recent international recommendations.[2]

This consensus proposes an imaging-guided approach to the classification and diagnostic evaluation of appendiceal abscesses. The framework integrates anatomotopographic localization, validated radiological severity grading, and evidence-informed imaging strategies within a unified diagnostic continuum. Its primary objective is to promote consistent interpretation, enhance multidisciplinary communication, and enable reliable patient stratification in both clinical practice and research settings.

Methods

This work forms part of a multicenter consensus initiative promoted by the Italian Society of Research in Surgery (SIRC) and the Italian Society of Emergency and Trauma Surgery (SICUT). A structured, modified Delphi methodology was employed to develop evidence-informed statements on imaging-based classification and diagnostic pathways for appendiceal abscess, building on established approaches in surgical consensus development.[2,7]

The process consisted of 4 rounds: 3 remote rounds conducted via anonymous electronic voting, designed to ensure independent judgment and minimize group influence, followed by a final in-person consensus conference held in Rome on November 6, 2025. During the face-to-face meeting, statements that had not achieved predefined agreement thresholds were openly discussed, refined based on expert input, and subjected to final anonymous voting.

Agreement thresholds were established a priori: statements with $\geq$80% agreement were accepted as consensus, whereas those with $\geq$95% agreement were classified as strong consensus. Given the primarily diagnostic focus of this initiative and the limited availability of high-level comparative evidence (eg, randomized trials specific to imaging-based stratification of appendiceal abscess), individual statements were not formally graded using evidence hierarchies, such as Grading of Recommendations Assessment, Development and Evaluation or Quality Assessment of Diagnostic Accuracy Studies-2. Instead, recommendations were derived from expert synthesis of the available literature and assessment of clinical applicability.[2]

Expert panel

The multidisciplinary expert panel comprised 60 individuals, including specialists in emergency surgery ($n = 25$), general surgery ($n = 25$), abdominal radiology ($n = 5$), pathology ($n = 4$), infectious diseases ($n = 1$), and clinical research methodology ($n = 20$). Panelists were selected based on demonstrated clinical expertise, peer-recognized scientific contributions in the field of complicated appendicitis, and active involvement in multidisciplinary diagnostic and management pathways. Radiologists with subspecialty expertise in CT and MRI for acute abdominal conditions participated in all phases of the process, ensuring that imaging-based recommendations remained clinically relevant, technically reproducible, and aligned with contemporary best practices.

Development of consensus statements

A dedicated working group of 14 individuals coordinated the formulation and drafting of the statements, drawing on a focused narrative review of the literature on imaging-based classification systems, anatomic and radiological descriptors of appendiceal abscess, and evidence-informed diagnostic strategies. The statements were developed to address key clinically relevant diagnostic questions and underwent iterative refinement throughout the Delphi rounds. Eight statements were drafted and voted on during the initial Delphi round, of which 6 were ultimately discussed at the face-to-face meeting. Quantitative voting outcomes and qualitative expert feedback were integrated at each stage to maximize clarity, internal consistency, and practical applicability. A summary of the final statements is presented in Figure.

Imaging-based and anatomically oriented classification and diagnostic pathways

The imaging-based classification proposed here does not redefine underlying disease entities. Rather, it translates established pathologic concepts into reproducible radiological descriptors that facilitate consistent identification, severity stratification, and effective multidisciplinary communication. Anatomic localization and radiological grading serve as complementary dimensions; when integrated, they form a standardized and clinically meaningful diagnostic framework that bridges pathology, imaging, and management.

Historically, classification systems and imaging strategies for appendiceal abscess have demonstrated substantial heterogeneity. Surgical and radiological literature has proposed multiple anatomic, radiological, size-based, and morphology-based schemes, often shaped by specialty-specific perspectives or institutional practice. Diagnostic pathways have likewise varied in modality selection, timing, interpretation criteria, and follow-up protocols, factors that collectively reduce reproducibility, limit interobserver agreement, and hinder meaningful comparison across studies.[2,7] Cross-sectional imaging provides a powerful means to overcome this variability by converting complex anatomic and inflammatory patterns into objective standardized descriptors. Contrast-enhanced CT remains the reference standard for suspected appendiceal abscess in adults, enabling precise delineation of abscess location, extent, internal complexity (eg, loculation, intralesional gas, appendicolith), and relationships to adjacent viscera. MRI serves as a valuable radiation-free adjunct in specific contexts, such as pregnancy, radiation-sparing pathways, or inconclusive US, thanks to its excellent soft-tissue contrast and multiplanar capabilities. In pediatric populations, low-dose CT protocols are increasingly supported when clinically indicated and when US or MRI proves nondiagnostic, effectively balancing diagnostic performance with radiation minimization.[2,8,9] Building on these principles, the following statements introduce an integrated, imaging-guided framework that links anatomotopographic classification with validated radiological severity grading (Jeffrey classification) and evidence-informed imaging strategies. This unified approach establishes a shared interpretive language for radiologists and clinicians, reduces interobserver variability, and promotes consistent patient stratification in both routine practice and research settings.

	Statements
APPENDICULAR ABSCESS CLASSIFICATION	*Appendiceal abscesses should be classified according to their predominant anatomotopographic location as: pelvic; mesenteric; retrocecal/retrocolic; or anterior with abdominal wall involvement.*
Radiological severity	*Radiological severity should be graded using the Jeffrey classification:* Grade 1: ≤3 cm periappendiceal phlegmon or abscess; Grade 2: >3 cm well-defined, localized abscess; Grade 3: Extensive, poorly defined abscess with pelvic, retroperitoneal, or interloop involvement.
DIAGNOSTIC IMAGING	*Contrast-enhanced CT is recommended in patients with suspected appendiceal abscess when diagnostic uncertainty persists after initial clinical and laboratory evaluation.*
	When imaging findings are atypical or clinical features raise concern for an underlying neoplasm—particularly in patients older than 50–55 years—contrast-enhanced CT is indicated.
Follow-up Imaging After Conservative Treatment	*In patients receiving conservative treatment for appendiceal abscess or phlegmon routine follow-up CT is not recommended.*
	In pregnant patients with suspected appendiceal abscess, ultrasound is recommended as the first-line modality; when ultrasound is nondiagnostic and MRI is available, MRI is recommended as the second-line examination.

Figure. A summary of the final statements.

Results

Statement 1.1—Anatomotopographic classification of appendiceal abscess

Agreement: 100%

Statement: Appendiceal abscesses should be classified according to their predominant anatomotopographic location as pelvic, mesenteric, retrocecal/retrocolic, or anterior with abdominal wall involvement.

The vermiform appendix exhibits considerable positional variability, with pelvic, retrocecal, subcecal, paracecal, and prececal configurations commonly identified in CT-based anatomic studies.[10,11] This variability significantly affects clinical presentation, radiological detectability, and therapeutic planning, underscoring the need for a standardized anatomotopographic framework. Radiological evidence demonstrates that appendiceal inflammation and abscess formation generally propagate along predictable anatomic planes, producing distinct imaging features based on the origin site and direction of inflammatory spread.[2,12]

Certain abscesses, particularly those with retroperitoneal or deep pelvic involvement, may remain clinically occult or underestimated on initial imaging, as reported in cases where retroperitoneal extension was overlooked on early CT examinations.[13] An anatomotopographic classification integrates the compartment of origin with the spatial distribution of infection across peritoneal and retroperitoneal planes. This provides a clinically meaningful depiction of disease progression, aligning imaging findings with symptoms and therapeutic feasibility. Compared with traditional anatomic nomenclature, this approach enhances clarity, reduces terminological inconsistency, and improves reproducibility in radiological reporting and multidisciplinary communication. Based on these principles, 4 primary anatomotopographic subtypes are delineated:

1. *Pelvic abscesses*

These typically arise from a pelvic-positioned appendix and may involve adjacent structures, such as the bladder, distal ureters, uterus, adnexa, or cul-de-sac. They often present with urinary or gynecologic symptoms.[2,11] Their dependent location and proximity to pelvic organs influence drainage route selection and increase the risk of complications, such as fistulization.[14]

2 *Mesenteric abscesses*

These originate within the mesoappendix or contiguous mesenteric fat and are generally confined to a well-defined vascular-lymphatic compartment.[12] Although commonly localized, they may become multiloculated when diagnosis or treatment is delayed. Their central position usually allows safe image-guided drainage, although intervening bowel loops may occasionally limit percutaneous access.[1]

3. *Retrocecal/retrocolic abscesses*

Associated with the most common anatomic variant of the appendix,[7] these abscesses may extend posteriorly into the retroperitoneal space, producing atypical or subtle symptoms that delay diagnosis. Retroperitoneal extension is particularly prone to early CT oversight, highlighting the importance of meticulous evaluation of posterior compartments.[13,15]

4. *Anterior abscesses with abdominal wall involvement*

This less common subtype is characterized by anterior extension toward the parietal peritoneum, sometimes with direct abdominal wall inflammation. CT is particularly effective in delineating these collections, assessing their relationships with adjacent structures, and distinguishing them from parietal phlegmon or cellulitis, key considerations for planning drainage and surgical intervention.[14,16]

To enhance reproducibility and support therapeutic decision-making, radiological reports should routinely document the primary anatomotopographic compartment, craniocaudal extent, maximal transverse diameter, skin-surface distance, intervening structures, and relationships with adjacent organs. Given that abscesses are often irregular, specifying whether the measurement should be the single largest dimension in any plane (axial, sagittal, or coronal) would further enhance reproducibility. Incorporating these elements into structured reporting templates promotes consistency, optimizes drainage pathway selection, and anticipates procedural challenges. This standardized classification also facilitates data harmonization in multicenter studies, supports targeted subgroup analyses, and provides a robust foundation for future research exploring associations between abscess location, clinical outcomes, recurrence rates, and prognostic modeling.[1,2]

Statement 1.2—Radiological severity grading

Agreement: 98%

Statement: Radiological severity should be graded using the Jeffrey classification.

The Jeffrey classification delineates 3 progressive disease categories based on CT findings[17]:

- Grade 1: Periappendiceal phlegmon or a well-defined abscess $\leq$3 cm;
- Grade 2: Localized, well-circumscribed abscess >3 cm;
- Grade 3: Extensive and/or poorly defined abscess with pelvic, retroperitoneal, interloop, or distant extension.

This pragmatic and reproducible CT-based framework integrates abscess size, morphological definition, and dissemination patterns to standardize severity assessment.[16,17] Grade 1 typically indicates early or contained inflammation; grade 2 corresponds to a larger but still well-demarcated collection; grade 3 reflects advanced pathology characterized by indistinct margins, multiloculation, or multicompartment extension—features associated with increased technical complexity and a higher likelihood of requiring percutaneous drainage or surgery.[1,2] Grading accuracy is strengthened by systematic reporting of essential radiological descriptors, including wall definition, intralesional gas, internal septations, appendicoliths, surrounding fat stranding, and involvement of adjacent structures. Radiological and clinical studies consistently affirm the prognostic value of such morphology-integrated severity systems:

- Contrast-enhanced CT reliably distinguishes well-circumscribed from poorly defined collections, with the latter predicting greater intervention needs.[4,5]
- Multiloculation and retroperitoneal or deep pelvic extension correlate with higher failure rates of conservative management.[6,18,19]
- Abscess diameter thresholds >3–4 cm align with the Jeffrey stratification and support drainage-oriented strategies.[2,20,21]
- The presence of an appendicolith, particularly in the context of an abscess, increases recurrence risk and the probability of intervention.[1,22]

Collectively, these findings validate the Jeffrey classification as a robust, multidimensional severity scale well suited for structured CT reporting and multidisciplinary decision-making, in alignment with contemporary guidelines for optimizing outcomes in complicated appendicitis.[2]

Statement 2.1—Indication for CT

Agreement: 98%

Statement: Contrast-enhanced CT is recommended in patients with suspected appendiceal abscess when diagnostic uncertainty persists after initial clinical and laboratory evaluation.

Contrast-enhanced CT plays a pivotal role in the diagnostic evaluation of suspected appendiceal abscess, particularly when clinical or imaging findings raise concern for an underlying neoplastic process. The prevalence of appendiceal neoplasms, including mucinous neoplasms, adenocarcinoma, neuroendocrine tumors, and lymphoma, increases with age and is substantially higher in complicated appendicitis, ranging from 9% to 29% in recent series, with rates of 14%–16% specifically in periappendiceal abscess. These tumors may mimic or be obscured by inflammation, necessitating careful radiological assessment. Intravenous contrast enhances visualization of mural enhancement patterns, focal masses, asymmetric wall thickening, irregular borders, and periappendiceal soft-tissue abnormalities, thus improving the sensitivity of CT in detecting malignancy within a complex inflammatory setting.[2,4,16] Additional CT features that raise suspicion for neoplasia include appendiceal dilation >10–15 mm, mural nodularity, focal soft-tissue thickening, disproportionate pericecal fat stranding relative to the abscess cavity, lymphadenopathy, peritoneal enhancement, and the absence of typical inflammatory fat stranding.[20,21,23] Retrospective and prospective data emphasize that these findings justify early contrast-enhanced CT, even when an abscess is already confirmed, since prompt recognition of malignancy directly influences diagnostic sequencing (eg, colonoscopy) and operative planning.[24] Contrast-enhanced CT also refines assessment of regional lymph nodes, peritoneal reflections, and adjacent organs, allowing detection of mucinous ascites, mural calcifications, or mucocele, suggestive of neoplasm. Superior delineation of perivisceral planes enhances diagnostic confidence when distinguishing phlegmonous appendicitis or inflammatory appendiceal mass/phlegmon from infiltrative tumors, reducing the risk of delayed malignancy diagnosis in complex inflammatory presentations.[2,15] In acute settings, intravenous contrast is essential, whereas oral contrast offers negligible benefit and should not delay imaging.

Collectively, current evidence supports broad use of contrast-enhanced CT when imaging findings are atypical, inflammation appears disproportionate to the clinical state, or neoplasm risk is elevated, particularly in patients aged >50–55 years or with specific risk factors. Timely, high-quality CT acquisition improves diagnostic precision, guides appropriate referral for endoscopic or surgical evaluation, and reduces missed appendiceal or cecal malignancies, in accordance with contemporary recommendations advocating heightened vigilance in complicated appendicitis.[2,15]

Statement 2.2—Contrast-enhanced CT in suspected malignancy

Agreement: 98%

Statement: When imaging findings are atypical or clinical features raise concern for an underlying neoplasm—particularly in

patients older than 50–55 years—contrast-enhanced CT is indicated.

In older adults, appendiceal and cecal neoplasms may mimic or coexist with inflammatory processes, making differentiation between complicated appendicitis and occult malignancy a critical diagnostic priority. Contrast-enhanced CT substantially improves visualization of mural thickening, asymmetric wall enhancement, focal soft-tissue masses, periappendiceal fat stranding, lymph node morphology, and other subtle abnormalities, thereby increasing diagnostic confidence in distinguishing inflammatory from neoplastic entities, such as adenocarcinoma, mucinous tumors, or lymphoma. Radiological studies consistently show that intravenous contrast enhances the detection of mural irregularities, enhancement asymmetries, and focal masses often not appreciable on noncontrast imaging.[2,4,16] Specific CT features associated with a higher likelihood of occult malignancy include disproportionate pericecal inflammatory changes, appendiceal dilation >10–15 mm, mural nodularity, soft-tissue thickening extending toward the cecal base, lymphadenopathy, peritoneal enhancement, the absence of typical inflammatory fat stranding, and mucocele-like characteristics.[5,20,25,26] These findings, confirmed across retrospective and prospective studies, justify prompt acquisition of contrast-enhanced CT even when an abscess is already established, as early recognition of malignancy directly influences diagnostic sequencing (eg, colonoscopy) and operative planning.[2,23] Contrast-enhanced CT also improves assessment of regional lymphadenopathy, peritoneal reflections, serosal surfaces, and possible mucinous implants or ascites—elements frequently obscured by adjacent inflammatory changes. This is particularly relevant in patients >50–55 years, in whom the incidence of appendiceal malignancy increases significantly and contemporary guidelines advocate heightened vigilance, especially in complicated appendicitis with periappendiceal abscess (neoplasm rates, 14%–16%).[2,23–25] Comprehensive evaluation of appendiceal and cecal wall morphology, focal thickening, nodal abnormalities, and proximal colon involvement supports appropriate triage to further endoscopic or surgical assessment. Early and selective optimization of imaging strategy ensures timely detection of malignancy while minimizing unnecessary contrast exposure in low-suspicion cases. This targeted, proactive approach reduces the risk of missed appendiceal or cecal cancer and enhances overall diagnostic accuracy in older adults with suspected appendiceal abscess, consistent with evidence-based recommendations that emphasize age-stratified imaging and follow-up in complicated presentations.[2,15,27]

Statement 2.3—Follow-up imaging after conservative treatment

Agreement: 98%

Statement: In patients receiving conservative treatment for appendiceal abscess or phlegmon, routine follow-up CT is not recommended.

Routine CT imaging after successful conservative management of appendiceal abscess or phlegmon is generally unnecessary. Clinical recovery, defined by resolution of symptoms and normalization of inflammatory markers (eg, C-reactive protein, white blood cell count), serves as a reliable indicator of therapeutic success. By contrast, persistent radiological abnormalities, such as residual inflammatory thickening or small collections, frequently remain visible for weeks or even months and do not correlate with treatment failure or recurrence.[2,4,16] Such findings may raise unwarranted concern, prompt unnecessary interventions, and expose patients to avoidable ionizing radiation, particularly in younger or radiation-sensitive individuals.[6] A selective, symptom-driven approach to follow-up imaging is therefore advocated. Reimaging should be considered only for persistent or recurrent abdominal pain, fever, atypical clinical progression, or suspected complications, such as enlarging collections, fistulization, or intra-abdominal sepsis—contexts associated with higher recurrence rates (10%–20% in nonoperative series).[1,2] When imaging is warranted, US is a suitable first-line modality, particularly for superficial or pelvic collections, because of its safety, accessibility, and lack of radiation. However, its diagnostic accuracy may be limited by bowel gas, patient habitus, or operator dependency. MRI offers superior soft-tissue contrast and is preferred when US is inconclusive or when minimizing radiation exposure is essential, such as in adolescents, younger adults, pregnant women, or women of reproductive age.[12,15] CT should be reserved for cases in which diagnostic uncertainty persists after US/MRI or when there is a strong suspicion of treatment failure, recurrent abscess, or alternative pathology requiring urgent intervention.[2,5,18] This selective, clinically guided strategy minimizes cumulative radiation exposure while ensuring timely detection of clinically meaningful complications. It aligns with contemporary evidence and guidelines emphasizing clinical parameters, rather than radiological normalization, as the principal criteria of successful nonoperative management, thereby improving patient safety and resource utilization.[2,15]

Statement 2.4—Imaging during pregnancy

Agreement: 98%

Statement: In pregnant patients with suspected appendiceal abscess, US is recommended as the first-line modality; when US is nondiagnostic and MRI is available, MRI is recommended as the second-line examination.

Diagnostic evaluation of suspected appendiceal abscess in pregnancy requires balancing maternal diagnostic needs with fetal safety, favoring modalities that eliminate or minimize ionizing radiation while maintaining high diagnostic accuracy. US is the preferred first-line examination because of its excellent safety profile, broad availability, and lack of radiation exposure. However, its diagnostic performance may be limited by maternal body habitus, bowel gas, or advancing gestational age, which hinders visualization of the appendix and pericecal structures. These constraints are reflected in reported sensitivities as low as 50–70% in pregnancy-specific cohorts.[12,16] When US is nondiagnostic, MRI is the recommended second-line modality. MRI provides superior soft-tissue contrast, multiplanar capability, and high sensitivity (>95%) for detecting inflammatory changes, phlegmonous appendicitis, appendiceal mass/phlegmon, or abscess, without ionizing radiation. Robust evidence supports its use in pregnant patients with suspected appendicitis, including differentiation from gynecologic or pelvic inflammatory mimics.[4,12,28] Gadolinium-based contrast agents should generally be avoided unless the diagnostic benefit clearly outweighs potential fetal risk, in accordance with international guidelines.[15,29] CT should be reserved for exceptional situations, specifically when MRI is unavailable, contraindicated, or nondiagnostic, and when the anticipated diagnostic value justifies fetal radiation exposure (typically estimated at 0.1–3 mGy depending on protocol). Although CT has high sensitivity for appendiceal abscess and its complications, its role in pregnancy is limited by radiation concerns. Low-dose CT protocols may be considered in urgent scenarios when delayed diagnosis poses a significant maternal or fetal risk.[2,5,15,18] This stepwise, evidence-informed imaging pathway, US first, MRI second, and CT only in select high-risk cases, provides a safe and effective strategy for evaluating suspected appendiceal abscess in pregnancy. It minimizes unnecessary fetal radiation exposure

while optimizing maternal diagnostic outcomes, consistent with updated multidisciplinary recommendations.[2,15,29]

Standardization and reporting

Consistent terminology is essential to ensure clarity, reproducibility, and high-quality communication across radiological reports and clinical documentation. All technical terms and abbreviations should be introduced at first mention, defined appropriately, and used consistently throughout the report to avoid ambiguity. Radiological interpretations should explicitly include the anatomotopographic classification, the Jeffrey radiological grade, the overall extent of disease, involvement of adjacent structures, and any imaging features suggestive of neoplasia. Together, these elements constitute the core data set necessary for accurate diagnosis, severity stratification, and effective therapeutic planning. Structured reporting is strongly encouraged, as it enhances interpretive clarity, reduces interobserver variability, and improves the completeness and uniformity of radiological documentation. Standardized templates should consistently incorporate key descriptors, including abscess size, wall definition, loculation, patterns of dissemination, the presence of an appendicolith, and involvement of peritoneal or retroperitoneal compartments, to facilitate reliable comparison across serial examinations, institutions, and clinical studies. Growing evidence demonstrates that structured CT interpretation improves diagnostic accuracy, supports appropriate triage to conservative, interventional, or surgical strategies, and strengthens the integrity and comparability of multicenter research data sets.

Discussion

This consensus delivers a comprehensive, imaging-guided framework for the classification and diagnostic evaluation of appendiceal abscess, directly addressing long-standing variability in anatomic terminology, radiological descriptors, and imaging pathways. Historical radiological assessments of complicated appendicitis have demonstrated considerable inconsistency in distinguishing phlegmon from abscess, characterizing morphology, and describing dissemination patterns, issues that have contributed to heterogeneous interpretation across institutions.[4,5] Foundational CT literature has consistently emphasized the need for a standardized diagnostic lexicon to enhance reproducibility and support multidisciplinary communication. The proposed anatomotopographic classification, encompassing pelvic, mesenteric, retrocecal/retrocolic, and anterior with abdominal wall involvement, represents a significant advancement in aligning radiological interpretation with clinical decision-making and therapeutic feasibility. Appendiceal positional variability, extensively documented in contemporary CT-based anatomic studies ,[11] exerts a profound influence on abscess formation, clinical presentation, and imaging detectability. Inflammatory spread follows predictable anatomic planes,[12] and retroperitoneal or deep pelvic extensions may remain occult on early imaging.[13] By systematically characterizing the compartment of origin and extension trajectory, this framework enhances interpretive consistency, facilitates interdisciplinary dialog, and supports robust multicenter research and outcome stratification. Adoption of the Jeffrey radiological severity grading system (grades 1–3) further strengthens objective stratification. This concise, reproducible scale integrates abscess size, wall definition, and dissemination patterns, features repeatedly associated with conservative management failure, percutaneous drainage requirements, and higher intervention rates in recent studies.[1,18] Contemporary evidence highlights the prognostic relevance of morphological complexity (eg, multiloculation, poorly defined borders, retroperitoneal extension) and appendicolith presence, the latter constituting an independent risk factor for failure of antibiotic-only therapy in periappendiceal abscess, although mitigated by percutaneous drainage.[1,6] These considerations reinforce the importance of including key descriptors, such as appendicolith, loculation, and nodal involvement, within structured reporting. The diagnostic pathway recommendations balance diagnostic accuracy with patient safety and resource optimization. Contrast-enhanced CT remains the reference modality in adults for delineating abscess morphology, complexity, and potential mimickers (eg, right-sided diverticulitis, terminal ileitis, occult neoplasm), consistent with the 2024 Infectious Diseases Society of America (IDSA) update and the 2025 World Society of Emergency Surgery (WSES) Jerusalem Guidelines.[1,15] Selective CT use for suspected malignancy, particularly in patients >50–55 years, is supported by mounting data demonstrating increased neoplasm prevalence (up to 14%–16% in complicated/periappendiceal abscesses managed nonoperatively), commonly associated with appendiceal dilation >10–15 mm, mural irregularity, disproportionate inflammation, or suspicion of mucocele/abscess on imaging.[23,24,26,30] Recent multicenter studies underscore the need for heightened vigilance in older adults, where underlying adenocarcinoma, mucinous neoplasms, or neuroendocrine tumors may mimic or coexist with inflammation, occasionally justifying interval appendectomy in selected subgroups.[1,23,24]

Selective, symptom-driven follow-up imaging is well supported by evidence showing that residual radiological abnormalities frequently persist despite clinical resolution and have limited predictive value for treatment failure after nonoperative management.[4,16] In pregnancy, the stepwise US → MRI → selective CT pathway reflects contemporary priorities of radiation avoidance combined with diagnostic accuracy, consistent with IDSA 2024 and WSES 2025 guidance.[2,12,15] A defining strength of this consensus is its endorsement of standardized and structured reporting, an increasingly critical practice in abdominal radiology. Incorporating anatomotopographic subtype, Jeffrey grade, dissemination patterns, and essential descriptors enhances interpretive precision, reduces interobserver variability, and improves integration into multidisciplinary pathways. This structured approach facilitates reliable patient stratification and cross-institutional comparisons.

Future research priorities include prospective, multicenter validation of the integrated anatomotopographic-Jeffrey framework, evaluation of its correlation with percutaneous drainage success and complications, and refinement of recurrence or failure prediction models combining imaging features (loculation, retroperitoneal extension, and appendicolith burden) with relevant clinical variables.[1,2] Comparative analyses of nonoperative versus interval operative strategies in high-risk groups—such as older patients, those with appendicolith, or cases with imaging-based suspicion of malignancy—and development of long-term oncologic surveillance protocols after conservative management would further inform individualized treatment pathways.[23,24]

In summary, this SIRC/SICUT consensus provides a unified, reproducible, and imaging-centered framework that integrates anatomic localization, validated radiological grading, and evidence-informed diagnostic pathways. By addressing enduring gaps in standardization, it enhances interpretive consistency, supports high-quality multidisciplinary decision-making, and lays a foundation for improved radiological accuracy and research rigor. Broad implementation is expected to reduce practice variability, optimize patient outcomes, and advance evidence generation in this complex and frequent clinical scenario.

In conclusion, this SIRC/SICUT consensus establishes a unified, imaging-guided framework for the classification and diagnostic evaluation of appendiceal abscess, integrating standardized anatomotopographic localization (pelvic, mesenteric, retrocecal/retrocolic, and anterior with abdominal wall involvement), the validated Jeffrey radiological severity grading system (grades 1–3), and evidence-informed imaging pathways. By providing a reproducible and multidisciplinary structure, it promotes consistent radiological interpretation, strengthens communication between radiologists and clinicians, and supports more accurate and timely therapeutic decision-making in this heterogeneous condition. The endorsement of standardized terminology, structured reporting, and selective imaging strategies, contrast-enhanced CT as the reference modality in adults, US-first/MRI-second in pregnancy, and symptom-driven follow-up, addresses long-standing limitations in reproducibility and variability. These recommendations align with, and complement, recent international guidance, including the 2025 WSES Jerusalem Guidelines[2] and the 2024 IDSA update on complicated intra-abdominal infections. These statements are intended to complement, not replace, clinical judgment and institutional protocols. Prospective, multicenter validation is needed to assess their impact on key outcomes, including diagnostic accuracy, nonoperative management success rates, percutaneous drainage efficacy, interval appendectomy requirements, and long-term neoplasm detection in high-risk subgroups, while refining the prognostic usefulness of the combined anatomotopographic-Jeffrey framework. Widespread adoption of this standardized approach is expected to reduce heterogeneity in diagnostic practice, enhance reporting consistency and comparability across institutions, and facilitate more reliable patient stratification and personalized management in both routine clinical care and research settings.

Funding/Support

The authors have indicated that they have no funding regarding the content of this article.

Conflict of Interest/Disclosure

All authors declare to have no conflict of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

Ethical approval

Not applicable, this is a Delphi consensus study.

Consent

Not applicable.

CRediT authorship contribution statement

Roberto Cirocchi: Writing – review & editing, Writing – original draft, Supervision, Investigation, Formal analysis, Data curation, Conceptualization. **Matteo Matteucci:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Antonia Rizzuto:** Writing – review & editing, Resources. **Giovanni Alemanno:** Writing – review & editing, Conceptualization. **Massimiliano Allegritti:** Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Lana Al-Sabe:** Writing – review & editing. **Gabriele Anania:** Writing – original draft. **Nikolaos-Achilleas Arkoudis:** Writing – review & editing. **Marco Assenza:** Writing – review & editing, Writing – original draft. **Paolo Aurello:** Writing – review & editing. **Francesco Barberini:** Writing – review & editing, Data curation. **Maria Irene Bellini:** Writing – original draft. **Alan Biloslavo:** Writing – review & editing. **Carlo Boselli:** Formal analysis, Data curation. **Gioia Brachini:** Writing – review & editing. **Francesco Brucchi:** Writing – review & editing, Writing – original draft. **Diletta Cassini:** Writing – review & editing, Conceptualization. **Isaac Cheruiyot:** Writing – review & editing, Conceptualization. **Bruno Cirillo:** Writing – review & editing. **Federico Coccolini:** Writing – review & editing. **Mario Corona:** Writing – original draft. **Piero Covarelli:** Writing – review & editing, Conceptualization. **Valerio Cozza:** Writing – review & editing. **Daniele Crocetti:** Writing – review & editing. **Justin Davies:** Writing – original draft. **Gunjan Desai:** Writing – review & editing. **Saurabh Dixit:** Writing – review & editing. **Alessandro Gemini:** Writing – review & editing. **Alessio Giordano:** Writing – review & editing. **Akinfemi Akingboye:** Writing – review & editing. **Weihua Gong:** Writing – review & editing. **Salvatore Guarino:** Writing – original draft. **Ahmed H.I. Helmy:** Writing – review & editing. **Sara Lauricella:** Writing – review & editing. **Augusto Lauro:** Writing – review & editing. **Gianluca Mascianà:** Methodology, Investigation. **Luca Properzi:** Writing – review & editing. **Alessandra Panarese:** Writing – review & editing, Writing – original draft. **Mauro Podda:** Writing – review & editing, Writing – original draft. **Georgi Popivanov:** Writing – review & editing. **Paolo Prosperi:** Writing – original draft. **Dario Tartaglia:** Writing – review & editing. **Jacopo Tesei:** Writing – review & editing, Writing – original draft. **Luca Tomassini:** Writing – review & editing. **Samuele Vaccari:** Writing – review & editing. **Vipul D. Yagnik:** Methodology. **Xiaonan Xiang:** Writing – review & editing. **Michelangelo Miccini:** Visualization. **Vito Cantisani:** Writing – review & editing, Writing – review & editing, Conceptualization. **Diego Mariani:** Writing – review & editing, Writing – original draft. **Mauro Zago:** Writing – review & editing. **Giulio Illuminati:** Writing – review & editing. **Giuseppe Nigri:** Writing – review & editing. **Paolo Sapienza:** Writing – review & editing. **Andrea Mingoli:** Writing – review & editing. **Paolo Bruzzone:** Writing – review & editing. **Vito D'Andrea:** Writing – review & editing, Writing – original draft. **Antonio Pesce:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization.

References

1. Min L, Lu J, He H. Clinical significance of appendicoliths in conservative treatment of acute complicated appendicitis patients with peri-appendiceal abscess: a single-center retrospective study. *Ann Med Surg (Lond)*. 2024;86:6440–6446.
2. Podda M, Ceresoli M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2025 edition of the World Society of Emergency Surgery Jerusalem Guidelines. *JAMA Surg*. 2026;161:283–295.
3. Walker C, Moosavi A, Young K, et al. Factors associated with failure of nonoperative management for complicated appendicitis. *Am Surgeon*. 2019;85:865–870.
4. Balthazar EJ, Birnbaum BA, Yee J, Megibow AJ, Roshkow J, Gray C. Acute appendicitis: CT and US correlation in 100 patients. *Radiology*. 1994;190:31–35.
5. Chalazonitis AN, Tzovara I, Sammouti E, et al. CT in appendicitis. *Diagn Interv Radiol*. 2008;14:19–25.
6. Lamm R, Kumar SS, Collings AT, et al. Diagnosis and treatment of appendicitis: systematic review and meta-analysis. *Surg Endosc*. 2023;37:8933–8990.
7. Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem Guidelines. *World J Emerg Surg*. 2020;15:27.

8. Haijanen J, Sippola S, Tammilehto V, et al. Diagnostic accuracy using low-dose versus standard radiation dose CT in suspected acute appendicitis: prospective cohort study. *Br J Surg*. 2021;108:1483–1490.
9. Park JH, Kim HY, Sim JY, Lee KH. Low-dose abdominal CT for evaluating suspected appendicitis: recommendations for CT imaging techniques and practical issues. *Diagnostics*. 2022;12:1585.
10. Patra A, Kaur H, Chhabra U, et al. Reappraisal of the variational anatomy of the vermiform appendix and their possible clinical applicability: a cadaveric analysis. *Folia Morphol (Warsz)*. 2024;83:716–726.
11. Singh AK. Variations in location of vermiform appendix: revisited with CT. *J Clin Diagn Res*. 2024;18:1–4.
12. Fenwick AKC, Hartery A. Appendicitis and beyond: a pictorial review of various appendiceal abnormalities. *Emerg Radiol*. 2021;28:651–664.
13. Khan R, Tulpule S, Regeti K, Hossain MA. Retroperitoneal, abdominal, and pelvic abscess in appendicitis: the limitation of diagnostic modalities. *J Med Cases*. 2015;6:430–432.
14. Hassan M, Babiker Z, Alfatih Hamza M. *Diagnosis and Management of Acute Appendicitis [Internet]*. IntechOpen; 2025.
15. Bonomo RA, Chow AW, Abrahamian FM, et al. 2024 Clinical Practice Guideline update by the infectious diseases Society of America on complicated intra-abdominal infections: risk assessment, diagnostic imaging, and microbiological evaluation in adults, children, and pregnant people. *Clin Infect Dis*. 2024;79(Suppl 3):S81–S87.
16. Pinto Leite N, Pereira JM, Cunha R, Pinto P, Sirlin C. CT evaluation of appendicitis and its complications: imaging techniques and key diagnostic findings. *AJR Am J Roentgenol*. 2005;185:406–417.
17. Jeffrey Jr RB, Laing FC, Townsend RR. Acute appendicitis: sonographic criteria based on 250 cases. *Radiology*. 1988;167:327–329.
18. Horrow MM, White DS, Horrow JC. Differentiation of phlegmon from abscess in right lower quadrant pain. *Emerg Radiol*. 2001;8:86–90.
19. Rhea JT, Rao PM, Novelline RA. Helical CT and complicated appendicitis: predictive value of CT findings. *AJR Am J Roentgenol*. 1997;168:123–127.
20. Birnbaum BA, Wilson SR. Appendicitis at the millennium. *Radiology*. 2000;215:337–348.
21. Lane MJ, Liu DM, Huynh MD, Jeffrey Jr RB, Mindelzun RE, Katz DS. Suspected acute appendicitis: nonenhanced helical CT in 300 consecutive patients. *Radiology*. 1999;213:341–346.
22. Markar SR, Penna M, Harris A. The clinical significance of appendicolith in appendicitis: systematic review and meta-analysis. *Surg Endosc*. 2012;26:1539–1545.
23. Foroutani L, Wang JJ, Kiran S, et al. True incidence of appendiceal neoplasms in patients presenting with complicated appendicitis: a call for a revised management algorithm. *Ann Surg Oncol*. 2026;33:4161–4168.
24. Laudon AD, Beaulieu-Jones BR, Duraiswamy S, et al. Incidental appendiceal neoplasms in a multicenter registry of appendicitis management. *Surgery*. 2026;190:109879.
25. Salminen R, Alajääski J, Rautio T, et al. Appendiceal tumor prevalence in patients with periappendicular abscess. *JAMA Surg*. 2025;160:526–534.
26. Naar L, Kim P, Byerly S, et al. Increased risk of malignancy for patients older than 40 years with appendicitis and an appendix wider than 10 mm on computed tomography scan: a post hoc analysis of an EAST multicenter study. *Surgery*. 2020;168:701–706.
27. Gaertner WB, Brown SR, Deutsch M, et al. The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the management of appendiceal neoplasms. *Dis Colon Rectum*. 2025;68:815–834.
28. Long SS, Long C, Lai H, Macura KJ. Imaging strategies for right lower quadrant pain in pregnancy. *AJR Am J Roentgenol*. 2011;196:4–12.
29. American College of Radiology. ACR–SPR practice parameter for imaging pregnant or potentially pregnant patients with ionizing radiation; 2023. https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Pregnant-Pts.pdf. Accessed May 11, 2025.
30. Rashid R, Khalabazyane B, Kadhmawi I, et al. Appendiceal neoplasm in conservatively managed acute appendicitis: a retrospective observational study. *Cureus*. 2024;16:e70480.