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Acute Appendicitis in Adults: New Diagnostic and Therapeutic Strategies

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Abstract

Acute appendicitis remains one of the leading causes of surgical acute abdomen and one of the most common surgical emergencies in adults. Although laparoscopic appendectomy remains the standard surgical treatment, recent years have seen a significant shift toward more individualized diagnostic and therapeutic strategies. The combined use of clinical scores, biomarkers, and diagnostic imaging can improve risk stratification and reduce negative appendectomies. Computed tomography plays a central role in adults when the initial clinical assessment does not establish the diagnosis, while ultrasound remains a useful tool, particularly when radiation exposure should be avoided. From a therapeutic standpoint, recent evidence supports the possibility of delaying appendectomy for up to 24 hours in selected patients with uncomplicated disease, without a significant increase in adverse outcomes. Antibiotic treatment is also a reasonable alternative for carefully selected patients with uncomplicated appendicitis, provided that adequate imaging assessment and follow-up are available. However, the presence of an appendicolith is associated with a higher likelihood of failure of conservative treatment and complications. In complicated disease, management should be individualized according to perforation, abscess, clinical status, and the feasibility of source control. This review examines the main advances in the contemporary diagnosis and treatment of acute appendicitis in adults.

Keywords: acute appendicitis; appendectomy; computed tomography; ultrasound; antibiotic treatment; laparoscopic surgery

Introduction

Acute appendicitis is one of the most frequent causes of presentation with acute abdominal pain and is a leading indication for emergency surgery. Despite its high frequency, diagnosis can be challenging because of variability in clinical presentation, particularly during the first hours of illness and in patients with atypical features. Likewise, the disease is not a completely homogeneous entity, as it may present as localized uncomplicated inflammation or progress to perforation, abscess, peritonitis, or sepsis.

For decades, the traditional approach relied on clinical identification of the disease followed by early appendectomy. However, the gradual incorporation of clinical scores, more accurate imaging techniques, and nonoperative treatment strategies has changed this paradigm. The 2025 WSES guidelines emphasize that integrating clinical scores and imaging improves diagnostic accuracy and can reduce the rate of negative appendectomies. They also indicate that laparoscopic surgery remains the standard surgical approach, although decision-making may be individualized according to patient and disease characteristics [1].

The aim of this review is to summarize the main recent changes in the diagnosis and treatment of acute appendicitis in adults, with particular emphasis on clinical risk stratification, the role of imaging, laparoscopic surgery, antibiotic treatment, and strategies for complicated disease.

Contemporary diagnostic strategies

The diagnosis of appendicitis remains primarily clinical, but the incorporation of stratification tools makes it possible to classify patients into low-, intermediate-, and high-risk groups. The Alvarado score and, particularly, the Adult Appendicitis Score can complement clinical assessment and help determine which patients require imaging studies [1].

The usefulness of these scores does not necessarily lie in establishing the definitive diagnosis on their own, but rather in improving patient selection for observation, imaging, or surgical assessment. In this regard, current recommendations favor a stepwise approach, avoiding both indiscriminate use of imaging and surgery based solely on a low-probability clinical suspicion.

Abdominal computed tomography (CT) has become one of the most accurate diagnostic tools in adults. Its main advantage is that it can confirm appendiceal inflammation while identifying findings that alter treatment, such as perforation, abscess, free fluid, obstruction, or an appendicolith. CT findings also allow a more precise distinction between complicated and uncomplicated disease [1, 2].

Ultrasound retains an important role because of its availability, lack of radiation, and ability to provide a dynamic assessment. Its performance, however, depends on operator experience, patient anatomy, and local inflammatory features. Therefore, in adults with persistent clinical suspicion and inconclusive ultrasound, CT can provide considerably valuable additional information.

The most important development is not replacing clinical judgment with an imaging test, but integrating clinical probability with imaging findings. This approach can reduce unnecessary interventions while also identifying patients with complicated disease at an early stage.

Laparoscopic appendectomy: the contemporary surgical standard

Laparoscopic appendectomy remains the standard surgical treatment for most adults with appendicitis who require intervention. Compared with open surgery, the laparoscopic approach offers advantages including less postoperative pain, shorter hospital stays, and faster functional recovery, while also allowing adequate exploration of the abdominal cavity [1, 2].

An important change in the concept of surgical urgency has been the recognition that appendectomy does not necessarily have to be performed immediately after diagnosis in every patient. The 2025 WSES guidelines state that, in patients with uncomplicated appendicitis, surgery may be deferred for up to 24 hours when clinical conditions permit, without a significant increase in adverse outcomes [1].

This concept is particularly relevant to the organization of emergency and surgical services, as it allows prioritization of patients at greater risk of perforation, sepsis, or other complications, without assuming that every brief delay necessarily constitutes an immediate surgical emergency.

Furthermore, contemporary recommendations do not routinely support drain placement after appendectomy for complicated appendicitis. The decision should be individualized according to intraoperative findings and the ability to achieve adequate infectious source control. SAGES guidelines also continue to favor surgical management of both uncomplicated and complicated disease, while

acknowledging areas in which the certainty of evidence remains limited [2].

Antibiotic treatment as an alternative for uncomplicated appendicitis

One of the most relevant changes in modern appendicitis management has been the establishment of antibiotic treatment as an alternative to surgery in certain patients with uncomplicated disease.

The CODA trial was one of the most important studies in this process. Among 1,552 adults with imaging-confirmed appendicitis, antibiotic treatment was noninferior to appendectomy with respect to health status measured at 30 days. However, approximately 29% of patients initially treated with antibiotics had undergone appendectomy by 90 days. This percentage was considerably higher among those with an appendicolith [3].

Long-term follow-up confirmed that a proportion of patients initially treated conservatively ultimately require surgery. These results do not invalidate antibiotic treatment, but clearly establish that it should be considered a management strategy and not necessarily a definitive alternative for all patients [4].

The presence of an appendicolith is especially important. In CODA, patients with this condition had higher rates of subsequent appendectomy and complications. Therefore, identification of an appendicolith on CT should be incorporated into the therapeutic discussion and shared decision-making process [3].

Accordingly, antibiotic treatment may be particularly appropriate for adults with uncomplicated appendicitis, without evidence of perforation, abscess, or generalized peritonitis, when adequate imaging assessment, clinical stability, and follow-up are ensured. Careful selection is essential to maintaining the safety of this strategy [3, 5].

Management of complicated appendicitis

Complicated appendicitis includes scenarios such as perforation, peritonitis, abscess, or an appendiceal phlegmon and requires a different therapeutic strategy. In these patients, the primary goal is to achieve adequate infectious source control and prevent progression to sepsis.

When generalized peritonitis or clinical deterioration is present, surgical treatment continues to play a central role. In selected patients with an appendiceal abscess or phlegmon, particularly when their overall condition is stable, nonoperative management with antibiotics and, when indicated, percutaneous drainage may be considered [1, 2].

After adequate source control and favorable clinical progress, the duration of antimicrobial treatment can be considerably reduced compared with the prolonged regimens historically used. Evidence from intra-abdominal infections with adequate source control shows that short courses may be sufficient in selected patients [6].

An increasingly important aspect is follow-up of adults treated nonoperatively for an appendiceal abscess. The 2025 WSES guidelines emphasize the need for follow-up strategies to detect underlying neoplasms, particularly in older patients [1].

Toward individualized management

Recent developments in appendicitis treatment reflect a transition from a uniform model toward one based on risk stratification. In this model, therapeutic decisions depend on a combination of clinical and imaging factors, as well as patient preferences.

The contemporary question is no longer merely whether a patient has appendicitis, but what type of appendicitis they have, what the risk of progression is, and which strategy offers the best balance between efficacy and morbidity.

This approach makes it possible to distinguish patients with uncomplicated, low-risk disease who may be candidates for antibiotic treatment from those with an appendicolith, perforation, abscess, or peritonitis, for whom a different strategy is needed. It also allows

consideration that a stable patient with uncomplicated disease does not necessarily require immediate surgery within the first hour after diagnosis.

Shared decision-making is also becoming more important. Patients should understand that antibiotic treatment may initially avoid surgery but carries a possibility of recurrence or subsequent appendectomy. Conversely, surgery provides definitive treatment of appendiceal disease, although it entails the inherent risks of a surgical procedure.

Future perspectives

Current research seeks to identify which patients may benefit from nonoperative strategies without increasing the risk of complications or recurrence. Integrating artificial intelligence, predictive models, biomarkers, and automated image analysis could improve patient classification and reduce diagnostic uncertainty.

In parallel, the development of minimally invasive techniques and endoscopic strategies could expand therapeutic options in certain scenarios. However, these approaches still require further evidence before replacing established treatments.

The overall trend points toward precision medicine applied to emergency surgery: more accurately identifying who needs immediate surgery, who can safely wait, who can initially be treated with antibiotics, and which patients require close monitoring after nonoperative management [7-10].

Conclusions

Acute appendicitis in adults is undergoing a therapeutic transformation. Although laparoscopic appendectomy remains the standard surgical treatment, contemporary evidence shows that not all patients require the same approach.

Integrating clinical scores with diagnostic imaging improves accuracy and distinguishes complicated from uncomplicated disease. In selected patients with uncomplicated appendicitis, antibiotic treatment is a valid alternative, although the risk of recurrence or subsequent surgery must be clearly explained. The presence of an appendicolith is an important factor in treatment selection.

In complicated disease, adequate infectious source control remains the fundamental principle. Surgery, percutaneous drainage, and antimicrobial treatment should be used according to the clinical presentation and imaging findings.

Ultimately, the future of appendicitis management does not appear to lie in replacing surgery, but in more precise patient selection and progressively individualized treatment based on evidence, disease characteristics, and shared decision-making.

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