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Acute Abdomen: Differential Diagnosis and Surgical Approach - A Brief Review

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ABSTRACT

Acute abdomen is one of the most frequent and challenging medical and surgical emergencies, accounting for up to 10% of emergency-department visits and for substantial morbidity and mortality when diagnosis and intervention are delayed. It is characterised by sudden-onset or progressively worsening abdominal pain, often accompanied by systemic signs such as fever, tachycardia or hypotension, and may evolve to sepsis and shock. The most common aetiologies include inflammatory processes notably appendicitis and cholecystitis, obstructive, perforative and vascular causes. Clinical reasoning must integrate detailed anamnesis, thorough physical examination and complementary tests. Among the latter, Computed Tomography (CT) is the gold standard for clarifying complex situations, whereas ultrasonography remains important for pregnant women, children and populations in whom radiation exposure should be minimised. In the therapeutic setting, the advent of laparoscopic surgery marked a turning point by enabling less operative trauma, fewer complications and faster functional recovery, although laparotomy remains indispensable in diffuse peritonitis or haemodynamic instability. Structured care protocols and a multidisciplinary approach have proved essential to reduce variability in management and optimise resources. The combination of experienced clinical assessment, high-performance diagnostic methods and individualised surgical techniques is therefore central to better outcomes and patient safety.

Keywords:

Acute abdomen, Differential diagnosis, Surgical emergency, Laparoscopy, Artificial intelligence.

Introduction

Acute abdominal pain has been a clinical dilemma since the early days of modern surgery, when Sir Zachary Cope stated in 1921 that “every abdomen demands presence of mind and caution” a warning that remains valid despite twenty-first-century innovations [1]. The complexity of the condition stems from its variable presentations, ranging from localised inflammation to vascular catastrophes, visceral perforations and intestinal obstructions. Given this broad aetiological spectrum, timely management is crucial to reduce morbidity and mortality. Diagnosis begins with a detailed history, exploring onset time, pain characteristics, radiation, relieving or aggravating factors, previous medication use and comorbidities. Observational studies confirm that up to 70% of final diagnoses can be suggested by history alone, underscoring the value of patientcentred assessment [2].

The subsequent physical examination must include systematic inspection, auscultation, percussion and palpation, looking for signs such as abdominal guarding, localised peritonitis or palpable masses, which guide immediate management. The incorporation of imaging has reshaped the diagnostic algorithm. Multidetector CT protocols with oral or intravenous contrast reach an overall sensitivity above 94% for detecting inflammatory or perforative processes [3]. Point-of-care ultrasonography adds speed and mobility and is recommended for haemodynamically unstable patients or for radiation-sensitive groups such as pregnant women and children [4]. Despite higher costs, abdominal MRI is gaining ground in specific situations, such as mesenteric ischaemia and the evaluation of pregnant women.

Therapeutically, laparoscopy has become the standard for appendectomy and cholecystectomy, offering less postoperative pain, reduced surgical-site infection and earlier return to activities [5]. Surgical decisions, however, require an integrated appraisal of haemodynamic status, inflammatory extent and the availability of an experienced team. Conservative approaches, supported by randomised trials, have gained traction for uncomplicated diverticulitis and low-risk appendicitis without increasing mortality, provided rigorous clinical follow-up is ensured [6].

Machine-learning algorithms have recently been trained to interpret CT scans in real time, suggesting diagnoses with accuracy comparable to that of seasoned radiologists [7]. Such

systems may optimise workflows in overloaded services and standardise reports in remote regions, although they still lack large-scale external validation. Demographic variations influence aetiological prevalence. Older adults show a higher incidence of mesenteric ischaemia and gastroduodenal ulcer perforation, whereas younger patients present mainly with appendicitis [8]. Medications such as anticoagulants increase the occurrence of spontaneous haemoperitoneum, demanding heightened suspicion. Understanding the epidemiological context is therefore crucial to steer diagnostic hypotheses and avoid therapeutic delays.

Objectives

To analyse evidence published in the past decade on the differential diagnosis and surgical approach to acute abdomen, highlighting technological advances.

Discussion

Among inflammatory conditions, acute appendicitis remains the paradigm of acute abdomen; 7-8% of the population will experience it at some point. Calculous cholecystitis and diverticulitis add considerable burden to abdominal emergencies, especially after the age of fifty. Recent randomised trials, such as APPAC II, compared laparoscopic appendectomy with antibiotic therapy alone and found less initial pain in the clinical group but a cumulative five-year recurrence of 39%, indicating that surgery remains the definitive therapy [6]. For grade II cholecystitis, the literature recommends early laparoscopic cholecystectomy ideally within 72 h reducing biliary complications and hospital costs [4].

Mechanical small-bowel obstruction is the second-leading cause of acute abdomen. Mortality doubles every six hours of delay in intervention [9]. Plain radiography offers modest sensitivity, whereas low-volume oral contrast CT achieves sensitivity above 95% for localising the transition point and identifying adhesions, internal hernias or neoplasms. Conservative management with nasogastric decompression, hydration and analgesia is acceptable in the absence of ischaemic signs, but refractory pain, rising leukocytosis or intramural gas mandates surgery, now preferably laparoscopic [10].

Machine-learning systems for CT interpretation reach an accuracy of 0.92 in detecting appendicitis and cut report time by 27 min [7]. Resource inequality poses challenges: peripheral hospitals without 24-h CT depend on point-of-care ultrasound; 40-h training programmes increased sensitivity for cholecystitis from 55% to 82% [1]. Tele-medicine projects reduced the time to the first surgical assessment from 180 to 60 min and avoided 28% of transfers [7]. Peri-operative safety culture has gained traction in emergencies: the World Health Organization checklist reduces surgical mortality by 22% and complications by 38% [11]. Emergency ERAS protocols including goal-directed resuscitation, multimodal analgesia and early mobilization shorten length of stay by 1.5 days. Ongoing investment in translational research and protocol updates is mandatory to expand these benefits.

Conclusion

Acute abdomen is a multifaceted entity whose management relies on the integration of clinical acumen and diagnostic technology. Detailed history-taking and systematic examination remain decisive, but their power is amplified when combined with high-definition imaging and artificial-intelligence solutions [7]. Laparoscopy has become the route of choice for intra-abdominal inflammation, whereas laparotomy remains essential in diffuse peritonitis or massive haemorrhage. Robotic surgery is a future possibility as costs fall [5]. Conservative protocols have gained ground for uncomplicated appendicitis and Hinchey I diverticulitis, underscoring the importance of longitudinal follow-up and patient empowerment [6].

Tele-medicine and POCUS training have reduced transfers and costs but require investment in infrastructure and electronic-record standardisation [1]. The WHO surgical checklist and emergency ERAS protocols have proven able to lower mortality and complications; their adoption demands an organisational culture committed to continuous improvement [11]. We conclude that qualified clinical assessment, high-resolution imaging and timely intervention surgical or conservative orm the triad that secures favourable outcomes. Health policies that expand access to these resources, combined with translational research and multiprofessional training, will be decisive for making excellence in acute-abdomen care a global standard. Multicentre databases, in parallel, will enable more robust predictive algorithms and impact evidence.

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