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Differential Diagnosis and Treatment of Medical Acute Abdomen

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Abstract: Acute abdomen is one of the most common emergencies in clinical emergency departments, characterized mainly by acute abdominal pain. It involves multiple disciplines including internal medicine, surgery, obstetrics and gynecology, and pediatrics, with complex etiologies and rapid progression. Misdiagnosis or delayed treatment can easily worsen the condition and even endanger the patient's life. With the development of medical technologies and diagnosis-treatment models such as artificial intelligence and precision medicine, the system for differential diagnosis and treatment of medical acute abdomen has been continuously improved, providing new ideas and methods for clinicians. Based on clinical practice, this paper summarizes the key points of differential diagnosis and standardized treatment of medical acute abdomen, and discusses the development trend of its clinical diagnosis and treatment, so as to provide a reference for clinical practice.

Keywords: Medical acute abdomen; Differential diagnosis; Standardized treatment; Risk stratification; Artificial intelligence

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1. Overview of medical acute abdomen

Medical acute abdomen refers to a clinical syndrome characterized by acute abdominal pain caused by etiologies without surgical indications. Lesions of medical acute abdomen may affect intra-abdominal organs such as the digestive and urinary systems; it can also be secondary to extra-abdominal organ diseases (e.g., chest and heart diseases) or systemic metabolic, immune, or toxic diseases, and some cases are related to neurological dysfunction [1]. Clinical features of medical acute abdomen are as follows:

(1) Onset

Acute or gradual; some patients first present with fever, cough, diarrhea, chest distress, etc., with abdominal pain as a secondary or accompanying symptom.

(2) Symptoms

Relatively mild abdominal pain, vague location, no fixed tenderness point, and rarely typical peritoneal irritation signs.

(3) Signs

Mild abdominal tenderness, no obvious muscular rigidity or rebound tenderness; accompanying symptoms are mostly related to the primary system. For example, abdominal pain caused by cardiovascular diseases is often accompanied by chest distress and profuse sweating; abdominal pain caused by respiratory diseases is often accompanied by cough and expectoration [2].

By etiology, medical acute abdomen is divided into three categories:

(1) Intra-abdominal organ origin

The most common type in clinic, including acute gastroenteritis, mesenteric lymphadenitis, mild acute pancreatitis, acute attack of chronic cholecystitis (non-suppurative), etc. Most of these lesions originate from intra-abdominal organs without surgical indications such as perforation, obstruction or strangulation.

(2) Extra-abdominal organ origin

Lesions outside the abdominal cavity cause abdominal pain through nerve referral or inflammation spread, such as acute myocardial infarction, lower lung pneumonia, pleurisy, acute urinary tract infection, intercostal neuralgia, etc. Some of these diseases (e.g., acute myocardial infarction) present only with upper abdominal pain and are easily misdiagnosed as surgical acute abdomen, which is a key point for clinical differentiation.

(3) Systemic disease origin

Caused by metabolic disorders, poisoning, immune abnormalities, neurological diseases, etc., such as diabetic ketoacidosis, chronic lead poisoning, porphyria, abdominal epilepsy. Such abdominal pain is mostly a local manifestation of systemic diseases, and the pain can be quickly relieved after the primary disease is treated [3]. In addition, neurofunctional diseases such as irritable bowel syndrome can also cause acute abdominal pain without organic lesions, classified as functional medical acute abdomen.

2. Differential diagnosis of medical acute abdomen

2.1. Differentiation from surgical acute abdomen

Medical and surgical acute abdomen have completely different treatment directions. Therefore, the first step in clinical management of acute abdomen is to distinguish between medical and surgical acute abdomen, requiring comprehensive judgment from medical history, incentives, symptoms, signs and other aspects.

From the perspective of medical history and triggers, medical acute abdomen is mostly induced by unclean diet, abdominal cold, overwork, or acute attack of underlying diseases (e.g., diabetic ketoacidosis due to irregular glucose control, myocardial infarction induced by exertion in coronary heart disease patients). Surgical acute abdomen is mostly related to greasy diet, overeating, strenuous activity, or abdominal trauma (e.g., severe pancreatitis caused by overeating, volvulus caused by strenuous exercise) [4].

From the perspective of symptom characteristics, medical acute abdomen usually presents fever before abdominal pain; pain is paroxysmal or persistent dull, vaguely located, relieved with the improvement of the primary disease, without defecation/flatulence cessation or intra-abdominal bleeding. Surgical acute abdomen presents abdominal pain before fever; pain is severe and progressive, clearly located, often with peritoneal irritation, and some show acute manifestations such as gastrointestinal obstruction or shock [5].

From the perspective of the characteristics of physical signs, medical acute abdomen shows mild abdominal tenderness, no muscular rigidity or rebound tenderness; the painful area is tender to pressure, and

abdominal breathing is not restricted. Surgical acute abdomen shows obvious tenderness (usually at the lesion site), marked muscular rigidity and rebound tenderness; the patient refuses palpation, abdominal breathing is weakened or absent, and some patients have abdominal masses.

2.2. Investigation of specific etiologies of medical acute abdomen

After excluding surgical acute abdomen, clinicians should investigate the specific cause of medical acute abdomen according to the patient's age, gender, underlying diseases, symptoms and accompanying manifestations [6].

(1) Children and adolescents

Mostly related to abdominal anaphylactoid purpura, mesenteric lymphadenitis, ascariasis, abdominal epilepsy.

(2) Middle-aged and elderly

Focus on cardiovascular and metabolic diseases such as acute myocardial infarction and diabetic ketoacidosis. Some patients with acute myocardial infarction have no chest pain but only acute upper abdominal pain with nausea and vomiting, which is highly prone to misdiagnosis.

(3) For intra-abdominal medical acute abdomen

Periumbilical pain with diarrhea and vomiting: mostly acute gastroenteritis related to unclean diet. Right lower abdominal pain with upper respiratory symptoms: mostly mesenteric lymphadenitis (common in children). Middle and upper abdominal dull pain with acid reflux and belching: mostly acute attack of chronic gastritis related to irregular diet [7].

(4) For extra-abdominal medical acute abdomen

Upper abdominal pain with chest distress, sweating, and ECG ST-segment changes: acute myocardial infarction. Upper abdominal pain with cough, expectoration, chest pain: lower lung pneumonia or pleurisy. Lower abdominal pain with frequent urination, urgency, dysuria, and elevated urine white blood cells: acute urinary tract infection.

(5) For systemic disease-related acute abdomen

Paroxysmal abdominal pain with elevated blood glucose and positive ketone bodies: diabetic ketoacidosis. Abdominal pain with pale skin and red urine: porphyria, confirmed by urinary porphyrin test [8].

2.3. Application of auxiliary examinations and advanced technologies

Auxiliary examinations are important for the differential diagnosis of medical acute abdomen. Laboratory tests, routine imaging, ECG and other traditional methods remain basic clinical tools.

(1) Laboratory tests

blood routine, urine routine, complete biochemistry, blood amylase, urine amylase, HCG, etc. Blood routine indicates infection; blood amylase is a key marker for pancreatitis; HCG excludes gynecological surgical acute abdomen such as ruptured ectopic pregnancy.

(2) ECG

Routine for elderly patients with upper abdominal pain to rule out acute myocardial infarction.

(3) Imaging

Abdominal ultrasound is the first choice (non-invasive, economical, fast) to show the morphology of

liver, gallbladder, pancreas, spleen, kidney and detect stones, edema, effusion, etc. Chest X-ray excludes pulmonary and pleural lesions.

(4) Diagnostic abdominal paracentesis

assists etiological judgment by the properties of aspirated fluid for patients with a small amount of intra-abdominal effusion or bleeding (bloody fluid suggests internal bleeding; purulent fluid indicates infection).

With the development of medical technology, artificial intelligence, precision imaging, endoscopy and other advanced technologies have been gradually applied. For example, AI-assisted imaging diagnostic systems can intelligently analyze abdominal CT and ultrasound images to identify lesions, suitable for rapid diagnosis in primary hospitals and emergency departments [9]. The development of capsule endoscopy and painless gastrointestinal endoscopy enables non-invasive or minimally invasive examination of digestive tract lesions, observing mucosal inflammation, bleeding, ulcers, etc., and performing minimally invasive treatments such as endoscopic hemostasis and biopsy, realizing the integration of diagnosis and treatment.

3. Standardized treatment of medical acute abdomen

The treatment principles of medical acute abdomen are: save life first, then treat the disease; treat the cause first, then give symptomatic care. Clinical treatment is mainly conservative, including general supportive care, etiological treatment, symptomatic treatment, and attention to the prevention and treatment of complications. Individualized plans are formulated according to the severity of the patient's condition; some patients can receive targeted treatment with minimally invasive or interventional techniques.

3.1. General supportive treatment

General supportive care is the foundation for all cases of medical acute abdomen, aiming to stabilize vital signs, correct water-electrolyte and acid-base imbalance, and create conditions for etiological treatment.

Patients with severe abdominal pain and vomiting should stay in bed; fasting or liquid/semi-liquid diet according to the condition; gastrointestinal decompression if necessary to reduce gastrointestinal burden.

Patients with dehydration or electrolyte imbalance receive intravenous fluid replacement; electrolytes (potassium, sodium, chlorine, etc.) are supplemented according to biochemical results to correct acidosis or alkalosis [10].

Critically ill patients (e.g., acute myocardial infarction, diabetic ketoacidosis, pre-shock state) receive oxygen inhalation, ECG monitoring, and close observation of blood pressure, heart rate, body temperature, oxygen saturation and other vital signs for timely intervention.

3.2. Etiological treatment

Etiological treatment is fundamental for medical acute abdomen. Only by removing the primary cause can abdominal pain be fundamentally relieved and recurrence prevented [11]. For internal acute abdomen with different causes, targeted treatment measures should be taken.

(1) nfectious diseases (acute gastroenteritis, mesenteric lymphadenitis, lower lung pneumonia)

Sensitive antibiotics selected based on sputum/fecal culture and drug sensitivity; empirical broad-spectrum antibiotics are used before results are available.

(2) Cardiovascular diseases (acute myocardial infarction)
Immediate thrombolysis, antiplatelet, lipid-lowering drugs; PCI for eligible patients to rapidly restore myocardial perfusion.
(3) Metabolic diseases (diabetic ketoacidosis)
Fluid replacement and insulin therapy to gradually correct ketosis and electrolyte disorders.
(4) Neurofunctional diseases (irritable bowel syndrome)
Intestinal flora regulation and gastrointestinal motility improvement combined with psychological counseling to relieve anxiety.

3.3. Symptomatic treatment

Symptomatic treatment relieves clinical manifestations and improves comfort, administered only after a clear diagnosis.

(1) Pain management
antispasmodics are preferred to relieve gastrointestinal smooth muscle spasm; they do not mask abdominal signs and are the first choice for medical acute abdomen [12]. For moderate to severe pain unresponsive to antispasmodics, mild NSAIDs or incremental intravenous narcotic analgesics can be used (relieve pain but preserve tenderness, without interfering with judgment).
(2) Vomiting and diarrhea
Antiemetics and antidiarrheals (e.g., montmorillonite powder) to relieve gastrointestinal symptoms.
(3) Peptic diseases with obvious acid reflux
Proton pump inhibitors and gastric mucosa protectants for acid suppression and mucosal protection.

3.4. Prevention and treatment of complications

Without timely or effective control, medical acute abdomen can lead to severe complications such as septic shock, multiple organ failure, massive gastrointestinal bleeding, and severe water-electrolyte imbalance, especially in elderly patients and those with multiple comorbidities. Close monitoring and early intervention are essential [13].

(1) Pre-shock manifestations (hypotension, tachycardia, cold extremities)
Immediate anti-shock treatment with rapid fluid expansion and vasoactive drugs if needed.
(2) Multiple organ failure (acute kidney injury, respiratory failure)
Timely organ support such as CRRT and mechanical ventilation [14].
(3) Continuous observation of symptoms, signs and laboratory changes
To adjust the treatment plan in a timely manner.

4. Development trend of clinical diagnosis and treatment of medical acute abdomen

The integration of artificial intelligence and precision medicine is an important trend. In addition to AI-assisted imaging diagnosis and clinical decision-making, big-data-based AI prognosis systems can predict disease progression. Precision medicine technologies such as genetic testing and metabolomics can precisely locate the causes of systemic disease-related acute abdomen and guide treatment [15].

The expansion of minimally invasive and interventional techniques has enabled diagnosis-treatment

integration for some medical acute abdomen. Besides endoscopic therapy, vascular interventions are used for gastrointestinal bleeding and liver abscess (e.g., selective arterial embolization for massive gastrointestinal bleeding, ultrasound-guided puncture and drainage for liver abscess).

The development of telemedicine allows primary hospitals to complete preliminary differentiation between medical and surgical acute abdomen through remote consultation and expert guidance, avoiding delays due to insufficient local resources.

5. Conclusion

Medical acute abdomen features complex etiologies, atypical symptoms, and easy confusion with surgical acute abdomen. Its differential diagnosis and treatment have always been key and difficult points in the emergency department. Clinical diagnosis and treatment should combine history taking, physical examination and auxiliary examinations, carry out standardized supportive, etiological and symptomatic treatment, and attach importance to the prevention and treatment of complications.

With the continuous development of artificial intelligence, precision medicine, multidisciplinary collaboration, minimally invasive intervention and other technologies and models, the diagnosis and treatment level of medical acute abdomen has been improved. Clinicians need to constantly update medical knowledge, master advanced technologies and concepts, and maintain rigorous clinical thinking to better meet the challenges of medical acute abdomen and provide higher-quality medical services for patients.

Disclosure statement

The author declares no conflict of interest.

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