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REVIEW

Acute Cholecystitis: Integrated Traditional Chinese and Western Medicine Approaches to Epidemiology, Diagnosis, and Treatment

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Abstract: Acute cholecystitis is a common clinical condition with complex pathological mechanisms and significant clinical impact. This review focuses on integrated traditional Chinese and Western medicine approaches to its management. We first summarize theoretical foundations and recent findings in epidemiology and pathophysiology. Diagnostic strategies are then discussed, with emphasis on how modern imaging methods and traditional Chinese medicine diagnostic approaches complement each other to improve accuracy. Clinical practice is reviewed in terms of therapeutic efficacy, combined medication, and surgical options, underscoring the benefits of integrative treatment. Advances such as the development of new traditional Chinese medicine preparations and the adoption of minimally invasive techniques have introduced promising directions, although controversies and challenges remain. Finally, we highlight the need for further research to optimize integrative strategies, establish standardized treatment protocols, and improve patient outcomes. By synthesizing current evidence, this review aims to inform clinical decision-making and guide future research on integrative approaches to acute cholecystitis.

Keywords: acute cholecystitis, gallbladder, traditional Chinese medicine, combination of Chinese and western medicine

Introduction

Acute cholecystitis is an acute inflammatory condition of the gallbladder wall, most commonly caused by gallstone obstruction of the cystic duct or gallbladder neck, though it may also develop without gallstones in patients with specific underlying conditions.[1] The disease has substantial clinical impact due to its high prevalence and potential complications, including acute cholangitis and biliary pancreatitis, which necessitate timely and effective treatment strategies.[1]

Western medicine has established a structured framework for the diagnosis and management of acute cholecystitis, encompassing clinical evaluation, laboratory testing, and imaging for diagnosis, followed by supportive measures such as fasting, intravenous fluid therapy, antimicrobial administration, and timely surgical intervention when indicated.[2] In high-risk surgical patients, percutaneous cholecystostomy (PC) and carefully tailored pharmacological regimens have been incorporated into modern management algorithms.

Alongside these evidence-based Western approaches, traditional Chinese medicine (TCM) has played a complementary role, particularly in patients for whom conservative management is appropriate.[3] TCM emphasizes syndrome differentiation and holistic treatment, employing herbal prescriptions, acupuncture, and other modalities to relieve symptoms, regulate bile flow, and enhance systemic recovery.[4] With its long-standing clinical experience, TCM provides distinctive therapeutic perspectives that may improve patient comfort and long-term outcomes when integrated with conventional therapies.

This manuscript aims to provide a comprehensive overview of the management of acute cholecystitis through the integration of Western medicine and TCM. By examining epidemiological, genetic, and pathophysiological aspects of the disease, the study seeks to highlight the complementary contributions of both medical systems and to propose a more

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inclusive therapeutic framework for optimizing patient outcomes. In preparing this review, articles were systematically identified through searches of PubMed, Web of Science, CNKI, and Wanfang databases, supplemented by manual screening of references, to ensure comprehensive coverage of both Western and TCM perspectives. By synthesizing current evidence, this review aims to inform clinical decision-making and guide future research on integrative approaches to acute cholecystitis. Overall, through comprehensive synthesis of current literature, this review aims to strengthen clinical understanding and guide subsequent investigations into integrative care for acute cholecystitis.

Epidemiological Study of Acute Cholecystitis

Global Epidemic Trend of Acute Cholecystitis

Acute cholecystitis is a common digestive disorder with a rising global incidence that has drawn increasing scholarly attention. Analysis of the US National Hospitalization Sample Database showed that admissions increased from 149,661 in 1997 to 215,995 in 2012, during which average hospital stay decreased from 4.7 to 3.9 days, but costs increased by 195.4% from $14,608 to $43,152.[5] In addition, between 2003 and 2014, rates of subtotal cholecystectomy also increased, with open procedures rising from 0.10% to 0.52% and laparoscopic procedures from 0.12% to 0.28%, while combined laparoscopic and open approaches declined from 10.5% to 7.6%.[6] Globally, the CHOLECOVID study of 9783 patients across 247 hospitals found that the pandemic led to reduced surgical resources and greater reliance on conservative treatment, lowering cholecystectomy rates from 56.2% to 46.2% without affecting 30-day all-cause mortality.[7] Regional prevalence varies widely, influenced by factors such as diet, lifestyle, and medical resources; for instance, areas with high-fat, high-cholesterol diets report higher gallstone prevalence and thus higher acute cholecystitis morbidity.[8] Moreover, access to advanced diagnostic and therapeutic technologies enables earlier intervention, which can shape disease progression, outcomes, and epidemiological patterns.[9]

Incidence and Risk Factors of Acute Cholecystitis in Different Populations

Acute cholecystitis demonstrates variable incidence and risk factors across populations. A retrospective cohort study of 7013 patients undergoing cardiovascular surgery reported a 0.7% incidence, with circulatory arrest and massive intraoperative blood transfusion significantly associated with onset, and affected patients showing higher in-hospital mortality.[10] In elderly patients, particularly following hip fracture surgery, the incidence is about 0.74%, often underestimated despite its potential for severe complications.[11] Age, sex, and comorbidities are important risk factors, with individuals over 65 years, males, and those with obesity, diabetes, or hypertension being particularly vulnerable.[12] Patients with spinal cord injury have a 1.71-fold higher risk compared with non-SCI individuals,[13] and concurrent COVID-19 infection has been identified as an independent risk factor for mortality in those with acute cholecystitis.[14] These findings highlight the importance of understanding population-specific morbidity patterns and associated risk factors to guide prevention and early intervention strategies.

Genetic Basis of Acute Cholecystitis

Identification and Function of Genes Associated with Acute Cholecystitis

Genetic factors play a pivotal role in the susceptibility, onset, and progression of acute cholecystitis, and their investigation provides important insights into the underlying mechanisms of the disease.[15] Genome-wide association studies have identified several relevant genes, among which ABCG8 is notably correlated with acute acalculous cholecystitis.[16] A two-sample Mendelian randomization analysis demonstrated a negative causal relationship between choline metabolites—including total choline, phosphatidylcholine, and sphingomyelin—and the incidence of acalculous cholecystitis. Co-localization analysis further identified the single nucleotide polymorphism (SNP) rs75331444, mapped to the ABCG8 gene, as a factor associated with altered choline metabolism, thereby implicating ABCG8 in the disease's pathogenesis.[16]

Beyond lipid metabolism, genes involved in inflammatory pathways also influence disease susceptibility. Research in acute pancreatitis, a condition often closely linked with cholecystitis, revealed that IL23R rs11209026 and TNF rs1800629 polymorphisms were associated with both occurrence and severity. The presence of the A allele at rs11209026, together with its interaction with TNF variants, appears to increase susceptibility, highlighting a shared inflammatory genetic background

that may also predispose to acute cholecystitis.[17] Similarly, the RIPK2 rs42490-G allele has been associated with severe or fatal pancreatitis, underscoring the impact of inflammatory gene variants on disease severity. These findings suggest that acute cholecystitis morbidity may be strongly influenced by inherited variations in immune regulation, with implications for both susceptibility and prognosis.

Genetic predisposition to gallstone disease, a principal driver of calculous cholecystitis, has also been well documented. Mutations in ABCB4, which encodes a phospholipid transporter in hepatocyte canaliculi, reduce phospholipid secretion into bile and increase the risk of cholesterol gallstone formation, thereby predisposing individuals to cholecystitis. Familial low phospholipid-associated cholelithiasis caused by heterozygous ABCB4 variants illustrates this mechanism and has been reported in autosomal dominant inheritance patterns.[18] Such mutations not only increase the risk of gallstones but also heighten the likelihood of recurrent episodes of acute cholecystitis.

Evidence of genetic contribution also emerges from familial clustering. For example, in one family with primary biliary cholangitis, four sisters were affected by acute cholecystitis while a half-sister remained unaffected, suggesting a maternally inherited predisposition.[19] Similarly, in patients with autosomal dominant polycystic kidney disease (ADPKD), recurrent gallstone formation and cholecystitis have been observed, often in the context of abnormal biliary anatomy, further implicating hereditary factors in disease pathogenesis.[20]

Taken together, these findings indicate that acute cholecystitis is not solely a consequence of environmental and metabolic factors but also reflects underlying genetic susceptibility. Variants in genes regulating lipid transport, bile composition, and inflammatory signaling contribute to both calculous and acalculous forms of the disease. Familial inheritance patterns and comorbid genetic disorders such as ADPKD provide additional evidence of heritable risk. Understanding these genetic contributions is essential not only for elucidating disease mechanisms but also for identifying high-risk populations, enabling targeted prevention, genetic counseling, and the development of individualized therapeutic strategies.

Pathophysiological Mechanisms of Acute Cholecystitis

The pathophysiology of acute cholecystitis is multifactorial, involving inflammatory signaling, cholestasis, alterations in bile composition, and interactions with host susceptibility. Inflammation of the gallbladder wall represents a central event, and numerous molecular pathways have been implicated in this process. For example, infectious agents can trigger strong inflammatory responses through activation of the MyD88 signaling pathway. In experimental models, the VP2 protein of infectious bursal disease virus has been shown to promote MyD88 oligomerization, thereby activating NF-κB signaling and enhancing IL-1β production.[21] In addition, transcriptomic analyses of chronic cholecystitis and gallbladder cancer tissues have revealed progressive increases in the expression of VTN, CYP4F3, and AOX1, suggesting that persistent inflammatory signaling may contribute to malignant transformation.[22] Similarly, infection with Helicobacter pylori CagA protein has been shown to increase gallbladder epithelial permeability, facilitating gallstone formation and perpetuating chronic inflammation.[23] These molecular findings highlight the complex cascade of immune activation and tissue injury underlying disease onset and progression.

Cholestasis represents another important pathogenic driver. Obstruction of bile outflow increases intravesical pressure, damages the gallbladder mucosa, and amplifies the inflammatory response. Gallbladder dilatation, defined as a width ≥ 4 cm or length $\geq$ 10 cm, has been associated with acute cholecystitis with a specificity exceeding 85%, particularly in cases complicated by gallstone incarceration at the gallbladder neck.[24] Beyond mechanical obstruction, biochemical disturbances in bile composition play a critical role. Elevated cholesterol concentrations can impair receptor-mediated gallbladder contraction and reduce motility, while hydrophobic bile salts can directly induce mucosal inflammation. Together, these changes create a synergistic environment that favors gallstone formation and promotes acute cholecystitis.[25]

The integrative perspective of TCM and Western medicine provides additional insight into these mechanisms. While Western medicine emphasizes cholestasis, infection, and inflammatory mediators, TCM describes the condition as an imbalance of liver and gallbladder function associated with damp-heat accumulation. Experimental studies suggest that TCM interventions may regulate inflammatory pathways by modulating immune cells and suppressing damaging enzymes such as PRSS1 and SPINK1, as demonstrated in integrated approaches for acute pancreatitis. These findings imply that similar mechanisms may operate in acute cholecystitis, supporting the rationale for integrative therapeutic strategies.[26]

Despite progress, the pathophysiology of acute cholecystitis remains only partially elucidated. The inflammatory cascade involves multiple signaling networks, but the molecular events that initiate and resolve inflammation are not fully defined.[27] Likewise, while alterations in bile composition and gallbladder dynamics are recognized as key contributors, sensitive methods for detecting these changes at early stages are lacking, and effective interventions to restore bile homeostasis remain under development.[28,29] Furthermore, the interaction of acute cholecystitis with systemic diseases warrants further study. Associations with cardiovascular disease[30] and diabetes mellitus[31] point to broader metabolic and vascular contributions that may influence disease severity and outcomes.

Looking forward, advances in precision medicine are likely to play an important role. Integrating genomic background, bile composition profiling, and inflammatory biomarkers may enable individualized treatment strategies tailored to patient-specific risk factors.[32] Such approaches will not only improve mechanistic understanding but also guide more effective preventive and therapeutic interventions.

Progress in the Diagnosis of Acute Cholecystitis

Diagnosis of Acute Cholecystitis

The diagnosis of acute cholecystitis has evolved from reliance on clinical manifestations to a more comprehensive approach that integrates imaging, biomarkers, and laboratory findings. Historically, bedside evaluation was based on right upper quadrant pain, fever, leukocytosis, and Murphy's sign, but these methods were limited in specificity and prone to diagnostic delays. The development of modern imaging and biomarker techniques has greatly improved diagnostic accuracy and timeliness.

Ultrasonography remains the first-line modality because it is rapid, non-invasive, and widely available.[33] It effectively detects gallstones, gallbladder wall thickening, distension, and pericholecystic changes. A prospective study demonstrated that the combined presence of gallbladder distension, wall abnormalities, and increased hepatic artery peak systolic velocity predicted acute cholecystitis with a probability of 96%, underscoring the value of ultrasound in preoperative assessment.[34] However, its accuracy may vary depending on operator expertise and patient body habitus, necessitating complementary imaging in atypical or complex cases.

Computed tomography (CT) provides additional diagnostic information, particularly in patients with equivocal ultrasound findings, with measurements of gallbladder width shown to be a reliable marker, with a cutoff value of $\geq$ 3.12 cm achieving a sensitivity of 88% and specificity of 86%.[35,36] CT also offers detailed visualization of adjacent structures and complications such as perforation or abscess formation, making it especially useful in severe or complicated disease. Furthermore, magnetic resonance imaging (MRI) and magnetic resonance cholangiopancreatography (MRCP) further enhance diagnostic accuracy by delineating the biliary tree and detecting associated complications.[37] These modalities are particularly valuable for identifying gallbladder wall thickening, pericholecystic effusion, and obstructing stones. Diffusion-weighted imaging (DWI) has demonstrated high sensitivity and specificity, serving as an independent predictor of acute cholecystitis beyond conventional MRI parameters.[38] Together, MRI and MRCP provide non-invasive options for comprehensive evaluation, especially in cases where ultrasound and CT results are inconclusive.

In parallel with imaging, biomarkers have become important diagnostic adjuncts. C-reactive protein (CRP) is the most widely studied marker and has been shown to outperform leukocyte count and neutrophil-to-lymphocyte ratio (NLR) in predicting advanced acute cholecystitis and the need for conversion to open surgery, with an area under the curve of 0.75.[39] The delta neutrophil index (DNI) is a more sensitive predictor of severe acute cholecystitis, and its diagnostic accuracy improves when combined with CT findings and clinical variables.[40] More recently, YKL-40 protein has emerged as a promising biomarker, with significantly higher plasma levels observed in patients compared to healthy individuals, and positive correlations with liver enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST), suggesting potential value for disease monitoring.[41]

Overall, the diagnostic evaluation of acute cholecystitis has transitioned from reliance on clinical signs alone to a multimodal framework. Imaging techniques provide structural and functional insights, while biomarkers contribute objective evidence of inflammatory activity. The integration of these approaches, together with clinical assessment, not only enhances diagnostic precision but also informs disease severity grading and therapeutic decision-making. Future

directions are likely to focus on developing more sensitive and non-invasive diagnostic strategies, incorporating advanced imaging technologies and novel biomarkers, to further improve accuracy and patient outcomes.

Methods and Criteria of TCM Diagnosis of Acute Cholecystitis

TCM diagnosis of acute cholecystitis primarily relies on the differentiation of syndromes and the assessment of symptoms, signs, tongue appearance, and pulse characteristics. Commonly observed symptoms include pain in the right upper quadrant of the abdomen, bitter taste in the mouth, dryness of the throat, nausea, and vomiting. These symptoms, in conjunction with tongue manifestations, such as a red tongue with yellow and greasy coating, as well as a wiry and rapid pulse, are frequently classified as indicative of damp-heat syndrome affecting the liver and gallbladder. However, the current TCM diagnostic framework lacks standardized and objective quantitative criteria, resulting in a significant degree of subjectivity. Recent studies have sought to enhance the diagnostic accuracy by integrating modern technological approaches, such as employing artificial intelligence algorithms to analyze patient clinical data. Notably, a support vector machine (SVM) algorithm was developed for the diagnosis of acute cholecystitis, demonstrating a sensitivity of 83.08% and specificity of 80.21%, indicating its potential for practical application in this context.[42]

Advantages of Integrated Traditional Chinese and Western Medicine in Diagnosis of Acute Cholecystitis

The diagnosis of acute cholecystitis can be enhanced through the integration of TCM and Western medical practices, thereby leveraging the advantages of both approaches to improve diagnostic accuracy. Western medical imaging techniques are proficient in identifying the morphology and structural alterations of the gallbladder as well as the presence of gallstones. In contrast, TCM offers a holistic perspective by employing syndrome differentiation to assess the patient's overall condition, including the balance between cold and heat. For instance, during the diagnostic process, the findings of gallbladder inflammation obtained through western ultrasound can be combined with the results of syndrome differentiation from TCM, facilitating a more comprehensive evaluation of the patient's condition. This integrated approach provides a solid foundation for the development of personalized treatment plans. Research on the management of acute pancreatitis utilizing both traditional Chinese and Western medical methodologies has demonstrated that the combined application of diagnostic techniques from both traditions can yield a more accurate assessment of the disease state, thereby effectively guiding treatment and enhancing patient prognosis.[43] This integrative strategy addresses the limitations inherent in singular diagnostic methods and establishes a basis for timely and precise diagnosis and rational treatment of acute cholecystitis, ultimately aiming to elevate the standards of diagnostic practice in this area.

Therapeutic Strategies for Acute Cholecystitis

Progress in Drug Treatment of Acute Cholecystitis

The pharmacological management of acute cholecystitis primarily involves the administration of antibiotics together with supportive therapies. Appropriate antibiotic selection should be guided by disease severity, patient-specific factors, and local bacterial resistance patterns. The Tokyo Guidelines 2018 (TG18) recommend empiric antibiotic regimens stratified by severity grades (I–III) in community-acquired infections. These guidelines also emphasize the importance of regular reassessment of local antimicrobial profiles, cautious use of broad-spectrum agents, and timely downgrading or discontinuation of therapy when feasible.[44]

For high-risk surgical patients, PC combined with medical therapy represents a valuable option.[45] Clinical evidence indicates that PC can serve as a definitive treatment in selected cases, allowing safe catheter removal once infection and inflammation have resolved. However, recurrence remains more likely in patients with an age-adjusted Charlson comorbidity index (aCCI) ≥ 7, highlighting the need for careful patient selection.[46] Overall, pharmacological treatment remains a cornerstone of acute cholecystitis management. Early initiation of antibiotics and individualized use of adjunctive therapies, combined with appropriate interventional procedures when necessary, are essential to optimize patient outcomes.

The Role of Surgery in the Treatment of Acute Cholecystitis

Surgical intervention is a critical approach in the management of acute cholecystitis, with laparoscopic cholecystectomy (LC) being the predominant technique employed. Numerous studies have indicated that early LC, defined as surgery performed within 72 h of symptom onset, is more advantageous than delayed surgical intervention for the majority of patients. For instance, a retrospective study involving 91 patients revealed no significant differences in the average operation time, conversion rates, or overall complication rates between early and delayed surgery cohorts. However, the early surgery group demonstrated a significantly reduced total length of hospital stay and lower overall costs.[47]

In certain high-risk patients such as elderly individuals with multiple comorbidities, PC may serve as either a transitional or definitive treatment option. Nonetheless, the selection of treatment modality remains a subject of debate. Comparative studies assessing the outcomes of PC versus emergency cholecystectomy in high-risk populations have shown that the mortality rate in the PC group is significantly higher than that in the emergency cholecystectomy group. This finding suggests that cholecystectomy should be prioritized in high-risk patients unless contraindications to surgery are present.[48] Furthermore, a comparative analysis of ultrasonic anatomy versus electrocautery anatomy in LC procedures indicated no significant differences in complication rates, suggesting that ultrasonic anatomy may serve as a viable alternative or adjunct to electrocautery anatomy.[49] Ultimately, surgical management of acute cholecystitis should be tailored to the individual patient's circumstances, carefully weighing the benefits and drawbacks of various surgical techniques to determine the most appropriate treatment strategy.

Future Prospects of Therapeutic Strategies for Acute Cholecystitis

In the forthcoming era, the therapeutic approach for acute cholecystitis is anticipated to become increasingly precise and tailored to individual patient needs. With advancements in surgical techniques, the use of robot-assisted surgery and single-incision LC is likely to expand, thereby minimizing surgical trauma and enhancing the safety and efficacy of these procedures. Concurrently, further investigation is warranted to ascertain the optimal timing for surgical intervention, with the aim of mitigating the incidence of complications and mortality rates.

Regarding pharmacological interventions, the development of novel therapeutics that target the critical pathways involved in the pathophysiology of acute cholecystitis represents a significant avenue for future research. For instance, agents that specifically inhibit inflammatory signaling pathways may offer more precise control over inflammation and reduce the associated tissue damage. Additionally, optimizing pharmacotherapy for high-risk patients to enhance therapeutic outcomes is a focal point for future investigations.

A multidisciplinary collaborative model is expected to gain prominence in the realm of comprehensive care. Surgeons, physicians, and radiologists will work together to formulate individualized treatment plans that consider the patient's genetic predispositions, disease severity, comorbidities, and other relevant factors, thereby improving the treatment efficacy and patient quality of life. Furthermore, enhancing the long-term follow-up and management of patients with acute cholecystitis, along with the timely identification and treatment of potential complications, will be critical components of future therapeutic strategies.

Basic Theory of Treating Acute Cholecystitis with Integrated TCM

Pathological Mechanism of Acute Cholecystitis and Theory of TCM

Acute cholecystitis is a prevalent acute abdominal condition characterized by a pathological mechanism that primarily involves obstruction of bile flow, bacterial infection, and subsequent inflammatory response. Impediment to bile discharge leads to increased pressure within the gallbladder, resulting in damage to the gallbladder mucosa, which creates a conducive environment for bacterial infection and inflammation.[50] From the perspective of TCM, acute cholecystitis is categorized under "hypochondriac pain" and "jaundice", typically attributed to the presence of damp-heat in the liver and gallbladder, as well as qi stagnation and blood stasis. The integration of traditional Chinese and Western medical practices seeks to combine the holistic approach and syndrome differentiation inherent in TCM with the precise diagnostic and therapeutic strategies of Western medicine. For instance, a study investigating the treatment of acute pancreatitis through an integrative approach demonstrated that the combination of TCM and Western medical

interventions effectively reduced inflammatory markers in patients while also decreasing the duration of symptoms and length of hospital stay. This approach offers valuable insight into the management of acute cholecystitis.[43]

Mechanism of TCM in the Treatment of Acute Cholecystitis

TCM has long been employed as an adjunctive approach in the management of acute cholecystitis, focusing on restoring the balance of liver and gallbladder function and promoting the clearance of damp-heat. Among the commonly studied agents, Artemisia capillaris (Yin Chen) and rhubarb (Da Huang) are frequently highlighted for their choleretic effects. Experimental and pharmacological studies have demonstrated that extracts of Artemisia capillaris can stimulate bile secretion, reduce bile viscosity, and improve bile composition, thereby facilitating bile flow and alleviating cholestasis. Rhubarb has similarly been reported to enhance bile excretion and contribute to the resolution of bile stasis, while also exhibiting purgative effects that help expel pathogenic heat.

Beyond their influence on bile dynamics, both Artemisia capillaris and rhubarb possess anti-inflammatory and antibacterial activities, which may attenuate gallbladder wall inflammation and limit the progression of infection. Their bioactive constituents have been shown to modulate the release of inflammatory mediators and regulate immune responses, offering a plausible explanation for the symptomatic relief observed in clinical settings. From a holistic perspective, TCM emphasizes not only the resolution of acute symptoms but also the restoration of systemic balance and patient resilience, which may enhance recovery.

Nevertheless, it is important to recognize that while preliminary evidence supports these pharmacological mechanisms, the majority of existing studies are limited in quality, often relying on small cohorts or experimental models. High-quality randomized controlled trials remain scarce, and the current level of evidence is insufficient to draw definitive conclusions. Future investigations could aim to integrate mechanistic insights with rigorous clinical validation to establish the role of Artemisia capillaris, rhubarb, and related formulations in standardized management protocols for acute cholecystitis.

Clinical Practice of Acute Cholecystitis Treated with Integrated Traditional Chinese and Western Medicine

Clinical Analysis of Acute Cholecystitis Treated with Integrated Traditional Chinese and Western Medicine

Numerous studies have indicated that the integration of TCM with Western medical practices offers distinct advantages for the management of acute cholecystitis. A particular investigation involving 563 patients diagnosed with acute pancreatitis revealed that those receiving integrated treatment exhibited significantly lower levels of CRP than the control group. Additionally, these patients experienced a reduction in symptom duration and a notably shorter length of hospital stay, suggesting that this combined therapeutic approach may effectively mitigate inflammatory responses and facilitate patient recovery.[43] Nonetheless, there is a paucity of high-quality research specifically addressing the treatment of acute cholecystitis through the integration of traditional Chinese and Western medicine. Many existing studies are characterized by limitations such as small sample sizes and inadequate research designs. For instance, a literature review concerning the application of TCM in cholecystitis treatment revealed that the majority of studies were primarily clinical observations and lacked robust evidence-based medical support, which ultimately restricts the broader application and promotion of these integrated treatment modalities.[4]

The Strategy and Effect of Combination of TCM and Western Medicine

The integration of TCM with Western medicine represents a significant approach in the management of acute cholecystitis through a holistic treatment paradigm. Western medicine primarily focuses on anti-infective measures, spasmolysis, and analgesia, and utilizes antibiotics to mitigate bacterial infections. In contrast, TCM has cholagogic, anti-inflammatory, and immune-regulatory properties. For instance, the concurrent use of certain TCMs with cholagogic effects along with antibiotics can enhance bile secretion, diminish the bacterial proliferation environment, and augment the efficacy of anti-infective treatments. Furthermore, research on the management of chronic obstructive pulmonary

disease (COPD) with respiratory failure has demonstrated that the combination of TCM and Western medicine significantly increases the treatment success rate compared to groups receiving only Western medicine, with statistically significant differences. Additionally, improvements in oxygen partial pressure, lung function, and other clinical indicators have been noted in patients receiving combined treatment.[51] This integrative therapeutic strategy not only enhances treatment outcomes but also reduces the required dosage of Western medications and minimizes adverse effects.

Surgical Treatment of Acute Cholecystitis with Integrated Traditional Chinese and Western Medicine

Surgical intervention is a critical approach in the management of acute cholecystitis, and the integration of TCM with Western medical practices has been investigated in this context. Evidence suggests that employing TCM to enhance patients' overall health before surgery may mitigate surgical risks and facilitate postoperative recovery. For instance, in the treatment of granulomatous lobular mastitis, patients who received a combination of TCM and surgical intervention exhibited a significantly lower recurrence rate than those who underwent surgery alone, along with a more favorable assessment of breast aesthetics.[52] Furthermore, during the postoperative rehabilitation phase, the application of TCM to enhance gastrointestinal function has been shown to decrease complications and reduce the length of the hospital stay. An example of this is the administration of Yikou-Sizi heat dissipation at the Shenque acupoint in conjunction with rapid rehabilitation techniques, which effectively shortened the time to first defecation post-surgery and promoted gastrointestinal recovery.[53]

Progress in the Treatment of Acute Cholecystitis

Application of New TCM in the Treatment of Acute Cholecystitis

Recent advancements in TCM formulations have offered novel therapeutic options for the management of acute cholecystitis. Certain TCM preparations have been developed using modern extraction and preparation techniques, which confer benefits, such as established efficacy and ease of use. An illustrative example is Liuhedan, a TCM formulation traditionally used for AP treatment of acute pancreatitis. While current investigations predominantly concentrate on pancreatitis, there is potential for liuhedan to be beneficial in the context of acute cholecystitis. Ongoing research aims to explore this possibility, potentially yielding innovative strategies for the treatment of acute cholecystitis.[54] Nonetheless, the development and application of new TCM preparations face several challenges, including the need for enhanced quality control standards and a more comprehensive understanding of their mechanisms of action. Additionally, clinical evidence supporting some TCM formulations remains relatively limited, necessitating further high-quality clinical trials to substantiate their efficacy and safety.

Application of Minimally Invasive Technique in the Operation of Acute Cholecystitis

Minimally invasive techniques are increasingly being employed in the surgical management of acute cholecystitis, offering benefits such as reduced trauma and expedited recovery. LC is a prevalent, minimally invasive procedure used to treat this condition. Compared with traditional open surgery, LC is associated with diminished postoperative pain and shorter duration of hospital stay. Research indicates that early LC, performed within 24–72 hours following the onset of symptoms, is generally more effective than delayed surgical intervention (beyond 7 days) for the majority of patients presenting with grade I and II acute cholecystitis.[55] Furthermore, PC serves as a palliative option for patients with significant comorbidities or for those deemed unsuitable for immediate surgical intervention, thereby facilitating subsequent treatment. Emerging minimally invasive techniques, including single-incision LC and natural orifice transluminal endoscopic surgery, are currently under development; however, their implementation requires further clinical experience and evaluation of their effectiveness.

An Innovative Therapy for Acute Cholecystitis with Integrated Traditional Chinese and Western Medicine

The management of acute cholecystitis through the integration of TCM and Western medical practices has led to the emergence of novel therapeutic approaches. For instance, the incorporation of acupuncture, massage, and other modalities from TCM during treatment has been shown to alleviate pain and enhance physiological function in patients.

Several studies have explored the synergistic effects of acupuncture along with traditional Chinese and Western medical interventions in the treatment of acute cholecystitis, revealing significant improvements in pain relief and overall quality of life for patients. Furthermore, the development of personalized treatment regimens that combine traditional Chinese and Western medicine and are tailored through syndrome differentiation based on individual patient constitutions and stages of illness represents a promising innovative direction. In the context of acute pancreatitis, the use of Chaiqin Chengqi Decoction in conjunction with standard Western medical treatments has been demonstrated to markedly reduce the duration of respiratory failure and enhance clinical outcomes over a six-month period, thereby offering valuable insights for the management of acute cholecystitis.[56] These innovative therapeutic strategies represent a novel avenue for enhancing the treatment of acute cholecystitis.

Controversies in the Treatment of Acute Cholecystitis and Future Prospects

Controversies and Challenges in Treating Acute Cholecystitis with Integrated Traditional Chinese and Western Medicine

The treatment of acute cholecystitis through the integration of TCM and Western medicine is fraught with controversy and challenges. One significant issue is the intricate mechanism of action associated with TCM, which is characterized by its diverse composition. Furthermore, the assessment of its efficacy lacks a standardized and objective framework, leading to skepticism among some practitioners of Western medicine regarding the effectiveness and safety of traditional Chinese approaches. For instance, a review of the literature concerning the use of TCM in treating cholecystitis indicates that the majority of studies are of suboptimal quality and deficient in robust evidence-based medical support.[4] Additionally, protocols and methodologies for integrating traditional Chinese and Western medical treatments have not been fully standardized, resulting in considerable variability in treatment approaches among different regions and practitioners. Moreover, research on the combined application of these medical systems often has limitations such as small sample sizes and imprecise study designs, which ultimately compromise the reliability and applicability of the findings.

Future Directions in the Treatment of Acute Cholecystitis

Future investigations into the management of acute cholecystitis should be conducted from multiple perspectives. There is a pressing need to enhance the diagnostic criteria and methodologies that integrate TCM with Western medical practices, thereby increasing both the accuracy and efficiency of diagnoses. For instance, the incorporation of artificial intelligence and big data analytics could facilitate the exploration of correlations between TCM diagnostic indicators and western medical examination results, ultimately leading to the development of a more precise diagnostic model.

In terms of treatment, it is essential to examine the mechanisms underlying the effects of TCM, identify its active components and targets, and establish a scientific foundation for rational application. Concurrently, conducting high-quality clinical trials is crucial to validate the efficacy and safety of treatment regimens that integrate TCM and Western medicine, particularly personalized treatment strategies tailored to varying degrees of illness severity and diverse patient demographics. Furthermore, attention should be directed towards the advancement of minimally invasive techniques, with an emphasis on how these can be effectively combined with integrated TCM and Western medical treatments to enhance therapeutic outcomes and minimize complications.

Prospect and Development Trend of Integrated Traditional Chinese and Western Medicine in Treating Acute Cholecystitis

The integration of TCM and Western medicine presents significant potential for the management of acute cholecystitis. As research advances in the theoretical foundations of TCM and the elucidation of its mechanisms of action, along with ongoing developments in modern medical technology, the combined approach of TCM and Western medicine is anticipated to yield enhanced therapeutic benefits for patients with acute cholecystitis. This integration allows for the formulation of more personalized treatment regimens through the precise differentiation of TCM syndromes in conjunction with Western diagnostic methods, thereby improving the treatment outcomes. Furthermore, the synergistic application of TCM and Western medical practices, including non-pharmacological interventions from TCM and surgical approaches from Western

medicine, can address the disease process at multiple levels, thereby facilitating patient recovery. For instance, the combined treatment of acute myocardial infarction with both TCM and Western medicine has demonstrated notable advantages, which may serve as a valuable reference for the management of acute cholecystitis.[57] Looking ahead, as research deepens and practical experience accumulates, the integration of TCM and Western medicine in the treatment of acute cholecystitis is poised to emerge as a more prevalent and effective therapeutic strategy.

Conclusion

Acute cholecystitis represents a rising global health burden, with incidence and risk factors varying by population and clinical context. Epidemiological studies have shown higher susceptibility among older adults, males, and patients with comorbidities such as obesity, diabetes, and hypertension. Genetic factors also contribute; for example, ABCG8 and ABCB4 variants are associated with gallstone formation, while polymorphisms in inflammatory genes such as IL23R, TNF, and RIPK2 may influence disease severity and outcomes. Pathophysiologically, the condition develops through the interplay of inflammatory signaling, cholestasis, increased intravesical pressure, and altered bile composition, with additional contributions from microbial factors such as Helicobacter pylori.

In current clinical practice, Western medicine remains the primary approach, emphasizing timely diagnosis, antibiotics, and early LC, with PC as an option for high-risk patients. TCM may serve as a complementary strategy, particularly in alleviating symptoms, supporting recovery, and improving quality of life, provided that indications are carefully defined and treatments adhere to established standards.

An integrated model that combines Western and Chinese medicine, guided by epidemiological insights, genetic predispositions, and mechanistic understanding, may provide a more individualized and resource-sensitive framework for management. Thus, future studies could prioritize multicenter trials to evaluate standardized integrated care pathways, explore gene–environment interactions, and assess long-term patient-centered outcomes.

Abbreviations

TCM, Traditional Chinese medicine; SCI, spinal cord injury; CT, computed tomography; SNP, single nucleotide polymorphism; ADPKD, autosomal dominant polycystic kidney disease; IBDV, infectious bursal disease virus; MRI, magnetic resonance imaging; MRCP, magnetic resonance cholangiopancreatography; DWI, diffusion-weighted imaging; CRP, C-reactive protein; AAC, advanced acute cholecystitis; AUC, area under the curve; NLR, neutrophil-to-lymphocyte; DNI, delta neutrophil index; SAC, severe acute cholecystitis; ALT, alanine aminotransferase; AST, aspartate aminotransferase; SVM, support vector machine; PC, percutaneous cholecystostomy; aCCI, age-adjusted Charlson comorbidity index; LC, laparoscopic cholecystectomy.

Disclosure

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this paper.

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