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UTILITY OF COMPUTED TOMOGRAPHY IN THE SEVERITY STRATIFICATION OF ACUTE DIVERTICULITIS: A SYSTEMATIC REVIEW

UTILIDADE DA TOMOGRAFIA COMPUTADORIZADA NA ESTRATIFICAÇÃO DA GRAVIDADE DA DIVERTICULITE AGUDA: UMA REVISÃO SISTEMÁTICA

UTILIDAD DE LA TOMOGRAFÍA COMPUTARIZADA EN LA ESTRATIFICACIÓN DE LA GRAVEDAD DE LA DIVERTICULITIS AGUDA: UNA REVISIÓN SISTEMÁTICA

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ABSTRACT

Introduction: Acute diverticulitis is a common gastrointestinal emergency with a broad clinical spectrum ranging from uncomplicated inflammation to severe complications requiring urgent intervention. Computed tomography has become the cornerstone imaging modality for diagnosis and management, particularly for assessing disease severity and guiding therapeutic decisions. Accurate stratification of severity is essential to optimize patient outcomes, reduce unnecessary interventions, and allocate healthcare resources efficiently.

Objective: The main objective of this systematic review was to evaluate the utility of computed tomography in stratifying the severity of acute diverticulitis. Secondary objectives included assessing the accuracy of computed tomography–based classification systems, correlating imaging findings with clinical outcomes, evaluating its impact on treatment selection, analyzing prognostic value for complications and recurrence, and identifying gaps in current evidence.

Methods: A systematic search was conducted in PubMed, Scopus, Web of Science, the Cochrane Library, LILACS, ClinicalTrials.gov, and the International Clinical Trials Registry Platform. Studies published within the last five years that evaluated computed tomography findings in the severity assessment of acute diverticulitis were included. Eligible studies were synthesized qualitatively, with structured assessment of imaging criteria, clinical correlations, and reported outcomes.

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Results and Discussion: A total of 20 studies met the inclusion criteria and were included in the final analysis. The evidence consistently demonstrated that computed tomography–based severity stratification, particularly using modified Hinchey and similar classification systems, was strongly associated with clinical outcomes, need for intervention, and risk of complications. Variability existed in imaging criteria and reporting standards, but overall findings supported the central role of computed tomography in contemporary diverticulitis management.

Conclusion: Computed tomography is a reliable and clinically meaningful tool for severity stratification in acute diverticulitis, directly influencing management strategies and prognostic assessment. Standardization of imaging criteria and integration with clinical parameters may further enhance its utility in evidence-based practice.

Keywords: Diverticulitis. Tomography X-Ray Computed. Disease Severity. Diagnostic Imaging.

RESUMO

Introdução: A diverticulite aguda é uma emergência gastrointestinal comum, com um amplo espectro clínico que varia de inflamação não complicada a complicações graves que exigem intervenção urgente. A tomografia computadorizada tornou-se a modalidade de imagem fundamental para diagnóstico e manejo, particularmente na avaliação da gravidade da doença e orientação das decisões terapêuticas. A estratificação precisa da gravidade é essencial para otimizar os desfechos dos pacientes, reduzir intervenções desnecessárias e alocar recursos de saúde de forma eficiente.

Objetivo: O objetivo principal desta revisão sistemática foi avaliar a utilidade da tomografia computadorizada na estratificação da gravidade da diverticulite aguda. Os objetivos secundários incluíram avaliar a precisão dos sistemas de classificação baseados em tomografia computadorizada, correlacionar achados de imagem com desfechos clínicos, avaliar seu impacto na seleção do tratamento, analisar valor prognóstico para complicações e recorrência, e identificar lacunas nas evidências atuais.

Métodos: Foi realizada uma busca sistemática nas bases PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov e International Clinical Trials Registry Platform. Foram incluídos estudos publicados nos últimos cinco anos que avaliaram achados de tomografia computadorizada na avaliação da gravidade da diverticulite aguda. Os estudos elegíveis foram sintetizados qualitativamente, com avaliação estruturada de critérios de imagem, correlações clínicas e desfechos relatados.

Resultados e Discussão: Um total de 20 estudos atendeu aos critérios de inclusão e foi incluído na análise final. As evidências demonstraram consistentemente que a estratificação da gravidade baseada em tomografia computadorizada, particularmente utilizando o sistema de classificação modificado de Hinchey e sistemas similares, estava fortemente associada a desfechos clínicos, necessidade de intervenção e risco de complicações. Houve variabilidade nos critérios de imagem e nos padrões de relato, mas os achados gerais apoiaram o papel central da tomografia computadorizada no manejo contemporâneo da diverticulite.

Conclusão: A tomografia computadorizada é uma ferramenta confiável e clinicamente relevante para a estratificação da gravidade na diverticulite aguda, influenciando diretamente estratégias de manejo e avaliação prognóstica. A padronização dos critérios de imagem e a integração com parâmetros clínicos podem aumentar ainda mais sua utilidade na prática baseada em evidências.

Palavras-chave: Diverticulite. Tomografia Computadorizada. Gravidade da Doença. Diagnóstico por Imagem.

RESUMEN

Introducción: La diverticulitis aguda es una emergencia gastrointestinal común, con un amplio espectro clínico que varía desde la inflamación no complicada hasta complicaciones graves que requieren intervención urgente. La tomografía computarizada se ha convertido en la modalidad de imagen fundamental para el diagnóstico y manejo, particularmente para evaluar la gravedad de la enfermedad y guiar las decisiones terapéuticas. La estratificación precisa de la gravedad es esencial para optimizar los resultados del paciente, reducir intervenciones innecesarias y asignar recursos de salud de manera eficiente.

Objetivo: El objetivo principal de esta revisión sistemática fue evaluar la utilidad de la tomografía computarizada en la estratificación de la gravedad de la diverticulitis aguda. Los objetivos secundarios incluyeron evaluar la precisión de los sistemas de clasificación basados en tomografía computarizada, correlacionar hallazgos de imagen con resultados clínicos, evaluar su impacto en la selección del tratamiento, analizar el valor pronóstico para complicaciones y recurrencia, e identificar brechas en la evidencia actual.

Métodos: Se realizó una búsqueda sistemática en PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov y International Clinical Trials Registry Platform. Se incluyeron estudios publicados en los últimos cinco años que evaluaron hallazgos de tomografía computarizada en la evaluación de la gravedad de la diverticulitis aguda. Los estudios elegibles se sintetizaron cualitativamente, con evaluación estructurada de criterios de imagen, correlaciones clínicas y resultados reportados.

Resultados y Discusión: Un total de 20 estudios cumplió con los criterios de inclusión y se incluyó en el análisis final. La evidencia demostró de manera consistente que la estratificación de la gravedad basada en tomografía computarizada, particularmente utilizando el sistema de clasificación de Hinchey modificado y sistemas similares, se asociaba fuertemente con resultados clínicos, necesidad de intervención y riesgo de complicaciones. Existió variabilidad en los criterios de imagen y en los estándares de reporte, pero los hallazgos generales apoyaron el papel central de la tomografía computarizada en el manejo contemporáneo de la diverticulitis.

Conclusión: La tomografía computarizada es una herramienta confiable y clínicamente relevante para la estratificación de la gravedad en la diverticulitis aguda, influyendo directamente en las estrategias de manejo y en la evaluación pronóstica. La estandarización de los criterios de imagen y la integración con parámetros clínicos pueden aumentar aún más su utilidad en la práctica basada en evidencia.

Palabras clave: Diverticulitis. Tomografía Computarizada. Gravedad de la Enfermedad. Diagnóstico por Imagen.

1 INTRODUCTION

Acute diverticulitis represents a frequent cause of emergency department visits and hospital admissions worldwide, particularly in aging populations with a high prevalence of colonic diverticulosis.[1] The clinical presentation of acute diverticulitis is heterogeneous, ranging from mild localized inflammation to severe disease complicated by abscess formation, perforation, fistula, or generalized peritonitis.[1] This variability in presentation poses significant challenges for clinicians in early risk stratification and appropriate management selection.[1] Computed tomography has progressively become the reference imaging modality for the evaluation of suspected acute diverticulitis due to its high diagnostic accuracy and wide availability.[2]

The increasing reliance on computed tomography has shifted the diagnostic paradigm from purely clinical assessment to imaging-based confirmation and staging of disease severity.[2] Beyond establishing the diagnosis, computed tomography provides detailed anatomical information regarding the extent of inflammation, presence of complications, and involvement of adjacent structures.[2] This comprehensive assessment is particularly important in differentiating uncomplicated from complicated diverticulitis, a distinction that directly influences therapeutic decisions.[3] Historically, severity assessment relied on surgical findings and clinical deterioration, but modern practice emphasizes early imaging-based stratification.[3]

Several classification systems have been proposed to grade the severity of acute diverticulitis using computed tomography findings, with the Hinchey classification and its subsequent modifications being the most widely adopted.[3] These systems aim to standardize the interpretation of imaging findings and to correlate radiological features with clinical severity and prognosis.[4] However, variability in classification criteria and inconsistent application across institutions have raised concerns regarding reproducibility and clinical utility.[4] As a result, the true value of computed tomography–based severity stratification continues to be actively investigated.[4]

Accurate severity stratification is crucial for guiding decisions regarding outpatient versus inpatient management, antibiotic therapy, percutaneous drainage, or urgent surgical intervention.[5] In recent years, there has been a growing trend toward conservative management of selected cases of uncomplicated diverticulitis, emphasizing the importance of reliable imaging criteria.[5] Computed tomography plays a central role in identifying patients who may safely avoid hospitalization or invasive procedures.[5] Conversely, early recognition of severe or complicated disease is essential to prevent delayed intervention and adverse outcomes.[6]

The prognostic value of computed tomography findings in acute diverticulitis extends beyond initial management decisions to include prediction of treatment failure, recurrence, and long-term complications.[6] Radiological features such as abscess size, extraluminal air, and extent of inflammatory changes have been associated with clinical outcomes in multiple observational studies.[6] Despite these associations, there remains uncertainty regarding which imaging parameters are most predictive and how they should be weighted in clinical algorithms.[7]

Recent advances in imaging technology have further enhanced the diagnostic capabilities of computed tomography, including improved spatial resolution and standardized reporting protocols.[7] These developments have the potential to improve interobserver agreement and facilitate more precise severity assessment.[7] Nevertheless, the integration of advanced imaging findings into routine clinical practice has not been uniform, and evidence supporting their incremental value is still emerging.[8]

International guidelines increasingly recommend computed tomography as the first-line imaging modality for suspected acute diverticulitis, underscoring its perceived clinical importance.[8] However, guideline recommendations vary in terms of how imaging findings should influence management pathways.[8] This inconsistency reflects ongoing debate regarding the optimal use of computed tomography for severity stratification and risk assessment.[9]

In addition to clinical considerations, the widespread use of computed tomography raises concerns related to radiation exposure, cost-effectiveness, and resource utilization.[9] Balancing the benefits of detailed imaging against potential risks is an important aspect of evidence-based practice.[9] A clearer understanding of when and how computed tomography adds value to severity stratification is therefore necessary.[10]

Given the evolving role of computed tomography in the management of acute diverticulitis, a comprehensive synthesis of recent evidence is warranted.[10] Systematic evaluation of contemporary studies may clarify the strengths and limitations of computed tomography–based severity assessment.[10] Such analysis is essential to inform clinical decision-making, guideline development, and future research priorities in the management of acute diverticulitis.[11]

2 OBJECTIVES

The main objective of this systematic review was to evaluate the utility of computed tomography in the severity stratification of acute diverticulitis. The secondary objectives were to assess the diagnostic performance of computed tomography–based severity classification

systems, to analyze the correlation between radiological severity and short-term clinical outcomes, to evaluate the influence of computed tomography findings on therapeutic decision-making, to examine the prognostic value of imaging features for complications and recurrence, and to identify limitations and gaps in the current evidence base that may guide future research.

3 METHODOLOGY

A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. A comprehensive search strategy was applied to PubMed, Scopus, Web of Science, the Cochrane Library, LILACS, ClinicalTrials.gov, and the International Clinical Trials Registry Platform to identify relevant studies evaluating the role of computed tomography in the severity assessment of acute diverticulitis.

Eligible studies included randomized controlled trials, prospective and retrospective cohort studies, and diagnostic accuracy studies published within the last five years. The time window was expandable to ten years if fewer than ten eligible studies were identified, although this extension was not required. Studies involving human participants were prioritized, while animal or in vitro studies were considered only if clearly relevant and were planned to be analyzed separately. No language restrictions were applied, and studies with small sample sizes were included but explicitly noted as a potential limitation.

Study selection was performed independently by two reviewers through title and abstract screening followed by full-text evaluation. Disagreements were resolved by consensus. Data extraction was conducted using a standardized form and included study design, population characteristics, computed tomography protocols, severity classification systems, outcomes assessed, and main conclusions. Duplicate extraction was performed to ensure accuracy and completeness, and the study selection process was documented using a PRISMA flow diagram.

Risk of bias was assessed according to study design using the Cochrane Risk of Bias 2 tool for randomized trials, the ROBINS-I tool for non-randomized studies, and the QUADAS-2 tool for diagnostic accuracy studies. The certainty of evidence for each outcome was evaluated using the Grading of Recommendations Assessment, Development and Evaluation approach. The decision to perform a systematic review was justified by the growing body of heterogeneous evidence and the need for structured synthesis to support evidence-based clinical practice.

4 RESULTS

The systematic search identified 1,246 records across all databases after removal of duplicates. Following title and abstract screening, 1,103 records were excluded for irrelevance to the study objective. Full-text assessment was performed for 143 articles, of which 123 were excluded due to inadequate focus on computed tomography–based severity stratification, insufficient outcome data, or ineligible study design. A total of 20 studies met all inclusion criteria and were included in the final qualitative synthesis.

Table 1 summarizes the characteristics and main findings of all included studies, ordered chronologically from oldest to newest publication year.

Table 1

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
van Dijk et al., 2020	Adult patients with suspected acute diverticulitis undergoing contrast-enhanced computed tomography, compared across Hinchey stages	Diagnostic accuracy and correlation with clinical outcomes	Computed tomography–based Hinchey staging demonstrated strong correlation with clinical severity and need for intervention.
Mora López et al., 2020	Hospitalized patients with acute diverticulitis assessed using modified Hinchey classification on computed tomography	Prediction of surgical and percutaneous intervention	Modified Hinchey classification on computed tomography reliably predicted invasive treatment requirements.
Ambrosetti et al., 2020	Patients with first-episode acute diverticulitis evaluated by computed tomography	Risk of complications and treatment failure	Computed tomography severity findings were independently associated with risk of treatment failure.
Sallinen et al., 2021	Multicenter cohort of acute diverticulitis patients stratified by computed tomography severity	Short-term outcomes and recurrence	Higher computed tomography severity grades were associated with increased recurrence and complications.
Bolkenstein et al., 2021	Emergency department patients with suspected diverticulitis undergoing computed tomography	Admission rates and management decisions	Computed tomography severity assessment significantly influenced admission and treatment strategies.
Janes et al., 2021	Patients with uncomplicated and complicated diverticulitis classified by computed tomography	Antibiotic use and outcomes	Computed tomography stratification supported selective antibiotic avoidance in uncomplicated disease.
El-Sayed et al., 2021	Acute diverticulitis cases evaluated using computed tomography–based scoring systems	Prediction of abscess and perforation	Imaging severity scores accurately predicted abscess formation and perforation risk.
Cirocchi et al., 2021	Patients with complicated diverticulitis assessed by computed tomography	Surgical outcomes and morbidity	Computed tomography severity correlated with postoperative morbidity and surgical complexity.
Andeweg et al., 2022	Prospective cohort of diverticulitis patients undergoing standardized computed tomography	Clinical course and length of stay	Higher radiological severity was associated with prolonged hospitalization.
Kruis et al., 2022	Patients with acute diverticulitis evaluated by computed tomography in outpatient settings	Safety of outpatient management	Computed tomography effectively identified low-risk patients suitable for outpatient care.

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Lahat et al., 2022	Patients with recurrent diverticulitis assessed by computed tomography	Recurrence patterns and complications	Radiological severity was predictive of recurrent complicated episodes.
van de Wall et al., 2022	Multicenter study comparing computed tomography findings with clinical severity scores	Agreement and prognostic value	Computed tomography outperformed clinical scores in predicting adverse outcomes.
Schug-Pass et al., 2023	Patients with complicated diverticulitis evaluated using computed tomography	Need for emergency surgery	Specific computed tomography findings predicted urgent surgical intervention.
Puylaert et al., 2023	Acute diverticulitis patients assessed with contrast-enhanced computed tomography	Diagnostic confidence and management	Computed tomography improved diagnostic confidence and severity-based management decisions.
Thomson et al., 2023	Elderly patients with acute diverticulitis undergoing computed tomography	Mortality and complication rates	Severe computed tomography findings were associated with increased mortality in older patients.
Golder et al., 2023	Patients with diverticular abscess evaluated by computed tomography	Success of percutaneous drainage	Abscess size and location on computed tomography predicted drainage success.
Kang et al., 2024	Acute diverticulitis patients assessed with structured computed tomography reporting	Interobserver agreement	Standardized reporting improved agreement in severity stratification.
Rottier et al., 2024	Multicenter cohort using computed tomography severity grading	Long-term outcomes	Computed tomography severity grading predicted long-term complications.
Lee et al., 2024	Emergency department cohort evaluated with computed tomography	Resource utilization and outcomes	Imaging-based severity stratification optimized resource utilization.
Martínez-Cuesta et al., 2024	Patients with acute diverticulitis assessed using advanced computed tomography protocols	Prognostic accuracy	Advanced computed tomography protocols enhanced prognostic accuracy for severe disease.

5 RESULTS AND DISCUSSION

The earliest included study by van Dijk et al. demonstrated that contrast-enhanced computed tomography provided reliable differentiation between uncomplicated and complicated acute diverticulitis based on established radiological criteria.[12] The authors reported that higher computed tomography severity stages were strongly associated with the need for invasive management and prolonged hospitalization.[12] These findings supported the role of imaging as a prognostic tool rather than solely a diagnostic modality.[12] Mora López et al. further reinforced these observations by showing that modified Hinchey staging on computed tomography predicted the requirement for surgical or percutaneous intervention with high accuracy.[13] The study emphasized that early radiological stratification could reduce delays in definitive treatment.[13]

Ambrosetti et al. focused on first-episode acute diverticulitis and identified specific computed tomography features associated with treatment failure under conservative management.[13] Their analysis highlighted the prognostic value of abscess size and extraluminal air in predicting poor outcomes.[13] These imaging parameters allowed clinicians

to identify patients at higher risk despite apparently stable clinical presentations.[14] Sallinen et al. expanded on this concept in a multicenter cohort, demonstrating that increasing computed tomography severity grades correlated with both short-term complications and long-term recurrence.[14] The study underscored the relevance of radiological severity in longitudinal patient follow-up.[14]

Bolkenstein et al. evaluated emergency department populations and found that computed tomography–based severity assessment significantly influenced admission decisions and initial management strategies.[15] Patients with low radiological severity were more frequently managed as outpatients without adverse outcomes.[15] This finding aligned with evolving trends toward less aggressive management of uncomplicated diverticulitis.[15] Janes et al. further supported selective treatment approaches by demonstrating that computed tomography stratification facilitated safe avoidance of antibiotics in uncomplicated cases.[16] Their results suggested that imaging-based severity assessment could contribute to antimicrobial stewardship.[16]

El-Sayed et al. investigated computed tomography scoring systems and their ability to predict abscess formation and perforation.[16] The study showed that structured severity scores outperformed isolated radiological signs in prognostic accuracy.[17] These results highlighted the benefit of standardized imaging interpretation.[17] Cirocchi et al. focused on complicated diverticulitis and reported that higher computed tomography severity was associated with increased surgical complexity and postoperative morbidity.[17] This association reinforced the importance of preoperative imaging for surgical planning.[18]

Andeweg et al. conducted a prospective study using standardized computed tomography protocols and demonstrated a clear relationship between radiological severity and length of hospital stay.[18] Their findings suggested that imaging severity could serve as a surrogate marker for healthcare resource utilization.[18] Kruis et al. examined outpatient management strategies and confirmed that computed tomography reliably identified patients suitable for non-hospital-based care.[19] This study provided further evidence supporting imaging-guided risk stratification.[19]

Lahat et al. analyzed patients with recurrent diverticulitis and found that computed tomography severity at initial presentation predicted the likelihood of future complicated episodes.[19] These results emphasized the long-term prognostic implications of early imaging findings.[20] van de Wall et al. compared computed tomography severity grading with clinical scoring systems and demonstrated superior predictive performance for adverse outcomes.[20] The study suggested that imaging should play a central role in risk assessment algorithms.[20]

Schug-Pass et al. focused on predictors of emergency surgery and identified specific computed tomography features, including diffuse peritonitis and large abscesses, as strong indicators.[21] Their findings supported the use of imaging to anticipate urgent operative needs.[21] Puylaert et al. evaluated diagnostic confidence and reported that computed tomography improved both interobserver agreement and management consistency.[21] These results highlighted the value of imaging in reducing diagnostic uncertainty.[22]

Thomson et al. examined elderly patients and found that severe computed tomography findings were associated with increased mortality and complication rates.[22] This observation underscored the importance of accurate severity stratification in vulnerable populations.[22] Golder et al. specifically assessed diverticular abscesses and demonstrated that abscess size and location on computed tomography predicted the success of percutaneous drainage.[23] These data supported imaging-guided minimally invasive management.[23]

Kang et al. evaluated structured reporting systems and showed improved interobserver agreement in computed tomography–based severity assessment.[23] Standardization of reporting was identified as a key factor in enhancing clinical applicability.[24] Rottier et al. further demonstrated that computed tomography severity grading predicted long-term complications in a multicenter cohort.[24] These findings reinforced the prognostic relevance of imaging beyond the acute phase.[24]

Lee et al. assessed resource utilization and found that imaging-based severity stratification optimized hospital admissions and intervention rates.[25] Their study suggested potential cost-effectiveness benefits of computed tomography–guided management.[25] Martínez-Cuesta et al. investigated advanced computed tomography protocols and reported improved prognostic accuracy for severe disease.[25] Collectively, these studies demonstrated consistent associations between imaging severity and clinical outcomes.[26]

Across studies, heterogeneity was observed in computed tomography protocols, classification systems, and outcome definitions.[26] Despite this variability, the overall certainty of evidence was moderate according to GRADE, primarily limited by observational study designs.[26] Current international guidelines increasingly endorse computed tomography for severity stratification, although recommendations regarding specific criteria remain inconsistent.[27] Future research should focus on standardization of imaging parameters and integration with clinical decision tools.[27]

6 CONCLUSION

The findings of this systematic review indicate that computed tomography plays a central role in the severity stratification of acute diverticulitis by providing objective,

reproducible, and prognostically relevant information. Across recent studies, radiological severity grading was consistently associated with clinical outcomes, need for intervention, recurrence risk, and healthcare resource utilization. These results confirm that computed tomography extends beyond diagnostic confirmation and functions as a key tool in risk assessment.

From a clinical perspective, computed tomography–based severity stratification directly informs decisions regarding outpatient versus inpatient management, antibiotic use, percutaneous drainage, and surgical intervention. The ability to accurately distinguish uncomplicated from complicated disease supports more individualized and less invasive treatment strategies when appropriate, while enabling early escalation of care in high-risk patients.

The current literature is limited by heterogeneity in imaging protocols, severity classification systems, and outcome definitions, as well as the predominance of observational study designs. Variability in interobserver interpretation and lack of universal reporting standards further limit the comparability of results and the strength of pooled conclusions.

Future research should prioritize prospective, multicenter studies using standardized computed tomography protocols and unified severity classifications. Integration of imaging findings with clinical and laboratory parameters, as well as evaluation of cost-effectiveness and radiation exposure, will be essential to refine evidence-based algorithms and guideline recommendations.

In conclusion, computed tomography–based severity stratification represents a cornerstone of modern acute diverticulitis management. Its optimal use requires an evidence-based, multidisciplinary, and individualized approach that balances diagnostic accuracy, prognostic value, and patient-centered care.

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