REVIEW

INTESTINAL RESEARCH

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Evidence-based clinical practice guidelines for diagnosis and medical management of acute colonic diverticulitis developed by the Korean Association for the Study of Intestinal Diseases (KASID)

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Acute colonic diverticulitis is a common gastrointestinal inflammatory disorder. The incidence of acute colonic diverticulitis has been steadily increasing in Korea, particularly among younger and middle-aged adults. This rising prevalence, along with the observed differences in clinical characteristics compared to Western populations, underscores the need for region-specific, evidence-based guidance. The Korean Association for the Study of Intestinal Diseases (KASID) established a task force to develop these clinical practice guidelines to optimize the diagnosis and medical management of acute colonic diverticulitis tailored to the Korean healthcare environment. These guidelines were developed through a systematic literature review, critical appraisal of evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology, and expert consensus via a modified Delphi method. They addressed 12 clinical questions encompassing prognostic factors, diagnostic modalities, initial management for uncomplicated diverticulitis, management of complications, and prevention of recurrence. The resulting recommendations provide clinicians with evidence-based guidance for individualized management based on patients' condition and values. These guidelines aim to enhance the quality of care and optimize outcomes for patients with acute colonic diverticulitis in Korea. **(Intest Res, Published online)**

Key Words: Diverticulitis, colonic; Practice guideline; Therapeutics; Diagnosis; Disease management

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INTRODUCTION

Acute colonic diverticulitis is a common inflammatory disorder of the large bowel caused by inflammation or infection of a colonic diverticulum. Approximately 4% of patients with colonic diverticulosis develop acute colonic diverticulitis during their lifetime.[1] Colonic diverticulosis is more prevalent in Western countries. Therefore, the overall prevalence of colonic diverticular disease, including diverticulitis and diverticular hemorrhage, has been reported to be lower in Asian populations.[2] However, the prevalence of diverticulosis has steadily increased over recent decades in Asian countries, including South Korea.[3-5] Although this trend may partly reflect an aging population, data from the Korean Health Insurance Review and Assessment Service revealed that more than 40% of patients diagnosed with diverticular disease were in their 40s and 50s. The rising incidence among young and middle-aged adults warrants further investigation and clinical attention. Acute colonic diverticulitis is generally mild and can be managed conservatively. Nevertheless, serious complications such as abscesses, peritonitis, strictures, and fistulas occur in approximately 12% of patients.[6] These complicated cases may require surgical intervention, including colectomy, which may result in considerable morbidity and mortality depending on the clinical condition. Clinical decision-making is therefore critical in determining patient outcomes. In addition, diverticulitis may recur even after successful treatment, with recurrence rates as high as 22% reported within 10 years.[7] Therefore, acute colonic diverticulitis imposes a considerable burden on quality of life (QoL) and substantial healthcare and socioeconomic costs, which should be considered in treatment planning. Given that management decisions vary across clinical scenarios, major academic societies worldwide have published guidelines for the diagnosis and treatment of acute colonic diverticulitis. Considering the differences in the clinical characteristics of acute colonic diverticulitis and the healthcare environment in Korea compared with other countries, particularly Western nations, there is a clear need to develop clinical practice guidelines tailored to the Korean medical setting.

In response, the Korean Association for the Study of Intestinal Diseases (KASID) established a task force to develop evidence-based guidelines. The task force conducted a systematic literature review and formulated recommendations to optimize diagnosis and management in South Korea. These guidelines aim to assist clinicians in making informed decisions by providing evidence and expert consensus on disease prognosis, diagnostic utility, medical management strategies, and recurrence prevention. They are adapted to the Korean healthcare setting by incorporating surveys of clinicians on real-world practices and patient-reported challenges and preferences. Ultimately, these guidelines seek to enhance treatment efficiency, maximize cost-effectiveness, and improve the quality of public healthcare services.

The primary users of these clinical practice guidelines are clinicians managing patients with acute colonic diverticulitis in secondary and tertiary medical institutions in Korea, although primary care providers may also refer to them in their clinical practice. In addition, these guidelines may provide appropriate disease-related information to patients, nurses, and healthcare policymakers to enhance their understanding of the disease; serve as an educational resource for students and trainees; and contribute to the research design of studies addressing unresolved clinical questions. The target population includes all adult patients seeking care for the diagnosis and treatment of acute colonic diverticulitis. Given the increasing incidence of left-sided colonic diverticulitis in Asia,[8] these guidelines encompass both right- and left-sided colonic diverticulitis. The scope includes prognostic differences based on clinical characteristics, selection of appropriate diagnostic modalities, medical management according to the presence or absence of complications, and the efficacy of pharmacological or surgical interventions for recurrence prevention. However, these guidelines primarily focus on medical management and do not address specific surgical techniques.

DEVELOPMENT PROCESS OF GUIDELINES

1. Guideline Development Committee

These guidelines were developed by the Clinical Practice Guideline Task Force of KASID and consist of 11 experts in the field of intestinal diseases. To develop recommendations for diagnostic imaging, an abdominal radiology expert recommended by the Korean Society of Abdominal Radiology joined the task force. In addition, to provide education, review, and consultation on methodological issues that may arise during the guideline development process, a methodology expert from the Clinical Evidence Research Team of the National Evidence-Based Healthcare Collaborating Agency participated. Consequently, the working committee comprised 13 members.

Starting with the kick-off meeting in August 2021, 13 working meetings and 5 educational programs were conducted. The working committee selected 12 clinical questions, with

one assigned member responsible for each question and 1 or 2 members designated as reviewers. The guidelines were developed collaboratively through literature search, critical reviews, meta-analyses, and determination of the level of evidence. The progress and discussions were reported and reviewed during committee meetings, and the draft recommendations prepared by each working member were comprehensively reviewed by the entire working group.

The consulting committee consisted of intestinal disease experts from KASID and specialists recommended by related academic societies, including the Korean Society of Abdominal Radiology, Korean Society of Gastroenterology, Korean Society of Coloproctology, Korean Academy of Family Medicine, and the Korean Association of Internal Medicine. The consulting committee served as an external reviewer for the overall structure of the guidelines and individual recommendations. All members involved in guideline development declare no conflicts of interest related to these guidelines. These guidelines were developed independently, without any influence from funding bodies. The funders played no role in the content, formulation of recommendations, or final approval of the study guidelines.

2. Selection of Clinical Questions

For the development of this clinical practice guideline, the questions were formulated as "Clinical Questions" rather than "Key Questions" to better reflect real-world clinical decision-making. Twelve clinical questions were developed through a review of international guidelines, consideration of commonly encountered issues in practice, evaluation of current evidence, and in-depth discussions during working committee meetings. These questions addressed major aspects of patient management, including patient characteristics, diagnosis, medical treatment, prevention of recurrence, and management of recurrence. The perspectives of clinical and methodological experts were incorporated as much as possible in formulating the questions and anticipated recommendations. As part of this process, the ongoing development of the guidelines was announced, and a survey on clinical practice patterns related to these topics was conducted among gastroenterologists and internal medicine specialists who are members of KASID and likely to be primary users of the guidelines. Each clinical question was structured according to the Population, Intervention, Comparator, and Outcome (PICO) framework, which provided the basis for literature searches, evidence appraisal, and synthesis. Several questions were further refined to improve clinical clarity and better represent real-world decision-making contexts. Final recommendations were derived from these clinical questions.

3. Determination of Guideline Development Method

These practice guidelines were developed using a hybrid method. First, to assess the feasibility of adapting existing international guidelines, a literature search was conducted in Ovid-MEDLINE using the keywords "colon," "diverticulitis," "diverticulitides," "diverticular*," and "inflamm*." The guidelines published by the American Gastroenterological Association (AGA), Japanese Gastroenterological Association, European Society of Coloproctology (ESCP), European Association for Endoscopic Surgery, Society of American Gastrointestinal and Endoscopic Surgeons, American Society of Colon and Rectal Surgeons, and the World Society of Emergency Surgery were identified[9-14] and evaluated using Appraisal of Guidelines for Research and Evaluation Instrument (AGREE) 2.0.[15] In addition, a thorough assessment was conducted to evaluate alignment with the clinical questions selected by our working committee, the validity of literature selection, and the process of evidence derivation. Consequently, the ESCP and Japan Gastroenterological Endoscopy Society guidelines were determined to be suitable for developing recommendations for Clinical Question 10, which addresses the prevention of recurrence using an adaptive methodology. With regard to other clinical questions, the reviewed guidelines either did not address the topics, lacked clarity in the derivation process of their recommendations, or had insufficient supporting evidence. Therefore, the existing guidelines were used only as references, and recommendations were developed using *de novo* methodologies.

4. Literature Searches and Selection

The literature search strategy was systematically structured with the assistance of a methodological expert. To enhance the sensitivity of the search and link similar clinical questions when necessary, the strategy focused on the population (P) and intervention (I) components of PICO. The literature search was conducted in Ovid-MEDLINE, Ovid-Embase, the Cochrane Library, and KoreaMed using keywords derived from each of the 11 clinical questions designated for *de novo* processing. Retrieved articles from each database were screened, and duplicates were removed. The remaining articles underwent primary and secondary selection or exclusion based on the literature selection criteria established by the working committee.

To supplement the search results, manual searches were conducted as needed. When relevant systematic reviews or meta-analyses were identified, their reference lists were also reviewed. Furthermore, supporting evidence for similar recommendations in existing guidelines was manually assessed to ensure no relevant evidence was omitted. The search period was from December 2021 to February 2022, and the detailed search strategy for each clinical question is presented in Supplementary Data 1. For each clinical question, 2 working committee members independently reviewed and crosschecked the literature to enhance objectivity. In cases of discrepancies, discussions and consensus processes were conducted to reach a final decision.

For Clinical Question 10, which was developed using an adaptive process, the latest literature was searched starting at least 1 year prior to the publication date of the selected practice guidelines, and the suitability of the evidence was assessed using the same methodology described above.

5. Evidence Appraisal and Synthesis

The quality of the selected literature was assessed, and evidence tables were prepared to summarize the findings. Various quality assessment tools were used based on the study design to evaluate the risk of bias in each study. For randomized studies, the Cochrane Risk of Bias for Randomized Studies 2.0 tool was used.[16] For non-randomized studies, the Risk of Bias for Non-randomized Studies 2.0 tool was utilized.[17] For studies assessing diagnostic accuracy, the Quality Assessment of Diagnostic Accuracy Studies tool was utilized.[18] Each study was independently reviewed by 2 members of the working committee. In cases where discrepancies arose between reviewers, consensus was first attempted; if consensus could not be reached, a third member was consulted to determine the final risk of bias. The use of existing systematic reviews was considered more efficient for some clinical questions. In such cases, only systematic reviews with at least a moderate-quality rating in A Measurement Tool for Assessment of Multiple Systematic Reviews (AMSTAR) 2.0 were included.[19]

The evidence was synthesized using an evidence table containing the selected literature. When quantitative data extraction and synthesis were feasible, a meta-analysis was performed to integrate the findings. However, if the amount of available evidence was too small or the data from individual studies were highly heterogeneous, making quantitative analysis infeasible, a qualitative synthesis was performed with a narrative description of the findings. For each clinical question, one working committee member synthesized the evidence, while another member reviewed the synthesis. Meta-analyses were conducted using Review Manager software (Version 5.4; The Nordic Cochrane Center, The Cochrane Collaboration, 2014, Copenhagen, Denmark). For meta-analyses involving data with significant heterogeneity, a random-effects model was applied, and subgroup analyses were performed to explore potential sources of heterogeneity.

6. Development of Clinical Recommendations

Draft recommendations for each clinical question were developed, and the level of evidence and strength of each recommendation were determined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology.[20] For each clinical question, the evidence level for critical and important outcomes was rated as high, moderate, low, or very low (Table 1). The strength of recommendations was determined by considering the 4 factors outlined in the GRADE methodology: level of evidence, balance between benefits and harms, patient values and preferences, resource implications (costs), and feasibility. Recommendations were categorized as strong or conditional for or against an intervention. When the direction of the recommendation was uncertain or the evidence was inconclusive, it was classified as "inconclusive" (Table 2). The level of evidence and the direction and strength of recommendations were determined through multiple discussions among the working committee members to reach an informal consensus. The grade of

Table 1. Definition of Level of Evidence According to GRADE Methodology

Level of evidence	Definition
High	Very confident that the true effect lies close to that of the estimate of the effect
Moderate	Moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low	Very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect

GRADE, Grading of Recommendations Assessment, Development, and Evaluation.

Table 2. Definition of Grade of Recommendations

Grading	Definition
Strong recommendation	Strongly recommended in most clinical situations when the benefits outweigh the harms or when considering patient values, preferences, and resources.
Conditional recommendation	Conditionally recommended because the benefits and harms may vary depending on the clinical situations, patient values and preferences, or resources.
Strongly against	Strongly not recommended in most clinical situations when the harms outweigh the benefits or when considering patient values, preferences, and resources.
Conditional against	Not recommended in some conditions when the harms may outweigh the benefits or when considering patient values and preferences, or resources.
Inconclusive	Not deciding to recommend due to significantly low quality of evidence or substantial uncertainty/variability in the balance of benefits and harms, while considering benefits and harms, the level of evidence, patient values and preferences, and available resources. The intervention cannot be recommended for or against, leaving it to the judgment of the clinician.
Expert consensus	Recommended based on clinical experience and expert consensus, considering the benefits and harms, patient values and preferences, and resources, although the evidence is lacking.

recommendation does not indicate the intensity of whether a particular action should be performed, but rather reflects the validity and general applicability of the recommendation. In developing the draft recommendations, potential barriers to real-world implementation and measures to enhance clinical uptake were also considered. Patient preferences and values were explicitly integrated into the development process. They were systematically analyzed and incorporated into decision-making. In particular, for Clinical Question 12, patient-reported experiences and expectations served as key evidence influencing both the direction and strength of the recommendation. Patient data were collected through a structured survey of individuals treated for recurrent diverticulitis, defined as 2 or more episodes, allowing the guideline development committee to actively incorporate real patient experiences and preferences into the recommendations.

7. External Review and Approval

Internal consultation feedback from KASID members and external expert group reviews of the draft recommendations were requested via email. Comments were collected regarding the level of agreement and appropriateness of the recommendations. Expert consensus was reached through an online meeting using the modified Delphi method. A recommendation was adopted if at least 70% of the total votes were "completely agree" or "generally agree." Recommendations that did not meet this threshold were revised based on feedback and discussed further before undergoing a second-round vote to achieve consensus. Ultimately, 20 recommendations addressing 12 clinical questions were developed, agreed upon, and formally adopted (Table 3).

8. Dissemination and Implementation

To promote the dissemination and practical application of these guidelines, KASID plans to hold educational symposia featuring diverse clinical cases, provide online resources on the society's official website, and distribute printed booklets summarizing the clinical recommendations. These initiatives aim to enhance implementation in real-world practice and improve accessibility for healthcare professionals.

9. Revision and Updating Process

These clinical practice guidelines will remain valid until new evidence or changes in clinical practice warrant revision. The KASID continuously monitors emerging data and coordinates updates through its Clinical Practice Guidelines Committee.

CLINICAL QUESTIONS AND RECOMMENDATIONS

Clinical Question 1: Should Differences in Clinical Presentation and Disease Course between Left- and Right-Sided Acute Colonic Diverticulitis Lead to Different Clinical Approaches or Treatment Strategies?

Recommendation 1. Acute left-sided colonic diverticulitis, which carries a higher risk of severe disease, recurrence, and emergency surgery than right-sided diverticulitis, warrants a more cautious and individualized management approach. (Grade of recommendation: conditional recommendation; Level of evidence: low)

Table 3. Summary of Recommendations for Diagnosis and Medical Management of Acute Colonic Diverticulitis

Recommendation		Grade of recommendation	Level of evidence
1.	Acute left-sided colonic diverticulitis, which carries a higher risk of severe disease, recurrence, and emergency surgery than right-sided diverticulitis, warrants a more cautious and individualized management approach.	Conditional recommendation	Low
2.1.	Immunocompromised patients with acute colonic diverticulitis should be managed with active and careful treatment, as they are at increased risk for emergency surgery, higher mortality, and prolonged hospitalization.	Strong recommendation	Low
2.2.	Complicated acute colonic diverticulitis in immunocompromised patients, particularly when involving the left colon, requires an active treatment strategy, including elective surgery when clinically indicated according to the patient's overall condition.	Conditional recommendation	Very low
3.1.	Abdominal CT scan is recommended as the diagnostic modality of choice for patients with suspected acute colonic diverticulitis, as it provides high diagnostic accuracy.	Strong recommendation	Moderate
3.1.1.	Abdominal CT scan is recommended for the evaluation of complications in patients with acute colonic diverticulitis, given its high diagnostic accuracy.	Strong recommendation	Very low
3.1.2.	The diagnostic accuracy of low-dose abdominal CT in patients with acute colonic diverticulitis is not significantly different from that of standard-dose abdominal CT; therefore, low-dose abdominal CT can be performed when indicated. However, it may have limitations in detecting diverticulitis-related complications.	Conditional recommendation	Low
3.2.	The diagnostic accuracy of abdominal US performed by an experienced examiner in patients with acute colonic diverticulitis is not significantly different from that of abdominal CT, and abdominal US can be considered as the initial diagnostic test in clinical situations where CT use is limited or restricted.	Conditional recommendation	Moderate
3.2.1.	Abdominal US performed by an experienced examiner may be considered first to evaluate the presence of complications in patients with acute colonic diverticulitis, where abdominal CT is limited or contraindicated.	Conditional recommendation	Very low
4.	Patients with acute colonic diverticulitis are recommended to undergo a screening colonoscopy after recovery from the acute episode, as the prevalence of colorectal cancer is higher in this population than in the general population. Colonoscopy may be deferred only if a high-quality colonoscopy was performed within the previous year and yielded negative findings.	Strong recommendation	Low
5.	In patients with uncomplicated diverticulitis who are not immunocompromised, empiric antibiotic therapy does not reduce the risk of surgery, additional interventions, readmissions, recurrence, or complications; therefore, conservative management without antibiotics may be considered as the initial treatment option based on clinicians' judgment.	Conditional recommendation	High
6.	If clinically tolerated, patients with uncomplicated acute diverticulitis may begin a light diet, such as a liquid or soft diet, as there is no evidence that therapeutic fasting or parenteral nutrition provides superior clinical outcomes compared with dietary advancement.	Conditional recommendation	Very low
7.	In hemodynamically stable patients with diverticulitis with microperforation but without panperitonitis, conservative treatment with antibiotics can be initiated first.	Conditional recommendation	Very low
8.1.	In patients with acute colonic diverticulitis with an abscess but without panperitonitis, non-surgical treatment such as antibiotics and percutaneous drainage can be initiated first.	Conditional recommendation	Very low
8.1.1.	In patients with acute colonic diverticulitis with an abscess but without panperitonitis, percutaneous drainage should be considered when the abscess size is ≥ 3 cm.	Conditional recommendation	Very low
9.	The use of aspirin or NSAIDs in patients with a history of acute colonic diverticulitis may be associated with an increased risk of recurrence and should be used with caution. Decisions regarding continuation or discontinuation of these medications should be made carefully, taking into account the patient's underlying conditions and overall clinical situation.	Conditional against	Low
10.1.	In patients who have recovered from acute colonic diverticulitis, mesalazine is not recommended for preventing recurrence or persistent symptoms.	Strongly against	Low
10.2.	Rifaximin is not recommended to prevent recurrence or persistent symptoms in patients who have recovered from acute colonic diverticulitis.	Strongly against	Very low
10.3.	In patients who have recovered from acute colonic diverticulitis, the use of probiotics is generally not recommended for the prevention of recurrence or persistent symptoms.	Conditional against	Very low
11.	A high-fiber diet is beneficial for general health, but current evidence is insufficient to recommend it for the prevention of recurrent diverticulitis.	Inconclusive	Very low
12.	In immunocompetent patients with multiple recurrences of acute colonic diverticulitis, the decision for surgical treatment should be individualized according to the patient's perceived QoL and clinical condition rather than based solely on the number of recurrences.	Conditional recommendation	Low

CT, computed tomography; US, ultrasonography; NSAIDs, nonsteroidal anti-inflammatory drugs; QoL, quality of life.

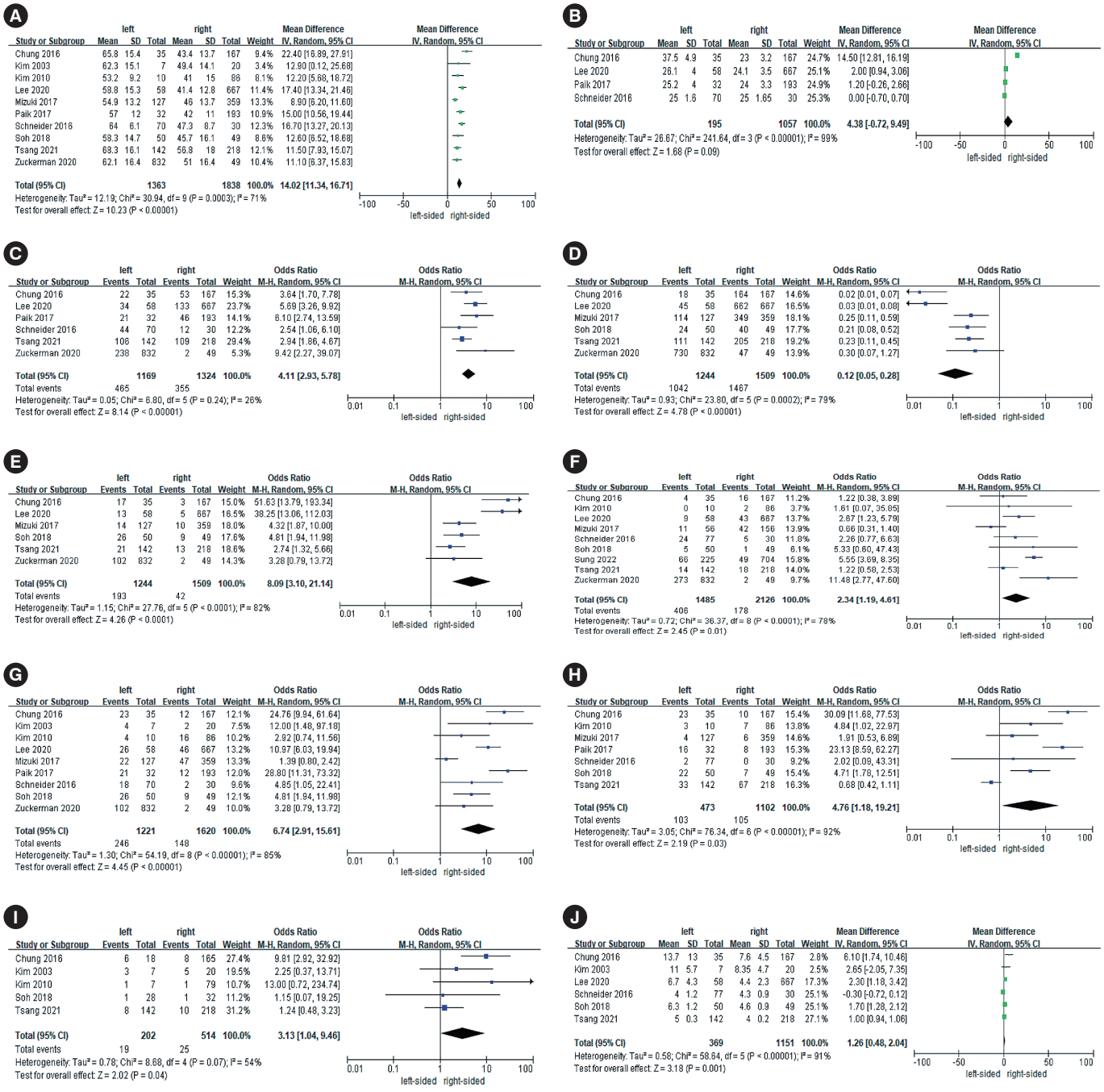

Fig. 1. Meta-analysis of clinical characteristics according to disease location (left-sided vs. right-sided) in patients with acute colonic diverticulitis. Forest plots show pooled mean differences or odds ratios with 95% confidence intervals (CIs) comparing left-sided and right-sided colonic diverticulitis. Analyses were as follows: (A) Age. (B) Body mass index. (C) Comorbidity. (D) Modified Hinchey stage I disease. (E) Modified Hinchey stage II–IV disease. (F) Recurrence. (G) Complicated diverticulitis. (H) Need for emergency surgery. (I) Failure of conservative treatment. (J) Length of hospital stay. M-H, Mantel-Haenszel; CI, confidence interval; IV, inverse variance.

1) PICO

P (Population): Patients with acute left-sided colonic diverticulitis

C (Comparison): Patients with acute right-sided colonic diverticulitis

O (Outcome): Clinical characteristics, disease severity, recurrence rate, need for emergency surgery

2) Evidence Review

An analysis of 11 observational studies on colonic diverticuli-

tis, including those from a previous meta-analysis,[8,21-29] 2 subsequently published studies,[30,31] and one Korean study,[32] revealed differences between right- and left-sided colonic diverticulitis.

Patients with right colonic diverticulitis were significantly younger than those with left colonic diverticulitis (mean difference [MD], –14.02; 95% confidence interval [CI], –16.71 to –11.34), whereas there was no significant difference in body mass index between the 2 groups (MD, –4.38; 95% CI, –9.49 to 0.72). Chronic comorbidities were more frequently observed in patients with left colonic diverticulitis than in those with right colonic diverticulitis (odds ratio [OR], 4.11; 95% CI, 2.93–5.78).

In terms of clinical course, left colonic diverticulitis was associated with poorer outcomes than right colonic diverticulitis. The proportion of mild, uncomplicated diverticulitis (Modified Hinchey classification I) was significantly higher in right colonic diverticulitis ($P<0.001$), whereas severe, complicated diverticulitis (Modified Hinchey classification II, III, or IV) was more frequent in left colonic diverticulitis (OR, 8.09; 95% CI, 3.10–21.14). The recurrence rate was also higher in patients with left colonic diverticulitis (OR, 2.34; 95% CI, 1.19–4.61). Furthermore, emergency surgery was more frequently required in patients with left colonic diverticulitis (OR, 4.76; 95% CI, 1.18–19.21), and the rate of conservative treatment failure was higher in left colonic diverticulitis (OR, 3.13; 95% CI, 1.04–9.46) (Fig. 1).

3) Considerations for Recommendation

Level of evidence

All reviewed studies were retrospective cohort studies. Owing to the inherent limitations of observational research, the overall level of evidence was rated as "low." Although patient selection criteria were clearly defined, differences in clinical factors such as age and comorbidities between groups may have introduced selection bias. Most studies analyzed clinical outcomes without adjusting for these confounding factors. For example, left colonic diverticulitis tends to occur more frequently in older individuals, which may partly explain the higher prevalence of comorbidities.[26] All included studies were relatively homogeneous regarding study design and diagnostic criteria and they provided consistent data on disease severity, clinical course, and outcomes by anatomical location.

Benefits and harms

Differences in disease severity between right- and left-sided diverticulitis can be explained pathophysiologically. Right-sided diverticula are mainly congenital true diverticula, involving all bowel wall layers and often presenting with a broad base. Consequently, right colonic diverticulitis tends to occur in younger individuals, is less likely to cause serious complications or require emergency surgery, and generally responds well to conservative treatment.[24,25,27,32] In contrast, left colonic diverticulitis often involves multiple diverticula and diffuse inflammation, particularly in the sigmoid colon, which may readily spread into the peritoneal cavity.[21,23,24] These features likely account for the higher disease severity and need for emergency surgery in left colonic diverticulitis. In addition, left colonic diverticulitis occurs more frequently in older patients with more comorbidities, further increasing complication risk.[25,28,32] Therefore, management should consider multiple clinical factors, such as age, comorbidities, and immune status, to ensure an individualized and comprehensive approach. The standard diagnostic modality is abdominal computed tomography (CT), recommended in all cases to confirm the diagnosis. Right colonic diverticulitis often presents with mild or short-lived symptoms and may initially be managed conservatively with laboratory testing and antibiotics. Left colonic diverticulitis is more likely to progress to severe disease or peritonitis, necessitating timely CT imaging and active diagnostic evaluation. Emergency surgery for complicated left colonic diverticulitis carries a relatively high risk of stoma formation; therefore, proactive medical management from diagnosis may improve outcomes. Although left colonic diverticulitis shows higher recurrence rates, evidence remains insufficient to recommend routine follow-up CT imaging after treatment of uncomplicated cases. In conclusion, left colonic diverticulitis generally has a more severe clinical course and requires more active diagnostic and therapeutic strategies than right colonic diverticulitis. In addition, factors such as advanced age and comorbidities may contribute to poorer outcomes, making individualized management essential.

Clinical applicability and practice patterns

In Asian populations, right colonic diverticulitis has historically been more common. However, a Japanese study reported that left-sided disease incidence increased from 4% in 1998 to 36% in 2009.[8] In a recent survey of Korean gastroenterologists, only 23.6% indicated that left colonic diverticulitis is associated with more severe complications, suggesting limited clinician awareness of its severity.[33] Overall, left colonic diverticulitis is no longer rare among Asian patients, and clinicians should be informed about its clinical characteristics and disease course.

Clinical Question 2: In Patients with Acute Colonic Diverticulitis, Does the Presence of an Immunocompromised Condition or Immunosuppressive Therapy Lead to Worse Clinical Outcomes, Such as Higher Rates of Surgery, Mortality, Longer Hospital Stay, or Recurrence, than Those without Immunosuppression?

Recommendation 2.1. Immunocompromised patients with acute colonic diverticulitis should be managed with active and careful treatment, as they are at increased risk for emergency surgery, higher mortality, and prolonged hospitalization. (Grade of recommendation: strong recommendation; Level of evidence: low)

Recommendation 2.2. Complicated acute colonic diverticulitis in immunocompromised patients, particularly when involving the left colon, requires an active treatment strategy, including elective surgery when clinically indicated according to the patient's overall condition. (Grade of recommendation: conditional recommendation; Level of evidence: very low)

1) PICO

P (Population): Patients with acute colonic diverticulitis who are immunocompromised

C (Comparison): Immunocompetent patients with acute colonic diverticulitis

O (Outcome): Clinical outcomes, including emergency surgery, overall mortality, hospital stay, recurrence

2) Evidence Review

A previous meta-analysis on the clinical course and prognosis of acute diverticulitis in immunocompromised patients included only those who underwent surgery.[34] Therefore, a new meta-analysis was conducted to include clinical outcomes after nonoperative or conservative treatment, incorporating a total of 10 observational studies (Fig. 2).[35-45] In these studies, 5,339 immunocompromised patients were analyzed, including those with a history of organ transplantation, chemotherapy, corticosteroid or immunosuppressant use, or AIDS, as well as 1,941,122 immunocompetent patients.

Among patients with acute diverticulitis, there was no significant difference in the overall risk of surgical intervention, including both emergency and elective surgeries, between immunocompromised and immunocompetent patients (relative risk [RR], 1.26; 95% CI, 0.81–1.96). However, the risk of emergency surgery was significantly higher in immunocompromised patients (34.3% vs. 22.4%; RR, 1.76; 95% CI, 1.31–2.38), and the overall mortality rate was also significantly higher (4.7% vs. 1.5%; RR, 3.65; 95% CI, 1.73–7.69). Postoperative mortality after emergency surgery was 13.1% in immunocompromised patients compared with 4.9% in immunocompetent patients (RR, 3.05; 95% CI, 1.70–5.45). In contrast, mortality after elective surgery did not differ significantly between the 2 groups. Postoperative morbidity was higher in immunocompromised patients (26.6% vs. 12.3%; RR, 2.07; 95% CI, 1.83–2.34), even in elective cases. The length of hospital stay was significantly longer in immunocompromised patients (MD, 6.12 days; 95% CI, 2.04–10.20). The risk of complications, including abscess, perforation, stricture, and fistula, was higher in immunocompromised patients but not statistically significant (RR, 1.24; 95% CI, 0.95–1.63). Similarly, recurrence rates were comparable between the 2 groups (RR, 0.96; 95% CI, 0.70–1.33).

In an additional analysis stratified by disease severity, immunocompromised patients with complicated diverticulitis had a significantly higher risk of emergency surgery (55.2% vs. 39.3%; RR, 1.77; 95% CI, 1.10–2.84) and (RR, 3.67; 95% CI, 1.58–8.50) than immunocompetent patients. Among those with uncomplicated diverticulitis, no significant difference in emergency surgery risk was observed.[45]

3) Considerations for Recommendation

Level of evidence

Most of the 10 non-randomized observational studies had an unclear risk of bias regarding confounding variables and participant selection. Some studies did not clearly define the control group as fully immunocompetent, and one study each was rated as high risk in these domains. However, their impact on the overall meta-analysis was limited. The level of evidence was rated as "low" for outcomes such as emergency surgery risk, postoperative mortality after emergency surgery, postoperative complications following elective surgery, and prolonged hospital stay, and "very low" for other clinical outcomes.

Benefits and harms

Immunocompromised patients with diverticulitis require antibiotic therapy even in uncomplicated disease owing to impaired bacterial clearance and delayed tissue healing. Nonoperative management failure is more frequent in this group, and clinicians should maintain a low threshold for surgical intervention.[46] This meta-analysis shows that immunocompromised patients have a 1.8-fold higher risk of emergency surgery and a 3.7-fold higher overall mortality than immunocompetent patients, with significantly higher postoperative mortality after

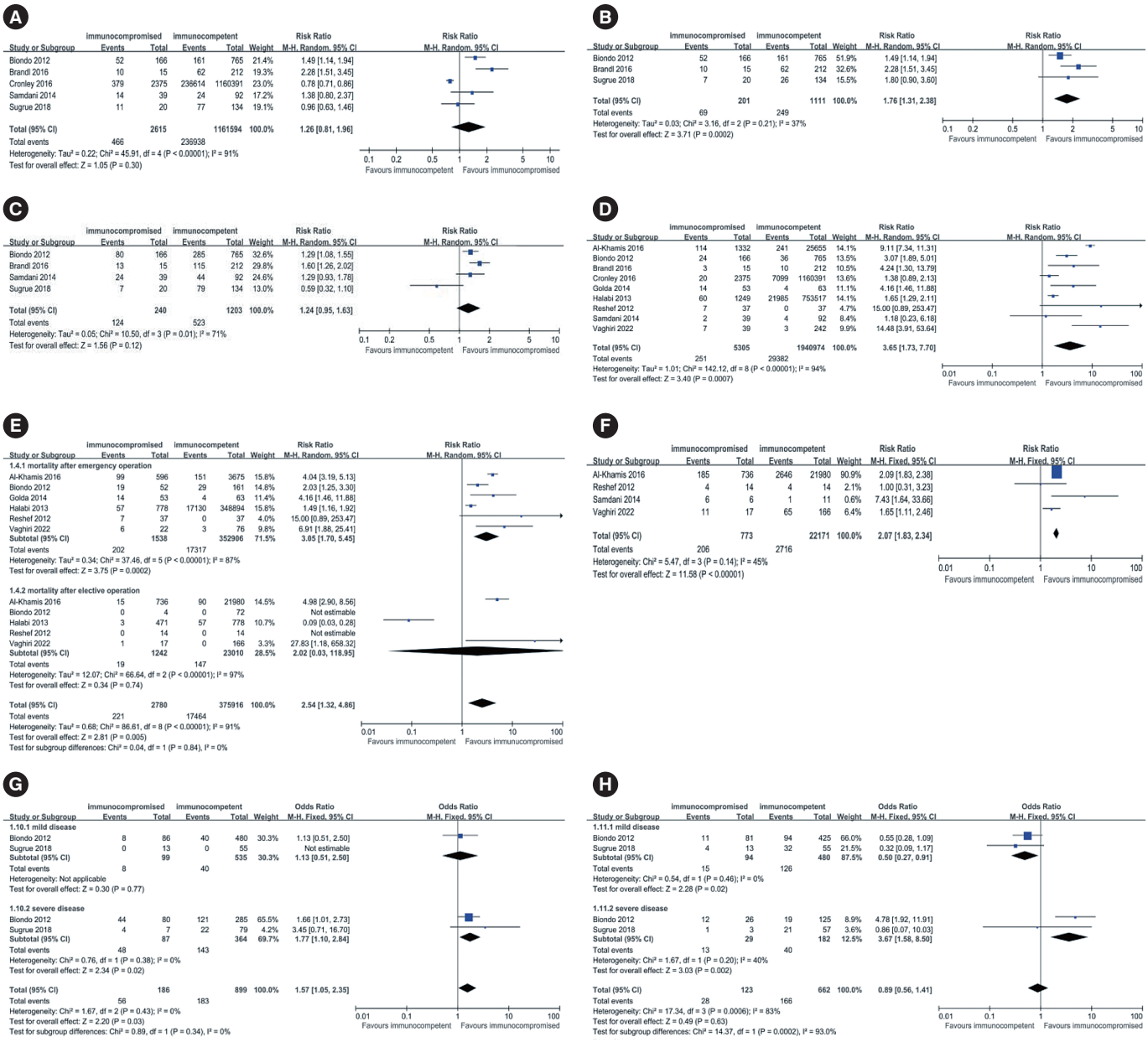

Fig. 2. Meta-analysis of clinical outcomes comparing immunocompromised versus immunocompetent patients with acute colonic diverticulitis. Forest plots show pooled odds ratios with 95% CIs. Analyses include (A) Overall need for surgery. (B) Emergency surgery. (C) Complicated disease. (D) Overall mortality. (E) Postoperative mortality. (F) Major morbidity after elective surgery. (G) Emergency surgery following failure of medical treatment stratified by disease severity. (H) Recurrence rate stratified by disease severity. M-H, Mantel-Haenszel; CI, confidence interval. Modified from Lee JG, Intest Res 2023;21:481-492.[45]

emergency surgery. Therefore, early CT evaluation and aggressive, proactive medical management, including an adequate course of broad-spectrum antibiotics, are strongly recommended.[9] For severe or complicated diverticulitis, immunocompromised patients have higher risks of emergency surgery, recurrence, and complicated recurrent disease. Elective surgical resection after recovery is conditionally recommended for carefully selected patients after multidisciplinary evaluation involving a colorectal surgeon.[12-14] However, as these patients, particularly those in poor general condition, are prone to postoperative complications and the survival benefit remains uncertain,[47] routine elective surgery is not supported. Decisions should be made on a case-by-case basis, considering overall health and comorbidities. Although stricter management is

generally required in immunocompromised patients, surgery should be considered cautiously in mild, uncomplicated cases. Nonoperative outcomes were not significantly different from those in immunocompetent patients,[35,44] and postoperative morbidity following elective surgery was more than twice as high, indicating limited benefit in mild disease. Because most studies did not stratify outcomes by disease severity, evidence supporting elective surgery in this subgroup remains insufficient. Conservative management, including appropriate antibiotics and close monitoring, is recommended for patients with mild, uncomplicated diverticulitis.

Most included studies involved left-sided colonic diverticulitis, so the severity and prognosis of right-sided disease in immunocompromised patients remain unclear. Although left-sided disease predominates in Western populations, right-sided disease remains common in Asia.[8,48] Right-sided diverticulitis generally has a lower risk of complications and a favorable prognosis.[49] Although evidence is insufficient to determine whether right-sided diverticulitis in immunocompromised patients warrants similarly aggressive management, careful clinical monitoring and close follow-up are advised, taking into account indirect evidence from left-sided cases.

Overall, despite the low level of evidence, the consistent trend toward higher risks of emergency surgery and mortality in immunocompromised patients supports the need for cautious, proactive, and individualized management.

Clinical Question 3: In Patients with Acute Colonic Diverticulitis, Which Imaging Modality Provides the Highest Diagnostic Accuracy, and Are Both CT and Ultrasonography (US) Useful for Diagnosis?

Recommendation 3.1. Abdominal CT scan is recommended as the diagnostic modality of choice for patients with suspected acute colonic diverticulitis, as it provides high diagnostic accuracy. (Grade of recommendation: strong recommendation; Level of evidence: moderate)

Recommendation 3.1.1. Abdominal CT scan is recommended for the evaluation of complications in patients with acute colonic diverticulitis, given its high diagnostic accuracy. (Grade of recommendation: strong recommendation; Level of evidence: very low)

Recommendation 3.1.2. The diagnostic accuracy of low-dose abdominal CT in patients with acute colonic diverticulitis is not significantly different from that of standard-dose abdominal CT; therefore, low-dose abdominal CT can be performed when indicated. However, it may have limitations in detecting diverticulitis-related complications. (Grade of recommendation: conditional recommendation; Level of evidence: low)

Recommendation 3.2. The diagnostic accuracy of abdominal US performed by an experienced examiner in patients with acute colonic diverticulitis is not significantly different from that of abdominal CT, and abdominal US can be considered as the initial diagnostic test in clinical situations where CT use is limited or restricted. (Grade of recommendation: conditional recommendation; Level of evidence: moderate)

Recommendation 3.2.1. Abdominal US performed by an experienced examiner may be considered first to evaluate the presence of complications in patients with acute colonic diverticulitis, where abdominal CT is limited or contraindicated. (Grade of recommendation: conditional recommendation; Level of evidence: very low)

1) PICO

P (Population): Patients with suspected acute colonic diverticulitis
I (Intervention): Abdominal CT scan or abdominal US
C (Comparison): Other diagnostic examinations (e.g., clinical assessment alone, plain abdominal radiography, or other imaging modalities)
O (Outcome): Diagnostic accuracy for the diagnosis of acute colonic diverticulitis

2) Evidence Review

A total of 17 articles were identified, including 5 retrospective studies[50-54] and 12 prospective studies.[55-66] Among them, 10 studies reported the diagnostic performance of CT,[54-58,60-63,65] and 9 reported the diagnostic performance of US.[50-52,58,59,62-64,66] In the meta-analysis, the diagnostic performance of CT scan was high, with a sensitivity of 96% (95% CI, 0.91–0.98) and a specificity of 98% (95% CI, 0.88–1.00). The diagnostic performance of US was also high, with a sensitivity of 85% (95% CI, 0.78–0.90) and a specificity of 98% (95% CI, 0.94–1.00), though the sensitivity was slightly lower than that of CT. Three prospective studies compared the diagnostic performance of clinical diagnosis without imaging and diagnosis with CT or US.[54,60,61] Clinical diagnosis alone had significantly lower diagnostic performance than CT or US, with pooled sensitivity and specificity of 78% (95% CI, 0.65–0.87) and 83% (95% CI, 0.45–0.96), respectively. Therefore, imaging studies such as CT or US are recommended for the diagnosis of acute colonic diverticulitis rather than clinical findings only. Three prospective studies directly compared CT and US. One study found CT

had higher sensitivity than US in differentiating acute appendicitis from acute colonic diverticulitis in patients with acute abdomen,[63] while the other 2 reported equivalent diagnostic performance.[58,62] Therefore, CT is recommended as the preferred imaging modality, with US as an alternative when CT is limited. Three studies evaluated the diagnostic performance of low-dose versus conventional-dose CT. Although criteria for low-dose CT varied across studies, all reported high diagnostic performance, with a pooled sensitivity of 96% (95% CI, 0.83–0.99) and specificity of 99% (95% CI, 0.75–1.00).[54,60,61] Thorisson et al.[61] reported that low-dose CT was nearly as accurate as conventional-dose CT for diagnosing acute diverticulitis (sensitivity, 99.1%; specificity, 100%), but had markedly lower sensitivity for detecting complications such as perforation (61%) or abscess (38%), despite high specificity (99%). These findings suggest that low-dose CT is not recommended for diagnosing diverticular complications. For diagnosing diverticulitis with complications, abdominal CT generally outperforms US.[52,53,65] Werner et al.[65] demonstrated that CT had good diagnostic performance for perforations (sensitivity 100% and specificity 91%) and abscesses (sensitivity 100% and specificity 97%). Hollerweger et al.[52] and Nielsen et al.[53] also reported that while US performs well for uncomplicated diverticulitis, CT is superior for detecting complicated cases. In contrast, a recent prospective study analyzing the diagnostic performance of US in complicated diverticulitis showed excellent diagnostic accuracy (sensitivity, 84%; specificity, 95.7%), suggesting that US may serve as a useful alternative to CT.[59] This study included a relatively large cohort of 240 patients; however, the number of patients with severe complications was small, and US assessment was limited to detecting the presence or absence of complications. Therefore, current evidence is still insufficient to justify replacing CT with US for diagnosing complicated diverticulitis.

3) Considerations for Recommendation

Level of evidence

Among the 10 studies assessing CT performance, none were randomized controlled trials (RCTs). Although several studies had a high risk of bias,[55-58,62,65] there were no serious concerns regarding inconsistency, indirectness, imprecision, or publication bias. According to the GRADE assessment, the overall level of evidence was rated as "moderate." The diagnostic performance of abdominal US was evaluated in 3 retrospective and 6 prospective studies. Given that several had a high risk of bias, the overall level of evidence was also rated as "moderate."[48-50,56,60,62,64] In contrast, studies evaluating low-dose CT and those assessing US for complicated diverticulitis were limited in number; thus, the overall level of evidence for these assessments was rated as "low" or "very low."[50-52,57-59]

Benefits and harms

Meta-analyses comparing clinical diagnosis and imaging modalities demonstrated that both CT and US have high diagnostic accuracy, with CT showing slightly greater specificity than abdominal US.[67] CT is widely used in patients with acute abdomen because it can be performed rapidly, provides high diagnostic precision, and helps identify or rule out alternative causes of abdominal pain.

A separate meta-analysis comparing US and CT directly found no statistically significant difference in overall diagnostic performance, leading the authors to recommend both as first-line options for diagnosing acute diverticulitis. However, CT was considered slightly superior for differentiating other abdominal conditions that can be critical in acute care.[68] Despite these advantages, CT carries potential risks, including radiation exposure and contrast-induced adverse effects, making it less suitable for children, pregnant women, and patients with chronic kidney disease.

Abdominal US offers several benefits, such as being quick, noninvasive, radiation-free, and capable of detecting localized tenderness. It can also be performed at bedside, which is particularly useful for critically ill or immobile patients. A European study reported that using US as the initial test in acute abdomen, followed by CT only when US results were inconclusive, achieved the highest sensitivity while minimizing radiation exposure.[69]

However, the use of US as a first-line diagnostic test varies by clinician and region. A survey of colorectal surgeons in the United Kingdom and the United States found that one-third of U.K. surgeons used US initially, compared with only 7% of US surgeons.[70,71] Similarly, Korean survey on the diagnosis and management of acute colonic diverticulitis found that 93.9% of clinicians preferred CT as the primary diagnostic test, whereas only 3.1% preferred US.[33] This preference may reflect US limitations, including reduced image quality in patients who are obese, restricted sonic windows, and dependence on the examiner's experience and skill. Therefore, it is recommended that abdominal US be performed by a skilled operator and considered primarily when CT is not feasible.

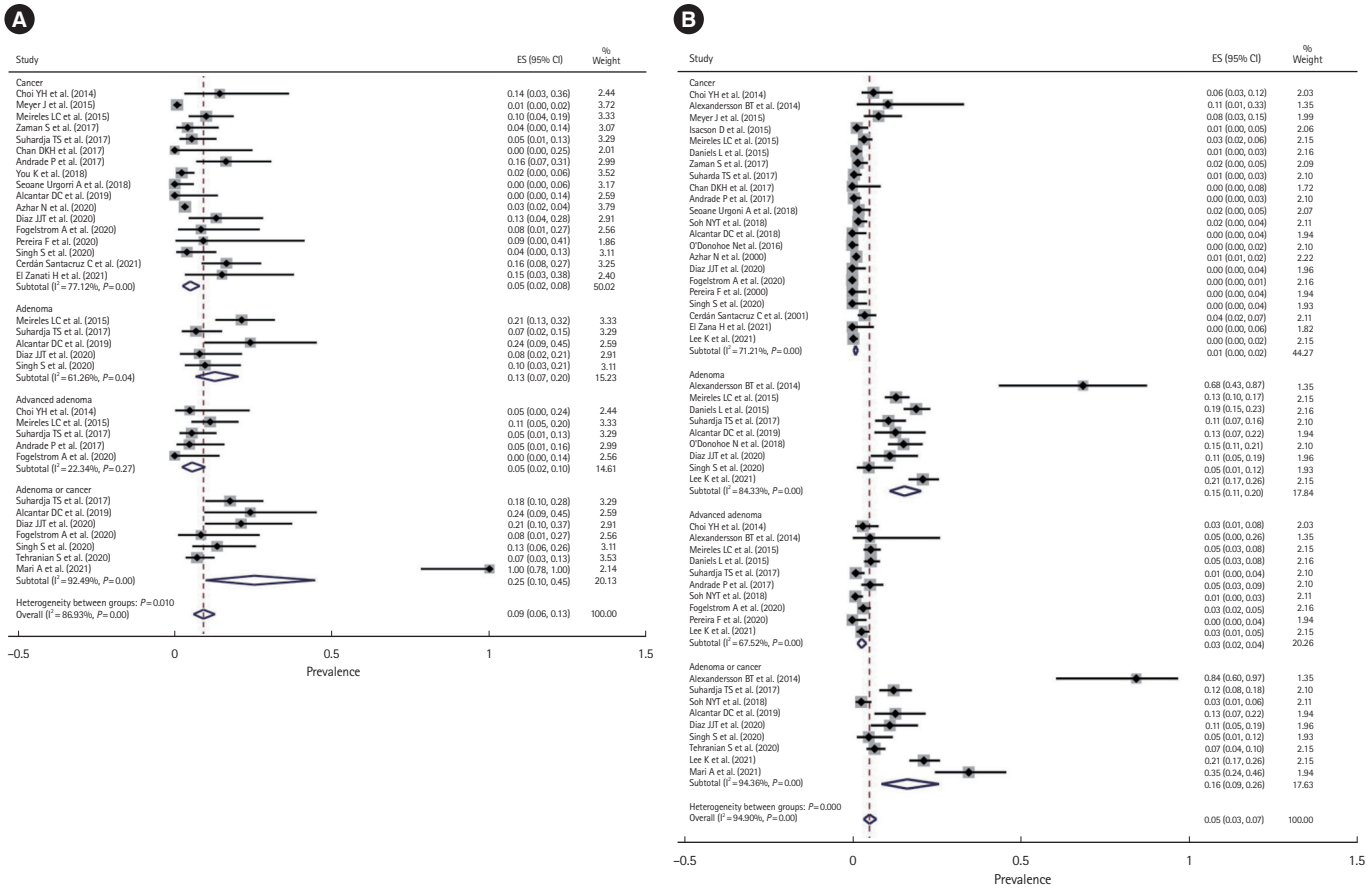

Fig. 3. Meta-analysis of the pooled prevalence of colorectal neoplasm among patients with complicated and uncomplicated diverticulitis. Forest plots show the pooled prevalence with 95% CIs for (A) complicated diverticulitis and (B) uncomplicated diverticulitis. ES, effect size; CI, confidence interval.

Clinical Question 4: Should a Colonoscopy Be Performed after Recovery from Acute Colonic Diverticulitis to Evaluate for ColorectalCancer?

Recommendation 4. Patients with acute colonic diverticulitis are recommended to undergo a screening colonoscopy after recovery from the acute episode, as the prevalence of colorectal cancer is higher in this population than in the general population. Colonoscopy may be deferred only if a high-quality colonoscopy was performed within the previous year and yielded negative findings. (Grade of recommendation: strong recommendation; Level of evidence: low)

1) PICO

P (Population): Patients recovering from acute colonic diverticulitis

I (Intervention): Colonoscopy after recovery from the acute episode

C (Comparison): No colonoscopy after recovery/routine follow-up without colonoscopy

O (Outcome): Detection of colorectal cancer or advanced adenoma

2) Evidence Review

The need for colonoscopic screening for colorectal cancer after recovery from acute colonic diverticulitis has been extensively studied. A total of 50 articles were reviewed, including studies from 3 meta-analyses published in 2019 and 2020,[72-74] as well as 20 additional, more recent studies. Based on these studies, we conducted a meta-analysis to determine the pooled prevalence of colorectal neoplasia in patients with acute diverticulitis and the RR of colorectal neoplasia compared with the general population.

Among 956,016 patients with acute colonic diverticulitis included in the 50 studies, 6,043 were diagnosed with colorectal cancer on colonoscopy performed after recovery, correspond-

ing to a pooled prevalence of 1.0% (95% CI, 0.01–0.02). When analyzed separately, the pooled prevalence of colorectal cancer was 5% (95% CI, 0.02–0.08) in 2,569 patients with complicated diverticulitis and 1% (95% CI, 0.01–0.02) in 7,660 patients with uncomplicated diverticulitis. The pooled prevalence of advanced adenomas was 3% (95% CI, 0.02–0.04) across all patients with acute colonic diverticulitis, compared with 5% (95% CI, 0.02–0.10) in those with complicated cases and 3% (95% CI, 0.02–0.04) in those with uncomplicated disease (Fig. 3).

Seven observational studies directly compared the detection rates of colorectal tumors between patients with acute colonic diverticulitis and control populations. Our meta-analysis demonstrated that patients with acute diverticulitis had a significantly higher risk of colorectal cancer than controls (RR, 1.76; 95% CI, 1.28–2.41). However, the RR of adenoma or advanced adenoma did not differ significantly between the 2 groups (Fig. 4).[48,75-123]

3) Considerations for Recommendation

Level of evidence

Of the 50 studies reviewed, 2 were prospective randomized studies, 5 were prospective observational studies, and 43 were retrospective observational studies. Some studies included only patients with complicated diverticulitis, while others excluded such patients, and some included patients with right- or left-sided colonic diverticulitis. This heterogeneity across the studies suggests potential selection bias in patient recruitment. Although selection bias could not be completely excluded, other domains—exposure measurement, blinding, outcome assessment, and diagnostic criteria—were generally rated as low risk, resulting in an overall risk of bias that was not considered serious. In the GRADE assessment, other domains influencing the certainty of evidence (consistency, directness, precision, and publication bias) were all rated as not serious. Although numerous studies consistently reported a higher incidence of colorectal cancer in patients with acute colonic diverticulitis regardless of the presence of complications, most of the available evidence was derived from observational studies; therefore, the overall certainty of evidence was rated as "low."

Benefits and harms

CT has a high diagnostic accuracy of approximately 99% for acute colonic diverticulitis and its complications.[72] However, some colorectal cancers present with CT findings similar to diverticulitis, leading to missed diagnoses if colonoscopy is not performed. In 41 of the 50 studies reviewed, colonoscopy was performed within 1 year after an episode of acute diverticulitis, and 5,984 of 953,777 patients were diagnosed with colorectal cancer. These findings suggest that CT alone may be insufficient to exclude colorectal cancer and that colonoscopy after recovery from acute diverticulitis contributes to early detection. This is particularly important in patients aged ≥50 years—the recommended age for population-based colorectal cancer screening—who have not undergone a high-quality colonoscopy within the previous year.

Colonoscopy allows direct visualization of the colonic lumen and has high diagnostic accuracy, but iatrogenic colonic perforation occurs in 0.04% to 0.07% of cases.[124] The procedure can be technically challenging in patients with severe colonic diverticulosis,[72] and excessive gas insufflation may increase the risk of perforation in inflamed or weakened bowel segments. In addition, bowel preparation may be suboptimal during the acute inflammatory phase, and the risk of complications is higher. Therefore, colonoscopy should not be performed during the inflammatory phase but rather 6 to 8 weeks after complete clinical resolution of diverticulitis and, preferably, within 3 months thereafter.[9,72] In a survey of Korean gastroenterologists, 94.7% reported performing colorectal cancer screening after recovering in patients aged ≥50 years with colonic diverticulitis, and 71.8% did so in those <50 years. Colonoscopy was the preferred screening method in 97.8% of respondents.[33] This lower rate of screening for colorectal cancer at younger ages may be related to the fact that population-based screening typically begins at age 50. In a study by Chan et al.[100] the incidence of colorectal cancer and advanced adenomas was not increased in patients <50 years with acute diverticulitis.

Patient preferences and values

In a survey of patients diagnosed with acute colonic diverticulitis, approximately 86% reported willingness to undergo colonoscopy when informed about the potential risk of colorectal neoplasia in patients with diverticulitis (Supplementary Data 2). These results suggest that when patients are adequately counseled about their colorectal cancer risk, a substantial proportion of patients are likely to accept colonoscopy despite its invasive nature.

Clinical Question 5: Does Empiric Antibiotic Therapy Improve Clinical Outcomes in Immunocompetent Patients with Acute Uncomplicated Diverticulitis?

Recommendation 5. In patients with uncomplicated diverticulitis who are not immunocompromised, empiric antibiotic

therapy does not reduce the risk of surgery, additional interventions, readmissions, recurrence, or complications; therefore, conservative management without antibiotics may be considered as the initial treatment option based on clinicians' judgment. (Grade of recommendation: conditional recommendation; Level of evidence: high)

1) PICO

P (Population): Patients with acute uncomplicated diverticulitis who are not immunocompromised

I (Intervention): Empiric antibiotic therapy

C (Comparison): No antibiotic therapy (conservative management without antibiotics)

O (Outcome): Risk reduction in surgery, additional interventions, readmission, recurrence, or complications

2) Evidence Review

A total of 10 studies were reviewed to compare the effectiveness

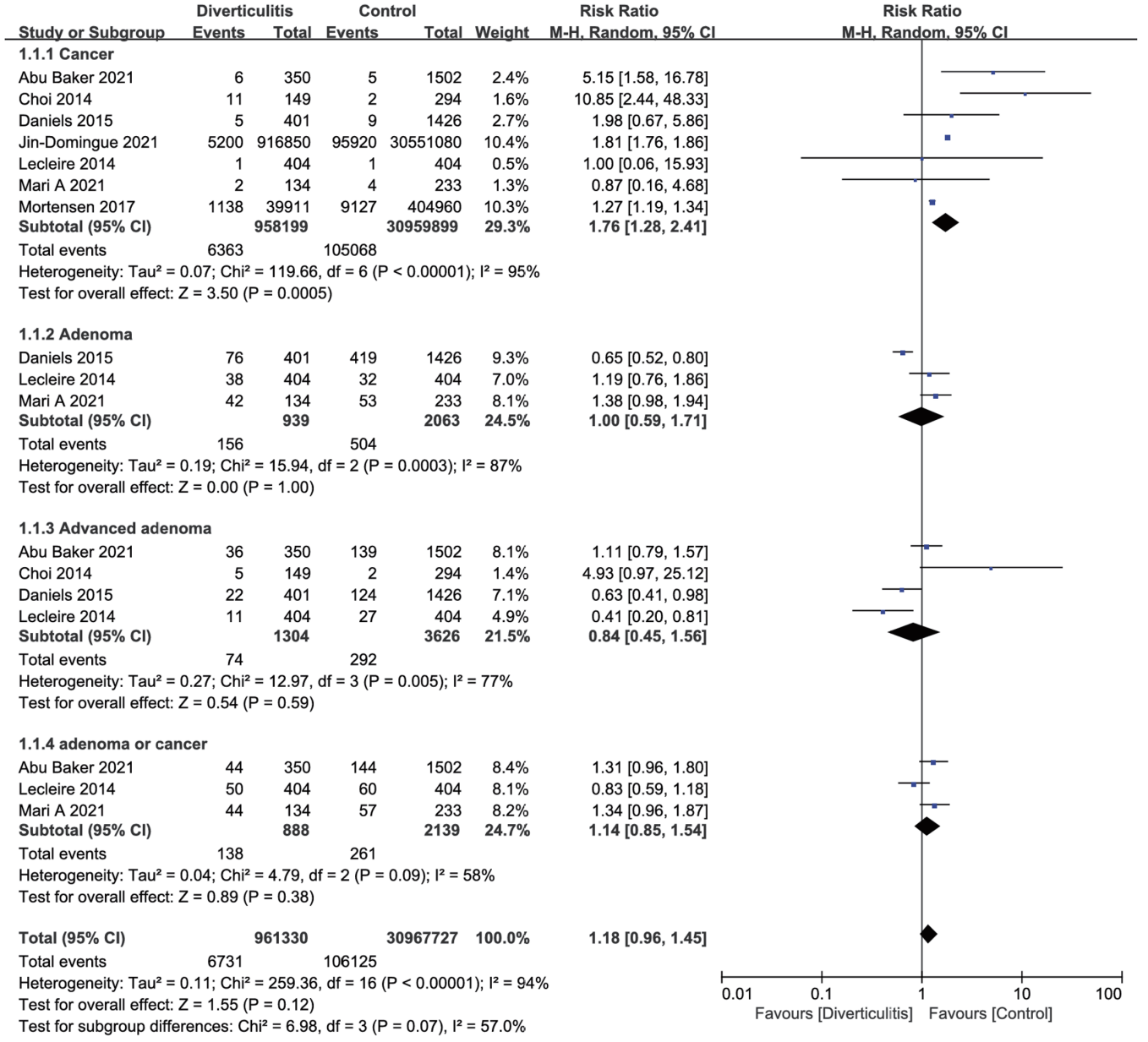

Fig. 4. Meta-analysis comparing the risk of colorectal neoplasm between patients with acute diverticulitis and control subjects. Forest plot shows pooled risk ratios with 95% CIs. Subgroup analyses include: colorectal cancer, adenoma, advanced adenoma, and adenoma or cancer. M-H, Mantel-Haenszel; CI, confidence interval.

of antibiotic therapy versus conservative treatment without antibiotics in immunocompetent patients with uncomplicated diverticulitis.[125-134] A meta-analysis of 6 retrospective observational studies, defining treatment failure as the need for surgery or additional interventions, antibiotic modification, readmissions, or development of complications, showed that antibiotic therapy was associated with a higher risk of treatment failure compared with conservative treatment (pooled treatment failure rates, 7.5% vs. 5.5%; RR, 1.53; 95% CI, 1.05–2.23).[125,127-130,133]

Regarding surgical intervention, meta-analyses of randomized and observational studies demonstrated no significant differences between the 2 groups. In 4 randomized prospective studies, surgical rates were 1.2% in the antibiotic group and 1.7% in the conservative group (RR, 0.72; 95% CI, 0.33–1.56)

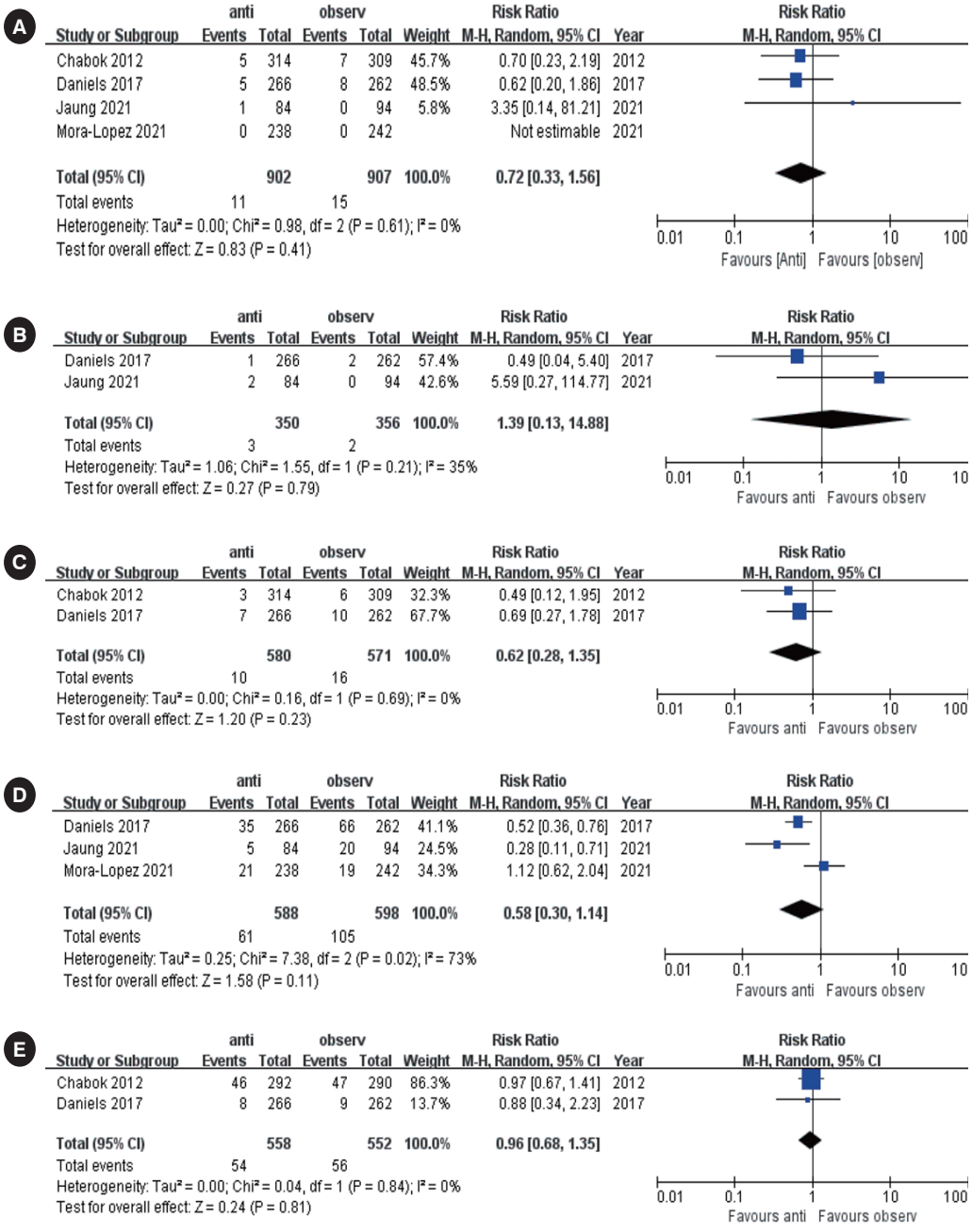

Fig. 5. Meta-analysis comparing antibiotic therapy versus observation in patients with uncomplicated acute colonic diverticulitis. Forest plots from randomized controlled trials compare outcomes as follows: (A) Rates of surgery. (B) Rates of intervention. (C) Complication rate. (D) Readmission rate. (E) Recurrence rate. M-H, Mantel-Haenszel; CI, confidence interval.

(Fig. 5).[126,131,132,134] In 4 retrospective observational studies, surgical rates were 8.2% in the antibiotic group and 1.8% in the conservative group, which did not reach statistical significance (RR, 3.45; 95% CI, 0.91–13.10), though interpretation is limited by differences in baseline characteristics.[125,127-129] Similarly, meta-analyses of randomized studies consistently found no significant differences between groups in terms of additional interventions, complications, readmissions, or recurrence.[126,131,132,134] In contrast, retrospective studies suggested that conservative treatment without antibiotics was associated with a significantly lower risk of complications and recurrence.[127-129]

These findings should be interpreted with caution, as some studies reported higher baseline white blood cell counts, C-reactive protein (CRP) levels, and body temperature in the antibiotic group, which may have influenced outcomes.

3) Considerations for Recommendation

Level of evidence

In immunocompetent patients with mild diverticulitis, antibiotic therapy showed no significant benefit in reducing treatment failure, surgical rates, the need for additional interventions, complications, readmission, or recurrence. The level of evidence was primarily assessed based on randomized prospective studies. Imprecision was rated as serious for additional interventions owing to a wide CI, whereas risk of bias, inconsistency, indirectness, imprecision, and publication bias were all rated as not serious for surgery, complications, readmission, and recurrence. Therefore, the overall level of evidence was rated as "high."

Benefits and harms

Excessive use of antibiotics can lead to adverse drug reactions, antibiotic resistance, and unnecessary healthcare resource utilization. Evaluating the effectiveness of antibiotic therapy has important clinical and public health implications. Risk factors and mechanisms associated with disease progression during conservative management without antibiotics remain incompletely understood. In an observational study of immunocompetent patients with uncomplicated left-sided diverticulitis, approximately 5% of patients progressed to complicated disease. Reported risk factors included concomitant systemic illness, symptom duration >5 days, vomiting, and CRP level >14 mg/dL.[135] However, it is difficult to conclude that these outcomes were directly caused by the absence of antibiotic therapy, and high-quality evidence regarding risk factors for treatment failure remains insufficient.

In Korea, right-sided diverticulitis is more prevalent and generally follows a more favorable clinical course than left-sided disease. Conservative management without antibiotics may therefore also be considered for immunocompetent patients with uncomplicated right-sided diverticulitis. One prospective[136] and one retrospective study,[137] including only patients with right-sided diverticulitis, demonstrated no significant benefit from antibiotic use. Although additional large-scale studies in Korean patients are warranted, current evidence supports withholding antibiotics in patients with mild uncomplicated diverticulitis or in cases incidentally detected during colonoscopy or imaging.

Clinical applicability, practice patterns, and resources

In a survey of Korean physicians, 88.6% of respondents indicated that antibiotics were necessary even for uncomplicated diverticulitis, indicating a clear gap between current evidence and real-world practice.[33] This gap likely results from multiple factors, including defensive medical practices arising from concerns about disease progression and medicolegal consequences, uncertainty regarding risk factors for worsening disease, and expectations of symptom relief with antibiotics. Therefore, empirical antibiotic use in uncomplicated diverticulitis is unlikely to decline substantially in the near future, and continued efforts are needed to bridge the evidence-practice gap. Further research is required to identify patient subgroups who can safely undergo conservative treatment without irreversible complications such as the need for surgery. Establishing such evidence will increase clinician and patient confidence in non-antibiotic management. Given these practical considerations, the recommendation remains conditional despite the overall high level of evidence.

Clinical Question 6: Does Therapeutic Fasting or Parenteral Nutrition Improve Clinical Outcomes Compared with Oral Dietary Intake in Patients with Uncomplicated Acute Colonic Diverticulitis?

Recommendation 6. If clinically tolerated, patients with uncomplicated acute diverticulitis may begin a light diet, such as a liquid or soft diet, as there is no evidence that therapeutic fasting or parenteral nutrition provides superior clinical outcomes compared with dietary advancement. (Grade of recommendation: conditional recommendation; Level of evidence: very low).

1) PICO

P (Population): Patients with uncomplicated acute colonic diverticulitis
I (Intervention): Therapeutic fasting and parenteral nutrition therapy
C (Comparison): Oral dietary intake (including light or soft diet)
O (Outcome): Improvement in clinical outcomes (including reduction in diverticulitis-related complications and recurrence rates)

2) Evidence Review

Therapeutic fasting and parenteral nutrition have traditionally been recommended for patients with acute colonic diverticulitis. However, evidence regarding their impact on disease course remains very limited. A retrospective study published in 2013 reported no difference in complication rates among patients with Hinchey classification 0, Ia, and Ib diverticulitis managed with fasting, liquid diet, or solid diet, although the fasting group had a longer hospital stay.[138] In a prospective single-arm cohort study published in 2016, patients with Hinchey Ia and Ib diverticulitis were allowed unrestricted oral intake. Consequently, 3.5% of patients underwent surgery, and 4.6% were readmitted owing to abdominal pain or recurrence, yielding an overall complication rate of 8.1%, comparable to previously reported rates.[139] Another prospective study of patients with uncomplicated diverticulitis reported that 97% of those who were allowed a liquid diet for 2 days recovered without complications.[140] However, these studies were not designed to directly compare the effects of dietary intake on outcomes, and confounding variables were not adequately controlled; therefore, a causal relationship cannot be established. Based on the limited evidence, oral intake does not appear to increase complication risk compared with fasting in patients with uncomplicated acute colonic diverticulitis, although large-scale randomized studies are lacking.

3) Considerations for Recommendation

Level of evidence

The retrospective study had unequal sample sizes, high selection bias, and no long-term follow-up.[138] The prospective single-arm study included 86 patients without a control group.[139] Therefore, the level of evidence was rated as "very low."

Benefits and harms

No large-scale RCTs or meta-analyses have directly compared fasting versus liberal oral intake for diverticulitis-related complications or recurrence. Evidence suggests fasting may relieve severe abdominal pain, particularly in patients with a numerical rating scale pain score >7, where fasting for at least 2 days was required.[141] However, prolonged fasting was associated with increased hospital stay and total medical costs.[142]

Clinical applicability, practice patterns, and resources

There are no standardized dietary recommendations for uncomplicated diverticulitis; dietary management is largely based on physician experience, patient symptoms, and overall clinical condition. A survey of Korean clinicians found that 53.2% recommended therapeutic fasting for uncomplicated diverticulitis, and most for 2–3 days, and 67.2% indicated hospitalization for moderate pain even without complications.[33] Although high-quality evidence is lacking, these data indicate that cautious and conservative approaches remain common in Korea even for mild and uncomplicated diverticulitis. Given that evidence regarding the benefits of fasting according to disease severity is limited, it may still be challenging to recommend maintaining oral intake in patients who continue to experience abdominal pain, even when imaging findings suggest only mild disease. However, the routine use of therapeutic fasting or parenteral nutrition may unnecessarily prolong hospitalization and increase healthcare costs. For patients who are unexpectedly hospitalized owing to acute diverticulitis, gradual initiation of a light diet, such as liquids, may be considered, with plans for close outpatient follow-up once symptoms improve.

Clinical Question 7: In Hemodynamically Stable Patients with Acute Colonic Diverticulitis and Microperforation without Panperitonitis (Hinchey Classification Ia), Is Conservative Treatment with Antibiotics an Appropriate Initial Treatment Option Compared with Surgery?

Recommendation 7. In hemodynamically stable patients with diverticulitis with microperforation but without panperitonitis, conservative treatment with antibiotics can be initiated first. (Grade of recommendation: conditional recommendation; Level of evidence: very low)

1) PICO

P (Population): Patients with acute colonic diverticulitis with microperforation (Hinchey Ia) without panperitonitis, who are hemodynamically stable
I (Intervention): Conservative treatment with antibiotics

C (Comparison): Surgical treatment
O (Outcome): treatment failure (including need for emergency surgery, additional intervention, or mortality)

2) Evidence Review

In cases of diverticulitis with pericolic extraluminal air confined to the area adjacent to the colon on CT, but without generalized peritonitis (Hinchey classification Ia), no published studies have directly compared conservative management with antibiotics and surgical treatment in terms of clinical outcomes, such as mortality or recurrence. Several studies have reported follow-up data on the clinical course of patients managed conservatively with antibiotics. However, most were small observational studies, which limited their ability to establish optimal treatment strategies. Accordingly, a systematic review of 8 studies was conducted to evaluate the treatment outcomes of conservative management in patients with acute colonic diverticulitis and microperforation without panperitonitis.[143-150] The pooled failure rate of conservative treatment during hospitalization or within 1 month of diagnosis was 7% (95% CI, 0.01–0.15) (Fig. 6).

In a study of patients with diverticulitis presenting with isolated pericolic air, elevated CRP levels at the onset of diverticulitis symptoms were independent predictors of emergency surgery or percutaneous drainage. White blood cell count and age were not statistically significant on multivariate analysis, but tended to be higher in the group that underwent emergency surgery or percutaneous drainage.[144] Another study reported that tachycardia, CRP level ≥15 mg/dL, pneumoperitoneum >5 mm, and peritoneal fluid collection in the pouch of Douglas were independent risk factors for antibiotic treatment failure in patients with diverticulitis with pericolic air; however, the results should be interpreted with caution because some patients with perforated diverticulitis who had distant air were also included in that study.[145]

3) Considerations for Recommendation

Level of evidence

Among the 8 studies included in the meta-analysis, 4 were retrospective observational studies and 4 were prospective observational studies, all with small sample sizes. Although the inclusion criteria were clearly defined, the definitions of conservative treatment (fasting and antibiotics) and non-surgical treatment (fasting, antibiotics, and percutaneous drainage) varied across studies, as did the definitions of treatment failure (emergency surgery or percutaneous drainage), resulting in substantial heterogeneity (I^2=85.3%). Therefore, the overall level of evidence was rated "very low."

Benefits and harms

In patients with diverticulitis with microperforation but without panperitonitis, the mean duration of hospitalization under antibiotic therapy ranges from 3 to 12 days, and additional procedures such as percutaneous drainage or emergency surgery are performed within 3–6 days of diagnosis when antibiotic treatment is unsuccessful.[143,144,149] Emergency surgery pro-

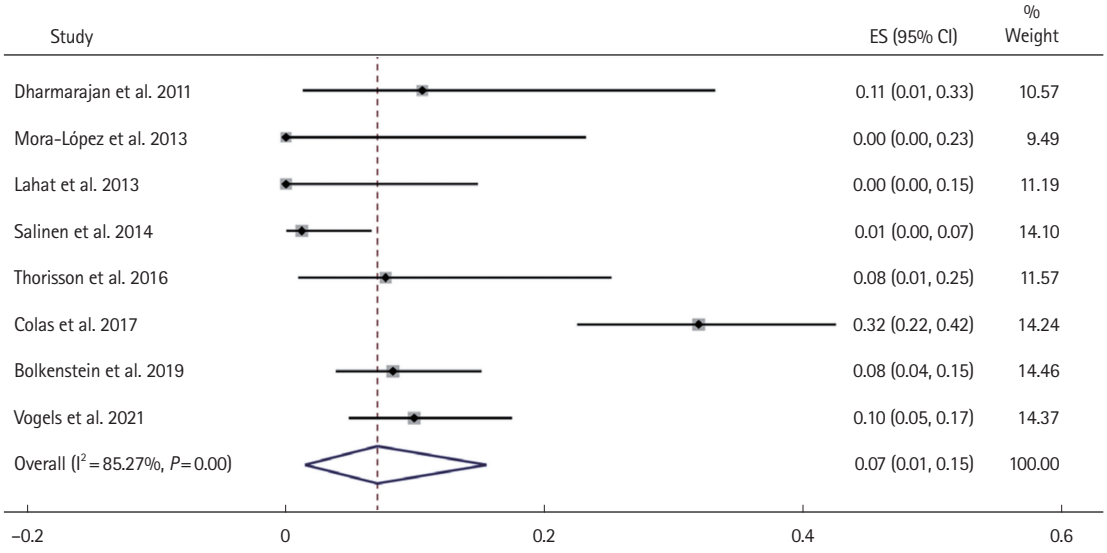

Fig. 6. Forest plot of the pooled rate of conservative treatment failure in patients with acute colonic diverticulitis complicated by microperforation. Conservative treatment failure is defined as the need for percutaneous drainage or surgery. ES, effect size; CI, confidence interval.

longs hospitalization by approximately 1 week, and the reported mortality rate in cases of failed conservative treatment is 0%–3%.[143-145,148,150] These findings suggest that initial conservative treatment is unlikely to worsen the clinical course or increase mortality in patients with microperforated diverticulitis without panperitonitis. In contrast, acute perforated diverticulitis with generalized peritonitis is an absolute indication for emergency surgery. Conservative management may reduce unnecessary surgery and its associated complications and mortality while shortening hospital stays and lowering healthcare costs. Therefore, conservative treatment, including fasting and antibiotic therapy, is the preferred initial option for patients with hemodynamically stable microperforated diverticulitis. However, patients at a higher risk of conservative treatment failure, such as those with markedly elevated white blood cell counts or CRP levels at diagnosis, significant comorbidities, or advanced age, should be closely monitored, and early surgical intervention should be considered if symptoms fail to improve or worsen.

Clinical Question 8: In Patients with Acute Colonic Diverticulitis with an Abscess but without Panperitonitis (Hinchey Ib/II), Is Nonsurgical Treatment, Such as Antibiotics and Percutaneous Drainage, an Effective and Safe Initial Treatment Option?

Recommendation 8.1. In patients with acute colonic diverticulitis with an abscess but without panperitonitis, nonsurgical treatment such as antibiotics and percutaneous drainage can be initiated first.

(Grade of recommendation: conditional recommendation; Level of evidence: very low)

Recommendation 8.1.1. In patients with acute colonic diverticulitis with an abscess but without panperitonitis, percutaneous drainage should be considered when the abscess size is ≥3 cm. (Grade of recommendation: conditional recommendation; Level of evidence: very low)

1) PICO

P (Population): Patients with acute colonic diverticulitis with abscess but without panperitonitis (Hinchey classification Ib/II)
I (Intervention): Non-surgical management, including antibiotic therapy and/or percutaneous drainage
C (Comparison): Surgical treatment
O (Outcome): Risk of emergency surgery, treatment failure, complications, or mortality

2) Evidence Review

There have been no well-designed RCTs comparing the outcomes of non-surgical management, such as antibiotic therapy or percutaneous drainage, with those of surgical treatment in patients with acute colonic diverticulitis with an abscess but without panperitonitis. Most published studies were single-center retrospective studies with a small number of patients, mainly describing the clinical course and prognosis of non-surgical management.[151-164] As the primary source of evidence for this clinical question, a previous systematic review analyzing 38 studies that evaluated the outcomes of non-surgical management, including fasting, antibiotic therapy, and percutaneous drainage, in patients with acute diverticulitis with an abscess without generalized peritonitis (Hinchey Ib/II) was reviewed. This systematic review included 1 RCT and 37 observational studies; no additional eligible studies were identified thereafter. The included randomized trial had the limitation that the outcomes for abscess and perforation were not analyzed separately.

According to a meta-analysis of observational studies, the pooled treatment failure rates—defined as surgery within 3 months, persistence or worsening of abscess or sepsis, or development of new complications such as peritonitis, ileus, or fistula—were 16.4% (95% CI, 12.6%–20.2%) in the non-surgical treatment group and 23.5% (95% CI, 11.2%–35.8%) in the percutaneous drainage group. Moreover, the mean abscess size was significantly larger in patients who underwent percutaneous drainage compared with those who received antibiotic therapy alone (MD, –2.626; 95% CI, –3.140 to –2.113).[165] Few studies have analyzed the risk factors for failure of non-surgical treatment in diverticulitis with an abscess. In a large multicenter retrospective study including 447 patients with Hinchey Ib/II diverticulitis, abscesses >3 cm were associated with an approximately 2-fold higher risk of treatment failure, including complications such as perforation, bowel obstruction, or fistula; readmission; persistent diverticulitis; emergency surgery; death; or the need for additional drainage within 30 days (OR, 2.05; 95% CI, 1.09–3.86). Furthermore, abscesses >5 cm were associated with a nearly 3-fold higher risk of emergency surgery within 30 days (OR, 2.96; 95% CI, 1.03–8.13).[151] These findings suggest that abscess size is a key risk factor for failure of non-surgical management. Siewert et al.[155] reported that, among 30 patients with diverticulitis and abscess, all 22 patients with abscesses ≤3 cm were successfully treated with antibiotics alone. Consistently, several clinical guidelines recommend antibiotic therapy without percutaneous drainage

for abscesses measuring ≤3 cm.[10,13,154,155,166,167] In contrast, for abscesses >5 cm, antibiotic therapy alone may be insufficient, and additional drainage procedures are generally recommended.[10,152,154] In comparative studies of percutaneous drainage outcomes, pelvic abscesses were associated with a 3-fold higher failure rate than pericolic abscesses (44.4% vs. 17.0%), and patients with severe systemic disease corresponding to American Society of Anesthesiologists class IV had a significantly increased risk of treatment failure (OR, 11.6; 95% CI, 3.97–45.5).[168] Subhas et al.[163] reported that patients who required 2 or more percutaneous drainages for diverticular abscesses experienced significantly prolonged hospital stays and antibiotic use, along with increased risks of sepsis and peritonitis, and thus recommended surgical treatment in such cases.

In summary, non-surgical management, including antibiotic therapy and percutaneous drainage, can be initiated first in patients with diverticulitis with an abscess but without generalized peritonitis. In particular, antibiotic therapy alone may be considered for abscesses measuring ≤3 cm, whereas additional percutaneous drainage may be warranted for abscesses measuring >3–5 cm. However, if the abscess is located in the pelvic cavity, exceeds 5 cm, or if the patient has considerable comorbidities, careful monitoring is essential because of the high likelihood of drainage failure. If there is no clinical improvement or worsening of symptoms in these patients after drainage, early surgical intervention should be considered to prevent adverse outcomes.[169]

3) Considerations for Recommendation

Level of evidence

Among the 38 studies included in the supporting meta-analysis, 4 were prospective cohort studies, one was an RCT, and 33 were retrospective cohort studies. Of the prospective studies, 3 were conducted between 1977 and 1990, and one included only 24 patients. Most retrospective studies were single-center with small sample sizes, and patients in the percutaneous drainage or surgery groups tended to have more severe clinical conditions, resulting in a high risk of selection bias. There was also substantial heterogeneity owing to inconsistent definitions of non-surgical management and treatment failure. The supporting meta-analysis was rated as low quality according to AMSTAR 2, and thus the overall level of evidence was considered "very low."

Benefits and harms

In patients with acute colonic diverticulitis with abscess but without generalized peritonitis, non-surgical management, including antibiotic therapy and percutaneous drainage, has been reported to reduce stoma formation, complications, mortality, hospital stay, and healthcare costs.[153] Successful percutaneous drainage has also been associated with reduced morbidity in subsequent elective operations.[152] Long-term follow-up studies found no significant differences in 1-year or 5-year survival among patients treated with antibiotics alone, percutaneous drainage, or surgery.[170]

However, recurrence occurred in approximately 30% of patients with diverticulitis complicated by an abscess within 1–2 years. Among those with recurrence, the success rates of non-surgical management ranged from 17.8% to 100%, and emergency surgery rates ranged from 0% to 26%, depending on the study.[158-160,171] The mortality rate for recurrent diverticulitis was low (0.7%–6.3%) and did not differ according to initial treatment modality.[151,170] Previous meta-analyses reported a failure rate of 16% for non-surgical management of diverticular abscesses without generalized peritonitis.[165] However, among patients requiring emergency surgery after non-surgical treatment failure, mortality ranged from 11% to 27%.[154,172] Patients with pelvic abscesses, abscess size ≥5 cm, or severe comorbidities are at higher risk of treatment failure and should be closely monitored, with early surgical intervention considered if symptoms fail to improve or worsen.

Approximately one-third of patients hospitalized for acute diverticulitis present with complications such as abscess, perforation, bowel obstruction, or fistula.[173,174] Acute diverticulitis with generalized peritonitis is an absolute indication for emergency surgery. In contrast, for hemodynamically stable patients with a diverticular abscess without generalized peritonitis, small abscess size, and no signs of severe sepsis, non-surgical management, including antibiotics with or without percutaneous drainage, can be considered as the initial treatment option.

Clinical Question 9: In Patients with a History of Colonic Diverticulitis, Does the Use of Aspirin or Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) Increase the Risk of Recurrence?

Recommendation 9. The use of aspirin or NSAIDs in patients with a history of acute colonic diverticulitis may be associated with an increased risk of recurrence and should be used with caution. Decisions regarding continuation or discontinuation of these medications should be made carefully, taking into account the patient's underlying conditions and overall

clinical situation. (Grade of recommendation: conditional against; Level of evidence: low)

1) PICO

P (Population): Patients with a history of colonic diverticulitis
I (Intervention): Use of aspirin or NSAIDs
C (Comparison): No use of aspirin or NSAIDs
O (Outcome): Risk of recurrence of diverticulitis

2) Evidence Review

No studies have directly evaluated the association between the use of aspirin or NSAIDs and the recurrence of colonic diverticulitis in patients with a history of the disease. However, indirect evidence can be drawn from observational studies that have investigated recurrence among patients who developed colonic diverticulitis. Eight observational studies were ultimately identified; however, owing to considerable heterogeneity among them, a meta-analysis could not be performed.

A nationwide Danish civil registry study evaluating treatment outcomes in patients with acute diverticulitis and abscesses reported that NSAID use was associated with an increased risk of recurrence in surgically treated patients. Moreover, NSAID users in both medical and surgical treatment groups showed a higher risk of mortality.[170] In another study of 194 patients with colonoscopically confirmed diverticulosis, 144 had no prior history of diverticulitis, and 50 had a previous episode. New-onset diverticulitis occurred in 2.1% of patients without a prior history, whereas 30% of those with a previous history experienced recurrence. The risk of diverticulitis was significantly higher among patients taking NSAIDs or aspirin (OR, 3.2; 95% CI, 1.5–6.9), although aspirin use alone was not statistically associated with an increased risk.[175] A prospective cohort study with 22 years of follow-up also reported an increased risk of diverticulitis among users of aspirin and non-aspirin NSAIDs. However, this study was limited by its reliance on self-reported questionnaire data, which may have affected the reliability of the findings.[176] Goh and Bourne[177] retrospectively analyzed 20 patients with perforated diverticulitis and found that 9 (45%) had used NSAIDs for >4 weeks, compared with 19 of 125 patients (15%) without perforation, corresponding to an RR of 2.961 (95% CI, 1.507–5.348). Another study demonstrated a 3.56-fold higher risk (95% CI, 1.50–8.43) of complicated diverticulitis among NSAID users.[178] In addition, mortality rates were higher among NSAID users with perforated diverticulitis,[179] supporting an association between NSAID use and the development of perforated or complicated diverticulitis.

However, some studies have reported no significant association between aspirin use and the risk of diverticulitis or its complications,[175,180] indicating inconsistencies in the evidence. Further large-scale prospective studies are required to clarify these relationships.

3) Considerations for Recommendation

Level of evidence

Among the 8 studies used as evidence, 6 were single-center retrospective studies, 1 was a multicenter retrospective study, and 1 was a single-center prospective study with 22 years of follow-up. In studies evaluating the risk of diverticulitis events or death in patients taking NSAIDs, all 8 reported an increased risk of diverticulitis (including both uncomplicated and complicated diseases) or mortality, whereas 2 studies assessing aspirin monotherapy did not show statistically significant results. Therefore, current evidence is insufficient to conclude that aspirin use is directly associated with an increased risk of recurrent diverticulitis. Although there was considerable heterogeneity among the studies in terms of objectives (such as recurrence, incidence, or mortality), the risks of bias, inconsistency, indirectness, imprecision, and publication bias were not deemed serious. However, because most studies were retrospective observational analyses, the overall level of evidence was rated as "low."

Benefits and harms

NSAIDs and aspirin are widely used for the treatment or prevention of chronic pain, inflammatory disorders, and cardiovascular diseases; however, these agents inhibit prostaglandin synthesis, which plays a key role in maintaining mucosal defense mechanisms, thereby predisposing patients to gastrointestinal mucosal injury.[175] Accordingly, the use of NSAIDs and aspirin is well known to increase the risk of gastrointestinal ulceration, bleeding, and perforation. Among patients with diverticular disease, the use of NSAIDs or aspirin has been associated with a higher risk of diverticular bleeding and diverticulitis than in non-users. In particular, regular aspirin use was associated with a 1.25-fold increased RR of diverticulitis (95% CI, 1.05–1.47) and a 1.70-fold increased RR of diverticular bleeding (95% CI, 1.21–2.39).[176] Furthermore, patients with diverticulitis who used NSAIDs or aspirin were at higher risk of diverticular perforation.[177] Although these findings do not clearly establish a direct causal relationship between NSAID or aspirin use and recurrent diverticulitis, these medications should

be used with caution in patients with a history of diverticulitis, given the potential risk of gastrointestinal complications. Decisions regarding continuation or discontinuation of NSAIDs or aspirin should be made on an individual basis, taking into account the severity of diverticulitis, the presence of underlying comorbidities, and the clinical necessity of these medications.

Clinical Question 10: Do Specific Pharmacological Agents Such as Mesalazine, Rifaximin, or Probiotics Reduce the Risk of Recurrence or Persistent Symptoms in Patients Who Have Recovered from an Episode of Acute Diverticulitis?

Recommendation 10.1. In patients who have recovered from acute colonic diverticulitis, mesalazine is not recommended for preventing recurrence or persistent symptoms. (Grade of recommendation: strongly against; Level of evidence: low)

Recommendation 10.2. Rifaximin is not recommended to prevent recurrence or persistent symptoms in patients who have recovered from acute colonic diverticulitis. (Grade of recommendation: strongly against; Level of evidence: very low)

Recommendation 10.3. In patients who have recovered from acute colonic diverticulitis, the use of probiotics is generally not recommended for the prevention of recurrence or persistent symptoms. (Grade of recommendation: conditional against; Level of evidence: very low)

1) PICO

P (Population): Patients who have recovered from acute diverticulitis

I (Intervention): Mesalazine/rifaximin/probiotics

C (Comparison): No pharmacologic treatment

O (Outcome): Prevention of recurrence or persistent symptoms

2) Evidence Review

Clinical questions regarding the 3 agents (mesalazine, rifaximin, and probiotics) were adapted from the 2020 ESCP guidelines, and the recommendations were revised and expanded accordingly. In addition, considering the publication dates of the supporting evidence for each agent, a supplementary literature search was conducted for studies published after 2009 to ensure that no relevant evidence was overlooked.

Various agents have been investigated to prevent symptom recurrence or persistence after the acute phase of diverticulitis. The anti-inflammatory drug, mesalazine (5-ASA), has been extensively studied. A 2017 Cochrane systematic review analyzed 7 RCTs and found that mesalazine did not show a statistically significant benefit compared with control treatment in preventing diverticulitis recurrence (recurrence rate 31.3% vs. 29.8%; RR 0.69; 95% CI, 0.43–1.09).[181] Two phase 3, multicenter, randomized, double-blind, placebo-controlled studies (SAG-37 and SAG-51), conducted at 74 centers in 9 countries in 2017, evaluated the efficacy of mesalazine at doses of 1.5 g and 3 g compared with placebo at 48 and 96 weeks.[182] In the SAG-37 trial evaluating the efficacy of mesalazine 3 g, 67.9% of patients in the mesalazine group and 74.4% in the placebo group remained relapse-free at 48 weeks, with no significant difference between groups (P=0.226). In the SAG-51 trial comparing mesalazine 1.5 g, 3 g) and placebo, the relapse-free rates at 48 weeks were 46.0%, 52.0%, and 58.0%, respectively (P=0.860 for 3 g mesalazine vs. placebo). At 96 weeks, the corresponding rates were 6.9%, 9.8%, and 23.1%, respectively, with no significant difference observed (P=0.980 for 3 g mesalazine vs. placebo). Two other phase 3, randomized, multicenter, double-blind, placebo-controlled trials (PREVENT 1, PREVENT 2) that compared the efficacy of mesalazine at doses of 1.2 g, 2.4 g, and 4.8 g with placebo also showed no significant difference.[183]

A randomized study compared rifaximin 400 mg twice daily for 7 days with the same regimen combined with mesalazine 800 mg for 7 days and reported a significantly lower recurrence rate in the combination group than in the rifaximin monotherapy (2.75% vs. 17.98%; P<0.01).[184] However, the quality of evidence was low because of the small sample size (n=109), lack of blinding, and single-center design. Another study evaluated the probiotic VSL#3 (450 billion/day for 15 days per month) administered either alone or in combination with balsalazide 2.25 g/day for 10 days per month. The addition of balsalazide to probiotic therapy did not provide a significant benefit in preventing recurrence of diverticulitis.[185] A multicenter, randomized, open-label controlled trial published in 2013 compared high-fiber supplementation (3.5 g twice daily) alone with the same regimen combined with the non-absorbable antibiotic rifaximin (400 mg twice daily for 1 week per month over 12 months) in patients with a recent episode of colonic diverticulitis in remission. The recurrence rate was 19.3% in the fiber-only group and 10.4% in the combination group, indicating that cyclic administration of rifaximin was associated with a significantly lower recurrence rate (OR 3.20; 95% CI, 1.16–8.82; P=0.025).[186] However, because of methodological limitations such as the open-label design and small sample size, further validation is required. An RCT published in 2013 compared 3 groups over 12 weeks: mesalazine (2.4 g/day) alone, mesalazine plus a

probiotic (*Bifidobacterium infantis* 35624; Align), and placebo. At the 9-month follow-up, the recurrence rates of diverticulitis were 28.1%, 37%, and 31%, respectively, with no significant differences among the groups.[187]

3) Considerations for Recommendation

Level of evidence

The Cochrane systematic review assessing the efficacy of mesalazine in preventing diverticulitis recurrence was rated as high quality (AMSTAR2: high). However, the 7 included RCTs exhibited considerable heterogeneity in control group composition, precluding meaningful data synthesis and limiting interpretability. Owing to this substantial heterogeneity, the overall certainty of evidence for mesalazine was graded as "low," despite the inclusion of RCTs. This assessment was primarily driven by serious risks of bias and imprecision. The evidence supporting the preventive efficacy of rifaximin was derived from a single RCT with a small sample size, which lacked a placebo control group and was conducted without blinding. Consequently, the study had serious or greater limitations in terms of risk of bias, inconsistency, and imprecision, resulting in an overall level of evidence rated as "very low." For patients with a prior episode of acute diverticulitis, no systematic reviews or well-designed RCTs have evaluated the preventive efficacy of probiotics. The single RCT used as evidence was unblinded and demonstrated serious or greater concerns regarding risk of bias, inconsistency, and imprecision, leading to an overall level of evidence rated as "very low."

Benefits and harms

Although mesalazine (an anti-inflammatory agent), rifaximin (a non-absorbable broad-spectrum antibiotic), and probiotics are commonly used to treat various gastrointestinal disorders, there is no evidence to support their efficacy in preventing the recurrence or persistence of symptoms. Mesalazine is associated with rare but serious adverse events, including pancreatitis, liver injury, renal dysfunction, and pulmonary disease. Rifaximin is generally well-tolerated, but peripheral edema, dizziness, fatigue, and gastrointestinal disturbances are relatively common; therefore, it should be used only under medical supervision. Given the lack of proven benefits, the long-term use of mesalazine or rifaximin for the prevention of diverticulitis recurrence is not recommended, considering the potential adverse effects and concerns regarding cost-effectiveness. In contrast, although the level of evidence regarding probiotics remains low, their risk of adverse events remains minimal. Thus, in immunocompetent patients, the use of probiotics cannot be strongly discouraged because of their excellent safety profile, particularly when the strain has demonstrated high-quality evidence of health benefits and the patient expresses a preference for its use.

Clinical applicability and practice patterns

Both mesalazine and rifaximin are prescription drugs used for specific indications. However, in real-world clinical practice, they are rarely prescribed for the prevention of diverticulitis recurrence. According to a survey of Korean physicians, only 1.1% reported prescribing rifaximin, 0.5% prescribed mesalazine, and 7.6% prescribed probiotics for this purpose.[33] Commercially available probiotic products contain a wide variety of bacterial strains and are commonly consumed to promote general health. The self-administration of probiotics is relatively common among patients with a history of diverticulitis. Although no specific strain has been shown to prevent recurrence, the low risk of adverse effects in immunocompetent patients does not justify restricting their use. Further research is warranted to identify probiotic strains that may contribute to the prevention of diverticulitis recurrence through modulation of the gut environment.

Clinical Question 11: In Patients Who Have Recovered from an Episode of Acute Colonic Diverticulitis, Is a High-Fiber Diet Effective in Preventing Recurrence of the Disease?

Recommendation 11. A high-fiber diet is beneficial for general health, but current evidence is insufficient to recommend it for the prevention of recurrent diverticulitis. (Grade of recommendation: inconclusive; Level of evidence: very low)

1) PICO

P (Population): Patients who have recovered from acute diverticulitis
I (Intervention): High-fiber diet
C (Comparison): Regular diet
O (Outcome): Prevention of recurrence of colonic diverticulitis

2) Evidence Review

To date, evidence on the effect of dietary fiber in preventing diverticulitis recurrence remains limited. A systematic review published in 2018 identified only 2 studies examining the association between dietary fiber intake and diverticulitis recur-

rence.[188] The literature search period for that review extended up to December 31, 2017, and no additional studies were identified thereafter. A 3-arm randomized crossover intervention study conducted in 1976 reported that patients who received fiber supplementation showed a higher rate of symptomatic remission at 1 month compared with those on a high-fiber diet.[189] In addition, a retrospective cohort study including 56 patients found that those who maintained a high-fiber diet had a lower incidence of surgery and complications related to recurrent diverticulitis compared with those who did not.[190] Meanwhile, several large epidemiologic cohort studies have reported that adherence to a high-fiber diet is associated with a reduced risk of initial diverticulitis development.[191-193] However, these studies evaluated dietary fiber intake as a risk factor for the first occurrence of diverticulitis and are therefore not directly applicable as evidence for recurrence prevention. In summary, the available studies suggest a potential benefit of a high-fiber diet in reducing the occurrence, recurrence, or persistence of diverticulitis symptoms. However, owing to limitations in study design and overall quality of evidence, current data are insufficient to support a definitive recommendation.

3) Considerations for Recommendation

Level of evidence

One RCT and one retrospective cohort study were included in the assessment of the evidence level. The RCT had a small sample size and used symptomatic remission, rather than diverticulitis recurrence, as the primary outcome. Furthermore, the randomization procedure was not described. Consequently, the risks of bias, indirectness, and imprecision were all rated as serious, and the overall level of evidence was judged to be "very low." The retrospective observational study was also a single study with a small sample size; therefore, its evidence level was rated "very low."

Benefits and harms

A high-fiber diet provides broad health benefits, including improvements in metabolic disorders, insulin resistance, obesity, cardiovascular disease, and colorectal cancer. Therefore, it can be recommended for general health promotion.[194] In general, risks are minimal, though some individuals may experience abdominal bloating or excessive gas with high fiber intake. A high-fiber diet does not require a prescription or follow-up visits and incurs no additional costs apart from patient education. Moreover, adherence is typically good, and resistance to dietary modifications is expected to be low.

Clinical Question 12: In Patients with Multiple Recurrences of Acute Colonic Diverticulitis, Does Surgical Treatment Provide a Better Prognosis and QoL than Repeated Conservative Medical Treatment?

Recommendation 12. In immunocompetent patients with multiple recurrences of acute colonic diverticulitis, the decision for surgical treatment should be individualized according to the patient's perceived QoL and clinical condition rather than based solely on the number of recurrences. (Grade of recommendation: conditional recommendation; Level of evidence: low).

1) PICO

P (Population): Immunocompetent patients with multiple recurrences of acute colonic diverticulitis

I (Intervention): Surgical treatment (elective segmental colectomy)

C (Comparison): Repeated or continued conservative medical management

O (Outcome): QoL, risk of recurrence, complications or adverse events, overall prognosis/long-term outcomes

2) Evidence Review

Two randomized comparative open-label trials[195,196] and 5 retrospective studies[197-201] were reviewed. Owing to substantial heterogeneity among the studies, a meta-analysis was not performed. In 2 randomized comparative studies (the DIRECT and LASER trials),[195,196] which compared surgical and conservative treatments in patients with recurrent left-sided colonic diverticulitis (≥3 episodes), the surgery group demonstrated a higher QoL at 6 months than the conservative treatment group. Among the 5 retrospective studies, 2 reported QoL outcomes.[197,200] In the study by Justin et al.,[197] no significant difference in QoL scores was found between the surgical (94.19±15.33) and conservative (91.70±14.22; $P=0.36$) groups. In contrast, Pasternak et al.[200] reported a significant improvement in QoL following surgery (95 vs. 114; $P<0.001$). However, this study compared pre- and postoperative QoL within 120 surgical patients; therefore, caution is required when interpreting its findings. Regarding serious adverse events related to surgery or conservative management, the DIRECT trial found no significant difference between the 2 groups: complications occurred in 34% of the surgical group and 40% of the conservative group.[195] In the LASER trial, major complications occurred in 10% of the surgical group and none in the conserva-

tive group.[196] In both trials, the proportion of patients with recurrent active inflammation was higher in the conservative treatment group than in the surgical group (1.9% vs. 23% and 5% vs. 27%, respectively).[195,196] One retrospective observational study also reported a higher recurrence rate with conservative treatment than with surgery, reaching 58%.[198]

When reviewing international practice guidelines, the AGA expert review in 2021 recommended that the decision to perform elective segmental resection should not be based solely on the number of diverticulitis recurrences. It emphasized that discussions regarding elective surgery should be individualized, taking into account disease severity, patient preferences and values, QoL, and the balance of potential risks and benefits.[9] Similarly, recently updated surgical society guidelines recommend that surgical decisions for diverticulitis should be made on a case-by-case basis rather than according to predefined recurrence thresholds.[12-14] The Japanese guideline states that recurrent uncomplicated diverticulitis is not necessarily an indication for colectomy, although elective surgery may be considered in specific situations, such as in immunocompromised patients.[10] The ESCP guideline further specifies that surgery should not be performed solely to prevent complicated diverticulitis, regardless of the number of prior episodes.[11]

3) Considerations for Recommendation

Level of evidence

In the 2 randomized comparative studies evaluating QoL after surgical versus conservative treatment, the level of evidence for this outcome was rated as "low" because both trials were open-label without blinding and had potential risks of selective outcome reporting owing to premature termination. For the 2 retrospective studies comparing QoL between treatment modalities, the evidence level was rated as "very low" owing to small sample sizes and serious imprecision. Regarding complication rates associated with each treatment, the level of evidence from RCTs was rated as "low" owing to heterogeneity across studies. In contrast, evidence for recurrence rates was rated as "moderate." In the retrospective studies, evidence for both outcomes was rated as "very low."

Benefits and harms

Historically, surgery was considered the standard treatment after 3 or more recurrences of colonic diverticulitis.[202] However, long-term follow-up studies have demonstrated that not all patients require surgical intervention, and recent evidence supports a more conservative, individualized management approach.[203] This shift in paradigm has been reinforced by several studies. In immunocompetent patients, recurrent uncomplicated colonic diverticulitis generally does not progress to complicated disease or become more severe over time. Therefore, prophylactic colectomy to prevent future complications is not routinely indicated. Furthermore, new diverticulitis may develop in other segments of the colon even after resection.[9] In contrast, repeated episodes of diverticulitis can cause persistent abdominal pain or bowel dysfunction, resulting in a decline in QoL. In patients with 3 or more recurrences, elective segmental colectomy has been shown to reduce recurrence risk and improve long-term QoL.[195,204] Taken together, these findings suggest that, in immunocompetent patients, surgery should not be performed solely to prevent complications but rather to improve QoL—its primary benefits being enhancement of QoL and reduction of recurrence rather than prevention of complications.

In complicated diverticulitis, although recurrence risk is slightly higher than that in uncomplicated disease, there is no evidence that severity increases with the number of recurrences.[158,205] Therefore, even in complicated cases, surgical decision-making should follow the same principles balancing benefits and harms and guided by patient-centered judgment.[11] Surgery entails potential risks including anastomotic complications, bowel obstruction, and new diverticulitis in remaining colonic segments. Thus, the decision to operate should be individualized, considering recurrence frequency and severity, symptom impact on QoL, and the patient's overall condition and comorbidities. In both RCTs, surgical treatment was associated with a significant improvement in QoL; however, all participants had recurrent left-sided diverticulitis, a subgroup known to have a higher recurrence rate than right-sided disease.

In contrast, for immunocompromised patients with complicated diverticulitis, elective surgery may be considered even at the first episode. Given that these patients are at higher risk of morbidity and mortality, management should involve a multidisciplinary approach to optimize outcomes (see Clinical Question 2).

Patient preferences and values

In a survey of patients with recurrent diverticulitis (Supplementary Data 3), all respondents, regardless of the number of previous episodes, indicated that they would choose conservative medical treatment if diverticulitis recurred. However,

when asked to consider a scenario of chronic or multiple recurrences, approximately 60% of participants stated they would consider surgical intervention. When considering repeated recurrences, all patients with complications (4/4, 100%) opted for surgery, whereas 2 of 5 patients without complications (40%) chose for surgery. Although the sample size was small, these findings suggest that the presence of complications may influence patients' treatment decisions. The main reasons for selecting surgery (multiple responses allowed) were disruption of personal schedules caused by unexpected disease episodes (58%) and fear of recurrent pain (50%). Those preferring conservative management cited disruption of schedules related to surgery (52.6%), positive response to previous medical therapy (47.4%), and fear of surgery (42.1%). The overlap in these reasons indicates that treatment decisions are shaped by individual circumstances, prior disease experiences, and personal perceptions of treatment risks and benefits.

Overall, these results suggest that patients generally prefer conservative management initially. However, as recurrences accumulate and pain or disruption of daily life increases, many begin to view surgery as a practical alternative. This underscores that treatment preference is more strongly influenced by individual symptom burden and perceived impact on QoL than by a uniform clinical criterion. In line with these patient preferences, a clinician survey showed that 71.4% of respondents agreed that the decision for surgical treatment in recurrent diverticulitis should be individualized for each patient.[33]

CONCLUSIONS

These guidelines were developed to provide evidence-based recommendations for the diagnosis and medical management of patients with acute colonic diverticulitis. Relevant literature was systematically reviewed, the quality of evidence was assessed, and recommendations were formulated through expert consensus. However, most available studies were observational, predominantly from Western populations, and included a substantial number of older studies with methodological limitations. Consequently, the level of evidence supporting many recommendations was rated as low or very low, and many recommendations were therefore considered conditional. To address these limitations, the guideline development committee surveyed Korean clinicians and patients and incorporated expert consensus to ensure practical applicability within the Korean clinical context. Despite these efforts, the guidelines have inherent limitations in addressing all possible clinical scenarios. Therefore, careful clinical judgment that considers each patient's individual condition remains essential in complex cases. High-quality studies reflecting the domestic healthcare environment are needed to establish more robust evidence, and continuous research efforts are required to resolve existing clinical uncertainties. We hope that these clinical practice guidelines will contribute to the provision of high-quality, evidence-based care for patients with acute colonic diverticulitis.

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Data Availability Statement
All data generated in this study are included in the manuscript. Supplementary materials are available on the *Intestinal Research* website.

Author Contribution
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Supplementary Material

Supplementary materials are available at the Intestinal Research website (https://www.irjournal.org).

REFERENCES

1. Shahedi K, Fuller G, Bolus R, et al. Long-term risk of acute diverticulitis among patients with incidental diverticulosis found during colonoscopy. Clin Gastroenterol Hepatol 2013;11:1609-1613.
2. Nagata N, Niikura R, Aoki T, et al. Increase in colonic diverticulosis and diverticular hemorrhage in an aging society: lessons from a 9-year colonoscopic study of 28,192 patients in Japan. Int J Colorectal Dis 2014;29:379-385.
3. Song JH, Kim YS, Lee JH, et al. Clinical characteristics of colonic diverticulosis in Korea: a prospective study. Korean J Intern Med 2010;25:140-146.
4. Kim JS, Cha SG, Kim YT, et al. The prevalence and clinical features of diverticular disease of the colon. Korean J Gastroenterol 1993;25:305-314.
5. Yamamichi N, Shimamoto T, Takahashi Y, et al. Trend and risk factors of diverticulosis in Japan: age, gender, and lifestyle/metabolic-related factors may cooperatively affect on the colorectal diverticula formation. PLoS One 2015;10:e0123688.
6. Strate LL, Morris AM. Epidemiology, pathophysiology, and treatment of diverticulitis. Gastroenterology 2019;156:1282-1298.e1.
7. Bharucha AE, Parthasarathy G, Ditah I, et al. Temporal trends in the incidence and natural history of diverticulitis: a population-based study. Am J Gastroenterol 2015;110:1589-1596.
8. Mizuki A, Tatemichi M, Nakazawa A, Tsukada N, Nagata H, Kanai T. Changes in the clinical features and long-term outcomes of colonic diverticulitis in Japanese patients. Intern Med 2017;56:2971-2977.
9. Peery AF, Shaukat A, Strate LL. AGA clinical practice update on medical management of colonic diverticulitis: expert review. Gastroenterology 2021;160:906-911.e1.
10. Nagata N, Ishii N, Manabe N, et al. Guidelines for colonic diverticular bleeding and colonic diverticulitis: Japan Gastroenterological Association. Digestion 2019;99 Suppl 1:1-26.
11. Schultz JK, Azhar N, Binda GA, et al. European Society of Coloproctology: guidelines for the management of diverticular disease of the colon. Colorectal Dis 2020;22 Suppl 2:5-28.
12. Francis NK, Sylla P, Abou-Khalil M, et al. EAES and SAGES 2018 consensus conference on acute diverticulitis management: evidence-based recommendations for clinical practice. Surg Endosc 2019;33:2726-2741.
13. Sartelli M, Weber DG, Kluger Y, et al. 2020 update of the WSES guidelines for the management of acute colonic diverticulitis in the emergency setting. World J Emerg Surg 2020;15:32.
14. Hall J, Hardiman K, Lee S, et al. The American Society of Colon and Rectal Surgeons clinical practice guidelines for the treatment of left-sided colonic diverticulitis. Dis Colon Rectum 2020;63:728-747.
15. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. CMAJ 2010;182:E839-E842.
16. Sterne JA, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ 2019;366:l4898.
17. Kim SY, Park JE, Lee YJ, et al. Testing a tool for assessing the risk of bias for nonrandomized studies showed moderate reliability and promising validity. J Clin Epidemiol 2013;66:408-414.
18. Whiting PF, Rutjes AW, Westwood ME, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. Ann Intern Med 2011;155:529-536.
19. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ 2017;358:j4008.
20. Kim SY, Choi M, Kim HJ, et al. Handbook for clinical practice guideline developer version 2.0. Seoul; NECA & KAMS, 2022.
21. Hajibandeh S, Hajibandeh S, Smart NJ, Maw A. Meta-analysis of the demographic and prognostic significance of right-sided versus left-sided acute diverticulitis. Colorectal Dis 2020;22:1908-1923.
22. Lee KY, Lee J, Park YY, Kim Y, Oh ST. Difference in clinical features between right- and left-sided acute colonic diverticulitis. Sci Rep 2020;10:3754.
23. Soh NY, Teo NZ, Tan CJH, et al. Perforated diverticulitis: is the

right and left difference present here too? Int J Colorectal Dis 2018;33:525-529.
24. Chung BH, Ha GW, Lee MR, Kim JH. Management of colonic diverticulitis tailored to location and severity: comparison of the right and the left colon. Ann Coloproctol 2016;32:228-233.
25. Kim SH, Byun CG, Cha JW, Choi SH, Kho YT, Seo DY. Comparative study of the clinical features and treatment for right and left colonic diverticulitis. J Korean Soc Coloproctol 2010;26:407-412.
26. Schneider LV, Millet I, Boulay-Coletta I, Taourel P, Loriau J, Zins M. Right colonic diverticulitis in Caucasians: presentation and outcomes versus left-sided disease. Abdom Radiol (NY) 2017;42:810-817.
27. Zuckerman J, Garfinkle R, Vasilevksy CA, et al. Short- and long-term outcomes of right-sided diverticulitis: over 15 years of North American experience. World J Surg 2020;44:1994-2001.
28. Paik PS, Yun JA. Clinical features and factors associated with surgical treatment in patients with complicated colonic diverticulitis. Ann Coloproctol 2017;33:178-183.
29. Tsang JS, Chung Foo C, Yip J, Kwok Choi H, Lun Law W, Siu Hung Lo O. Emergency surgery comparison of right versus left acute colonic diverticulitis: a 10-year outcome analysis. Surgeon 2021;19:150-155.
30. Sung CW, Liu KL, Wang HP, et al. Colonic diverticulitis location is a risk factor for recurrence: a multicenter, retrospective cohort study in Asian patients. Sci Rep 2022;12:4559.
31. Kim HU, Kim YH, Choe WH, et al. Clinical characteristics of colonic diverticulitis in Koreans. Korean J Gastroenterol 2003;42:363-368.
32. Kim CN. What is the difference between right- and left-sided colonic diverticulitis? Ann Coloproctol 2016;32:206-207.
33. Lee JG, Park YE, Chang JY, et al. Diagnosis and management of acute colonic diverticulitis: results of a survey among Korean gastroenterologists. Korean J Intern Med 2023;38:672-682.
34. McKechnie T, Lee Y, Kruse C, et al. Operative management of colonic diverticular disease in the setting of immunosuppression: a systematic review and meta-analysis. Am J Surg 2021;221:72-85.
35. Biondo S, Borao JL, Kreisler E, et al. Recurrence and virulence of colonic diverticulitis in immunocompromised patients. Am J Surg 2012;204:172-179.
36. Brandl A, Kratzer T, Kafka-Ritsch R, et al. Diverticulitis in immunosuppressed patients: a fatal outcome requiring a new approach? Can J Surg 2016;59:254-261.
37. Reshef A, Stocchi L, Kiran RP, et al. Case-matched comparison of perioperative outcomes after surgical treatment of sigmoid diverticulitis in solid organ transplant recipients versus immunocompetent patients. Colorectal Dis 2012;14:1546-1552.
38. Cronley K, Wenzke J, Hussan H, et al. Diverticulitis in HIV-infected patients within the United States. HIV Med 2016;17:216-221.
39. Golda T, Kreisler E, Mercader C, Frago R, Trenti L, Biondo S. Emergency surgery for perforated diverticulitis in the immunosuppressed patient. Colorectal Dis 2014;16:723-731.
40. Al-Khamis A, Abou Khalil J, Demian M, et al. Sigmoid colectomy for acute diverticulitis in immunosuppressed vs immunocompetent patients: outcomes from the ACS-NSQIP database. Dis Colon Rectum 2016;59:101-109.
41. Samdani T, Pieracci FM, Eachempati SR, et al. Colonic diverticulitis in chemotherapy patients: should operative indications change? A retrospective cohort study. Int J Surg 2014;12:1489-1494.
42. Halabi WJ, Jafari MD, Nguyen VQ, et al. Colorectal surgery in kidney transplant recipients: a decade of trends and outcomes in the United States. Am Surg 2013;79:1026-1033.
43. Vaghiri S, Prassas D, Knoefel WT, Krieg A. Surgical management in immunosuppressed patients with sigmoid diverticulitis, still a challenge: a single-center observational study. Int J Colorectal Dis 2022;37:1909-1917.
44. Sugrue J, Lee J, Warner C, et al. Acute diverticulitis in renal transplant patients: should we treat them differently? Surgery 2018;163:857-865.
45. Lee JG, Park YE, Chang JY, et al. Comparative outcomes of acute colonic diverticulitis in immunocompromised versus immunocompetent patients: a systematic review and meta-analysis. Intest Res 2023;21:481-492.
46. Feingold D, Steele SR, Lee S, et al. Practice parameters for the treatment of sigmoid diverticulitis. Dis Colon Rectum 2014;57:284-294.
47. Coccolini F, Improta M, Sartelli M, et al. Acute abdomen in the immunocompromised patient: WSES, SIS-E, WSIS, AAST, and GAIS guidelines. World J Emerg Surg 2021;16:40.
48. Kim MJ, Woo YS, Kim ER, et al. Is colonoscopy necessary after computed tomography diagnosis of acute diverticulitis? Intest Res 2014;12:221-228.
49. Oh HK, Han EC, Ha HK, et al. Surgical management of colonic diverticular disease: discrepancy between right- and left-sided diseases. World J Gastroenterol 2014;20:10115-10120.
50. Ahn JR, Ryu SY, Kim HY. Study for clinical utility of ultrasound

as a diagnostic tool in diverticulitis with right lower quadrant pain. J Korean Soc Emerg Med 2003;14:162-167.
51. Chou YH, Chiou HJ, Tiu CM, et al. Sonography of acute right side colonic diverticulitis. Am J Surg 2001;181:122-127.
52. Hollerweger A, Macheiner P, Rettenbacher T, Brunner W, Gritzmann N. Colonic diverticulitis: diagnostic value and appearance of inflamed diverticula-sonographic evaluation. Eur Radiol 2001;11:1956-1963.
53. Nielsen K, Richir MC, Stolk TT, et al. The limited role of ultrasound in the diagnostic process of colonic diverticulitis. World J Surg 2014;38:1814-1818.
54. Walter SS, Maurer M, Storz C, et al. Effects of radiation dose reduction on diagnostic accuracy of abdominal CT in young adults with suspected acute diverticulitis: a retrospective intraindividual analysis. Acad Radiol 2019;26:782-790.
55. Ambrosetti P, Jenny A, Becker C, Terrier TF, Morel P. Acute left colonic diverticulitis: compared performance of computed tomography and water-soluble contrast enema: prospective evaluation of 420 patients. Dis Colon Rectum 2000;43:1363-1367.
56. Cho KC, Morehouse HT, Alterman DD, Thornhill BA. Sigmoid diverticulitis: diagnostic role of CT: comparison with barium enema studies. Radiology 1990;176:111-115.
57. Lee IK, Jung SE, Gorden DL, et al. The diagnostic criteria for right colonic diverticulitis: prospective evaluation of 100 patients. Int J Colorectal Dis 2008;23:1151-1157.
58. Pradel JA, Adell JF, Taourel P, Djafari M, Monnin-Delhom E, Bruel JM. Acute colonic diverticulitis: prospective comparative evaluation with US and CT. Radiology 1997;205:503-512.
59. Ripollés T, Sebastián-Tomás JC, Martínez-Pérez MJ, Manrique A, Gómez-Abril SA, Torres-Sanchez T. Ultrasound can differentiate complicated and noncomplicated acute colonic diverticulitis: a prospective comparative study with computed tomography. Abdom Radiol (NY) 2021;46:3826-3834.
60. Tack D, Bohy P, Perlot I, et al. Suspected acute colon diverticulitis: imaging with low-dose unenhanced multi-detector row CT. Radiology 2005;237:189-196.
61. Thorisson A, Nikberg M, Torkzad MR, Laurell H, Smedh K, Chabok A. Diagnostic accuracy of acute diverticulitis with unenhanced low-dose CT. BJS Open 2020;4:659-665.
62. Toorenvliet BR, Bakker RF, Breslau PJ, Merkus JW, Hamming JF. Colonic diverticulitis: a prospective analysis of diagnostic accuracy and clinical decision-making. Colorectal Dis 2010;12:179-186.
63. van Randen A, Laméris W, van Es HW, et al. A comparison of the accuracy of ultrasound and computed tomography in common diagnoses causing acute abdominal pain. Eur Radiol 2011;21:1535-1545.
64. Verbanck J, Lambrecht S, Rutgeerts L, et al. Can sonography diagnose acute colonic diverticulitis in patients with acute intestinal inflammation? A prospective study. J Clin Ultrasound 1989;17:661-666.
65. Werner A, Diehl SJ, Farag-Soliman M, Düber C. Multi-slice spiral CT in routine diagnosis of suspected acute left-sided colonic diverticulitis: a prospective study of 120 patients. Eur Radiol 2003;13:2596-2603.
66. Zielke A, Hasse C, Nies C, et al. Prospective evaluation of ultrasonography in acute colonic diverticulitis. Br J Surg 1997;84:385-388.
67. Andeweg CS, Wegdam JA, Groenewoud J, van der Wilt GJ, van Goor H, Bleichrodt RP. Toward an evidence-based step-up approach in diagnosing diverticulitis. Scand J Gastroenterol 2014;49:775-784.
68. Laméris W, van Randen A, Bipat S, Bossuyt PM, Boermeester MA, Stoker J. Graded compression ultrasonography and computed tomography in acute colonic diverticulitis: meta-analysis of test accuracy. Eur Radiol 2008;18:2498-2511.
69. Laméris W, van Randen A, van Es HW, et al. Imaging strategies for detection of urgent conditions in patients with acute abdominal pain: diagnostic accuracy study. BMJ 2009;338:b2431.
70. Munikrishnan V, Helmy A, Elkhider H, Omer AA. Management of acute diverticulitis in the East Anglian region: results of a United Kingdom regional survey. Dis Colon Rectum 2006;49:1332-1340.
71. Schechter S, Mulvey J, Eisenstat TE. Management of uncomplicated acute diverticulitis: results of a survey. Dis Colon Rectum 1999;42:470-476.
72. Koo CH, Chang JH, Syn NL, Wee IJ, Mathew R. Systematic review and meta-analysis on colorectal cancer findings on colonic evaluation after CT-confirmed acute diverticulitis. Dis Colon Rectum 2020;63:701-709.
73. Rottier SJ, van Dijk ST, van Geloven AA, et al. Meta-analysis of the role of colonoscopy after an episode of left-sided acute diverticulitis. Br J Surg 2019;106:988-997.
74. Meyer J, Orci LA, Combescure C, et al. Risk of colorectal cancer in patients with acute diverticulitis: a systematic review and meta-analysis of observational studies. Clin Gastroenterol Hepatol 2019;17:1448-1456.e17.
75. Sakhnini E, Lahat A, Melzer E, et al. Early colonoscopy in patients with acute diverticulitis: results of a prospective pilot study. Endoscopy 2004;36:504-507.

76. Hjern F, Jonas E, Holmström B, Josephson T, Mellgren A, Johansson C. CT colonography versus colonoscopy in the follow-up of patients after diverticulitis: a prospective, comparative study. Clin Radiol 2007;62:645-650.
77. Lahat A, Yanai H, Menachem Y, Avidan B, Bar-Meir S. The feasibility and risk of early colonoscopy in acute diverticulitis: a prospective controlled study. Endoscopy 2007;39:521-524.
78. Lahat A, Yanai H, Sakhnini E, Menachem Y, Bar-Meir S. Role of colonoscopy in patients with persistent acute diverticulitis. World J Gastroenterol 2008;14:2763-2766.
79. Lau KC, Spilsbury K, Farooque Y, et al. Is colonoscopy still mandatory after a CT diagnosis of left-sided diverticulitis: can colorectal cancer be confidently excluded? Dis Colon Rectum 2011;54:1265-1270.
80. Westwood DA, Eglinton TW, Frizelle FA. Routine colonoscopy following acute uncomplicated diverticulitis. Br J Surg 2011;98:1630-1634.
81. Schmilovitz-Weiss H, Yalunin E, Boaz M, et al. Does a colonoscopy after acute diverticulitis affect its management? A single center experience. J Clin Gastroenterol 2012;46:317-320.
82. Schout PJ, Spillenaar Bilgen EJ, Groenen MJ. Routine screening for colon cancer after conservative treatment of diverticulitis. Dig Surg 2012;29:408-411.
83. Brar MS, Roxin G, Yaffe PB, Stanger J, MacLean AR, Buie WD. Colonoscopy following nonoperative management of uncomplicated diverticulitis may not be warranted. Dis Colon Rectum 2013;56:1259-1264.
84. Chabok A, Smedh K, Nilsson S, Stenson M, Påhlman L. CT-colonography in the follow-up of acute diverticulitis: patient acceptance and diagnostic accuracy. Scand J Gastroenterol 2013;48:979-986.
85. Elmi A, Hedgire SS, Pargaonkar V, Cao K, McDermott S, Harisinghani M. Is early colonoscopy beneficial in patients with CT-diagnosed diverticulitis? AJR Am J Roentgenol 2013;200:1269-1274.
86. Alexandersson BT, Hreinsson JP, Stefansson T, Jonasson JG, Bjornsson ES. The risk of colorectal cancer after an attack of uncomplicated diverticulitis. Scand J Gastroenterol 2014;49:576-580.
87. Choi YH, Koh SJ, Kim JW, et al. Do we need colonoscopy following acute diverticulitis detected on computed tomography to exclude colorectal malignancy? Dig Dis Sci 2014;59:2236-2242.
88. Lecleire S, Nahon S, Alatawi A, et al. Diagnostic impact of routine colonoscopy following acute diverticulitis: a multicenter study in 808 patients and controls. United European Gastroenterol J 2014;2:301-306.
89. Sallinen V, Mentula P, Leppäniemi A. Risk of colon cancer after computed tomography-diagnosed acute diverticulitis: is routine colonoscopy necessary? Surg Endosc 2014;28:961-966.
90. Daniels L, Ünlü Ç, de Wijkerslooth TR, et al. Yield of colonoscopy after recent CT-proven uncomplicated acute diverticulitis: a comparative cohort study. Surg Endosc 2015;29:2605-2613.
91. Isacson D, Thorisson A, Andreasson K, Nikberg M, Smedh K, Chabok A. Outpatient, non-antibiotic management in acute uncomplicated diverticulitis: a prospective study. Int J Colorectal Dis 2015;30:1229-1234.
92. Meireles LC, Fernandes SR, Ribeiro LC, Velosa J. Role of endoscopy after an acute episode of diverticulitis: analysis of a cohort of Portuguese patients from a tertiary referral center. Eur J Gastroenterol Hepatol 2015;27:1429-1432.
93. Meyer J, Thomopoulos T, Usel M, et al. The incidence of colon cancer among patients diagnosed with left colonic or sigmoid acute diverticulitis is higher than in the general population. Surg Endosc 2015;29:3331-3337.
94. Ou G, Rosenfeld G, Brown J, et al. Colonoscopy after CT-diagnosed acute diverticulitis: is it really necessary? Can J Surg 2015;58:226-231.
95. Grahnat CJ, Hérard S, Ackzell A, Andersson RE. High probability of an underlying colorectal cancer among patients treated for acute diverticulitis: a population-based cohort follow-up study. World J Surg 2016;40:2283-2288.
96. Horesh N, Saeed Y, Horesh H, et al. Colonoscopy after the first episode of acute diverticulitis: challenging management paradigms. Tech Coloproctol 2016;20:383-387.
97. Ramphal W, Schreinemakers JM, Seerden TC, Crolla RM, Rijken AM, Gobardhan PD. What is the risk of colorectal cancer after an episode of acute diverticulitis in conservatively treated patients? J Clin Gastroenterol 2016;50:e35-e39.
98. Walker AS, Bingham JR, Janssen KM, et al. Colonoscopy after Hinchey I and II left-sided diverticulitis: utility or futility? Am J Surg 2016;212:837-843.
99. Andrade P, Ribeiro A, Ramalho R, Lopes S, Macedo G. Routine colonoscopy after acute uncomplicated diverticulitis: challenging a putative indication. Dig Surg 2017;34:197-202.
100. Chan DKH, Tan KK. There is no role for colonoscopy after diverticulitis among Asian patients less than 50 years of age. Gastrointest Tumors 2017;3:136-140.
101. Mortensen LQ, Burcharth J, Andresen K, Pommergaard HC, Rosenberg J. An 18-year nationwide cohort study on the as-

sociation between diverticulitis and colon cancer. Ann Surg 2017;265:954-959.
102. Suhardja TS, Norhadi S, Seah EZ, Rodgers-Wilson S. Is early colonoscopy after CT-diagnosed diverticulitis still necessary? Int J Colorectal Dis 2017;32:485-489.
103. Zaman S, Chapman W, Mohammed I, Gill K, Ward ST. Patients with computed tomography-proven acute diverticulitis require follow-up to exclude colorectal cancer. Intest Res 2017;15:195-202.
104. Seoane Urgorri A, Zaffalon D, Pera Román M, et al. Routine lower gastrointestinal endoscopy for radiographically confirmed acute diverticulitis: in whom and when is it indicated? Rev Esp Enferm Dig 2018;110:571-576.
105. Soh NY, Chia DK, Teo NZ, Ong CJ, Wijaya R. Prevalence of colorectal cancer in acute uncomplicated diverticulitis and the role of the interval colonoscopy. Int J Colorectal Dis 2018;33:991-994.
106. You K, Bendl R, Taut C, Sullivan R, Gachabayov M, Bergamaschi R. Randomized clinical trial of elective resection versus observation in diverticulitis with extraluminal air or abscess initially managed conservatively. Br J Surg 2018;105:971-979.
107. Alcantar DC, Rodriguez C, Fernandez R, Kumar S, Junia C. The necessity of a colonoscopy after an acute diverticulitis event in adults less than 50 years old. Cureus 2019;11:e5666.
108. O'Donohoe N, Chandak P, Likos-Corbett M, et al. Follow up colonoscopy may be omissible in uncomplicated left-sided acute diverticulitis diagnosed with CT: a retrospective cohort study. Sci Rep 2019;9:20127.
109. Abdulazeez Z, Kukreja N, Qureshi N, Lascelles S. Colonoscopy and flexible sigmoidoscopy for follow-up of patients with left-sided diverticulitis. Ann R Coll Surg Engl 2020;102:744-747.
110. Azhar N, Buchwald P, Ansari HZ, et al. Risk of colorectal cancer following CT-verified acute diverticulitis: a nationwide population-based cohort study. Colorectal Dis 2020;22:1406-1414.
111. Díaz JJ, Asenjo BA, Soriano MR, Fernández CJ, Aurusa JO, Rentería JP. Efficacy of colonoscopy after an episode of acute diverticulitis and risk of colorectal cancer. Ann Gastroenterol 2020;33:68-72.
112. Fogelstrom A, Hallen F, Pekkari K. Computed tomography diagnosed first time diverticulitis and colorectal cancer. Int J Colorectal Dis 2020;35:1895-1901.
113. Khoury T, Mahamid M, Lubany A, et al. Underlying colorectal cancer was rarely detected after an episode of acute diverticulitis: a retrospective analysis of 225 patients. J Gastrointest Cancer 2020;51:48-52.
114. Pereira F, Linhares M, Tristan J, Banhudo A. A selective approach for colonoscopy after acute diverticulitis. Ann Gastroenterol 2020;33:222.
115. Singh S, Shuttleworth J, Alagoda U, et al. Differentiating colorectal carcinoma from diverticulitis with computerised tomography: does every patient need follow-up colonoscopy after an episode of acute diverticulitis? Cureus 2020;12:e12027.
116. Tehranian S, Klinge M, Saul M, Morris M, Diergaarde B, Schoen RE. Prevalence of colorectal cancer and advanced adenoma in patients with acute diverticulitis: implications for follow-up colonoscopy. Gastrointest Endosc 2020;91:634-640.
117. Abu Baker F, Ganayem M, Mari A, Taher R, Suki M, Kopelman Y. Acute complicated diverticulitis is associated with an increased advanced neoplasia diagnosis rate: a retrospective study on 1852 patients. Medicine (Baltimore) 2021;100:e24271.
118. Cerdán Santacruz C, Muriel Álvarez P, Roig Ferreruela G, et al. Interval colonoscopy following acute diverticulitis should not be discouraged yet: results from a retrospective cohort. Surg Endosc 2021;35:6819-6826.
119. El Zanati H, Chen A, Attiya A, Leung E. Is routine colonoscopy necessary for patients who have an unequivocal computerised tomography diagnosis of acute diverticulitis? Scott Med J 2021;66:11-15.
120. Hannan E, Harding T, Duggan W, Brosnan C, Maguire D. Routine endoscopy after acute sigmoid diverticulitis: would a sigmoidoscopy be sufficient? Cureus 2021;13:e17648.
121. Jin-Dominguez F, Mansoor E, Panhwar MS, et al. Epidemiology of diverticulitis and prevalence of first-ever colorectal cancer postdiverticulitis in adults in the United States: a population-based national study. Dis Colon Rectum 2021;64:181-189.
122. Lee KY, Lee J, Park YY, Oh ST. Routine colonoscopy may be needed for uncomplicated acute right colonic diverticulitis. BMC Gastroenterol 2021;21:91.
123. Mari A, Khoury T, Sbeit W. Post-diverticulitis colonoscopy was not associated with higher colonic adenoma and carcinoma: a multicenter case-control study. Medicina (Kaunas) 2021;57:682.
124. Gavin DR, Valori RM, Anderson JT, Donnelly MT, Williams JG, Swarbrick ET. The national colonoscopy audit: a nationwide assessment of the quality and safety of colonoscopy in the UK. Gut 2013;62:242-249.
125. Hjern F, Josephson T, Altman D, et al. Conservative treatment

of acute colonic diverticulitis: are antibiotics always mandatory? Scand J Gastroenterol 2007;42:41-47.
126. Chabok A, Påhlman L, Hjern F, Haapaniemi S, Smedh K. Randomized clinical trial of antibiotics in acute uncomplicated diverticulitis. Br J Surg 2012;99:532-539.
127. de Korte N, Kuyvenhoven JP, van der Peet DL, Felt-Bersma RJ, Cuesta MA, Stockmann HB. Mild colonic diverticulitis can be treated without antibiotics: a case-control study. Colorectal Dis 2012;14:325-330.
128. Isacson D, Andreasson K, Nikberg M, Smedh K, Chabok A. No antibiotics in acute uncomplicated diverticulitis: does it work? Scand J Gastroenterol 2014;49:1441-1446.
129. Brochmann ND, Schultz JK, Jakobsen GS, Øresland T. Management of acute uncomplicated diverticulitis without antibiotics: a single-centre cohort study. Colorectal Dis 2016;18:1101-1107.
130. Estrada Ferrer O, Ruiz Edo N, Hidalgo Grau LA, et al. Selective non-antibiotic treatment in sigmoid diverticulitis: is it time to change the traditional approach? Tech Coloproctol 2016;20:309-315.
131. Daniels L, Ünlü Ç, de Korte N, et al. Randomized clinical trial of observational versus antibiotic treatment for a first episode of CT-proven uncomplicated acute diverticulitis. Br J Surg 2017;104:52-61.
132. Mora Lopez L, Ruiz-Edo N, Serra Pla S, Pallisera Llovera A, Navarro Soto S, Serra-Aracil X. Multicentre, controlled, randomized clinical trial to compare the efficacy and safety of ambulatory treatment of mild acute diverticulitis without antibiotics with the standard treatment with antibiotics. Int J Colorectal Dis 2017;32:1509-1516.
133. Bolkenstein HE, Draaisma WA, van de Wall B, Consten E, Broeders I. Treatment of acute uncomplicated diverticulitis without antibiotics: risk factors for treatment failure. Int J Colorectal Dis 2018;33:863-869.
134. Jaung R, Nisbet S, Gosselink MP, et al. Antibiotics do not reduce length of hospital stay for uncomplicated diverticulitis in a pragmatic double-blind randomized trial. Clin Gastroenterol Hepatol 2021;19:503-510.e1.
135. Rottier SJ, van Dijk ST, Ünlü Ç, van Geloven AA, Schreurs WH, Boermeester MA. Complicated disease course in initially computed tomography-proven uncomplicated acute diverticulitis. Surg Infect (Larchmt) 2019;20:453-459.
136. Kim JY, Park SG, Kang HJ, et al. Prospective randomized clinical trial of uncomplicated right-sided colonic diverticulitis: antibiotics versus no antibiotics. Int J Colorectal Dis 2019;34:1413-1420.
137. Lee KY, Lee J, Park YY, Oh ST. Routine antibiotics may not be needed to treat uncomplicated right diverticulitis: a retrospective cohort study. PLoS One 2021;16:e0255384.
138. van de Wall BJ, Draaisma WA, van Iersel JJ, van der Kaaij R, Consten EC, Broeders IA. Dietary restrictions for acute diverticulitis: evidence-based or expert opinion? Int J Colorectal Dis 2013;28:1287-1293.
139. Stam MA, Draaisma WA, van de Wall BJ, Bolkenstein HE, Consten EC, Broeders IA. An unrestricted diet for uncomplicated diverticulitis is safe: results of a prospective diverticulitis diet study. Colorectal Dis 2017;19:372-377.
140. Alonso S, Pera M, Parés D, et al. Outpatient treatment of patients with uncomplicated acute diverticulitis. Colorectal Dis 2010;12(10 Online):e278-e282.
141. Yoo T, Yang KH, Kim J, et al. Predictive factors affecting the clinical course of patients with diverticulitis: who needs hospital management? Ann Coloproctol 2018;34:23-28.
142. Lorente L, Cots F, Alonso S, et al. Outpatient treatment of uncomplicated acute diverticulitis: impact on healthcare costs. Cir Esp 2013;91:504-509.
143. Vogels S, Frouws M, Morks AN, et al. Treating acute colonic diverticulitis with extraluminal pericolic air: an Acute Care Surgery in the Netherlands (ACCSENT) multicenter retrospective cohort study. Surgery 2021;169:1182-1187.
144. Bolkenstein HE, van Dijk ST, Consten EC, et al. Conservative treatment in diverticulitis patients with pericolic extraluminal air and the role of antibiotic treatment. J Gastrointest Surg 2019;23:2269-2276.
145. Colas PA, Duchalais E, Duplay Q, et al. Failure of conservative treatment of acute diverticulitis with extradigestive air. World J Surg 2017;41:1890-1895.
146. Thorisson A, Smedh K, Torkzad MR, Påhlman L, Chabok A. CT imaging for prediction of complications and recurrence in acute uncomplicated diverticulitis. Int J Colorectal Dis 2016;31:451-457.
147. Lahat A, Avidan B, Sakhnini E, Katz L, Fidder HH, Meir SB. Acute diverticulitis: a decade of prospective follow-up. J Clin Gastroenterol 2013;47:415-419.
148. Mora Lopez L, Serra Pla S, Serra-Aracil X, Ballesteros E, Navarro S. Application of a modified Neff classification to patients with uncomplicated diverticulitis. Colorectal Dis 2013;15:1442-1447.
149. Dharmarajan S, Hunt SR, Birnbaum EH, Fleshman JW, Mutch MG. The efficacy of nonoperative management of acute complicated diverticulitis. Dis Colon Rectum 2011;54:663-671.
150. Sallinen VJ, Mentula PJ, Leppäniemi AK. Nonoperative man-

agement of perforated diverticulitis with extraluminal air is safe and effective in selected patients. Dis Colon Rectum 2014;57:875-881.
151. Lambrichts DP, Bolkenstein HE, van der Does DC, et al. Multicentre study of non-surgical management of diverticulitis with abscess formation. Br J Surg 2019;106:458-466.
152. Elagili F, Stocchi L, Ozuner G, Kiran RP. Antibiotics alone instead of percutaneous drainage as initial treatment of large diverticular abscess. Tech Coloproctol 2015;19:97-103.
153. Aquina CT, Becerra AZ, Xu Z, et al. Population-based study of outcomes following an initial acute diverticular abscess. Br J Surg 2019;106:467-476.
154. Brandt D, Gervaz P, Durmishi Y, Platon A, Morel P, Poletti PA. Percutaneous CT scan-guided drainage vs. antibiotherapy alone for Hinchey II diverticulitis: a case-control study. Dis Colon Rectum 2006;49:1533-1538.
155. Siewert B, Tye G, Kruskal J, et al. Impact of CT-guided drainage in the treatment of diverticular abscesses: size matters. AJR Am J Roentgenol 2006;186:680-686.
156. Elagili F, Stocchi L, Ozuner G, Dietz DW, Kiran RP. Outcomes of percutaneous drainage without surgery for patients with diverticular abscess. Dis Colon Rectum 2014;57:331-336.
157. Singh B, May K, Coltart I, Moore NR, Cunningham C. The long-term results of percutaneous drainage of diverticular abscess. Ann R Coll Surg Engl 2008;90:297-301.
158. Devaraj B, Liu W, Tatum J, Cologne K, Kaiser AM. Medically treated diverticular abscess associated with high risk of recurrence and disease complications. Dis Colon Rectum 2016;59:208-215.
159. Gaertner WB, Willis DJ, Madoff RD, et al. Percutaneous drainage of colonic diverticular abscess: is colon resection necessary? Dis Colon Rectum 2013;56:622-626.
160. Jalouta T, Jrebi N, Luchtefeld M, Ogilvie JW. Diverticulitis recurrence after percutaneous abscess drainage. Int J Colorectal Dis 2017;32:1367-1373.
161. Felder SI, Barmparas G, Lynn J, Murrell Z, Margulies DR, Fleshner P. Can the need for colectomy after computed tomography-guided percutaneous drainage for diverticular abscess be predicted? Am Surg 2013;79:1013-1016.
162. Gregersen R, Andresen K, Burcharth J, Pommergaard HC, Rosenberg J. Short-term mortality, readmission, and recurrence in treatment of acute diverticulitis with abscess formation: a nationwide register-based cohort study. Int J Colorectal Dis 2016;31:983-990.
163. Subhas G, Rana G, Bhullar J, Essad K, Mohey L, Mittal VK. Percutaneous drainage of a diverticular abscess should be limited to two attempts for a resilient diverticular abscess. Am Surg 2014;80:635-639.
164. van de Wall BJ, Draaisma WA, Consten EC, van der Kaaij RT, Wiezer MJ, Broeders IA. Does the presence of abscesses in diverticular disease prelude surgery? J Gastrointest Surg 2013;17:540-547.
165. Fowler H, Gachabayov M, Vimalachandran D, Clifford R, Orangio GR, Bergamaschi R. Failure of nonoperative management in patients with acute diverticulitis complicated by abscess: a systematic review. Int J Colorectal Dis 2021;36:1367-1383.
166. Andeweg CS, Mulder IM, Felt-Bersma RJ, et al. Guidelines of diagnostics and treatment of acute left-sided colonic diverticulitis. Dig Surg 2013;30:278-292.
167. Andersen JC, Bundgaard L, Elbrønd H, Laurberg S, Walker LR, Støvring J. Danish national guidelines for treatment of diverticular disease. Dan Med J 2012;59:C4453.
168. Elagili F, Stocchi L, Ozuner G, Mody R, Baker ME, Kiran RP. Predictors of postoperative outcomes for patients with diverticular abscess initially treated with percutaneous drainage. Am J Surg 2015;209:703-708.
169. Jacobs DO. Clinical practice: diverticulitis. N Engl J Med 2007;357:2057-2066.
170. Gregersen R, Andresen K, Burcharth J, Pommergaard HC, Rosenberg J. Long-term mortality and recurrence in patients treated for colonic diverticulitis with abscess formation: a nationwide register-based cohort study. Int J Colorectal Dis 2018;33:431-440.
171. Garfinkle R, Kugler A, Pelsser V, et al. Diverticular abscess managed with long-term definitive nonoperative intent is safe. Dis Colon Rectum 2016;59:648-655.
172. Ambrosetti P, Chautems R, Soravia C, Peiris-Waser N, Terrier F. Long-term outcome of mesocolic and pelvic diverticular abscesses of the left colon: a prospective study of 73 cases. Dis Colon Rectum 2005;48:787-791.
173. Li D, Baxter NN, McLeod RS, Moineddin R, Wilton AS, Nathens AB. Evolving practice patterns in the management of acute colonic diverticulitis: a population-based analysis. Dis Colon Rectum 2014;57:1397-1405.
174. Mills AM, Holena DN, Kallan MJ, Carr BG, Reinke CE, Kelz RR. Effect of insurance status on patients admitted for acute diverticulitis. Colorectal Dis 2013;15:613-620.
175. Reichert MC, Krawczyk M, Appenrodt B, et al. Selective association of nonaspirin NSAIDs with risk of diverticulitis. Int J Colorectal Dis 2018;33:423-430.
176. Strate LL, Liu YL, Huang ES, Giovannucci EL, Chan AT. Use

of aspirin or nonsteroidal anti-inflammatory drugs increases risk for diverticulitis and diverticular bleeding. Gastroenterology 2011;140:1427-1433.
177. Goh H, Bourne R. Non-steroidal anti-inflammatory drugs and perforated diverticular disease: a case-control study. Ann R Coll Surg Engl 2002;84:93-96.
178. Piekarek K, Israelsson LA. Perforated colonic diverticular disease: the importance of NSAIDs, opioids, corticosteroids, and calcium channel blockers. Int J Colorectal Dis 2008;23:1193-1197.
179. Morris CR, Harvey IM, Stebbings WS, Hart AR. Incidence of perforated diverticulitis and risk factors for death in a UK population. Br J Surg 2008;95:876-881.
180. Lorimer JW, Doumit G. Comorbidity is a major determinant of severity in acute diverticulitis. Am J Surg 2007;193:681-685.
181. Carter F, Alsayb M, Marshall JK, Yuan Y. Mesalamine (5-ASA) for the prevention of recurrent diverticulitis. Cochrane Database Syst Rev 2017;10:CD009839.
182. Kruis W, Kardalinos V, Eisenbach T, et al. Randomised clinical trial: mesalazine versus placebo in the prevention of diverticulitis recurrence. Aliment Pharmacol Ther 2017;46:282-291.
183. Raskin JB, Kamm MA, Jamal MM, et al. Mesalamine did not prevent recurrent diverticulitis in phase 3 controlled trials. Gastroenterology 2014;147:793-802.
184. Tursi A, Brandimarte G, Daffinà R. Long-term treatment with mesalazine and rifaximin versus rifaximin alone for patients with recurrent attacks of acute diverticulitis of colon. Dig Liver Dis 2002;34:510-515.
185. Tursi A, Brandimarte G, Giorgetti GM, Elisei W, Aiello F. Balsalazide and/or high-potency probiotic mixture (VSL#3) in maintaining remission after attack of acute, uncomplicated diverticulitis of the colon. Int J Colorectal Dis 2007;22:1103-1108.
186. Lanas A, Ponce J, Bignamini A, Mearin F. One year intermittent rifaximin plus fibre supplementation vs. fibre supplementation alone to prevent diverticulitis recurrence: a proof-of-concept study. Dig Liver Dis 2013;45:104-109.
187. Stollman N, Magowan S, Shanahan F, Quigley EM. A randomized controlled study of mesalamine after acute diverticulitis: results of the DIVA trial. J Clin Gastroenterol 2013;47:621-629.
188. Dahl C, Crichton M, Jenkins J, et al. Evidence for dietary fibre modification in the recovery and prevention of reoccurrence of acute, uncomplicated diverticulitis: a systematic literature review. Nutrients 2018;10:137.
189. Taylor I, Duthie HL. Bran tablets and diverticular disease. Br Med J 1976;1:988-990.
190. Leahy AL, Ellis RM, Quill DS, Peel AL. High fibre diet in symptomatic diverticular disease of the colon. Ann R Coll Surg Engl 1985;67:173-174.
191. Crowe FL, Balkwill A, Cairns BJ, et al. Source of dietary fibre and diverticular disease incidence: a prospective study of UK women. Gut 2014;63:1450-1456.
192. Strate LL, Keeley BR, Cao Y, Wu K, Giovannucci EL, Chan AT. Western dietary pattern increases, and prudent dietary pattern decreases, risk of incident diverticulitis in a prospective cohort study. Gastroenterology 2017;152:1023-1030.e2.
193. Ma W, Nguyen LH, Song M, et al. Intake of dietary fiber, fruits, and vegetables and risk of diverticulitis. Am J Gastroenterol 2019;114:1531-1538.
194. Barber TM, Kabisch S, Pfeiffer AF, Weickert MO. The health benefits of dietary fibre. Nutrients 2020;12:3209.
195. van de Wall BJ, Stam MA, Draaisma WA, et al. Surgery versus conservative management for recurrent and ongoing left-sided diverticulitis (DIRECT trial): an open-label, multicentre, randomised controlled trial. Lancet Gastroenterol Hepatol 2017;2:13-22.
196. Santos A, Mentula P, Pinta T, et al. Comparing laparoscopic elective sigmoid resection with conservative treatment in improving quality of life of patients with diverticulitis: the Laparoscopic Elective Sigmoid Resection Following Diverticulitis (LASER) randomized clinical trial. JAMA Surg 2021;156:129-136.
197. Justin V, Uranues S, Rabl H, Fingerhut A. Quality of life in uncomplicated recurrent diverticulitis: surgical vs. conservative treatment. Sci Rep 2020;10:10261.
198. Sigurdardottir J, Chabok A, Thorisson A, Smedh K, Nikberg M. Elective surgery should be considered after successful conservative treatment of recurrent diverticular abscesses. Scand J Gastroenterol 2020;55:454-459.
199. Mueller MH, Glatzle J, Kasparek MS, et al. Long-term outcome of conservative treatment in patients with diverticulitis of the sigmoid colon. Eur J Gastroenterol Hepatol 2005;17:649-654.
200. Pasternak I, Wiedemann N, Basilicata G, Melcher GA. Gastrointestinal quality of life after laparoscopic-assisted sigmoidectomy for diverticular disease. Int J Colorectal Dis 2012;27:781-787.
201. Holmer C, Lehmann KS, Engelmann S, Gröne J, Buhr HJ, Ritz JP. Long-term outcome after conservative and surgical treatment of acute sigmoid diverticulitis. Langenbecks Arch Surg 2011;396:825-832.
202. Rafferty J, Shellito P, Hyman NH, Buie WD. Practice parameters for sigmoid diverticulitis. Dis Colon Rectum 2006;49:939-

944.
203. Al Harakeh H, Paily AJ, Doughan S, Shaikh I. Recurrent acute diverticulitis: when to operate? Inflamm Intest Dis 2018;3:91-99.
204. Bolkenstein HE, Consten EC, van der Palen J, et al. Long-term outcome of surgery versus conservative management for recurrent and ongoing complaints after an episode of diverticulitis: 5-year follow-up results of a multicenter randomized controlled trial (DIRECT-trial). Ann Surg 2019;269:612-620.
205. Buchwald P, Dixon L, Wakeman CJ, Eglinton TW, Frizelle FA. Hinchey I and II diverticular abscesses: long-term outcome of conservative treatment. ANZ J Surg 2017;87:1011-1014.