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The Use of Antibiotics in Diverticulitis: An Update in Non-operative Management

Mariana Morales-Cruz and Paulina Moctezuma Velázquez

“Antibiotics prescription was considered the standard procedure for an episode of acute noncomplicated diverticulitis; nowadays, in well-selected patients, antibiotics may be avoided.”

Abstract

Diverticulosis is a common disease among Western and developed nations. Approximately 20% of patients with diverticulosis will become symptomatic. Acute diverticulitis is a common manifestation of diverticular disease. Different classifications exist to try to categorize it but, it is generally considered as complicated or uncomplicated. Eighty-five percent of patients with an acute onset of diverticulitis will have an uncomplicated presentation. The best way to assess the degree and severity of the disease is a CT scan along with some biochemical parameters like CRP. Recent guidelines from associations all over the world accept non-antibiotic therapy as a valid strategy of treatment for the non-complicated diverticulitis. Antibiotics are still compulsory in immune-compromised patients, the elderly, those with comorbidities, and those with signs of sepsis. Recommendations should be made on a case-by-case basis.

Keywords: uncomplicated diverticulitis, outpatient treatment, antibiotics, conservative management

1. Introduction

Diverticulosis is a common disease among the Western and developed nations; its prevalence increases with age, being 10% in adults over 40 years and around 70% in patients over 80 years. Approximately 20% of patients with diverticulosis will become symptomatic [1].

Worldwide, the incidence of diverticular disease is rising. Lifestyle and Western diet seem to be the factors influencing this epidemiological change, increasing most dramatically among age groups between 18 and 64 years old. Amid young patients, diverticular disease is more common in men, while in the elderly population, the prevalence is similar between both sexes [2]. Diverticular disease can occur in any part of the colon, but the left side is more frequently affected in Western countries, while up to 70% of cases in Asia appear on the right side [3].

Different classifications exist to categorize acute diverticulitis, but it is generally classified as uncomplicated or complicated. The computed tomography of the

abdomen and pelvis is the best way to assess its severity. Further investigations to characterize it include white blood cell count and C-reactive protein levels [4]. About 85% of patients that attend to the emergency department for an acute onset of diverticular disease will have an uncomplicated form of it, and they may be treated conservatively [5]. The rest of the cases will present with abscess, fistula, perforation, stricture, or peritonitis, where surgical treatment is advised in an urgent or elective setting. Surgical options are diverse, but the indications and recommendations to choose one strategy over the other are beyond the scope of this chapter.

Regarding nonoperative management, patients can be hospitalized or sent home with or without antibiotics. Treatment should be tailored according to the patient's characteristics [6]. Patients with uncomplicated diverticulitis by CT may develop severe complications in 1.4% of the cases [7], while recurrence rates have been described to be from 5 to 20% [8]. Recurrence risk tends to be higher in patients with a previous episode of complicated diverticulitis (24% vs. 23.4%, $p = 0.622$) rather than in patients with uncomplicated diverticulitis, and most of these episodes occur within the first year [9] of the initial onset.

2. Discussion

2.1 Medical approach of uncomplicated diverticulitis

Diverticulitis treatment has been modified throughout time. The prescription of antibiotics used to be the therapeutic foundation of it, but it could be avoided now in well-selected patients [10]. The nonantibiotic treatment strategy was formulated more than a decade ago when diverticular physiopathology was reassessed. At first, it was known that diverticular occlusion, micro-perforation, and peritoneal infection were the origin of diverticulitis [11]. Later, with the finding of TNF- α overexpression, it was concluded that inflammation plays a crucial role in diverticulitis development [12]. Even more, patients with diverticular disease seem to have changed in the gastrointestinal flora, including the depletion of some fecal microbiota species that have anti-inflammatory properties [13]. Subjects with diverticula seem to have more macrophages in the intestinal wall than their healthier counterparts, promoting inflammation rather than infection [14] and therefore raising the question about the actual need for antibiotics for its treatment during an acute flare.

Under this hypothesis, anti-inflammatory medication has been suggested as a treatment for acute uncomplicated diverticulitis, sparing the use of antibiotics as long as complications are not present.

Two of the most important contributions regarding the avoidance of the use of antibiotics were made by the AVOD (Antibiotika Vid Okomplicerad Divertikulit—Swedish for “antibiotics in uncomplicated diverticulitis”) and DIABOLO (DIverticulitis: AntiBiotics Or cLose Observation?) randomized control trials (RCT), published in 2011 and 2016, respectively.

The DIABOLO study [15] was a multicentric trial evaluating two different approaches for the management of uncomplicated acute diverticulitis, either observation or antibiotic treatment. The patients included were those with the first episode of left-sided uncomplicated diverticulitis, classified according to Hinchey's or Ambrosetti's scale. The diagnosis was confirmed with a CT scan in the first 24 h of presentation.

The antibiotic used was amoxicillin-clavulanic acid (unless allergic), and it was handed intravenously four times a day for the first 2 days and then switched to oral three times a day until a 10-day course was completed. For the initial doses, all the patients had to be admitted contrary to the observational group, which was treated

in the outpatient setting as long as the patient could tolerate a regular diet, there was no fever, and there was reasonable pain control. Only 34 patients were sent home under this premise.

The primary analyses included 528 patients. The median time to recovery during 6 months follow-up was 14 days for patients who had conservative management vs. 12 days among those with antibiotics. Readmission rates were comparable: 17.6% in the observation vs. 12.0% in the antibiotic group ($p = 0.148$).

The proportion of patients with recurrent diverticulitis was similar in the two groups (3.4 vs. 3.0%; $p = 0.494$). Rates of sigmoid resection were comparable (3.8 vs. 2.3%; $p = 0.323$) for both emergency resection (0.8 vs. 1.1%; $p = 0.553$) and elective resection (3.1 vs. 1.1%; $p = 0.254$). In both groups, the most common reason for sigmoid resection was colonic obstruction (3 of 10 in the observation group vs. 2 of 6 in the antibiotic group), followed by perforation (2 of 10 vs. 2 of 6).

Another multicenter trial was the AVOD [7], where 10 surgical departments in Sweden and one in Iceland participated. Uncomplicated diverticulitis was defined as an episode of clinical signs compatible with diverticulitis, including fever and raised inflammatory markers complemented with computed tomography (CT). The randomization was done with sealed envelopes, and the patients were treated with just intravenous fluids or with antibiotic therapy, but in any case, hospital admission was required. A total of 623 patients were enrolled in the study—309 patients in the no-antibiotics arm and 314 in the antibiotics group. In the antibiotics group, the treatment was initiated with an intravenous combination of a cephalosporin (cefuroxime or cefotaxime) and metronidazole, or with carbapenem antibiotics or piperacillin-tazobactam, and then changed to an oral regimen for completion of 7 days. The discharge was made after the improvement of clinical and biochemical parameters in both groups. Further investigations with colonoscopy, barium enema, or CT colonography were made if none of these were performed within 1 year before admission at 6 or 8 weeks. No significant differences were found between patients treated with or without antibiotics. Neither did between the frequencies in surgery, length of hospital stay, recurrence of diverticulitis, chronic pain, or changes in bowel habit after 12 months.

This study group recently published a long-term follow-up of this cohort. At a median time of 11 years, the authors found no significant differences between the two groups in terms of recurrences (both 31.3%), complications, surgery for diverticulitis, or reported quality of life (EQ-5DTM) [16].

It is extremely important to mention that both trials supporting the avoidance of antibiotics included only patients with early-stage disease (Hinchey I and Ia). These RCTs are also prone to perform a selection bias because no blinding was made, and actual rates among centers were variable. Antibiotic treatment was also not standardized [17].

van Dijk et al. [18] made an individual-patient data meta-analysis with 1109 patients of the DIABOLO and AVOD trials: 545 in the observational group and 564 in the antibiotics group. To make results comparable, he redefined some of the concepts evaluated—ongoing diverticulitis, recurrent diverticulitis, and complicated diverticulitis. Ongoing diverticulitis was the persistence of symptoms during the following 3 months after initial discharge, and recurrent diverticulitis was defined as any episode occurring after discharge. The mean duration of follow-up was 12 months. Baseline characteristics were similar among groups; however, primary diverticulitis was slightly and significantly more common in the antibiotics group 454 cases vs. 408 in the nonantibiotic ($p = 0.029$). The length of stay for the initial hospital admission was shorter, although nonsignificant in the observational group. The rate of ongoing diverticulitis was 7.2% (39 of 545) in the observational group vs. 5.0% (28 of 564) in the antibiotics group ($p = 0.062$). The rates of recurrent

diverticulitis were comparable: 8.6% (47 of 545) vs. 9.6% (54 of 564), respectively ($p = 0.610$). The rate of complicated diverticulitis within 1 month was 1.8% (10 of 545) in the observational group vs. 1.1% (6 of 564) in the antibiotics group ($p = 0.204$); at 1-year follow-up, it was 4% (22 of 545) vs. 2.1% (12 of 564), respectively ($p = 0.079$). Rates of sigmoid resection were no differences between the groups at 1 month or 1 year.

Other studies with less statistical power (non RCT) have had the same findings as to the DIABOLO and AVOD. Some meta-analyses have been made trying to gather more evidence about this topic, and the main outcomes address the recurrence, need for surgery, complication rate, and treatment failure.

A meta-analysis from Desai et al. [19], with seven studies for a total of 2241 patients, concluded that recurrent diverticulitis was actually slightly higher among patients who received antibiotics compared with those who did not 12.6% vs. 11.5% [pooled rate of recurrent diverticulitis OR = 1.27 (95% CI = 0.90–1.79); $p = 0.18$]. Total complications were higher among patients who had antibiotics 27.8% vs. 19.85% [pooled OR = 1.99 (95% CI, 0.66–6.01); $p = 0.22$], and so was treatment failure 3% vs. 4.5% (pooled OR = 0.68 (95% CI, 0.42–1.09); $p = 0.11$], and readmission rates 14.5% vs. 15.2% [pooled OR = 0.75 (95% CI, 0.44–1.30); $p = 0.31$], pointing out that all negative outcomes tend to be lower in the nonantibiotic group, although no statistical significance was found in any of them. But it is also worth mentioning that the rate of sigmoidectomy was higher in the patients treated without antibiotics, 1.5% vs. 4.8% [pooled OR = 3.37 (95% CI, 0.65–17.34); $p = 0.15$]. In the end, the benefit of treating patients without antibiotics was proven in fewer costs, less hospital stays, and less antibiotic resistance.

Emile et al. [20] published a systematic review of nine studies with 2565 patients. Failure was defined as the deterioration of symptoms requiring an antibiotic prescription or the readmission within 1 month of discharge due to persistency of them, with or without complications. Recurrence was defined as a new episode of diverticulitis within 1 month after discharge, and readmission was defined as a hospital admission within 1 year after discharge. They concluded that there were no differences in treatment failure, (OR = 1.5, $p = 0.06$), recurrence (OR = 0.81, $p = 0.2$), complications rate (OR = 0.56, $p = 0.25$), hospital readmissions (OR = 0.97, $p = 0.91$), need for surgery (OR = 0.59, $p = 0.28$), or mortality (OR = 0.64, $p = 0.47$). In this meta-analysis, the only predictor for failure in the nonantibiotic group was associated comorbidities ($p < 0.001$). Other authors found that a CRP higher than 170 mg/dL was also associated with treatment failure.

A Cochrane systematic review from 2012 [21], including three randomized control trials, found no difference in outcomes between patients with uncomplicated diverticulitis treated with or without antibiotics. The patients included in the analyzed studies were healthy with a Hinchey I or Ia stage of the disease.

Mege and Yeo [22] made a meta-analysis including 2321 patients from 11 different studies. The primary endpoint was treatment failure, recognizing this as the need for emergency surgery (0.7% vs. 1.4%; $p = 0.1$). The secondary outcome was a recurrence, this being readmission for a new episode of acute diverticulitis 1 month after the previous episode (11% vs. 12%; $p = 0.3$). Then again, no difference was found. Emergency surgery occurred less frequently in the observational group than in the treatment group (0.5% vs. 1%, $p = 0.34$), and even elective surgery happened at comparable rates. But if we consider only the randomized control trials included, elective surgery occurred in 0.9% of the patients treated with antibiotics vs. 2.5% in the antibiotic group ($p = 0.04$).

The reason why elective surgery may be more frequently performed in patients in the nonantibiotic group might be the misperception of being undertreated, so they sought a definitive treatment. Antibiotics may reduce low-grade colonic

inflammation avoiding complications such as obstruction, recurrence, or ongoing diverticulitis [11].

Another meta-analysis included nine studies; two RCT, five cohort studies, and two case-control studies, with a total of 1164 patients. In this, patients treated without antibiotics required an additional intervention or treatment in 5.3% of the cases vs. the 3.6% on the antibiotic group but without statistical significance (risk ratio = 1.48; $p = 0.28$) [17]. The study concluded that treatment without antibiotics is associated with a shorter hospital stay and no difference in readmission rates (risk ratio = 1.17; $p = 0.26$), need for surgical or radiological intervention (risk ratio = 0.61; $p = 0.34$), recurrence (risk ratio = 0.83; $p = 0.21$), and complications (risk ratio = 0.70–1.18; $p = 0.67$ –0.91).

Mocanu et al. [23] performed another meta-analysis considering two RCT, one single-center cohort, two retrospective cohorts, one prospective cohort, one retrospective case control, and one prospective cohort single arm with a total of 2469 patients. The outcomes included were—recurrence (readmission greater than 1 month following intervention), treatment failure (recurrence of symptoms within 1 month of intervention), abscess, bleeding, fistula, perforation, stenosis, and need for elective or emergent surgery. The overall complication rate was 18.7%, and there was no difference among groups 17.7% in the nonantibiotic group vs. 20.2% in the antibiotic group (OR = 0.72; CI = 0.45–1.16; $p = 0.18$). Recurrence was the most common seeing with a rate between 2 and 28%. The rates of abscesses, perforation, stenosis, elective and emergency surgery were also no different. There was a statistical difference in the length of stay being 1 day less for the nonantibiotic group. They concluded that antibiotic use in patients with acute uncomplicated diverticulitis is not associated with a reduction in significant complications.

Daniels et al. [24] ran a pragmatic RCT with the analysis of the information from 528 patients. His observational strategy proved no inferiority when compared to the antibiotic treatment for the first episode of uncomplicated diverticulitis. The duration of initial admission was longer, and the rate of antibiotic-related adverse events was higher in the antibiotic group, suggesting that antibiotics can be omitted. He also mentions that 7.3% of the patients treated without antibiotics had ongoing diverticulitis vs. 4.7% in the antibiotic group $p = 0.183$.

Quality of life between both treatments has not been adequately addressed; there is a lack of information regarding this critical outcome. Ongoing diverticulitis might not be a precise indicator of the quality of life, but it does make reference to the persistency of symptoms, which may affect the quality of life of patients [24].

The number of days, type of antibiotics, and inpatient or outpatient administration are the other questions arousing in regard to uncomplicated diverticulitis treatment. Antibiotic therapy must be effective against aerobic (*Escherichia coli*, *Proteus*, *Klebsiella*, and *Enterococcus*) and anaerobic (*Bacteroides*, *Clostridium*, *Bifidobacterium*, and *Peptostreptococcus*) bacteria. In general, a broad-spectrum antibiotic should be elected or combination therapy with metronidazole and quinolones or third-generation cephalosporins or beta-lactam antibiotics with a beta-lactamase inhibitor [10]. Under the premise of reducing antibiotic resistance and costs, Schug-Pass et al. [25] designed a randomized trial to elucidate whether short-term therapy (4 days) with ertapenem is as effective as standard therapy (7 days) in an inpatient scenario. Randomization was conducted on day 4, with antibiotic therapy being then either terminated or continued for a further three days. In uncomplicated sigmoid diverticulitis, symptomatic improvement happens in the first 96 h. This prospective randomized trial demonstrated that a shorter 4-day treatment period is just as effective as the standard treatment (98.0% vs. 98.2%).

A prospective, single-arm study overviewed [26] the safety and efficacy of symptomatic (nonantibiotic) treatment for CT-proven uncomplicated acute

diverticulitis during a 30-day follow-up period. A total of 153 patients (95%) completed the follow-up. A total of 14 (9%) patients had pericolic gas. Altogether, 140 (87%) patients were treated as outpatients, and four (3%) of them were admitted to the hospital at some point. The primary outcome of this study was to find the progression to complicated diverticulitis. None of the subjects developed it or needed surgery, but 2 days (median) after inclusion, antibiotics were given to 14 (9%, six orally, eight intravenously) patients.

Jackson and Hammond [27] did a systematic review back in 2014 justified by the lack of evidence to support the traditional inpatient treatment with bowel rest, intravenous fluids, and intravenous antibiotics. This review included nine studies (415 patients) where all, except for one, used either CT scan or US to confirm uncomplicated diverticulitis. Once the diagnosis was made, some protocols would discharge patients immediately on oral antibiotics and a liquid diet for 10 days. Other protocols would keep patients in the hospital for 24 h before sending them home. Three of the studies allowed some patients to have outpatient care even with abscesses between 2 and 3 cm. About 403 patients out of a total of 415 (97%) participants were successfully treated in the outpatient setting, concluding that a more progressive, ambulatory-based approach is effective and safe.

Another systematic review including 21 studies (11 prospectives, nine retrospectives, and only one randomized trial) with 1781 patients was recently published by Cirocchi et al. [28]. Outpatient management for acute left diverticulitis was the primary outcome evaluated. The meta-analysis concluded that outpatient management is safe. The overall failure rate was 4.3% (95% CI = 2.6–6.3%). Ambulatory treatment was associated with an estimated daily cost savings of between €600 and €1900 per patient treated.

With the growing evidence that antibiotic therapy is not essential for the treatment of acute uncomplicated diverticulitis, several guidelines support the observational management in afebrile clinically stable cases.

A survey conducted in 2011 [29] between gastroenterologists and surgeons found a general opinion about antibiotics not being for everyone any longer. The Danish and Dutch guidelines from 2011 to 2012, respectively, do not recommend the routine use of antibiotics [30].

The American Gastroenterological Association in 2015 advised that antibiotics should be used selectively rather than routinely in patients [31]. Stating also that treatment with broad-spectrum antibiotics may not solve the symptomatology in patients with acute uncomplicated diverticulitis. However, antibiotics may decrease the risk of recurrence and diverticular complications in comparison with no antibiotics. The effect of antibiotics on the development of sepsis and the need for surgery or colostomy remains uncertain.

Recent guidelines from associations all over the world now consider nonantibiotic therapy as a valid strategy for uncomplicated acute diverticulitis, among this associations the American Society of Colorectal Surgeons Clinical practice guidelines for the treatment of left-sided colonic diverticulitis (2020) [32], the Second International Symposium on Diverticular Disease [33], held in Rome in 2016, and the 2020 WSES guidelines [34] address that CT scan findings must be compatible with uncomplicated acute diverticulitis and patients must not show signs of sepsis. The WSES established that immunocompetent patients with uncomplicated diverticulitis without signs of systemic inflammation should not receive antibiotic therapy. This was supported too by last year's ESCP guidelines [35]; the commissioning guide for colonic diverticular disease made by the Royal College of Surgeons of England [36] in 2014, and the Japanese Gastroenterological Association [37] in 2019.

The EAES and SAGES [38] guidelines also make a remark about the immunocompetence of the patients, establishing those healthy individuals with

uncomplicated acute diverticulitis will have similar outcomes with just symptomatic treatment. The antibiotic prescription should be reserved for immunocompromised patients and cases with sepsis. The recommendations from other societies can be found in **Table 1**.

Society	Recommendation	Grade of evidence	References
World Society of Emergency Surgery (WSES): update of the guidelines for the management of acute colonic diverticulitis in the emergency setting (2020)	In immunocompetent patients with uncomplicated diverticulitis without signs of systemic inflammation, we recommend not to prescribe antibiotic therapy	1A	Cochrane Review, AVOD, Mali et al., DIABOLO and DIABOLO LONG TERM
American Society of Colon and Rectal Surgeons (ASCRS): clinical practice guidelines for the treatment of left-sided colonic diverticulitis (2020)	Selected patients with uncomplicated diverticulitis can be treated without antibiotics	1A	AVOD, DIABOLO, Mege et al., Sánchez-Velázquez: systematic review, Isacson et al., Van Dijk ST, COCHRANE, Estrada Ferrer et al., Desai et al., Au S et al., Emile et al. Mocanu et al., Bolkenstein
European Society of Coloproctology (ESCP): Guidelines for the management of diverticular disease of the colon (2020)	Patients with acute uncomplicated diverticulitis do not require antibiotics routinely. Antibiotic treatment should be reserved for immunocompromised patients and patients with sepsis	Strong	AVOD, Isacson et al., van Dijk ST et al., Desai M et al., Daniels L et al.
EAES and SAGES 2018 consensus conference on acute diverticulitis management: evidence-based recommendations for clinical practice	In immunocompetent individuals presenting with uncomplicated acute diverticulitis, symptomatic treatment without antibiotics provides similar outcomes to treatment with antibiotics	Weak	Galetin T et al., Kohler L et al.
American Gastroenterological Association Institute Guideline on the Management of Acute Diverticulitis	Antibiotics should be used selectively rather than routinely in acute uncomplicated diverticulitis	Low quality	AVOD, DIABOLO, Stollman AGA, Sultan S AGA, Graham et al., Peery AF, Feingold D, et al., Morris et al.
American Gastroenterological Association Institute Technical Review on the Management of Acute Diverticulitis (2015)	Treatment with broad-spectrum antibiotics for at least seven days may not improve symptom resolution. Nevertheless, it may decrease the risk of recurrence and diverticular complications	Low quality	COCHRANE, Morris AM et al., DIABOLO, Daniels LUC, de Korte N A et al., Hjern F et al.

Society	Recommendation	Grade of evidence	References
Guidelines of Diagnostics and Treatment of Acute Left-Sided Colonic Diverticulitis (Netherlands)	Antibiotic treatment is recommended when signs of generalized infection and affected general condition or signs of bacteremia or septicemia are present. Antibiotic treatment is recommended in immunocompromised patients	Level A2	Ridgway PF et al., AVOD Schug-Pass C et al.
Danish national guidelines for the treatment of diverticular disease	The use of antibiotics in uncomplicated diverticulitis is justified by septicemia, affected general condition, pregnancy, or immuno-suppression. Antibiotics are not routinely recommended	Ib	Kaiser et al., Sarin S, Chautems et al., Schug-Pass C et al., Byrnes MC et al., AVOD , Hjern F et al
Italian Society of Colon and Rectal Surgery. Practice parameters for the treatment of colonic diverticular disease: Guidelines	The suggestion of avoiding antibiotics in acute uncomplicated diverticulitis may not improve short- or long-term outcomes. Use only on a case-by-case basis	Ib	AVOD, Andersen JC, et al., Westwood DA et al., Hjern F et al., DIABOLO
Diverticular disease: guidelines of the German Society for Gastroenterology, Digestive and Metabolic Diseases and the German Society for General and Visceral Surgery	In acute uncomplicated left-sided diverticulitis with no risk indicators for a challenging course, antibiotic therapy can be omitted subject to close clinical monitoring	Open recommendations	AVOD, Hjern F et al., Schug-Pass C et al.
Royal College of Surgeons (RCS) of England: Commissioning guide—Colonic diverticular disease (2014)	There is low-level evidence that patients suitable for management at home may be managed without the use of antibiotics		COCHRANE
Japan Gastroenterological Association (JGA): Guidelines for colonic diverticular bleeding and colonic diverticulitis (2019)	Antibiotic therapy has been reported to be unnecessary for colonic diverticulitis without abscess or perforation, but no studies have been conducted in Japan. Therefore, the efficacy of antibiotic therapy among Japanese patients is currently unclear. Antibiotic therapy is considered acceptable in current clinical practice	C	Brochmann ND et al., AVOD, DIABOLO, Isacson D et al., Daniels L et al.

Table 1.
Recommendations on the treatment of noncomplicated acute left diverticulitis.

2.2 Right-sided colonic uncomplicated diverticulitis.

Right-sided diverticulosis is a rare condition in the Western population, but it is often seen in Asian countries. Its prevalence does not increase with age as it happens with the sigmoid diverticula. Right colon diverticula are usually solitary, true (all layers), and congenital; muscle hypertrophy is not observed [39]. Acute right

diverticulitis episodes generally occur in middle-aged men [40]. Differential diagnosis is complex, and it is frequently misinterpreted as acute appendicitis. There is not much literature regarding the treatment for right-sided diverticulitis.

The only study we were able to find about this subject was the one made by Destek and Gül [41] with 22 patients. Nine (40.9%) were female, and 13 (59%) were male. The age range was 26–84 years, with a mean age of 50.9 years. The duration of symptoms (nausea, diarrhea, and pain) prior to hospitalization was 1–5 days. In general, leukocytosis was detected in 77.2% of all patients, and high CRP levels were found in all of them (100%). About 59% of the patients had diverticulitis in the right colon, and 41% of them had diverticulitis in the cecum. Patients were classified as Hinchey stage I or II. Symptomatic conservative treatment was applied in 19 patients (86.3%). Oral intake was discontinued for 2 or 3 days, intravenous hydration therapy with balanced solutions was given, intravenous dual antibiotic therapy was applied, and after 2–8 days, they were discharged with oral regimes. A percutaneous drainage catheter was placed under sonography in four patients (18.1%) in whom the localized abscess did not regress with conservative treatment.

Generally speaking, most recent guidelines support the use of the same principles already discussed for the treatment of right-sided diverticulitis.

2.3 Uncomplicated diverticulitis and diet

For years, patients have been instructed to consume a clear-liquid or low-residue diet (low fiber), or even to deprive themselves of food for bowel rest during the diverticulitis flare [42, 43]. Several guidelines have supported this. A survey conducted in the Netherlands in 2011 showed that 83.2% of participating gastroenterologists and surgeons advised some form of bowel rest [42], but the Dutch guideline of 2012 stated that an unrestricted diet could also be advised [44].

In the prospective, observational study published by Isacson et al. [45] in 2015, patients with confirming CT scan for uncomplicated diverticulitis were enrolled to receive recommendations on oral intake of fluids for the first 48 h followed by a liquid diet and then moving on to a complete diet as tolerated. Readmission within 1 month with or without complications was defined as a management failure. In total, 155 patients were included in the study, and only four patients had treatment failure. Five patients (3.3%) had a recurrence within the 3-month follow-up period.

A prospective, uncontrolled study of an unrestricted diet in 86 patients with uncomplicated diverticulitis concluded that this was well tolerated, although 8% had serious adverse events and 20% had ongoing symptoms [46].

A high-dietary fiber diet is hypothesized to prevent diverticulitis recurrence by reducing the contact time between stool and diverticula [47]. There has been an increased use of probiotic supplementation under the assumption of them decreasing the risk of infection and inflammation of the diverticula [48].

The systematic review of Dahl et al. [49] addressed the lack of high-quality reports and research about the dietary management of adults with acute, uncomplicated diverticulitis. However, generalized observations tended to agree that either a free diet or a restricted one is equal in terms of recovery. A multicenter trial is underway to evaluate an unrestricted vs. a progressive diet in uncomplicated diverticulitis.

3. Conclusions

The nonantibiotic management in patients with uncomplicated diverticulitis still has some unsettled topics like management of the right-sided or recurrent

uncomplicated disease; further investigation in different populations and world regions is needed. More supervision on antibiotic prescription needs to be encouraged in patients who receive therapy for acute diverticulitis to make a cost-effect analysis for each case [50].

In conclusion, antibiotics may not improve outcomes in acute uncomplicated diverticulitis, but the high mortality associated with sepsis requires clinicians to maintain a low threshold in high-risk individuals such as immunocompromised patients, the elderly, and those with comorbidities [51]. Therefore, recommendations should be made on a case-by-case basis. If antibiotic therapy is necessary, oral administration is equally as effective as intravenous administration, and an expeditious switch from intravenous to oral may allow the fastest patient discharge.

Conflict of interests

Authors declare no conflict of interests.

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