

Surgical Management of Diverticulitis

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Abstract

Background: Diverticulitis has easily become one of the most common causes of gastrointestinal tract related hospitalizations in the 21st century. The disease presentation is varied clinically from mild, uncomplicated diverticulosis that can be managed as an outpatient, to complicated diverticulitis that is associated with peritonitis and sepsis.

Aim: In this study our aim is to understand the epidemiology, pathophysiology, and management of diverticulitis.

Methodology: This review is a comprehensive research of PUBMED since year 2009 till 2015.

Conclusion: Diverticulitis was managed historically with antibiotics initially, with many patients undergoing urgent or emergent surgeries. Nevertheless, the treatment model has changed and favors nonoperative management over surgical interventions as recent literature has shown that it is more beneficial in the majority of patients. Surgical management remains indispensable in a subset of patients as the only successful intervention, and various technical aspects can improve the prognosis of the disease.

Keywords: Diverticulitis; Colonic Diverticula; Gastrointestinal Tract; Peritonitis and Sepsis

Introduction

Colonic diverticula are described as small outpouchings from the colonic lumen produced by mucosal herniation through the colonic wall where the vascular systems feed the colon and where most colonic wall defects occur. Acute diverticulitis is a condition of the colon wall structure that prevails in all western and Asian countries. In 2004, in USA, diverticular disease was the third most common gastrointestinal diagnosis among discharged patients from hospitals. However, diverticulosis is still common in developed countries, and found to be even more prevalent in Japan where the prevalence of diverticular disease in 1980 was only five percent of the population, but during

the 1990s it climbed to around 30%. Age is an important risk factor as only 16 - 22% in people less than 40 years of age reported diverticulosis in contrast to 42 - 60% in the older age population (over 80 years). There is a difference in the localization of diverticula between Western and Asian countries. Colonic diverticula are discovered in the sigmoid colon in > 90% of people in Western nations, whereas the right-sided kind is found in around 70% of the patients in Asia. Roughly 75 - 80% of patients with anatomical diverticulosis continue to be symptoms-free during their life. For 20% of individuals with diverticulosis that is complicated with diverticulitis, 1 - 2% need a hospital stay, as well as 0.5% call for emergent surgery complicated by an abscess or peritonitis [1].

Methodology

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE since 2009 till year 2016. The search terms used were diverticulitis, gastrointestinal abnormalities, gastrointestinal perforation, GIT surgery, diverticulitis surgical management.

Two reviewers have independently reviewed the studies and abstracted data, and disagreements were resolved by consensus.

Epidemiology

Diverticular disease of the colon prevails in established countries. Westernized countries have high occurrences of left-sided diverticulosis. Right-sided diverticulosis although uncommon in Western populaces, is a lot more common in Asia, whereas prevalence of diverticulosis is still lower than that of western countries. Left-side diverticulosis, however, is still a lot more common in Asia. The existence of right-sided diverticula is a distinctive condition from left-sided diverticulosis, and also is believed to be caused mainly due to hereditary factors. In Finland, the occurrence of diverticulitis has actually climbed to 50% in the last 20 years, mainly partly to decreased nutritional fiber and also affected by an aging populace. The occurrence of diverticula in colon increases significantly with older age. Under the age of 30, just 1 to 2% of the population have diverticulosis. In early postmortem examination research studies from the 1920s to the 1940s, the total frequency was reported as 2 to 10%. Occurrence increases to 50 - 66% in people older than 80 years of age. Roughly 10 to 25% of patients with diverticulosis will certainly establish diverticulitis. The occurrence of the condition in men is around equivalent to that of women. McConnell, *et al.* reported that diverticular bleeding happens a lot more frequently in the male population but strictures take place more frequently in females [2].

Pathogenesis

Numerous elements consisting of colonic wall defects, motility of the colon, genes, fiber consumption, vitamin D nutrition, high BMI as well as an inactive lifestyle have been examined as well as believed to affect the pathogenesis of the disease. An early as well as prominent concept as to the etiology of diverticulosis was initially defined by Burkitt in 1971, based on his monitoring that indigenous Africans had a reduced occurrence of diverticular illness. While the pathogenesis of diverticulosis has mostly been believed to be due to ecological factors such as diet plan, current epidemiologic data shows the profound hereditary aspect in the growth of diverticular illness. In 1994, Aldoori, *et al.* analyzed the connection between nutritional fiber intake and symptomatic diverticular condition as well as discovered that a reduced nutritional fiber consumption increased the symptomatic diverticular disease prevalence. Crowe, *et al.* evaluated the organization in between nutritional fiber consumption with threat of diverticular condition difficulties. They located that usage of high fiber diet plan was linked with reduced risk of hospital admissions as well as fatality from diverticulosis [2].

Various studies suggest that a lower serum vitamin D (25-OH) may cause higher risk of diverticulitis and associate the pathogenesis of diverticulitis with poor vitamin D intake. Furthermore, with increasing rates of obesity and inactive lifestyle, the rate of diverticular disease has also rose over the past three decades. A positive link between increasing body mass index, waist circumference, and waist-to-hip proportion with the risk of developing diverticular disease has been established. Various research studies have been performed in

identifying the results of excessive body weight on gut microbiota transformations in both human and mice studies, in an effort to see if this might describe weight contribution to diverticulitis [3].

Clinical presentation

Although subjective complaints are clearly tough to evaluate, Köhler, *et al.* grouped pain in the left lower quadrant, fever, and changes in relief patterns to be symptomatic indications of diverticulosis. One need to think that a great deal of patients with grievances of discomfort in the left lower quadrant, fever, and straining are most likely out of medical sight, seeking medical advice from their family doctor. Such complaints are thought about to be self-limiting, and in some cases cured by antibiotic treatment. Diverticulitis episodes do not represent these subjective complaints, resulting in an underestimation of these symptoms of the disease. Moreover, limitations of the medical diagnosis of diverticulitis need to be addressed. Diverticular episodes are identified by focus on more unbiased indications, like raised infectious laboratory parameters in lab tests and normal findings on CT scan or colonoscopy. Yet, this does not narrow down the subjective patient complaints. It is the mix of particular symptoms that still form the basis for a differential medical diagnosis and the sign for additional medical evaluations. For example, impaired passage of a stool is suggestive for a stenosis, in which a colonoscopy can separate between post-diverticulitis stenosis or cancer; diverticular bleeding is the most common reason for reoccurring rectal blood loss, however once again cancer diagnosis must be eliminated by a colonoscopy; and pneumaturia is pathognomic for a colovesical fistula, which normally a CT scan will clearly display it. In addition, a generalized peritonitis is detected by physical examination. The combination of the following signs need to be considered: an ill patient with fever, lack of peristalsis, and extremely tender abdominal area on palpation. A CT scan is typically compulsory in discovering its cause and validating the indication for surgical intervention. Problems such as stenosis, fistula, or persistent diverticular bleeding are clear signs for an optional sigmoid resection, however likewise the avoidance of perforated diverticulitis by carrying out an optional sigmoid resection has been basic policy for numerous years. Just recently, these suggestions have been challenged since brand-new literature on the nature of diverticulitis has revealed that the majority of perforations do not happen after reoccurrences, however at the very first attack of complicated diverticulitis. Moreover, conservative management of persistent non-perforated diverticulitis is related to low rates of morbidity and death. These brand-new insights led to a more conservative and personalized technique to diverticular disease, making the level of subjective problems much more essential [4].

Diagnosis

The preliminary assessment of a patient with presumed diverticulitis needs to start with a total history and physical examination, and, in some precise cases of persistent illness, the medical diagnosis can be made without additional imaging studies. When the medical diagnosis remains in concern, or the patient has serious signs and perhaps complicated diverticulitis, CT axial imaging must be carried out. CT can differentiate diverticulitis from other conditions, consisting of irritable bowel disease, gastroenteritis, or gynecologic illnesses. While the existence of sigmoid inflammation and diverticulosis can be recognized by CT imaging, colon cancer or other etiologies cannot be dependably separated by imaging, so all patients with a first time episode need to be followed with a colonoscopy to rule out malignancy. The colonoscopy ought to be performed in a postponed (4 to 6 weeks) style to decrease the dangers of perforation from over-distension. In addition to being utilized for diagnostic functions, CT scans can divide patients by intensity and recognize those with problems of diverticulitis, such as stricture, abscess, or pneumoperitoneum. Diverticulitis with mild symptoms is generally related to thickening of the colon wall and peri-colonic inflammatory modifications such as fat stranding. In cases of complex diverticulitis, the frequently utilized Hinchey category can be used. Those with type I illness have just localized para-colonic abscesses, type II consists of illness with pelvic or remote abscesses, and types III and IV have actually generalized purulent and feculent peritonitis, respectively. An additional category system from the European Association for Endoscopic Surgeons is based just on scientific, instead of radiographic findings, with 3 grades of illness varying from uncomplicated and symptomatic (grade I) to persistent uncomplicated (grade II) to complicated (grade III), which can consist of hemorrhage, abscess, phlegmon, perforation, peritonitis, blockage, fistula, or stricture [5].

Basic surgical principles

The primary concept of surgical treatment of sigmoid diverticulitis is total resection of the whole sigmoid colon in order to permit the formation of a tension-free anastomosis in the upper part of the rectum. Elimination of all recurring diverticula situated orally to the anastomosis is not required because the variety of recurring diverticula in the colon does not associate with the risk of development or reoccurrence of the diverticular illness. An essential point is the place of the anastomoses in the upper rectum as these have a substantially lower reoccurrence rate than anastomoses found in the sigmoid colon. The right aboral resection margin can be recognized on the basis of completion of the taeniae coli. Throughout diverticulitis surgical treatment some authors maintain the inferior mesenteric artery (in contrast to the practice in oncological surgical treatment) reduce the threat of anastomotic failure or sexual dysfunction due to intra-operative nerve injury, therefore enhancing the patient outcomes. Mobilization of the left flexure depends on the surgeon; nevertheless, with enough length of the colon this treatment is not definitely needed. Mobilization of the left colon flexure assists in positioning of a tension-free anastomosis. Positioning of a protective ileostoma might be called for in unusual cases with high-risk anastomosis. The above detailed surgical concepts for optional sigmoid colon resection in diverticulitis are usually accepted and hold for both minimally intrusive and open surgical treatment [6].

Preoperative considerations for diverticular surgery

Ureteral catheter use is not indicated on a routine basis, according to literature, as the risk of ureteral injury from elective colectomy for diverticulitis is much less than 1%. Longer operative times in addition to more costs, and complications related to stents insertion have been associated with routine ureteral catheters. However, ureteral catheters should be contemplated in patients that are morbidly obese, resurgery, or have radiation exposure risk. In addition, the literature has shown that regular usage of oral mechanical bowel preparation is not needed. Both randomized trials and by meta-analysis, have actually revealed that the absence of bowel preparation does not affect the rates of post-surgical infection or anastomotic failure. To carry out a bowel preparation or not is per surgeon choice. Unlike the oral mechanical bowel preparation, research studies have actually shown that using oral prescription antibiotics can reduce surgical infections after colon resection. Using nonabsorbable oral prescription antibiotics, such as neomycin, erythromycin, and metronidazole, reduce general surgical infections, when administered preoperatively, organ infections, surgical site infections, and ileus, in contrast with mechanical preparation alone. A research study presented by Veterans Affairs with practically 10,000 patients compared the rates of surgical site infection without any bowel preparation (18.1%), mechanical bowel preparation (20%) to those who got oral prescription antibiotics alone (8.3%), or in addition to a mechanical bowel preparation (9.2%) [7].

Surgical treatment

The surgical treatment paradigm of diverticulitis revolves around resection of the entire sigmoid colon or connecting it between a soft site of descending colon and the upper rectum. The latter is generally recognized by the convergence of the taeniae, which commonly occurs at the site of the promontory of the sacrum. Mobilization of the splenic flexure should be left to the discretion of the operating surgeon and is usually not necessary in the situation of redundant left colon. There might be cases of complicated diverticulitis in which the degree and also level of inflammatory changes call for the usage of ureteral stents and/or creation of a colon anastomosis in the more distal part of the rectum. With respect to the degree of resection, it is not needed to eliminate the whole colonic segment bearing diverticula, which might actually be impossible in some situations due to the degree as well as thickness of diverticula throughout the colon. Maintenance of the sigmoid colon is associated with increased recurrence rates for the patients. In contrast, the surrounding of the tissue affected by the diverticulosis has a variable presentation of the inflammatory process. Care ought to be taken to avoid addition of any diverticula into a stapled colorectal anastomosis. These concepts are usually accepted and need to be used similarly to open or laparoscopic surgical treatment [8].

The surgery timing in relation to the latest recent attack of diverticulitis has had conflicting evidence. Traditionally, the surgery requires 4 - 6 weeks of waiting after a diverticulitis attack before performing the elective surgery. Alternatively, some doctors have actually suggested that early treatment for diverticular disease might reduce hospital stay and also possibly future hospital admissions related to the typical method with preliminary antibiotic administration as well as postponed elective surgery. In the situation of laparoscopic surgical procedure early surgical intervention has been linked to higher reoccurrence rates complicated by inflammation. There is evidence that shows that an early surgery, within thirty days from the most recent attack, doesn't cause increased morbidity when compared with surgeries done between the first month and the second month following the most recent episode. A study evaluating early colon sigmoid surgery, done five- eight days after initial antibiotic treatment, has revealed that this is associated with increased patient morbidity when it is compared with surgeries done four to six weeks after the latest hospitalization. While the information concerning the results of early surgical procedure following hospitalization for sigmoid diverticulitis stays questionable, there does not appear to be adequately constant evidence at the minute to validate any kind of anticipation of optional surgical procedure before the typical 4 - 6 weeks waiting duration [9].

Diverticulitis classification

Uncomplicated diverticulitis

Type 1 diverticulitis is present if the patient has the normal clinical indications of diverticulitis (including laboratory findings) and also if imaging shows no indications of complications (abscesses, fistula, or openings). Patients without symptomatic diverticulitis do not profit from surgical treatment. Since the annual reoccurrence rate for effectively treated uncomplicated diverticulitis is very low (around 2%), and since only a small percentage of these patients need to undertake surgical treatment due to diverticulitis over a long-lasting course (10 - 13%), efficiently dealt with acute uncomplicated diverticulitis is not an indicator for surgical procedure. In addition, transplant recipients and immunosuppressive patients (e.g. taking corticosteroids) have an increased rate of acute diverticulitis with a greater mortality (around 25%) than does the normal population [6].

Recurrent, uncomplicated diverticulitis

While there is consensus that the intense monitoring of diverticulitis does not include medical intervention, the role of optional colectomy to protect against reoccurring diverticulitis is less well defined. Formerly, elective colectomy was recommended complying with the second episode of uncomplicated or first episode of complicated diverticulitis, given concern that these patients were most likely to have frequent disease. These recommendations occurred from the period prior to routine use of CT scans and antibiotics. Optional sigmoid colectomy is a prophylactic procedure developed to reduce frequent diverticulitis. Therefore, understanding the symptoms of persistent condition may help define which patients would profit from resection. Hall, *et al.* carried out a retrospective evaluation of 672 patients treated nonoperatively for diverticulitis at the Lahey Clinic. Of these, 36% developed reoccurring illness over an average 5 years of follow-up, yet just 3.9% of patients had complicated recurrence. Multivariable forecasters of any type of reoccurrence were retroperitoneal abscess (Hazard Ratio HR = 4.5), household background (HR = 2.2), as well as included colonic segment > 5 centimeters (HR = 1.7), whereas right colonic diverticulosis was compared to left-sided (HR = 0.27). Several medical professionals and patients fear that their following episode will certainly be a severe episode, even necessitating emergent operation with temporary colostomy. In previous decades, this concern regarding a colostomy often brought about optional surgical treatment however, as Hall as well as his colleagues showed with the < 4% rate of recurrent complicated diverticulosis, many patients with an initially uncomplicated episode will never ever have severe complications [5].

Complicated diverticulitis

There shows up to be less conflict regarding the surgical timing in the treatment of complicated diverticulitis. Certainly, for patients that are in extremis or those who fall short nonoperative therapy, appropriate surgical intervention is indicated. The inquiry occurs, when and also if to surgically intervene on patients who recouped from a nonoperative therapy plan of complicated diverticulitis to stop and eliminate the disease reoccurrence. Presently, the indication is that patients under elective resection six to eight weeks after resolution of complicated diverticulitis are good surgical candidates. There is little information in the literature concerning the timing of elective surgery adhering to clinical treatment of challenging diverticulitis as most of the literature speaks to severe surgical monitoring of diverticulitis complicated with sepsis/perforation. In 1994, Farmakis, *et al.* reported on the outcomes of surveys sent to the doctors of 176 patients discharged from the hospital with a medical diagnosis of complicated diverticulitis. Of the 120 patients that responded, 10 perished from reoccurring complicated diverticular condition; 29 perished from other problems. Forty of 110 patients (omitting those who died) were still symptomatic or were so at the time of unassociated fatality. Thirty-nine patients developed an extreme complication after the preliminary admission, 14 of whom had the exact same complication occurring again. Of the 77 patients that had originally been managed by sigmoid resection, only two recurrent complications compared to 37 of 43 patients were managed cautiously. Of the 10 patients that passed away from recurring diverticular disease, nine had not undergone sigmoid colectomy at or after the admission. This research highly supports optional sigmoid resection adhering to resolution of complicated diverticulitis. Presently, the practice is to carry out an elective resection, whether open or laparoscopic, after resolution of the inflammatory process [10].

Elective surgery indications

Elective surgery for sigmoid diverticulitis has an ever-changing indication. Traditionally, the teaching has been that 2 attacks of uncomplicated diverticulitis was the clear-cut indication for elective colectomy. This was based on the notion that there was an increased risk of complicated diverticulitis complication such as perforation causing diffuse peritonitis and sepsis after the second attack. Hence, surgery would therefore prevent the risk of complicated diverticulitis complications and lower patient mortality. Other research studies based on choice analysis have actually shown that the recommended timing of optional surgery to maximize life span should be after the 3rd or fourth episode of uncomplicated diverticulitis. Contemporary advocates of surgical procedure after second attack say that earlier surgery favorably influences patient symptoms and wellbeing. As a result of this change, the most current version of the Practice Parameters for Diverticulitis from the American Society of Colon and Rectal Surgery states that “the number of attacks of uncomplicated diverticulitis is not always an overriding aspect in defining the suitability of surgery” [9].

Technical aspect of surgical management

Alternatives for clear-cut surgical treatment involve resection of the affected colon with or without anastomosis. The two-stage approach refers to sigmoid colectomy with end colostomy and later colostomy reversal. This technique ended up being the standard operating procedure for complicated diverticulitis in the 1980s. It is related to high morbidity rates, in addition to increased non-reversed colostomies reaching 55%. Surgical monitoring, therefore, has actually developed to establish intestinal tract continuity, using the sigmoid, with diverting loop ileostomy (DLI). This is frequently used in the presence of abscess or totally free perforation. The surgical resection margin ought to expand proximally to compliant bowel (does not require to be devoid of diverticula) and also distally to the top rectum. A sufficient distal margin is the most important factor in determining reoccurrence after resection. Colocolonic anastomosis has up to four times more risk than that of intestines anastomosis to end up with reoccurances after resection. Some have supported for splenic flexure mobilization to promote tension-free anastomosis. Colostomy use has actually been linked with greater comorbidities. Indications for surgical procedure entail resection of the impacted colon with or without anastomosis. The existing body of evidence suggests that key anastomosis can and also should be done in patients with acute diverticulitis, if patients' conditions are permitting. Eventually, the

surgeon decides using his judgement which course of action is better to the patient taking into account the clinical status of the patient including comorbidities, motility of the intestines, and extent of peritoneal contamination [11].

Conclusion

Contrasted to the previous era, the nonoperative strategy to managing acute diverticulitis is currently the reason to the huge bulk of hospital admissions. Emergent surgery, if required, remains to be predominantly needed for the sepsis-related diverticulitis with the most typical procedure being the 2-staged procedure. Greater success in medically temporizing patients in the current period has permitted lowered emergent surgical procedures with possible morbidity or mortality and added to the higher percentage of effective single-staged treatments currently done in the elective management. To conclude, as diverticular disease in younger patients may result in complicated diverticulitis as a result of longer life span, special care ought to be thought about for patients with this condition, although recurring diverticulitis does not show up to influence the complications of the demand for medical treatments in patients with colonic diverticulitis. In addition, left colonic diverticulitis might develop complications such as abscesses and/or perforations, and patients that are older are preferred to be treated surgically. Therefore, a preventative colectomy ought to be reassessed as one of the options for the therapies of patients with left colonic diverticulitis who are older than 50 years of age.

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