

## Colonic Diverticulitis: Risk Factors, Diagnosis and Management

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**ABSTRACT:** Diverticulosis or diverticular disease of having diverticula in the colon, more common in the sigmoid colon a common place for increased pressure. Prevalence of diverticular disease increases with age, 30% over 45 years and 60% of those over 70 years, more prominent in western society. Advance age, constipation, low dietary fiber, the fiber theory is unproven, and connective tissue disorders are contributory factors in colonic diverticulosis. The diverticula formation thought to be caused by increased intraluminal pressure and weakening of bowel wall. Clinical manifestations of colonic diverticulosis include acute, uncomplicated or complicated diverticulosis. Diagnosis of acute diverticulitis mainly by clinical evaluation with other alternative conditions excluded. Plain films of abdomen, computed tomography (CT), contrast enema, endoscopy, and ultrasonography are helpful in clinical diagnosis. Frequently isolated pathogens include *Bacteroides* spp, *Peptostreptococcus*, spp. *Enterobacteriaceae*, *viridans streptococci*, and enterococci. Therapy includes oral hydration and 7-10 days oral broad spectrum antibiotics. Surgical evaluation is indicated in patients with uncontrolled sepsis, generalized peritonitis, acute deterioration, persistent obstruction, and failure to respond to medical therapy.

**KEYWORDS:** Diverticulosis, Diverticulitis, Risk factors, Diagnosis, and Management.

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### I. INTRODUCTION

Diverticulitis, defined as inflammation and infection of the bowel wall associated with diverticula, is the most frequent complication of this disorder [1]. Diverticulitis is also known as Diverticulosis or **diverticular disease**, is the condition of having diverticula in the colon, which are outpocketings of the colonic mucosa thoroughness of muscle layers in the colon wall. These are more common in the sigmoid colon, which is a common place for increased pressure. This uncommon before age of 40, and increases in incidence after that age [2]. It afflicts approximately 30% of the population over 45 years of age and 60% of those over 70 years. It is estimated that approximately 10 to 20% of these people with diverticulosis will develop either hemorrhage or diverticulitis [3,4]. The complications of diverticulosis cause considerable morbidity in the United States. Health care expenditures for this disorder are estimated to be 2.5 billion per year [5]. Only 10% to 25% of patients with diverticulosis manifest clinical disease, making its true prevalence difficult to measure [6]. Although this disorder occurs worldwide, diverticulosis is particularly prominent in Western society, where the prevalence has been estimated to 30% to 40%. In contrast, the prevalence of diverticulosis in rural Asia and Africa is estimated to be less than 1% [7]. Increased prevalence is observed in populations that become westernized presumably because of dietary changes or other environmental factors [8]. The complications of diverticulosis, including diverticulitis also increase with age, although some studies have suggested that diverticulitis may be more malignant in patients who are younger than 40 years of age [9,10]. Most extensively studied risk factor for the development of diverticular disease is low dietary fiber intake. Diets with reduced dietary fiber are associated with more colonic diverticulosis and with symptomatic diverticular disease [7,11]. However, the fiber theory is unproven [12]. Contrary to popular belief, however, popcorn, corn, and nuts do not appear to increase the incidence of diverticular disease. In fact, nut and popcorn consumption may be protective [13]. Tobacco, alcohol, and caffeine consumption also do not appear to increase diverticular disease [14]. Diagnosis of acute diverticulitis can be made based on the clinical evaluation, more than half of the patients with clinically suspected diverticulitis are found to have alternative conditions [15]. Frequently isolated organisms include *Bacteroides* spp, *Peptostreptococcus* spp, *Enterobacteriaceae*, *viridans streptococci*, and enterococci [16]. Conservative medical therapy is successful in 70% to 80% of patients hospitalized with acute diverticulitis [17]. The paper reviews the current literature, risk factors, diagnosis and management of diverticulitis.

### II. RISK FACTORS

Contributory or risk factors of diverticulitis include: (a) increasing age (b) constipation (c) a diet that is low in fiber (contradicted by the latest study [5]) (d) connective tissue disorders (such as Marfan syndrome and Ehlers Danlos Syndrome) that may cause weakness in the colon wall (e) hereditary or genetic predisposition [18].

The exact etiology of colonic diverticulitis has yet to be fully clarified and many claims are only anecdotal [19]. The modern emphasis on the value of fiber in the diet began with Cleave, and strong case was made by Neil Painter, and Adam Smith that a deficiency of dietary fiber is the cause of diverticular disease. They argued that colonic muscles needed to contract strongly in order to transmit and expel the small stool associated with a fiber deficient diet. The increased pressure in the segmented section of bowel over years gave rise to herniation at the vulnerable point where blood vessels enter the colonic wall [20-22]. However, the U.S. National Institutes of Health (NIH) consider the fiber theory "unproven" [12]. A 2012 study in the *Journal of Gastroenterology* found that "A high-fiber diet and increased frequency of bowel movements are associated with greater, rather than lower, prevalence of diverticulosis. The study involved 2,104 participants, 30-80 years old, who underwent outpatient colonoscopies from 1998 to 2010 and were reviewed regarding diet and physical activity [18].

Denis Burkitt suggested that the mechanical properties of the colon may be different in the Africans and the European subjects. He theorized that because African eat diet containing more fiber than Europeans and use the natural squatting position for defecation, they pass bulky stools without straining, and thus rarely if ever develop colonic diverticulosis [23]. Change in the strength of the colonic wall with age may be an etiological factor. Connective tissue is a significant contributor to strength of the colonic wall. The mechanical properties of connective tissue depend on a wide variety of factors, the type of tissue and its age, the nature of the intramolecular and intramolecular covalent cross links and the quantity of the glycosaminoglycans associated with the collagen fibrils. The mucosa of the colon is composed almost entirely of collagen, both type 1 and type 11. Several layers of collagen fibers make up the submucosa of the human colon. The collagen fibril diameters and fibril counts are different between the left and right colon and change with age and in colonic diverticulosis [24,25]. The implication is that changes normally associated with ageing are more pronounced in colonic diverticulosis [26].

Iwasaki found that the tensile strength of Japanese colon obtained at post-mortem declined with age [27]. Similarly the mechanical properties of the colon stronger in African than European subjects [27]. However this race-based claim is contradicted by the virtually identical incidence of diverticular disease in black and white Americans [28].

The strength of the colon decreases with age in all parts of the colon, except the ascending colon. The fall in tensile strength with age is due to a decrease in the integrity of connective tissue [29]. Cross linkage of collagen is increased in colonic diverticulosis. The mucosal layer is possibly more elastic and it is likely that stiffer external layers break and allow the elastic mucosa to herniate through forming a diverticulum. Collagen has intermolecular and intramolecular cross links which stabilize and give strength to the tissue in which it is located. Accumulation of covalently linked sugar molecules and related increased cross linking products are found in a variety of tissues with aging tissues with ageing, skin, vascular tissue, the cordae tendinae of heart valves and the colon [30]. This reduces the strength and pliability of the collagen. Colonic diverticulosis increases in frequency with age. There is a reduction in the strength of the colonic mucosa with age, and that increased contractions in the descending and sigmoid colon secondary to an insufficient fiber content in diet cause protrusion through this weakened wall. Colonic diverticulosis is in general a benign condition of the bowel which uncommonly becomes symptomatic and even less commonly becomes a truly clinical complicated problem [31].

### **III. PATHOPHYSIOLOGY**

The formation of diverticula is thought to be caused by a combination of increased intraluminal pressure and weakening of the bowel wall [17]. Higher dietary fibre increases stool volume and reduces bowel transit time, leading to decreased intracolonic pressure. The pathogenesis of diverticulitis has been thought to be very similar to that of acute appendicitis: a fecalith obstructs the neck of diverticulum, causing mucus accumulation bacterial overgrowth, perforation, and inflammation of the bowel wall and adjacent tissues. Recent speculation has also raised the question of whether changes in the intestinal microbiota, a consequence of low dietary fiber Western diet, alter mucosal immune homeostasis, leading to low grade chronic inflammation [32,33].

Micro perforation may remain well localized, leading to limited colonic wall inflammation and the formation of a small peridiverticular phlegmon or abscess. Macroperforation results in larger abscesses, if not confined, its complications include distant abscesses, extension to other organs, spreading peritonitis, larger inflammatory masses, and fistula [9,17]. Less commonly gross fecal contamination can occur with free rupture of an unobstructed and uninflamed diverticulum into the peritoneal cavity. Rupture of a localized peridiverticular abscess into peritoneal cavity does not result in gross fecal contamination, presumably because the diverticulum neck is obstructed by a fecalith [17]. Like most other cases of secondary peritonitis, acute diverticulosis is a polymicrobial infection caused by a variety of endogenous anaerobes and facultative bacteria. Commonly isolated organisms include *Bacteroides* spp, *Peptostreptococcus* spp, *Enterobacteriaceae*, viridans streptococci and enterococci [16].

#### IV. CLINICAL PRESENTATIONS

Diverticulosis can present with painless rectal bleeding as bright red blood per rectum. Cramps and tenderness may also occur in the affected areas. Most people with colonic diverticulosis are unaware of this structural change. When symptoms do appear in a person over 40 years of age it is important to seek medical advice and reduce more dangerous conditions such as cancer of colon or rectum [34]. Clinical manifestations of colonic diverticulosis include:

(a) **uncomplicated diverticulosis** in which patients complain of symptoms such as cramping, bloating, flatulence, and irregular defecation. However, it is not clear if these symptoms are attributable to the underlying diverticulosis or to extent irritable bowel syndrome [35]. The clinical manifestations of uncomplicated diverticulitis resemble those of appendicitis, but with findings typically on the left side of the abdomen. Diverticulitis often starts with visceral hypo gastric pain that evolves to somatic pain that is localized in the case of sigmoid disease; to the left lower quadrant. In contrast to acute appendicitis the pain is recurrent and is present for several days before presentation [36]. Fever, nausea and vomiting, changes in bowel habits, and urinary symptoms accompany the pain. Leukocytosis is common but not invariable (69% to 93 % of cases) [37]. Urinalysis may reveal sterile pyuria if inflammation extends to urinary tract system. Trace blood may be present in the stool, but hematochezia is uncommon and should raise suspicion for an alternative diagnosis. Low-grade fever is common in uncomplicated disease, and the physical examination typically reveals abdominal tenderness, guarding, and rebound tenderness in the left lower quadrant, the suprapubic area, or both; bowel sounds may be hypoactive or normal. A palpable abdominal mass may be caused by an inflammatory process but may be also indicative of cancer. High fever and abdominal rigidity suggest generalized peritonitis after perforation. Hyperactive bowel sounds suggest obstruction. Fistulization of the bladder or ureter with the colon lead to pneumaturia and fecaluria [38]; passage of feces and flatus through the vagina occurs, with fistula formation with the vagina or uterus [39]. Recurrent diverticulitis can lead to stricture and obstruction. Pyogenic liver abscess and pylephlebitis are rare complications [40].

(b) **complicated colonic diverticulosis**. This is very uncommon but highly dangerous. The diverticula may bleed, either rapidly (causing bleeding through rectum) or slowly (causing anemia). The diverticula can become infected and develop abscesses, or even perforate. These are serious complications and medical care is needed. Infected diverticula and development of the abscesses merits the term diverticulitis. First time bleeding from rectum, especially in individuals aged over age 40, could be due to colon cancer, colonic polyps and inflammatory bowel disease rather than diverticulosis and requires clinical investigation [8].

#### V. DIAGNOSIS.

The diagnosis of acute diverticulitis can be made based on the evaluation, more than half of patients with clinically suspected diverticulitis are found to have alternative conditions [9,15,]. For this reason, diagnostic studies are performed in most cases of suspected diverticulitis, and they are particularly important in the patients with an atypical presentation, a suspected complication, severe illness or clinical deterioration [41]. Diagnosis of acute diverticulitis include:

- 1) **plain films of abdomen** are useful to exclude extracolonic air in an abscess or evidence of colonic abscess.
- 2) **computed tomography (CT)** scanning has become the test of choice, especially if the clinical diagnosis is not clear or complication is suspected [3] or if there is poor response to medical care [42]. Any patient with a palpable abdominal mass should have a CT scan. CT diagnosis criteria include localized colonic wall thickening (>5cm) and inflammation of pericolic fat (poorly marginated, stranding, increased attenuation) or localized wall thickening and presence of periodic abscess [3]. CT scanning has the additional advantage of delineating extraluminal complications of diverticulitis and suggesting other diseases: tuboovarian abscess, colonic ischemia, mesenteric thrombosis and pancreatitis, which at times like diverticulitis
- 3) **contrast enema**-safety is **controversial**. Water-soluble contrast, but not barium may be safe and useful in patients with mild to moderate diverticulitis [3]. No preparation of the bowel should precede a water-soluble contrast enema. Communication with the radiologist to limit the study to the segment of colon in question with careful attention to the amount of pressure being applied is essential [4].
- 4) **endoscopy**-most authorities consider uncomplicated diverticulitis a contraindication because of the risk of diverticular perforation with insufflations of the bowel during the procedure [3]. Occasionally, limited sigmoidoscopy with minimal air insufflation is performed in ambiguous cases to exclude other diagnosis, such as inflammatory bowel disease, carcinoma, or ischemic colitis [9,15].

5) **ultrasonography**-false-negative results were noted in 15% of 54 patients examined. The effectiveness of this examination is very examiner dependent [3].

6) **blood cultures** should be obtained in hospitalized patients to detect bacteremia[3].

## **VI. MANAGEMENT**

Most patients with diverticulosis have minimal to no symptoms, and do not require any specific treatment. High-fiber diet and fiber supplements are advisable to prevent constipation[11]. The American Dietetic Association recommends 20-35 grams of each day. Wheat bran has much to commend it as has been shown to reduce intra colonic pressure. Isphagula (Psyllium husk, Isbagol-Ayurvedic) is also effective at 1-2 grams a day[43].

The National Institute of Diabetes and Digestive and Kidney Diseases(NIDDK) says foods such as nuts, popcorn hulls, sunflower seeds, pumpkin seeds, caraway seeds, and sesame seeds have traditionally been labeled as problem foods for people for this condition, however, no specific data exists to prove this hypothesis. The seeds in tomatoes, zucchini, cucumbers, strawberries, raspberries, and poppy seeds, are not considered harmful by the NIDDK. Some doctors also recommend avoidance of fried foods, nuts, corn, and seeds to prevent complications of diverticulosis. Either these diet restrictions are beneficial is uncertain; recent studies have stated that nuts and popcorn do not contribute positively or negatively to patients with diverticulosis or diverticular complications. Colonic stimulants should be avoided. Treatments like some colon cleansers that cause hard stools, constipation, and straining are not recommended [13].

## **VII. THERAPY**

A trial of outpatient therapy is indicated for acute, uncomplicated diverticulitis or for a well-localized small(< cm in diameter) peridiverticular abscess, provided the patient can tolerate oral hydration and 7-10 days of oral broad-spectrum antimicrobial therapy[9,15]. Drugs must have an antimicrobial spectrum that includes facultative and anaerobic colonic flora(e.g. quinolone/ metronidazole, amoxicillin, clavulanic acid). If the patient is unable to tolerate oral hydration, requires narcotic analgesics, or fails to improve despite appropriate outpatient therapy, admission to hospital for bowel rest, nasogastric tube placement, and parenteral antibiotics is indicated. Elderly patients and those with compromised immune system or other comorbidities should also be hospitalized. Parenteral antibiotics should be started for treatment of secondary peritonitis [44]. Failure to respond to medical therapy within 48 to 72 hours should prompt repeat investigations, consideration of alternative diagnoses, and surgical evaluation [9,15].

Conservative medical therapy is successful in 70% to 80% of patients hospitalized with acute diverticulitis[17,36]. Indications for emergency colonic resection include uncontrolled sepsis, generalized peritonitis, acute clinical deterioration, persistent obstruction, and failure to respond to medical therapy. Under these circumstances, a two-stage operation, such as the Hartmann procedure, is usually performed [45]. The Hartmann procedure entails resection of the diseased colon, and colostomy, and closure of the distal loop or creation of mucous fistula; colonic continuity can be restored several months later by elective anastomosis[46]. An alternative two-stage operation is primary resection of the diseased segment of colon with immediate anastomosis after intraoperative colonic lavage and proximal fecal diversion, followed later by elective stoma closure[46].

Elective colonic resection is usually performed in cases of fistula formation or recurrent attacks of diverticulitis or complicated diverticulitis brought under control with conservative therapy[17,37]. In these cases, a one-stage procedure with primary resection and anastomosis can be performed, with lower morbidity and mortality and a shorter hospital stay than a two-stage procedure. Elective surgery should also be considered for patients at high risk of complications of recurrent diverticulitis, including those with immunosuppressive conditions(e.g. organ transplantation, chronic corticosteroids therapy, renal failure) and perhaps those younger than 40 years of age, although these considerations are controversial [47,10,48]. Laparoscopic sigmoidectomy is an alternative to laparotomy in cases of mild to moderate disease[49]. Retrospective studies have found that a one-stage procedure, combined with intraoperative colonic lavage but no protective diverting colostomy, may be feasible even the moderate to high-risk patient with colonic perforation [50].

The classic three-stage procedure, consisting of drainage and proximal diverting colostomy, interval resection of diseased bowel with primary anastomosis, and stoma closure, has already been abandoned because failure to eliminate the source of peritoneal infection resulted in higher mortality rates compared with the two-stage procedure[45].

## VIII. CONCLUSION

Diverticulitis or diverticulosis is the inflammatory infection of bowel wall, having diverticula in the colon, more prevalent in the western population, over 45 years of age, than Asia and Africa. Low fiber intake is associated with diverticular disease, although unproven. Conservative medical therapy is successful in majority of hospitalized patients, colonic resection is needed in patients with clinical deterioration.

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