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Review Article

**AN OVERVIEW OF DIAGNOSIS DIVERTICULOSIS AND
COMPLICATIONS**¹Rakan mohammed ahmed alshuwaykan, ²Bandar Abdullah alqahtani, ³Abdulaziz Suleman alassiri, ⁴Ahmed Abdu Alnaji, ⁵Abdullah Noman Alatawi**Abstract:**

Diverticulosis when diverticula occur in, outpouching from the large colon. It can happen in any part of colon, but usually in sigmoid colon. Proper diagnosis is very important and in this review we discuss the diagnosis approaches, etiology and complications. We conducted a detailed search through medical electronic databases' Medline/PubMed and Embase, searching studies discussing managing, diagnosis and complications of diverticulosis, published up to end of ,2018. Diverticulosis of the colon is one of the most frequent anatomical alteration of the human colon. In the large majority (80%) of individuals it runs asymptomatic, while it comes to be symptomatic in around 20% of those individuals. Besides the typical symptoms and signs, throughout the diverticular ailment, several uncommon problems might be seen. Pylephlebitis, perforation, digestive tract obstruction, abscess and fistula development may be counted among the uncommon issues. Attributes of the abdominal pain (located in the left lower abdominal quadrant, moderate-to-severe intensity, duration \geq 24h) are useful in differentiating Symptomatic Uncomplicated Diverticular Disease (SUDD) from diverticulosis with Irritable Bowel Syndrome (IBS).

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INTRODUCTION:

Diverticulosis of the colon is the most common anatomical colonic alteration, frequently discovered throughout colonoscopy [1]. It is a structural change of the colonic wall characterized by the presence of pockets called 'diverticula'. These diverticula are characterized by herniation of the colonic mucosa and sub-mucosa via defects in the muscle mass layer at the weakest factor in the colonic wall: the sites of penetration by blood vessels of the colon wall surface [2]. These kinds of diverticula, which are really pseudodiverticula as herniation is not via all colonic layers, happen normally in the left colon. The real prevalence of diverticulosis is unidentified. In Europe, it is greatly age-dependent and is uncommon (occurrence of 5%) in those under the age of 40 years, growing up to 65% in those aged 65 years or even more [3]. For many years, it has actually been believed that this kind of diverticulosis exclusively influenced the westernized globe and resulted from an absence of fiber in the diet and grew pressure at the colonic wall [4]. Nevertheless, current information has disclosed a rise in the frequency of colonic diverticulosis throughout the world [5]. Colonic diverticulosis occurring in the best colon is characterized by true diverticula, in which there is herniation of all colonic wall surface layers. Right-sided diverticulosis is rather usual in Asian people. For instance, Yamada et al. just recently found right-sided colonic diverticulosis in 21.6%, and left-sided or bilateral diverticulosis in 18.6% of Japanese people going through colonoscopy [6].

Although most individuals with colonic diverticulosis continue to be asymptomatic, about 20% of patients will create signs and symptoms, creating so-called 'diverticular disease' (DD) of whom 15% will eventually create issues [1]. DD enforces a considerable concern on westernized National Health Systems. In the USA, the occurrence of DD raises with age, with about 70% of individuals aged ≥ 80 years revealing diverticulosis, and DD accounts for greater than 300 000 hospital admissions, 1.5 million in-patient care days, and 2.4 billion dollars in direct prices yearly [1]. The occurrence of DD and its problems seems increasing, and the variety of patients with DD can be expected to enhance in coming years in accordance with existing patterns as the population continues to age. In the USA, general annual age-adjusted admissions for acute diverticulitis boosted from 120 500 in 1998 to 151 900 in 2005 (26% boost). Rates of admission boosted a lot more rapidly within patients aged 18- 44 years (82%) and 45- 74 years (36%). The number of elective operations for diverticulitis increased from 16 100 to 22 500 each year during the very same

amount of time (29%), in addition to a much more rapid rise (73%) in rates of surgical procedure for individuals aged 18 - 44 years [7]. Ultimately, in Europe DD accounts of about 13 000 deaths annually [3].

OBJECTIVES:

Diverticulosis when diverticula occur in, outpouching from the large colon. It can happen in any part of colon, but usually in sigmoid colon. Proper diagnosis is very important and in this review we discuss the diagnosis approaches, etiology and complications.

METHODOLOGY:

We conducted a detailed search through medical electronic databases' Medline/PubMed and Embase, searching studies discussing managing, diagnosis and complications of diverticulosis, published up to end of ,2018. English language restriction was applied to the search and we included those studies with human subjects only.

DISCUSSION:

• CLASSIFICATION

Asymptomatic diverticulosis

Asymptomatic diverticulosis is frequently an occasional discovery in patients undergoing imaging for various other signs [8]. Nevertheless, the clinical relevance of such findings is unclear as there is no sign for treatment or further follow-up for patients with asymptomatic diverticulosis [8].

Diverticulitis

Inflammation of a diverticulum leads to diverticulitis. It can present as either an acute or chronic process. Diverticulitis is the most typical problem of diverticulosis, which happens in about 10% to 25% of patients [9]. The pathophysiology of diverticulitis is the blockage of the diverticulum sac by fecalith, which by irritability of the mucosa creates low-grade inflammation, congestion and additional obstruction [8]. Diverticulitis might be further classified as uncomplicated and difficult (Fig. 1). Complex diverticulitis is normally characterized by the formation of abscesses, fistulas, blockage and/or perforation [8]. An essential consideration in the management of diverticulitis is the choice to hospitalize a patient or otherwise. According to American Society for Colon and Rectal Surgery (ASCRS) a number of aspects weigh in to that choice consisting of failing to endure oral intake, pain level, general comorbidities, and social assistance at home.

Symptomatic uncomplicated diverticular disease

In the recent years, there has been an advancement in the taxonomic classification of symptomatic diverticular disease into several distinctive types (Figure 1). These consist of chronic recurrent diverticulitis, segmental colitis related to diverticulosis (SCAD) and symptomatic straightforward diverticular disease (SUDD) [10]. SUDD is defined as chronic diverticulosis with associated chronic abdominal pain in the absence of acute signs of diverticulitis or obvious colitis [10]. There may be an overlap between SUDD and irritable bowel syndrome (IBS) due to comparable pathophysiologic mechanisms underlying both disease processes, that includes visceral hypersensitivity [10]. This was examined by Clemens et al., where they identified that SUDD patient had hyperalgesia in the sigmoid colon with diverticula. SUDD is additionally contrasted to IBS in regards to altered colonic mobility [11]. Bassotti et al. showed that patients with diverticulosis have a reduction in the variety of colonic interstitial cells of Cajal (ICC) and enteric glial cells despite the fact that there were no irregularities in the enteric neuronal populace [12]. They examined ICC due to their duty in

regulation of intestinal motor function and postulated that with reduction in ICC, there is a decline in colonic electric sluggish wave activity which results in slowed down transit. At this time, it is unclear whether SUDD and IBS are on a continuum in terms of their pathophysiology or whether patients with IBS are more likely to have diverticulosis and therefore with chronic abdominal pain be classified as SUDD.

Segmental colitis associated with diverticulosis

SCAD is now identified as a distinct entity. It is defined by nonspecific segmental swelling in the sigmoid colon bordered by several diverticula [13]. It does not necessarily include the diverticular orifice [13]. Risk elements include male sex and age over 50 years [13]. Preliminary discussion is usually rectal bleeding with some presenting with diarrhea and/or abdominal discomfort [13]. Freeman examined the scientific behavior of SCAD in over a 20-year period and kept in mind that all patients had complete medical and pathological remission of illness even those not treated with oral 5-aminosalicylate [14]. Of significance, is the reality that this procedure seems benign and self-limited [13].

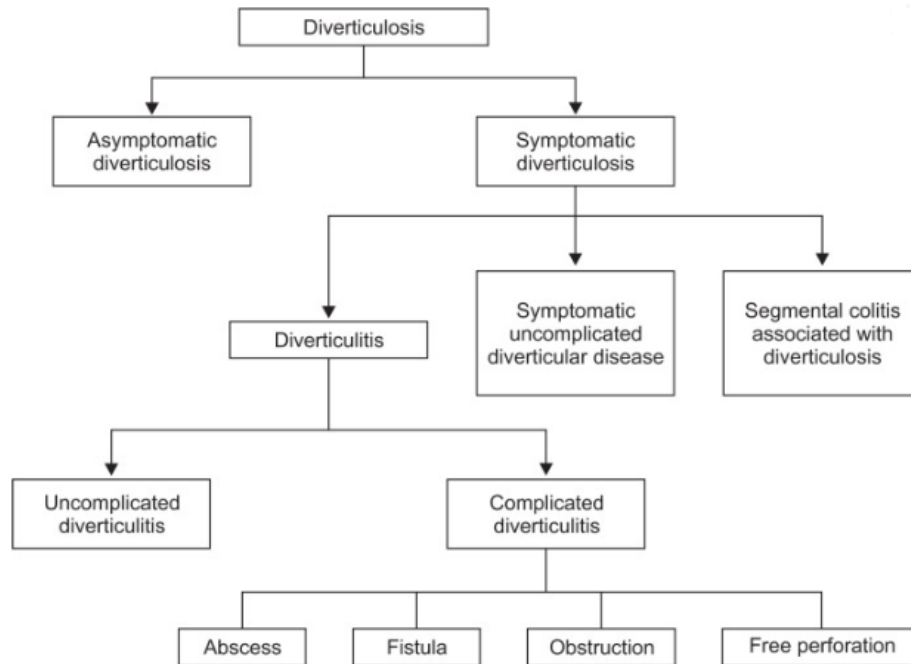


FIGURE 1. Classification of diverticular disease

• Etiology

Numerous detailed evaluations on the etiology of the diverticulosis are available [15]. We summarize the significant findings right here to provide perspective for the animal versions discussed listed below. There

is presently no confirmed device relating to the etiology of diverticulosis. Possible risk factors and relationships have been identified based on different research studies. In general, it is possible to group the most likely risk elements into 5 categories: (1)

integral colon structure, (2) diet, (3) adjustments in colon microstructure, (4) perturbed colonic motility, and (5) hereditary predisposition. The initial risk element, the inherent framework of the colon, is considered as the primary factor for the greater frequency of diverticula, specifically in this area of the gastrointestinal (GI) tract. While the entire GI tract is covered by total longitudinal and circumferential muscle layers, the longitudinal muscle in the colon is focused into 3 bands called taenia. In between the taenia, the colon is covered just by the circular muscular tissue layer where blood vessels penetrate right into the tissue. The lack of longitudinal muscle mass between the taenia and the "tunnels" created by these blood vessels is thought to constitute weak points along which the mucosa and submucosa can herniate to form diverticula [16]. The existence of taenia is hence favored in a potential translational animal model.

Second, a low-fiber diet plan resulting in harder stool and hence greater intracolonic pressures is believed to be a major contributor based upon the correlation between frequency of diverticulosis and geographical dietary behaviors of humans (along with numerous animal studies, as reviewed later on) [16]. A low-fiber diet, resulting in tiny stools which only periodically distend the colon, is additionally thought to initiate elastin deposition in the taenia, causing secondary thickening of the circular muscle mass layer and greater intracolonic pressure [17]. This lines up with a research study revealing thickening of the colonic muscle mass layer in diverticulosis patients [18]. Conflicting evidence exists relating to the result of nutritional fiber, nevertheless, as a causative element of diverticulosis [19]. Various other lifestyle variables besides diet plan, such as smoking, alcohol, and lack of physical activity, have actually been linked with a boosted danger of diverticulosis [20]. In line with the findings related to way of life, excessive weight has actually likewise been shown to boost the risk of diverticulosis [21]. Of all the way of living elements taken into consideration, low-fiber diet is absolutely one of the most vital factors in any kind of animal design of diverticulosis. Third, an adjustment in the microstructure of the colon tissue has been suggested as an initiator of diverticulosis. Decrease in the mechanical strength of the colon with aging because of modifications of the collagen structure has been suggested as a danger aspect for diverticulosis [21]. A contrast of European and African colons disclosed that the mechanical strength decreased in both with age, yet African colons maintained greater mechanical strength, which might clarify the lower frequency of diverticulosis in African populaces [21].

Fourth, an adjustment in colonic motility in

diverticulosis was reported first in the 1960s and included greater colonic pressures gauged in patients with diverticulosis compared to regulate group [22]. These discoveries were verified several years later in 2001 when increased motility was observed in the impacted sections of diverticulosis patients during a 24-h recording [23].

The fifth danger element, genetic predisposition, was at first recommended as a result of the frequency of left-side diverticulosis in Western populations, whereas right-side diverticulosis prevails in Asian populations [24]. This claim was later on supported by research studies reporting a boosted risk of diverticulosis in patients with Marfan or Ehlers-Danlos syndrome, both impacting connective tissue [24]. A 2012 research study on doubles in Sweden estimated that genetic variables make up 40% of the threat of diverticulosis [25]. Finally, a rat study concluded that babies birthed to mothers formerly fed upon high-fiber diet were less most likely to create diverticula than children born to mommies fed a low-fiber diet recommending an epigenetic duty [18].

• Signs And Symptoms

Diverticular disease can present in many different ways including asymptomatic disease, infectious complications, and gastrointestinal bleeding. Acute diverticulitis can present as mild intermittent pain or as chronic severe unrelenting abdominal pain. Systemic symptoms of fever and a change in bowel habits are common. Constipation is reported in approximately 50% of patients and diarrhea in 25% to 35%.50 Other symptoms include nausea, vomiting, and urinary symptoms. In cases of overt peritonitis, abdominal examination may be notable for rigidity, rebound tenderness, and guarding. Laboratory testing is often notable for a leukocytosis and elevated inflammatory markers.

• Diagnosis

Diverticular disease can be diagnosed clinically with classic providing signs and symptoms or more often with a confirmatory test done radiologically or via colonoscopy.

Radiological Diagnosis

Characteristically, barium enema was used for the diagnosis of diverticular disorder.⁵¹ However, presently, computed tomography (CT) has become the criterion for detecting diverticular disorder [29]. Both CT of the abdominal area and pelvis and CT colonography work in identifying the illness, extent of illness, and issues of disorder [28]. In the more emergent setting, CT of the abdomen and hips is more frequently made use of. The sensitivity for acute diverticulitis is 94%, with a specificity of 99%

[29]. When CT of the abdominal area and hips is utilized, the Buckley or Hinchey classification system

can be made use of to examine the severity of diverticulitis (Tables 1 and 2).

TABLE 1. Buckley Classification [27].

Class	Computed tomographic findings
<i>Mild disease</i>	Bowel wall thickening Fat stranding
<i>Moderate disease</i>	Bowel wall thickening >3 mm Phlegmon/small abscess
<i>Severe disease</i>	Bowel wall thickening >5 mm Perforation with subdiaphragmatic free air Abscess >5 mm

TABLE 2. Hinchey Classification [26].

Class	Computed tomographic findings
<i>Stage I</i>	Pericolic abscess/phlegmon
<i>Stage II</i>	Pelvic, intra-abdominal, or retroperitoneal abscess
<i>Stage III</i>	Purulent peritonitis
<i>Stage IV</i>	Fecal peritonitis

Endoscopic Diagnosis

Colonoscopy is the major analysis tool for detecting diverticular illness. Asymptomatic diverticular disease is a frequent incidental discovery on screening colonoscopy (Figure 2).³ However, colonoscopy is not utilized in the setting of acute diverticulitis. In this setting, there is an issue for possible perforation pertaining to air insufflation. Although diverticulitis can be recognized on colonoscopy and is seen in up to the 2% of screening colonoscopy,⁵⁷ it cannot determine specific disorder problems such as abscess [28].

Differential Diagnosis

A variety of conditions may imitate acute diverticulitis. Both ulcerative colitis and Crohn ailment may present with comparable findings of abdominal discomfort and changes in bowel routines. In cases of serious inflammation, both problems might likewise provide with systemic discoveries of high temperature. Ischemic colitis may additionally present similar to acute diverticulitis. This usually provides in patients that establish transient episodes of hypotension, resulting in decreased blood flow to the colon. This can result in scattered abdominal discomfort or local stomach discomfort to the locations of ischemia as well as adjustment in digestive tract habits and low-grade fever. An essential distinction, however, is that ischemic colitis is usually connected with bloody diarrhea, which is not normally existing in cases of diverticulitis. In a similar way, both transmittable gastroenteritis and

acute appendicitis need to be eliminated.

• Complications

The result of diverticular disorder on patients' lifestyle is still being elucidated. Also, when asymptomatic, patients with a history of symptomatic diverticular illness experience reduced health-related quality of life than did controls in areas related to digestive tract symptoms and general psychological function [28]. Although an exact causal relationship has yet to be developed, epidemiological researches implicate diverticular ailment with the advancement of irritable digestive tract disorder. Other delayed long-lasting difficulties consist of depression, anxiousness, and chronic abdominal discomfort [30]. Provided the association of long-lasting bowel symptoms after attacks of diverticular illness, Spiegel et al created and confirmed a quality-of life tool for chronic diverticular illness [31]. Their study found that diverticular disease has a significant effect on patients' lifestyle both throughout and after diverticular assaults. Patients reported adverse psychosocial, social, and physical symptoms attributed to diverticular ailment. The psychological consequences credited to diverticular disease consisted of anticipation anxiety, anger, clinical depression, devitalization, frustration, and social ostracism. Surprisingly, these signs were present even without energetic diverticular signs, yet patients particularly attributed these psychological adjustments to their diverticular ailment [31].

CONCLUSION:

Diverticulosis of the colon is one of the most frequent anatomical alteration of the human colon. In the large majority (80%) of individuals it runs asymptomatic, while it comes to be symptomatic in around 20% of those individuals. Besides the typical symptoms and signs, throughout the diverticular ailment, several uncommon problems might be seen. Pylephlebitis, perforation, digestive tract obstruction, abscess and fistula development may be counted among the uncommon issues. Attributes of the abdominal pain (located in the left lower abdominal quadrant, moderate-to-severe intensity, duration \geq 24h) are useful in differentiating Symptomatic Uncomplicated Diverticular Disease (SUDD) from diverticulosis with Irritable Bowel Syndrome (IBS). Stomach CT scan is still the gold requirement in diagnosing acute diverticulitis. Intestinal tract ultrasonography may be additionally helpful as first-line diagnosing device in pose correct diagnosis, and CT-colonography might be useful as predicting tool on the end result of the ailment. Radiologists ought to be cognizant of the facility uncommon difficulties of acute diverticulitis as they may need a multi-disciplinary treatment technique.

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