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DIVERTICULAR DISEASE OF THE COLON – UP DATE

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Definition

Diverticula are sac-like protrusions of colonic wall, varing in size from few millimeters to several centimeters. True diverticula contain all layers of the colonic wall and are believed to be congenital. They are very uncommon in colon. False or pseudo-diverticula represent otherwise stated in this article, the term diverticula refers to the predominant lesion, namely colonic pseudo- diverticula. The term diverticulosis indicates the presence of multiple diverticula of the colon. The term diverticular disease of the colon may be applied to all stages of the disease from diverticulosis to its complications (60).

Aetiology

Recent advances have resulted in an improved understanding of both of the cause and the physiological changes that occur in the bowel of the diverticular disease of the colon. It is generally accepted that diverticula are caused by various factors that intermittently increase colonic intraluminal pressure coupled with progressive decrease in colonic wall strength (52). Normal fecal transport is modulated by coordinated, segmental muscular contractions that serve to separate the colonic lumen into a series of chambers. Contraction of any chamber tends to increase intraluminal pressure within that segment. Under normal circumstances, the chamber is open at one end, thereby allowing passage of feces; which results in lowering of intraluminal pressure. Patients with diverticular disease exhibit such segmentation, but individual chambers tend to become occluded at both ends during muscular contraction. When out flow from aparticular segments is obstructed, both proximally and distally massive increase in intraluminal pressures, as high as 90 mmHg, have been noticed (44). Such isolated increases of intraluminal pressure are thought to predispose to herniation of muscosa through the bowel wall and, thus, to the development of diverticula.

Low-fibre diets are associated with a narrowed colon filled with small; hardened feces; segmentation is enhanced, and high luminal pressure tend to develop. Although this concepts has been widely disseminated, definitive evidence for a casual relationship between low dietary fibre and the development of diverticular disease still of controversial issue (30). This colonic motility dysfunction is coupled with progressive decrease in tensile strength of the wall of colon associated with aging. Gross examinations of diverticular colons report thickening of the muscle wall and shortening of the taenia, with a resulting accordion-like bunching of the folds. Routine histopathology does not, however, reveal muscle hypertrophy. More recently, electron microscopic studies have confirmed that the colonic wall in diverticulosis has structurally normal muscle cells, but contains a> 2-fold increase in elastin deposition between the muscle cells in the taenia. The elastin is laid down in a contracted form, presumably causing shortening of the taenia and the resulting bunching of the circular muscle (52).

Anatomic Features

Diverticular tend to develop at specific points in the circumference of the colon. This localization is determined, in part, by the anatomic relationship between the colonic musculature and its nutrient blood supply. Diverticula form at so-called weak points where the nutrient blood vessels (vasa recta) penetrate the circular muscle layer in its route to the mucosa. This perforating vessels tend to penetrate the colonic wall along the mesenteric border of the two antimesenteric taeniae. The gaps in the circular muscle layer where the vasa recta penetrate, constitute points of potential weakness through which the mucosa and submucosa can hernaite, forming diverticula. Diverticula therefore are usually located between the single mesenteric taenia and either of the two antimesentric taeniae. Less commonly, diverticula form in the area between the antimesenteric taeniae. Although, also

consisting of mucosal herniation through the muscular layers of the colonic wall, these diverticula tend to be less prominent. In many instances the muscosal herniation does not quite extend to the serosa, causing these to be referred to as intramural diverticula [44].

The distribution of diverticula throughout the colon also tends to follow a pattern, but with considerable individual variation. The overwhelming majority of diverticula occurs in the descending and sigmoid colon. It is estimated that 90% to 95% of patients with diverticulosis will have involvement of the sigmoid colon. Approximately 65% of patients will have disease limited to the sigmoid colon alone [50].

The observed high percentage of sigmoid colon involved in the disease, attributed to the development of the highest intraluminal pressure per unit of muscular wall tension. The physical principles of pressure and tension relationships within the tubular colon play in important role in the development of the disease. Laplace defined these relationships as follow: T = PR, where T is tension in the gut wall, P is intraluminal pressure, and R is radius of the cylinder or sphere.Thus in the sigmoid, where the lumen of the gut is small, muscular tension generates maximum pressures within the lumen of the bowel [50].

Pathology

Diverticulosis and diverticulitis

Diverticulosis is the presence of non-inflamed diverticula, or out-pounchings from the lumen of the gut through the muscular wall, which consists of mucosa, attenuated submucosa, sparse muscular fibres, and serosal covering. Initially, these diverticula are microscopic in size but continued rhythmic peaks of intraluminal pressure due to peristaltic contractions cause them to enlarge slowly. Diverticulae are usually about 1 cm in diameter, but they may become larger. Diverticula of 3 cm or more in size are called giant diverticula; these gas-filled protuberances have been recorded with a diameter of 35 cm. The globular diverticula communicate with the bowel lumen by a very narrow neck, through which gas usually can pass freely; a valve-like mechanism may contribute to the formation of giant diverticula. Diverticula frequently fill with fecal material extruded from the lumen that may then become inspissated and firm. This process usually begins in the sigmoid and spreads proximally over the course of several year [49].

Factors that initiate diverticulitis are speculative [53]. Pressure necrosis or erosion from inspissted feces in the diverticulum has been implicated as a causative mechanism. Transmitted pressure from peristaltic contraction may cause ballooning of the diverticulum and subsequent microscopic or macroscopic rupture. Inflammation generally occurs first at the apex of the diverticulum, which is the area of poorest circulatory perfusion and is often (or perhaps always) associated with micro- or macroperforation. Gross perforation results in immediate general fecal contamination of the peritoneum. More frequently, the perforation is contained by tissues in the wall of the colon or its mesentery or is buttressed by inflammatory adhesions to the abdominal or pelvic wall or adjacent viscera, a localized abscess then forms. This may rupture back into the lumen of the colon, track along the wall or mesentery of the bowel, may be contained by pelvic visceral surfaces or adherent small bowel loops, attach to the abdominal wall, or may dissest into the retropertoneal tissues. The abscess may resolve by local healing, persist as a localized collection, rupture free into the peritoneal cavity, or may dissect through tissue planes to drain externally by fistulization to bowel, genitourinary track, abdominal wall, or perineum. [41]. The mixed bacterial flora of the colon causes severe inflammation with extensive tissue necrosis and very dense scar formation on healing. Repeated bouts of localized diverticulitis may thus result in ligneous inflammatory swelling, and scarring of the sigmoid throws the mucosa into ridges of redundant folds that further inhibit effective stool transit. [53].

Complications of diverticula Disease

The complications of diverticula disease include mass formation, abscess, purulent peritonitis, fecal peritonitis, obstruction, fistula, hemorrhage and other rare miscellaneous complication.

Mass

A mass is the result of attempted localization of the inflammatory process by adherence to surrounding structures. A mass is more common if the inflammation arises from an antimesenteric diverticulum and if there have been previous episodes of inflammation so that the omentum is already adherent to the bowel. Although the inflammatory reaction usually resolves, the sigmoid colon never returns to normal [56]..

Abscess

An abscess is more common if there has been no previous peri diverticulitis. A localized abscess complicates diverticular disease in 10-57% of patients, and evolves (1) as a pericolic collection arising in an antimesenteric taenia, (2) as a mesenteric abscess from a diverticulum in the mesentery, or (3) from a pyogenic lymph node [32; 9, 57]. Painter described the pathology of abscess as occurring in a segment of "slowly evolving pericolitis, which permits envelopment of the affected segment of bowel by adjacent appendices epiploices, omentum, parietal abdominal wall, small bowel, bladder and uterus". An abscess often starts in the mesocolon and tracks into the retroperitoneum or

retrorectal area, occasionally involving the buttock or hip. A demonstrable connection between the abscess and the lumen of the bowel may not be evident [44].

Purulent Peritonitis

Purulent peritonitis may be generalized or localized [61; 10]. Diffuse purulent peritonitis is characterized by a turbid peritoneal exudates; the serosal surface of the thickened oedematous bowel is inflamed and the peritoneum is oedematous . It is frequently impossible to identify the site of colonic perforation. If the perforation is localized, the sigmoid colon bearing the perforation is walled off by omentum, small bowel, bladder, rectum, uterus, ovaries and the parietal or pelvic peritoneum. Purulent peritonitis may be due to gangrenous sigmoiditis, which is a rare ischaemic process carrying a high mortality [44].

Fecal Peritonitis

Fecal peritonitis from a perforated diverticulum is less common than purulent peritonitis but carries a mortality, which may approach 75% particularly in the elderly. There is diffuse peritonitis, profound circulatory disturbance, endotoxaemia and Gram-negative shock [53]. The peritoneum contains fecal fluid and a free communication with the lumen of the sigmoid colon is evident. Fecal peritonitis may be due to diverticular disease complicated by infarction, stercoral ulceration or drug-inuced ulceration particularly from NSAIDS in the sigmoid colon [11].

Obstruction

In diverticular disease sigmoid obstruction is never complete. Usually the rigid non-contractile sigmoid colon cannot accommodate normal peristalsis, which results in a functional occlusion. Obstruction is exacerbated by oedematous mucosal folds and solid fecal residue. Obstruction of the sigmoid is worse during episodes of inflammation but complete resolution is possible when the inflammation subsides. If the stricture is due to encasement by fibrous tissue as a consequence of a long-standing pericolic abscess, resolution may not occur. Acute small bowel obstruction may also occur in diverticular disease when the small bowel becomes adherent to a pericolic inflammatory mass [20].

Fistula

A pericolic abscess or localized peritonitis may be complicated by a fistula through the abdomainl wall resulting in a colocutaneous fistula [21], or, more frequently, may involve other viscera, particularly the bladder, vagina, uterus, ureter, colon, small bowel or appendix [24; 14; 67]. Fistula often involve both the skin and other viscera. Colovesical fistula is the most common fistula in diverticular disease. Furthermore, diverticular disease is the most common cause of this fistula. Such fistulae rarely close spontaneously since colonic pressures are higher than intravesical pressures and the fistulous track becomes epithelialized. Colovesical fistula is more common in men than women, presumably because the uterus commonly protects the bladder from this complication in women. It may occur in up to 20% of patients requiring surgery for diverticular disease [63]. Colovaginal fistula nearly always occurs in women who have had a previous hysterectomy. Enteroenteic fistulae are usually associated with an inflammatory mass and often complicated, involving the small and large bowel, bladder and skin. Enteroenteric fistulae may also occur after a previous resection for diverticular disease. Spontaneous enterocutaneous fistula is surprisingly rare in diverticular disease and is usually a postoperative complication or is associated with coexisting Crohn's disease [21].

Hemorrhage

It was estimated that 10% of patients with diverticulosis have lower gastrointestinal tract bleeding at some time, ranging in severity from an occasional guaiac-positive stool to massive lower gastrointestinal tract bleeding. Bleeding which is intermittent and slight must be distinguished from bleeding caused by adenocarcinoma of the colon. Acute massive hemorrhage form diverticular disease is of great significance and generally occurs in individuals with diffuse diverticulosis affecting the colon. Erosion of a small blood vessel by inspissated faces in the diverticulum has been suggestion as a cause for massive hemorrhage. An alternative mechanism may be traction and tearing of the relatively inelastic vessels when the diverticulum stretches during peristaltic contraction. Massive bleeding is the indication for surgery in approximately 10 percent of patients requiring operative treatment for diverticular disease [69].

Others

Giant colonic diverticulum is an uncommon complication of diverticular disease. These are air cysts, which may or may not communicate with the bowel. Solitary cysts are usually found to be adherent to the antimesenteric border of the sigmoid colon. The cyst wall may be as much as 1 cm thick and is lined by inflamed mucosa. The wall of the cyst consists of vascular connective tissue and fibrous tissue. The presence of muscle and muscosal lining suggests that the lesion is more likely to be a true cyst than a reduplication [42].

Clinical Presentation

(I) Clinical Presentation of diverticulosis

The large majority of patients with diverticulosis will remain entirely asymptomatic. There is no data to support any therapeutic recommendations or routine follow-up in this large population. An unquantified subset of the remainder will have bothersome symptoms attributed to their diverticular disease, so-called symptomatic

uncomplicated diverticulosis. Symptomatic uncomplicated diverticular disease is often characterized by left iliac fossa or lower abdominal pain associated with alteration in bowel habit. Change in bowel habit usually consists of episodes of loose stools or of constipation relieved by the passage of pelted feces. Characteristically, bowel habit is unpredictable and is often associated with abdominal pain [60]. Other symptoms include abdominal distention, right iliac fossa pain, mucous discharge, and urgency if diarrhea is a prominent symptom. Weight loss, anorexia and symptoms of anaemia are rare. A history of progressive change in bowel habit, passage of altered blood, colicky lower abdominal pain with diarrhea, anorexia, weight loss and anaemia is highly suggestive of colorectal carcinomas but it is often impossible from the history alone to distinguish diverticular disease from malignancy [60] hence flexible colonoscopy and contrast radiology are always indicated in these patients. Saint's triad is evidenced by symptoms of co-existing hiatal hernia and gallstones. Features of the irritable bowel syndrome are also common in patients with uncomplicated diverticular disease.

Clinical examination is usually normal, with no signs of anaemia or weight loss. Discomfort is sometimes elicited over the descending colon, and feces may be felt in the sigmoid or even the transverse colon, rectal examination is normal. In a patient with nonspecific symptoms of colonic dysfunction, the demonstration of diverticula radiographically or colonscopically adds little to the diagnostic probabilities or management because of the high prevalence of this finding in the general population. One must be careful to consider alternative diagnoses before attributing the symptoms solely to diverticulosis. These nonspecific symptoms obviously overlap considerably with those of the Irritable Bowel Syndrome (IBS) [30]

(II) Clinical features and Investigations of diverticulitis

Patients with acute diverticulitis usually have left lower quadrant abdominal pain on presentation, which is associated with fever and leucocytosis. An appreciable rate of error may occur, however, by relying on the latter two symptoms for diagnosis. Patients may also have tenderness and guarding with or without peritoneal signs. Pelvic or rectal examination or both may reveal a mass. Urinary tract symptoms should alert the clinician to a possible colovesical fistula. The differential diagnosis should include carcinoma, Crohn's disease, ulcerative colitis, ischemic colitis, pelvic inflammatory disease, pyelonephritis, and appendicitis. The diagnosis of diverticulitis may be made by plain radiography, contrast enema examination, ultrasonography, computed tomography (CT), or endoscopy [20].

Plain Radiography

An erect chest radiograph, together with erect and supine abdominal radiographs should generally be performed on most patients with clinically significant abdominal pain. The erect chest film has the dual purpose of detecting a pneumoperitoneum, which has been reported to be present in up to 12% of patients with acute diverticulitis, and to assess cardiopulmonary status in a generally eldery population with frequent comorbid illness. Abdominal X-rays have been reported to be abnormal in 30 – 50 % of patients with acute diverticulitis. Findings include small or large bowel dilation or ileus, bowel obstruction, or soft tissue densities suggesting abscesses [39].

Contrast studies

Barium enema should not be used in the acute situation since barium peritonitis can result with a high mortality (> 50%). Moreover, the use of barium can interfere with subsequent endoscopy, sonography or CT. in this acute setting, it is possible to safely, promptly, and accurately differentiate acute diverticulitis from other causes of left lower quadrant peritonitis with the use of a water-soluble contrast enema (e.g. Gastrografin). Furthermore, this examination is better than CT in ruling out carcinoma [18].

Computed tomography

CT plays a major role in acute left colonic diverticulitis with high sensitivity. It is an important adjunct to surgical colonic resection for an associated abscess and often reduces the need for a two-stage colectomy. Best results are achieved by using an abdominoperineal helicoidal mode CT with contrast orally and rectally; intravenous contrast may be given when associated abscess is suspected. It was found that its sensitivity for severity of diverticulitis is significantly higher than that of water-soluble contrast enema [35]. CT has been shown to be particularly valuable in the diagnosis and in draining an associated abscess and hence change a two-stage (or multistage) procedure into a single-stage surgical procedure [27]. Percutaneous drainage is feasible for patients with an associated pelvic abscess but not for small abscesses in the contiguous mesentery where en bloc resection is often necessary. Intial CT has a predictive value for the risk of secondary complications after successful medical management of the first acute attack and represents an important guideline for further therapeutic evaluation. In conclusion, in patients with acute diverticulitis severe enough to gain hospital admission, CT should be the initial imaging technique, because of the superior definition of bowel wall thickness and the extent of extraluminal disease. CT is fast, innocuous and highly sensitive. It plays a key-role in diagnosing associated abscesses and has a statistically significant predictive value for conservative treatment failure and the risk of secondary

complications after successful medical treatment of the first acute attack [47].

So in the assessment of acute diverticulitis, CT and contrast enema examination should probably be viewed as complementary examinations. In particular, contrast enema examination may be useful in the patient with equivocal or misleading results on CT. Results of CT may be misleading, particularly in patients with substantial colonic wall thickening in whom a diagnosis of carcinoma must be excluded and in patients with small intramural abscess. The contrast enema examination may be more useful in such patients [18].

Radiological criteria used to diagnose acute diverticulitis and assess its severity [4]

	Mild diverticulitis	*Severe diverticulitis*
Computerized tomography	Localized wall thickening (>5mm) Inflammation of pericolic fat	The same +at least one of the following: Abscess Extraluminal air Extraluminal gastrografin
Garstrografin enema	Segmental lumen narrowing tethered mucosa ± mass effect	The same +at least one of the following: Extraluminal air Extraluminal gastrografin

Ultrasound

Ultrasound is highly radiologist-dependent and many authors stopped using it when they noted that, in the majority of cases, the radiologist was not sure of his findings and proposed to deal with his failure by doing a CT. Many other authors, however, are of the opinion that sonography with compression is highly sensitive and specific for the diagnosis of acute diverticulitis with or without abscess [68].

Endoscopy

Endoscopy is relatively contra-indicated in the acute phase of diverticulitis because insuflation of air may convert a contained perforation into free perforation. For this reason it is rather exceptional to require urgent flexible sigmoidoscopy in acute situations, the only reason would be to rule out inflammatory bowel disease where steroid could be indicated. In other unusual cases, where differential diagnosis includes conditions such as ischemic colitis or carcinoma, endoscopy should be done after signs of peritonitis have settled, since the risk of disturbing a wall-off perforation is more likely with the insufflation of air. [7].

(III) Clinical Features of Complicated Diverticular Disease

Obstruction

Large bowel obstruction is usually insidious and incomplete. It is usually evident from increasing constipation, mucous discharge, episodes of spurious diarrhoea, gaseous distension and the passage of narrow caliber stools. Complete obstruction was reported in less than 10% of patients with stenosis due to diverticular disease [20]. Indeed, complete large bowel obstruction is much more likely to be due colorectal carcinoma than to diverticular disease. Barium enema examination may be diagnostic but flexible endoscopy should always be attempted, even if it is impossible to negotiate the sigmoid loop [7]. Obstruction of the small bowel adherent to an inflammatory mass is more common and is associated with abdominal distension, vomiting and a typical ladder pattern on a plain radiograph of the abdomen [20].

Abscess

Diverticular disease complicated by an abscess is usually associated with localized abdominal or perineal pain [4]. Typically there is a history of rigors, sweats, weight loss and anorexia [51]. If there is a pelvic abscess urinary symptoms are common and are often associated with tenesmus, perineal pain and the passage of pus into the rectum or vagina if the abscess discharges spontaneously. Rectal or vaginal examination will usually identify a pelvic abscess but examination will be normal if the abscess lies above the pelvic brim. If the abscess is pointing anterior to the sigmoid colon abdominal examination will usually reveal a tender mass with fluctuation and oedema of the abdominal wall. Ileus or mechanical small bowel obstruction is a common complication. Computed tomography is the radiological tool of choice and may also have a therapeutic role through guiding the drainage of the abscess percutaneously [47].

Fistula

The most common fistula is from sigmoid colon to the bladder. The patient usually complains of episodes of frequency, dysuria, fever and peneumaturia, sometimes there is an abdominal mass and microscopic haematuria with pus cells in the urine [5]. The urine is often infected. Colocutaneous fistulas are usually quite obvious clinically. Patients have often had an episode of fever and abdominal pain suggesting an abscess. Resolution of symptoms is generally accompanied by passage of gas and intestinal contents through the skin (often an old wound).

Spontaneous colocutaneous fistulas are rare and most occur after operation or following drainage of an abscess [21]. The track of the fistula can be confirmed by a fistulogram. It is unusual for these fistulas to be associated with a large volume of fecal discharge. Usually only small amounts of pus and gas emerge. Enteroenteric fistulas are often a symptomatic unless there is an associated abscess, a cutaneous or bladder fistula as well, or obstruction of the small or large bowel. Colovaginal fistula usually occurs in women who have had a previous hysterectomy and track directly from the sigmoid colon to the posterior fornix [23]. There is a history of passing gas, pus, and occasionally intestinal contents, through the vagina. The fistula is rarely large enough to be associated with fecal incontinence. Rectovaginal fistulas either occur after an operation for diverticular disease or where the disease has been complicated by a pelvic abscess. Diagnosis is usually confirmed by examination under anaesthesia, sigmiodoscopy, barium enema, intravenous pyelography and cytoscopy [62].

Purulent Peritonitis

Patients with purulent peritonitis may have prodromal symptoms suggesting a pre-existing abscess, but there may be no antecedent history. The patient is dehydrated and unwell, usually with fever, local or diffuse guarding, absent bowel sounds and leucocytosis; severe circulatory failure is generally note a feature of purulent peritonitis [20].

Fecal Peritonitis

The clinical presentation of fecal peritonitis is similar to that of patients with purulent peritonitis, but evidence of severe circulatory collapse and endotoxaemia are common. The patient is toxic and hypovolaemic, with low central venous and left atrial filling pressures. There are signs of acidosis, hypoxaemia and obvious tachycardia. Peripheral failure is evidenced by poor peripheral venous filling, hypotension, low cardiac output and oliguria [20].

Hemorrhage

Many patients with diverticular hemorrhage present with self- limited or minor episodes of bleeding. Patients often describe intermittent, sporadic passage of bright red or maroon blood per rectum. Fifty percent of patients will give a history of a previous episode of colonic hemorrahe. Usually, abdominal pain or discomfort is absent and physical examination is unremarkable. One third of patients with diverticular hemorrhage (or about 5% of all patients with diverticulosis) present with massive, exsanguinating hemorrhage. Such patients demand immediate resuscitation and therapeutic intervention. The overwhelming majority of these patients are elderly, usually in their seventh or eighth decade. Consequently, 70% of these patients have serious co-morbid diseases. These associations undoubtedly contribute to the high morbidity and mortality (10% to 20%) associated with diverticular hemorrhage [43].

(IV) Unusual Clinical Presentation

Diverticular Disease In the Immunocompromised Patient

Immunocompromission is associated with an increased incidence of colon perforation in patients with diverticular disease. The most common form of Immunocompromission is long-term corticosteroid therapy. Immunocompromised patients with diverticular tend to present with minimal or no symptoms or suggestive physical findings. The masking of the clinical features of colon perforation is an important reason for delayed in this group. Medical treatment of acute diverticulitis is successful in 75% on non-immunocompromised patients, but operation may be required in almost all patients who are immunocompromised. Patients with impaired immune response are more likely to present with a free intraperitoneal perforation because of the inability of the immunocompromised patient to adequately wall-off an inflammatory process. Early operative intervention should be considered in any immunocompromised patient with acute diverticulitis. Some surgeons even advocate elective colon resection in patients with diverticular disease who are about to undergo kidney transplantation [17].

Diverticular Disease in Young Patients

Symptomatic diverticular disease in patients younger than age 40 comprises only 2% to 4% of all patients with diverticulosis. Although diverticular disease is unusual in younger patients several important distinctions from the usual situation exist. Of patients younger than 40 years of age with diverticulitis, 90% are men. The reason for this predominance is unclear although obesity may be a predisposing factor. The correct admitting diagnosis of acute diverticulitis is made in only 15% to 35% of these patients. Because of the uncommon occurrence of diverticula in this age group, the diagnosis of acute diverticulitis is often not even considered in the evaluation of abdominal pain. Despite the fact that the inflammatory process originates in the sigmoid colon in 70% to 85% of cases, a preoperative diagnosis of acute appendicitis is made in one third of patients. The disease also tends to follow a more fulminant course and is associated, therefore, with a higher incidence of complications. Up to 70% of patients with diverticulitis in this age group may eventually require operative intervention. Therefore, symptomatic diverticular disease in patients younger than 40 is a strong indication for surgical resection [6].

Recurrent Diverticular After Resection

Patients who undergo colonic resection for diverticular disease rarely require a second operation. Yet, a small percentage of patients may have recurrence of

disease with signs and symptoms of acute diverticulitis after what had appeared to be adequate resection. This has been estimated to occur in approximately 7% of patients who have undergo resection; 20% of these patients may require another operation. Controversy exists as to how much bowel should be resected on initial operation for diverticulitis. Diverticulitis usually involves a short segment of sigmoid colon. The average length of bowel resected is 17.2 cm. Resection should be sufficient to remove the inflammatory lesion and to perform an anastomosis in soft pliable bowel. All distal diverticula should be resected [50]. Total sigmoidectomy was advocated to prevent recurrent diverticulitis. Recurrent diverticulitis developed after resection more commonly in patients in whom the sigmoid colon had been used for the distal margin of anastomosis as opposed to patients in whom the rectum had been used. Excision of all distal diverticula and anastomosis to the rectum is performed to prevent or lessen the incidence of recurrent diverticulitis after resection. Anastomosis to the distal sigmoid was a risk factor for the development of a colocutaneous fistula, presumably because of the narrow distal sigmoid acted like distal obstruction to an anastomosis. Any patient who has signs and symptoms of recurrent diverticulitis after resection should be examined for possible inflammatory bowel disease, particularly Crohn's disease and ischemic bowel disease. Another suggested cause of recurrent diverticulitis is the possibility that the patient did not have diverticulitis in the first place. In such patients, review of the original pathologic findings may be useful [20].

Diverticular Disease and Carcinoma

Although initially it was believed that diverticular disease predisposed patients to carcinoma of the colon as a result of chronic irritation, it is now recognized that the two conditions may commonly exist in the same patient. Patients with concomitant diverticulitis and carcinoma of the colon had a much poorer prognosis, which may have been the result of a delay in diagnosis. Colonic diverticula obscure the sigmoid colon, making detection of mucosal lesions difficult. Therefore, all patients with known diverticular disease and guaiac-positive stools should be investigated aggressively to rule out coincidental carcinoma. Flexible sigmoidoscopy or colonoscopy in this group of patients is superior to the barium enema study [36].

Crohn's Disease and Diverticulitis

Patients who undergo resection for diverticular disease rarely need a second operation for recurrent disease. Subset of patients who require a second operation for recurrent pain, fever, and leucocytosis may, in fact, have Crohn's disease [22]. Reviewing patients who underwent initial sigmoid resection for presumed diverticular disease, they found features consistent with a diagnosis of late-onest Crohn's colitis include anorectal disease, rectal bleeding, fistula, complicated course after initial resection, multiple operations, and extraintestinal manifestations. The patients reported by Gledhill and Dixon tended to be older than most patients with diverticular disease. Crohn's disease should be considered in the differential diagnosis of recurrent diverticular disease after resection and in the patient who appears to have a complicated course after resection [22].

Management of uncomplicated disease (Diverticulosis and uncomplicated diverticulitis)

Medical Treatment of Diverticulosis

Conservative treatment is advised for uncomplicated diverticular disease, surgical therapy is rarely entertained as a therapeutic option in UK and USA. The 1980 saw a growing increase in the use of high fibre diets, not only in the treatment of uncomplicated disease but as a form of preventing complications [1]. Bran tablets had a greater effect on stool weight, transit time and motility than Normacol (Sterculia) and ispaghula. Although, there is a marked placebo effect with any therapy for uncomplicated diverticular disease, still high fibre diet improves bowel habit, stool consistency and transit time and is at least as good as placebo [1]. Patients taking high fibre diet had at least a four fold reductions in subsequent surgical treatment and the incident of symptoms was at least halved. Other agents having a role in the control of symptomatic diverticular disease, particularly if associated with irritable bowel syndrome, include antispasmodics and anti-diarrhoeal agent [30].

Medical Treatment of Uncomplicated Diverticulitis

The treatment of diverticulitis depends on the disease. Patients with minimal symptoms or signs of inflammation can be treated on an outpatient basis with a clear liquid diet and broad-spectrum antibiotics. The antibiotics are continued for 7 to 10 days. Pain medications should be avoided. If the inflammation is so severe as to warrant analgesic administration, the patient should be hospitalized and given intravenous antibiotics. The use of morphine especially should be avoided because it increases intracolonic pressure and can aggravate the inflammatory process. Meperidine decreases intraluminal pressure and is more appropiate analgesic. Patients with significant signs of inflammation should be hospitalized for bowel rest, intravenous fluids, and intravenous broad-spectrum antibiotics. Nasogastric suction is usually not necessary unless the inflammation is accompanied by ileus or obstruction.

The patient's symptoms usually respond promptly to non operative treatment, with noticeable improvement occurring within 48 h. As the clinical situation permits, diet is resumed and investigative studies may be performed after 3 weeks. A colonoscopic examination is usually indicated after the inflammation resolves to evaluate the extent of diverticulitis and to rule out the presence of a

cancer. A barium enema may demonstrate the extent of diverticulosis, but this is a less accurate test for identifying small polyps or malignant growth in the presence of numerous diverticular. When a patient recovers from a simple, uncomplicated episode of diverticulitis, a high-fiber diet is recommended. Surgery is seldom indicated in such circumstances because 70 percent of patients who have recovered from one uncomplicated episode of diverticulitis will have no recurrence [54].

Surgical management

There seems like little justification for prophylactic sigmoid colectomy for uncomplicated diverticular disease. However, one of the problems inherent in interpreting the surgical literature on this subject is that many surgical reviews are retrospective and usually report on overall experience, rather than confining data analysis to specific operations for defined surgical problems [37].

Complications for diverticular disease and their associated mortality rates are so severe that attempts have been made to define groups for patients who should benefit from elective colon resection to avoid these complication. The following guide lines concerning indications for elective colectomy for patients with diverticular disease [37].

Patients younger than 50 years who had (i) one or more episodes of proven diverticulitis associated with abdominal pain, fever, mass, leucocytosis, obstructive symptoms, inability to distinguish from carcinoma, and/or (ii) episode of diverticulitis associated with extravasation of contrast material at the time of barium enema, water – soluble enema, or CT scan [58].

Patients older than 50 years who had two episodes of diverticulitis associated with criteria listed above.

The few patients who present with giant diverticula should also treated by elective colon resection [13].

Candidate for organ transplantation and those patients taking long term corticosteroid or non steroidal anti-inflammatory drugs should undergo elective colon resection whatever the severity of diverticulitis.

Narrowing or marked deformity of the sigmoid on radiographic examination.

Clinical or radiographic signs that don't definitely exclude carcinoma.

I) Historical Review of Myotomy

The principle was to divide the hypertrophied muscle, thus allowing the mucosa to bulge through the muscle defect and thereby relieving the functional obstruction. In the 1960s, myotomy for the treatment patients with diverticular disease generated much interest. Reilly described longitudinal myotomy[48]. Transverse myotomy was described by Hodgson in 1973. A combined taeniamytomy was described [31]. The mortality and complication rate after myotomy for diverticular disease were high and has been almost abandoned today [52].

ii) Elective colon resection for diverticular disease operative procedure and technical consideration

Mechanical bowel preparation, antibiotic cover and prophylactic heparin are given preoperatively. It is wise to mark a stoma site in left and right iliac fossa since a stoma may be necessary if there are technical difficulties. Sepsis, scarring, foreshortening, thickening and narrowing of the bowel associated abscess, obstruction, and fistule present challenges that require technical expertise and mature judgement. In addition, decisions have to be made regarding avoidance of injury to adjacent structures, the length of the bowel to be resected, primary anastomosis or diversion of the fecal stream, the security of bowel to be resected, primary anastomsis or diversion of the fecal stream, the security of bowel anastomosis, the advisability of colostomy proximate to an anastomosis, and appropriateness in placement of drains [36]. The spleen and left ureter are particulary at risk of damage during operations for diverticular disease. Accidental splenic injuiry and subsequent splenectomy create a risk of venous thromboembolic complications. The left ureter may be adherent to the sigmoid mesentery or bound in dense scar in the region of the pelvic brim, sometimes with partial internal obstruction. Preoperative placement of left ureteral catheter as a stent may help to identify the ureter in an area of inflammation or dense scar. Ureteral injury can be avoided dissecting the mesentery of the decending colon from Gerrota's fascia, identifying the ureter near the renal pelivis, then dissecting downward through the difficult area, keeping the ureter in a posterior position and always in view [50]. General anaesthesia, with muscle relaxation is necessary and the patient should be catheterized. Lloyed-Davis position is advised since it affords better exposure of the pelvis. It gives the surgeon the option of using the circular stapling device and a rectal washout. The choice of abdominal incision is important for a safe and convenient resection of the left colon. Although a midline or left paramedian incision is the more conventional approach, an oblique curved incision that begins at the lateral border of the right rectus muscle 4 cm above the symphysis pubis crosses both rectus and curves upward to the costal margin in the left flank gives ideal exposure of both the spleen and the depth of the pelvis. The use of Trendelenberg position and tilting of the table to the right permit the small bowel to be packed into the right upper abdomen, leaving the field clearly exposed from the splenic flexure to the cul-de-sac [50]. Closure of the wound in layers and reapproximation of the rectus muscles by figure-of-eight synthetic absorobable sutures gives reliable and comfortable healing and essentially removes the risk of incisional herniation. If a sigmoid or descending colostomy is required the bowel may be brought through a separate

incision above and medial to incision to create a stoma at the level of the umbilicus. Transverse colostomy may be accomplished easily by lifting the abdominal wall with the left hand within the abdomen and making a transverse right upper quadrant incision through which a loop of right transverse colon may be drawn [50].

The length of colon to be depends upon the extent of muscular abnormalities in the gut wall as well as the extent of the inflammatory changes. The distal resection margin should be at the level of the intraperitoneal rectum, which is usually the distal extent of diverticular disease. The rectum may be effectively brought upward by blunt retroperitoneal dissection from the hollow of the secrum, making division and anastomosis technically easier. The resected specimen should include all the narrowed and inflamed segment, as well as the area of muscular thickening and foreshortening. In most instances this will require resection of a length of at least 25 cm. The splenic flexure should be freed and the left colic artery and vein divided and ligated near their origins to permit the splenic flexure or left transverse colon to be brought to the rectum without tension. The anastomosis may be stapled or hand-sewn but must be accurate, without tension and in well perfused bowel. If the anastomosis is not technically perfect, a right transverse colostomy should be added and, in selected cases, pelvic drainage will be required [40]

Management of complications of diverticular disease of colon

I) Diverticulitis with abscess.

II) Generalized peritonitis.

III) Diverticulitis with fistula.

IV) Obstruction.

V) Hemorrhage.

Diverticulitis with Abscess

Free perforations into the peritoneum causing frank bacterial peritonitis can be life threatening, but are fortunately very uncommon. A grading system reflecting the degree of perforation had been described [25].

Stage I: Confined pericolic abscess.

Stage II: Distant abscess (retroperitoneal or pelvic).

Stage III: Generalized peritonitis caused by rupture of a pericolic or pelvic abscess, "non-communicating" with bowel lumen because of obliteration of diverticular neck by inflammation.

Stage IV: Fecal peritonitis caused by free perforation of a diverticulum. An important advance in the treatment of diverticulities has been the development of percutaneous drainage of abdominal abscess. A patient with an abscess that has resulted from a perforation of a diverticulum usually has pain localized to the left lower abdomen. A tender abdominal mass may be palpable, and if the abscess resides low in the pelvis, it may be palpable by digital rectal examination. Abdominal CT scan will confirm the diagnosis. Either of these modalities also permits guided placement of a drain through the abdominal wall into the abscess, allowing evacuation of the purulent material. Small pericolic abscesses (Stage I) can often be treated with antibiotic and bowel rest. If the abscess is located low in the pelvis (Stage II) and can not be approached safely through the abdominal wall, it can be drained safely into the rectum through a transanal or transvaginal approach [27].

These approaches are immeasurably preferable to a celiotomy, during which the abscess contents potentially could contaminate other areas of the peritoneal cavity. In such circumstances, it is usually necessary to perform Hartmann's operation, requiring the patient to have a temporary colostomy. Another option is resection of the diseased segment with primary anastomosis and proximal diverting colostomy. Percutaneous drainage of the abscess provides safe control of the infection, and an elective resection can be anticipated. At the time of elective surgery, it is usually possible to resect the diseased sigmoid colon and construct an anastomosis between the descending colon and rectum, thus avoiding a colostomy. It is mandatory to excise all abnormally thickened colon and to extend the resection to incorporate normal rectal wall. It is felt that a major cause of recurrent diverticulitis following sigmoidectomy is the failure to completely resect the abnormally thickened muscular wall at the rectosigmoid junction. It is seldom necessary to mobilize the rectum distally beyond 2 cm below the sacral promontory to obtain normal bowel for a satisfactory anastomosis. Although diverticula may be present throughout the colon, it is not necessary to incorporate all of them in the resected specimen. Only the colon with a thickened, brittle wall needs to be excised [54].

Generalized Peritonitis

Spreading generalized peritonitis may occur if the infection originating from the perforated diverticulum is not immediately localized by the normal peritoneal defenses (Stage III). If the perforation remains unsealed, the entire peritoneal cavity can be contaminated, with resulting generalized fecal peritonitis (Stage IV). This complication is rare, but immediate surgical intervenation is mandatory. Urgent celiotomy is required to control the infection. If the peritonitis is not so severe as to prohibit intestinal resection. The diseased segment of bowel containing the perforation should be resected. The distal segment of bowel should be closed or exteriorized as a mucous fistula, and the bowel proximal to the resected segment is used to construct a colostomy. Since the great majority of diverticular perforations occur in the sigmoid colon, there is seldom sufficient length of distal bowel to reach the abdominal wall as a mucous fistula. Therefore, it is usually

necessary to suture or staple the distal bowel (Proximal rectum).

This operation is frequently called Hartmann's operation after the French surgeon, Henri Hartmann, who described it as a treatment for proximal rectal cancer in 1921. Hartmann's operation is the most common operation for the emergent treatment of diverticulitis [8]

If the peritonitis is so severe that resection of the perforated segment cannot be accomplished, then diversion of feces with a completely diverting colostomy proximal to the perforation should be considered. This is a far less satisfactory procedure and should be avoided because the site of contamination remains in peritoneal cavity. Diversion of the fecal stream of the source of infection, accompanied by appropriate antibiotics and nutritional support, should permit resolution of the peritonitis. When the patient has recovered completely, usually over a period of no less than 10 weeks, the colostomy can be taken down and intestinal continuity resorted with an anastomosis between the descending colon and the rectum [54].

Diverticulitis with Fistula

A fistula between the sigmoid colon and other organs, including bladder, vagina, small intestine, and skin, is a relatively frequent complication of diverticulitis. Diverticulitis is a more common cause of sigmoid-vesical fistula than cancer or Crohn's disease. A fistula is usually formed by an abscess that drains into an organ, establishing a tract between the source of the abscess (the perforated sigmoid diverticulum) and the secondarily involved organ. Fistulas between the sigmoid colon and the bladder are more common in men than in women because the uterus lies between the sigmoid colon and bladder are more common in men than in women because the uterus lies between the sigmoid colon and bladder in women. Women with fistulas between the sigmoid colon and bladder or vagina usually have had a previous hysterectomy. A fistula from the sigmoid colon to the skin may result from percutaneous drainage of an abscess caused by diverticulitis [20].

A fistula between the colon and the urinary bladder presents with recurring urinary tract infections, fecaluria, or pneumaturia. In the presence of distal urinary tract obstruction (prostatic hypertrophy in men), a sigmoid-vesical fistula may be complicated by ascending urinary tract infection and sepsis. CT most accurately confirms the fistula by demonstrating air in the bladder. A barium enema will demonstrate the presence of a fistula in fewer than 50 percent of patients, and intravenous pyelography is even less rewarding. Cystoscopy usually reveals cystitis and bullous edema in the area of the fistula [54]

Presence of a fistula caused by diverticulitis is seldom a cause for emergency surgical treatment. The formation of a fistula often results in improvement in the patient's conditions, since it allows natural drainage of an abdominal abscess. Initial treatment should be directed toward control of any associated sepsis. Sepsis in a patient with a sigmoid-vesical fistula and distal urinary tract obstruction should be treated by relief of the obstruction (with a Foley catheter or suprapubic cystostomy) and appropriate intravenous antibiotics. Before definitive surgical treatment, the cause of the fistula should be confirmed. The second most common cause of fistula between the sigmoid colon and the bladder is sigmoid carcinoma. Colonoscopy should be used to directly visualize the sigmoid mucosa and to exclude carcinoma, for the curative surgical treatment of sigmoid-vesical fistula caused by cancer involves obtaining wider margins of surgical resection than would be reasonable for patient whose primary disease is diverticulitis [54]. After diverticulitis has been established as the cause of the fistula and sepsis has been controlled, treatment is directed toward resolution of the localized inflammation in the region of the fistula. This often can be accomplished by antibiotics administered on an inpatient basis. Total parenteral nutrition and bowel rest, concomitant with intravenous antibiotics, have been used in some patients to permit more rapid resolution of inflammation in preparation for surgery. The surgical treatment of a fistula caused by diverticulitis is excision of the diseased segment of the colon containing the site of perforation. It was found that placement of stents in the ureters by means of cystoscopy immediately prior to celiotomy of great help. This technique facilitates identification of the ureter in an area in which the normal anatomy may be distorted or difficult to evaluate because of inflammation. Usually the fistulous tract can be interrupted surgically by blunt dissection. If the fistula involves the bladder, the defect in the bladder can be closed primarily, but unless the defect is large, this is serldom necessary. Providing adequate drainage of the bladder with a Foley catheter or suprapubic cystostomy for a week to 10 days will allow the bladder defect to heal. If the local inflammation is not severe, a one-stage operation usually can be accomplished by sigmoidectomy and anastomosis between the descending colon and rectum [54]. If inflammation is too extensive to permit a primary anastomosis, it may be prudent to perform Hartmann's operation, as discussed previously. On some occasions it may be possible to fashion an anastomosis between the colon and rectum, but adjacent inflammation in the pelvis may be unfavorable, causing the risk of anastomotic leak to be unacceptable. In such instances, the anastomosis can be protected by a proximal transverse colostomy or ileostomy. After the patient has recovered and evaluation reveals the anastomosis to have healed satisfactorily, the proximal stoma can be closed [54]. On rare occasions, the infection will be so severe that cannot be controlled with the measures outlined above, and the extent of inflammation will not permit a bowel resection to be accomplished safely. In such instances, fecal

diversion is mandatory, with a colostomy constructed proximal to the area perforation and fistula.

Management of Hemorrhage

Initial resuscitative measures, as for any patient with gastrointestinal hemorrhage and hypovolemia, should be begun promptly. With adequate fluid resuscitation, blood transfusion, and correction of coagulation abnormalities, 70% to 80% of patients cease bleeding spontaneously. However, approximately 15% of all patients presenting with massive diverticular hemorrhage will require emergent operation before further diagnostic information can be obtained. The mortality in this group is high, often approaching 30% to 50% [29]. If a bleeding source can be localized at arteriography, selective intrarterial ifusion of vasopreein (0.1 to 0.4 units per minute) or embolization with thrombotic agents, such as absorbable gelatin or autologous clot, have been used with success. In patients with an identifiable site of bleeding, selective intra-aretrial infusion of vasopressin (a potent vasoconstrictor) can be expected to control hemorrhage in over 90% of cases. The infusion should be started ar a rate of 0.2 unit per minute. If the bleeding is not controlled promptly, the rate can be increased to a maximum of 0.4 unit per minute. Continued bleeding despite vasorpressin infusion is an indication for other therapeutic measures, usually a surgical procedure. If, however, bleeding stops with the administration of vasopressin, the infusion should be maintained for another 24 hours. If bleeding does not recur, the infusion should be tapered gradually and discontinued over the subsequent 12 hour. The catheter should be left in place for an additional 8 to 12 hours for use if bleeding recurs. Selective vasopressin infusion, however, is not without problems. Its vasoconstrictive effects are often only temporary, with up to 50% of patients rebleeding after the infusion has been stopped. Vasopressin is also associated with infrequent but potentially serious side effects. Major complications can include myocardial, mesenteric, and cerebral ischemia; arrhythmias; hypertension; hyponatremia; and fluid overload. Embolic, thrombotic, and septic complications due to the indwelling arterial catheter also contribute to an overall complication rate of 4% to 6%. Still, selective arterial infusion of vasopressin may convert an emergent situation to an elective or semi-elective one, thereby decreasing the operative mortaliy in this elderly, high-risk patient population [50]. Transcatheter embolizartion might be an alternative to vasopressin, especially in situations where vasopressin has not been effective or is contraindicated. However, use of embolization for the treatment of lower intestinal hemorrhage is controversial. Due to a postembolic colon infraction rate of 13%, transcatheter embolizaition has been used more often for control of upper intestinal hemorrhage. On rare occasions, colonoscopy may reveal an actively bleeding lesion at the base of a diverticulum, thereby permitting attempts at electrocoagulation or laser photoablation. Diverticular hemorrhage however, is usually not amenable to endoscopic therapy [64].

Emergent operation should be performed in any patient who continues to bleed despite resuscitative and therapeutic maneuvers. Indications for include persistant hemodynamic instability, a transfusion requirement of greater than 2000 ml over a 24-hour period, and recurrent hemorrhage. Emergent operation can be either directed or not, directed, depending on the unsuccessfull or failure of preoperative localization. If a bleeding site has been identified by colonoscopy or arteriography, a segmental resection can be performed with the expectation that bleeding will be controlled in over 90% of patients. A primary anastomosis is usually possible because fecal matter has usually been removed secondary to passage of large amounts of blood. If the source of bleeding has not been identified, total abdominal colectomy with ileoproctostomy should be performed. This procedure will cure the patient with colonic bleeding but is associated with high mortality rates (30% to 50%). However, even with angiographic localization and a limited segmental resection, an operative mortality rate of 20% to 30% can be expected in emergent circumstances. Segmental resection should not be performed when the site of colonic hemorrhage has not been identified. Blind segmental resection associated with an extremely high rate of rebleeding (35% to 50%) [54]. Attempts at intraoperative localization of previously unidentified bleeding sites, either by multiple enterotomies or divided colostomies, are usually unsuccessful. Other maneuvers that have been used sporadically to localize bleeding intraoperatively include Dopp;er scanning, transillumination of the bowel lumen, intra-arterial injection of methylene blue dye, and intraoperative colonoscopy, all with very limited success. Total abdominal colectomy with ileoproctostomy should be selected in the absence of localization because this obviates the even higher morbidity and mortality associated with inability to control hemorrhage at the initial operation. Elective colon resection is recommended in any patient with a history of previous diverticular bleeding who presents with a second episode of hemorrhage.

Clinical Results

Overall mortality rates in patients requiring operation for colon diverticular disease are in the range of 5 per cent. Mortality among patients requiring emergency surgery for complications of the disease is more than five times greater than among those undergoing elective procedures. Patients need an average of 1.5 operations for successful treatment, but those with severe complications often require several staged procedures before recovery [49]. Complications of operations are frequent (approximately 30 per cent overall), often serious, and usually related to sepsis. Multiple organ failure may follow septic shock, which occurs either as a manifestation of the primary disease or as a postoperative

complication. Morbidity among patients with postoperative complications tends to be prolonged, often lasting for several months [20]. The high mortality and morbidity rates among patients treated for complications of diverticular disease support the recommendation that those who are at high risk of developing complications should undergo elective colon resection. Unfortunately, 50 per cent of those who require emergency operations for complications of diverticular disease have had symptoms for less than 30 days at the presenting illness [20]. Long-term results of colon resection for diverticular disease are excellent. Most patients are relieved of their colonic bowel complaints and all the septic sequel of the disease, although they tend to have slightly more frequent stools as compared to their preoperative status. Patients who require ileorectal anastomosis for massive hemorrhage may have troublesome diarrhoea that generally responds to medical management. Recurrent diverticulitis is rare following adequate resection of the diseased bowel segment, and affects less than 5 per cent of patients overall. However, among patients who have had incompleted staged operative treatment and who may be left with a colostomy and defunctioned sigmoid or rectum, the disease and its complications may continue in the defunctioned segment [60].

Special Considerations

Right-Sided Diverticulitis

Isolated divertticula of the right colon occur in 1% to 3% of all patients with diverticular disease; however, right-sided diverticultitis accounts for 4% to 9% of all operations for inflammatory complication. Two types of diverticula are generally recognized. Acquired right sided. They develop secondary to the same pathologic process that leads to formation of diverticula concentrated in the sigmoid colon. The incidence of these acquired lesions also increases with age. Congenital diverticula are usually solitary lesions and are most commonly found in the right colon, with 88% located in the cecum. Their incidence does not increase with age. Congenital diverticula often contain fecoliths, which may lead to inflammation and perforation [66] .

The average age of patients with right-sided diverticula (i.e., 44 years) is less than that of patients with sigmoid diverticula. Patients usually present with right lower quadrant pain, thereby leading to a diagnosis of actue appendicitis. Appendicitis is the preoperative diagnosis in 60% of patients with right-sided diverticulitis. Several clinical features, however, may help to differentiate diverticulitis from appendicitis. Patients with diverticulitis are usually older. Symptoms are often of a longer duration (average, 3.3 days) as opposed to less than 24 hours in patients with appendicitis. The pain begins in the right lower quadrant and remains there, unlike th migrating history typical of appendicitis. Episodes of nausea and vomiting are less common (about 20% of patients) than with appendicitis (about 80 % of patients). Right-sided diverticulitis is diagnosed correctly in only 5% to 7% of cases, with the diagnosis frequently being made at laparotomy. Physical examination is usually not helpful in making the correct diagnosis. Barium enema and, more recently, CT scaning occasionally provide diagnostic assistance. In patients with an atypical clinical presentation for acute appendicitis consideration should be given to obtaining one of these studies. At exploration, two thirds of patients will have an isolated, inflamed diverticulum that can be treated by local resection. One third of patients wil have developed a large, inflammatory mass that is extremely difficult to distinguish from, a neoplasm. Right partial colectomy or hemicolectomy is then indicated [66].

Giant Divertivula

Giant colonic diverticula are extremely uncommon. Giant diverticula, otherwise known as gaint air cysts, most commonly present with vague abdominal pain and enlarging abdominal mass that is mobile and tympanitic on physical examination. Plain abdominal radiographs reveal a large, usually solitary, air-filled cystic cavity. Although, on rare occasions, the gallbladder, urinary, small intestinal diverticula, and intra-abdominal abscesses can present as large, air-filled cavities, volvulus of the colon is the major differential diagnosis. Three distinct pathologic forms of giant colonic diverticula have been identified. One variant represents an unsual enlargement of the commonly recognized false colonic diverticula and occurs in the absence of perforation or active inflammation. The second variant develops after perforation of a diverticulum with subsequent formation of an abscess cavity. The abscess cavity remains in communication with the colonic lumen, with enlargement of the cavity occurring secondary to either a continued air leak or the presence of gas-forming organisms within it. The third variant contains all three layers of the colonic wall, representing, therefore, a true congential lesion. Giant diverticula usually arise from the sigmoid colon and are treated by resection of the involved bowel segment [16].

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