

# Treatment of colonic diverticular disease: Role of surgery

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Colon diverticula are herniations of the mucosa and the submucosa through weak points in the colonic wall (pulsion diverticula) usually at the site where the vasa recta penetrate the circular muscular layer of the colon adding to intraluminal pressure, generally in the segments of the colon with smaller diameter such as the sigmoid colon. This reaffirms Laplace's law that the tension on the wall of a cylinder is inversely proportional to the radius multiplied by the pressure within the cylinder. Factors that predispose to these conditions are a diet low in fiber and high in refined carbohydrates and a hypersegmentation of the colon caused by emotional stress and irritating foods (1,2).

Since the first description of colon diverticula by Cruveilhier in 1849, they have been more and more frequently diagnosed in western countries, especially after the appearance of colon x-rays enhanced with the administration of an enema during the First World War.

In the majority of cases colon diverticula do not have specific clinical symptoms. Symptoms can appear to be inadvertent and patients can be asymptomatic. In other cases patients have abdominal malaise, discomfort in the left abdomen, flatulence, anorexia, nausea, or alternating episodes of constipation and diarrhea. These symptoms and signs are indistinguishable from those of irritable bowel syndrome.

When this disease is not accompanied by complications medical measures and treatments that are considered include those that stimulate motility and increase the speed of the intestinal transit, diminishing the intraluminal pressure. These measures include such as a fiber rich diets and fecal bulk formers. Some antispasmodics and intestinal motility coordinators such as trimebutine, pinaverium bromide and otilonium bromide can also be used.

In other cases diverticulitis presents other clinical manifestations such as fever, leucocytosis, abdominal masses (generally in the left iliac fossa or hypogastrum), peritoneal irritation signs located in these same zones, anorexia, nausea, vomiting, generalized peritonitis, intestinal obstruction or cystitis.

Diverticulitis generally occurs due to micro or macro perforations of the diverticulum which cause inflammatory changes that have a wide range of potential severity. These micro or macro perforations of the diverticulum have been attributed to several mechanisms:

- a. Mechanical trauma from the fecaliths which inflames the mucosa.
- b. Obstruction of the neck of the diverticulum allows bacterial overgrowth.
- c. Increasing intraluminal pressure due to episodes of emotional stress or irritating foods that cause spasm and severe hypersegmentation of the colon explodes the diverticulum (3, 4).

The severity of these inflammatory and infectious changes has been clinically classified by several authors. Initially Hughes proposed the following classification in 1963.

- I- Local Peritonitis (PHLEGMON)
- II- Pelvic or Pericolic Abscess
- III- General peritonitis due to ruptured pericolic or pelvic abscess
- IV- General peritonitis due to free perforation (Fecal) (5).

This system as modified by Hinchey became the most popular classification, and is the one in current use.

- I- Pericolic or Mesocolic Abscess
- II- Pelvic Abscess
- III- General Purulent Peritonitis
- IV- General Feculent Peritonitis

These clinical classifications have been adapted evaluations of diverticulitis using abdominal CT scans, sonograms and MRIs in conjunction with traditional clinical evaluations.

Ambrosetti has developed a classification system based on CT findings.

### **Mild diverticulitis**

- Thickening of the sigmoid wall
- Inflammation of pericolic fat

### **Severe diverticulitis**

- Abscess
- Extraluminal Air
- Extraluminal Contrast (7).

When we adopt or use a classification for disease or condition, we generally hope that it solves two types of questions for us: Does it establish a prognosis? And, does it give us any treatment strategies.

It would be useful to consider these other radiological classifications for CT scans in this light:

- STAGE O: Inflammation confined to the wall of the colon, thickening of the wall of the colon and the pericolic fat.
- STAGE I: Small abscesses up to 3 cm confined to the mesocolon.
- STAGE II: Abscesses that extend outside the mesocolon but are confined to pericolic or pelvic structures of less than 5 cm.
- STAGE III: Abscesses in the pelvic or outside pericolic tissues larger than 5 cm.
- STAGE IV: Clinical symptoms of general peritonitis and sepsis with stage III CT findings. Pneumoperitoneum

or extrusion of contrast medium to entire abdominal cavity; freely moving fluid in entire abdominal cavity, air-fluid levels and generally dilated loops.

An abdominal CT scan with contrast has 80% to 90% sensitivity and gives 10% to 20% false negatives. As 70% of diverticulitis cases are solved with medical treatment, some question the routine use of CT scans for confirming and stratify this diagnosis and for initial exclusion of other pathologies. They reserve CT scans solely for cases in which there is no clinical improvement with medical treatment. It is used to search for collections or abscesses that can be drained with percutaneous punctures and drainage catheters guided by CT or Ultrasound (8, 9, 10, 11).

In stages O and I, treatment begins by suspending oral intake of food and liquids and substituting parenteral administration of fluids to leave the intestines at rest. If there is no intestinal or ileal intestinal paralysis, a smooth saline laxative such as milk of magnesia is used to increase intestinal transit speed and avoid hypersegmentation and increasing intraluminal pressure of the colon. At the same the colon is cleaned and emptied. Antispasmodics and intestinal motility coordinators such as trimebutine, otilonium bromide, pinaverium bromide and hyoscine bromide are also routinely used. It is mandatory to use antibiotics which cover anaerobic and gram negative intestinal flora. First line combinations include metronidazole and ciprofloxacin, and clindamycin with amikacin or ampicillin/sulbactam. Newer antibiotics are used as second line therapy when authorized by the infectious disease department. In less severe cases ambulatory treatment with a clear liquid diet and administration of medicines orally can be considered.

In Stage II medical treatment can be initiated and evaluated 48 to 72 hours later for determination of need for percutaneous drainage.

In stage III the patient begins medical treatment and percutaneous drainage and positioning of a drainage catheter is immediately coordinated (12, 13).

For stage IV the patient is considered to be an urgent surgical case. Surgery may be either open or laparoscopic.

During the medical treatment of stages 0, I and II, it is advisable to evaluate the patient every 8 to 12 hours. In cases of clinical deterioration or persistence of ileum or fever for more than 48 or 72 hours the patient must be reevaluated to determine if percutaneous drainage or surgery is needed.

### **URGENT SURGICAL CASES**

Indications for urgent surgery:

- a. General peritonitis.
- b. Sepsis.

- c. Uncontained perforations.
- d. Acute clinical deterioration.
- e. No improvement after medical treatment for 48 to 72 hours.
- f. Immunosuppressed patients (4).

Various, and controversial, surgical procedures exist to treat acute processes. There are surgical principles which must be therapeutic objectives:

1. Resect out the infectious center.
2. Resect thickened and contracted segments.
3. Resect the distal segment of the sigmoid. Do not leave any residual sigmoid tissue to avoid relapses. The anastomosis must extend to the superior rectum.
4. Resect the descending colon when it is compromised.
5. Isolated diverticula in segments other than in the sigmoid of the colon have no importance (14, 15, 16).

The most frequently used surgical procedures are (17, 18):

1. Laparoscopic: Drain the purulent collection. Suture the point of the perforated diverticulum and position the percutaneous drain. This is a controversial procedure that should only be used for purulent peritonitis. More evidence is needed before it can be fully accepted (19, 20).
2. Three step procedure: 1 - Transverse colostomy and drainage. 2- Resection of the compromised segment. 3- Closure of the colostomy. This three steps procedure is not currently used.
3. Two step procedure. Variant 1: Resection of the inflamed segment and colostomy either through a Mikulicz procedure or a Hartmann's pouch colostomy. Closure of the colostomy. Variant 2: Resection and primary anastomosis with colostomy or proximal derivative ileostomy. Closure of the colostomy or ileostomy.
4. Single step procedure: Resection and primary anastomosis. There are well defined criteria for single step surgery. The intestine must not be stretched. It must not be full of feces. There can be no wall edema. The anastomosis must be done above the peritoneal reflection. There can be no fecal contamination, and the patient must be in good condition (21).

The two steps procedure is the standard treatment for general, purulent or fecal peritonitis (16).

The one step procedure has been accepted for mild diverticulitis with inflammation and local abscesses that can feasibly be included in the resection. It can also be used in other cases in which the patient does not present severe sepsis (16).

Recently, systematic reviews of more than 50 studies have indicated that resection and anastomosis in a single step in cases of purulent or fecal peritonitis has a rate of filtration

of anastomoses of 4% and morbidity and mortality rates no different from those caused by resection and colostomy. These results must be viewed with caution, especially when considering severely ill patients with noticeable toxicity, multiple organ failure and shock, since we do not yet have randomized and controlled studies to support the use of this procedure in these cases conduct (22, 23).

It should be considered that patients who have diabetes or HIV or who are undergoing chemotherapy, or are dependent on steroids, or are otherwise immunosuppressed have very mild clinical manifestations that do not correspond with the severity the diverticulitis found surgically. A high percentage of these patients do not respond to medical treatment, and therefore need more care before undergoing any kind of early surgery (24).

### Prophylactic and elective surgery

After acute processes have been treated, and patients have responded to medical treatment or percutaneous drainage, it is necessary to define which patients are candidates for elective or prophylactic colon surgery. These are some of the elements which should be considered in making the decision of whether or not to perform elective or prophylactic surgery:

1. Patient should be younger than 40, or older than 80, taking life expectancy into account
2. Comorbidity and surgical risk.
3. Number and severity of diverticulitis episodes, and intervals between episodes.
4. Persistence of abdominal pain (chronic pain).
5. Deformities of the colon that do not allow for evaluation.
6. Colovesical, colovaginal, colocutaneous fistulas.
7. Other external factors including work related activity (Pilots, submariners, veterinarians etc. who have difficulty accessing specialized medical care).

The accepted elective and/or prophylactic procedure is a segmental resection of the descendent and sigmoid colon with a primary anastomosis to the superior rectum. This procedure can be safely performed openly or laparoscopically by trained physicians (25).

The paradigm proposed by the American Society of Colon and Rectal Surgeons is that surgery is recommended after a second episode of diverticulitis in order to prevent other attacks of diverticulitis or the necessity of an ostomy (Currently, this is controversial). According to the work of Parks it was thought that each attack of diverticulitis was more severe, and responded less to medical treatment, than did the previous episode (26, 27).

A recent study of 366 patients demonstrated that the diverticulitis recurrences are not more severe than previous

episodes and respond as well as earlier occurrences do to medical treatment (28).

Elective and prophylactic surgery for diverticular disease has a higher morbidity rate than cancer surgery and a mortality rate of approximately 15% for older patients, which is not a negligible risk (29).

The colectomy does not guarantee new episodes of diverticulitis will not occur. Completely resecting the sigmoid colon and performing an anastomosis at the level of the promontory diminishes recurrence rates from 13% to 3% (30).

For reasons previously explained, if severity of episodes of diverticulitis has been mild and intervals are longer than a year, regardless of the number of episodes, we can consider judicious medical treatment with antispasmodics and coordinators of intestinal motility such as trimebutine, pinaverium bromide, otilonium bromide plus recommending change lifestyle changes such as small scheduled meals and avoidance of prolonged fasting to avoid abdominal distension. It is also important to avoid exposure to situations that cause emotional stress and consequent colonic spasms (31).

For patients who have had two or more episodes of severe diverticulitis the risk of elective surgery can be justified (31).

The paradigm that says that patients younger than 40 years old should have elective surgery after the first episode has weakened. In spite of the longer life expectancy of these patients, they do not have more frequent recurrences, shorter intervals between recurrences, or more severe episodes than does the rest of the population. In a study of 118 patients the recurrence rates for patients older or younger than 50 years show no differences (31, 32).

For patients over 80 years of age who have shorter life expectancies, more comorbidity and greater surgical risk, as well as for other patients who have high surgical risks, prophylactic surgery must be considered with less enthusiasm.

Elective therapeutic colectomies are completely justified in cases that present fistulas, obstructions or persistent diverticulitis.

In the treatment of colovesical, colovaginal or colenteric fistulas it is recommended that the patient should be monitored for 5 or 6 months prior to any surgery to see if the fistula will close spontaneously and to see if the acute and subacute intraabdominal inflammation resolves. This method avoids inflammatory plastron which makes surgery more difficult. Then, if needed, the appropriate surgery is resection of the totality of the sigmoid colon and colorectal anastomosis to interpose a flap of the greater omentum between the colonic anastomosis and the sutured fistula of the organ (33, 34).

## REFERENCES

1. Burkitt DP, Walker ARP, Painter NS. Dietary fiber and disease. *JAMA* 1974; 229(8): 1068-74.

- Painter NS, Burkitt DP. Diverticular disease of the colon, a 20th century problem. *Clin Gastroenterol* 1975; 4: 3-21.
- Morson BC. Pathology of diverticular disease of the colon. *Clin Gastroenterol* 1975; 4: 37-52.
- Ferzoco LB, Raptopoulos V, Silen W. Acute Diverticulitis. *N Eng J Med* 1998; 338(21): 1521-26.
- Hughes ESR, Curtherbertson AM, Carden. ABC: The surgical management of acute diverticulitis. *Med J Aust* 1963; 1: 780-782.
- Hinchey EJ, Schall PGH, Richards GK. Treatment of perforated disease of the colon. *Adv Surg* 1978; 12: 86-109.
- Ambrosetti P, Jenny A, Becker C, et al. Acute left colonic diverticulitis – compared performance of computed tomography and water soluble contrast enema: a prospective evaluation of 420 patients. *Dis Colon Rectum* 2000; 43: 1363-67.
- Ambrosetti P, Robert JH, Witzig et al Acute left colonic diverticulitis: a prospective analysis of 226 consecutive cases. *Surgery* 1994; 115: 546-50.
- Ambrosetti P, Robert JH, Witzig, et al. Prognostic factors from computed tomography in acute left colonic diverticulitis. *Br J Surg* 1992; 79: 117-19.
- McKee RF, Deignan RW, Krukowski ZH. Radiological investigation in acute diverticulitis. *Br J Surg* 1993; 80: 560-65.
- Johnson CD, Baker ME, Rice RP, Silverman P, Thompson WM. Diagnosis of acute colonic diverticulitis: comparison of barium enema and CT. *Am J Roentgenol* 1987; 148: 541-6.
- Mueller PR, Saini S, Wittenburg J, et al. Sigmoid diverticular abscesses: Percutaneous drainage as an adjunct to surgical resection in 24 cases. *Radiology* 1987; 164: 321-5.
- Stabile BE, Puccio E, van Sonnenberg E, et al. Preoperative percutaneous drainage of diverticular abscesses. *Am J Surg* 1990; 159: 99-104.
- Benn PL, Wolff BG, Ilstrup DM. Level of anastomosis and recurrent colonic diverticulitis. *Am J Surg* 1986; 151: 269-71.
- Rodkey, GV, CE Welch. Changing patterns in the surgical treatment of diverticular disease. *Ann Surg* 1984; 200: 466-78.
- Constantinides VA, Tekkis PP, Remzi FH, Fazio VW. et al. Primary resection with anastomosis vs Hartmann procedure in nonelective surgery for acute colonic diverticulitis: a systematic review. *Dis Colon Rectum* 2006; 49: 966-981.
- Fazio VW, Church JM, Delaney CP. *Current Therapy in Colon and Rectal Surgery* Second Edition. Elsevier Mosby, Inc. 2005. p. 285-295.
- Sher ME, Agachan F, Bortul M, Nogueras JJ, Weiss EG, Wexner. SD. Laparoscopic surgery for diverticulitis. *Surg Endosc* 1997; 11: 264-7.
- Schwandener O, Farke S, Fischer F, et al. Laparoscopic colectomy for recurrent and complicated diverticulitis: a prospective study or 396 patients. *Langenbecks Arch Surg* 2004; 389: 97-103.
- Guller U, Jain N, Hervey S, Purves H, Pictobon R. Laparoscopic vs. open colectomy: outcomes comparison

- based on large nationwide databases. *Arch Surg* 2003; 138: 1179-86.
21. Farkouh E, Hellou G, Allard M, et al. Resection and primary anastomosis for diverticulitis with perforation and peritonitis. *Can J Surg* 1982; 25: 314-316.
  22. Belmonte C, Klas JV, Perz JJ, Wong WD, Rothenberger DA, Goldberg SM, Madoff RD. Hartmann procedure: first choice or last resort in diverticular disease? *Arch Surg* 1996; 131(6): 612-617.
  23. Salem L, Flum DR, Primary anastomosis or Hartmann's procedure for patients with diverticular peritonitis? A systemic review. *Dis Colon Rectum* 2004; 47(11): 1953-1964.
  24. Parkin JD, Shield CF, Chang FC, Farha GJ, Acute diverticulitis. Comparison of treatment in immunocompromised and nonimmunocompromised patient. *Am J Surg* 1984; 148: 745-748.
  25. Rafferty J, Shellito P, Hyman N, Buie D, Standards Committee of the American Society of Colon and Rectal Surgeons. *Dis Colon Rectum* 2006; 49: 939-44.
  26. Rafferty J, Shellito P, Hyman N, Buie D, Standards Committee of the American Society of Colon and Rectal Surgeons. *Dis Colon Rectum* 2006; 49: 939-44.
  27. Wong WD, Wexner SD, Lawry A, et al. Practice parameters for the treatment of sigmoid diverticulitis supporting documentation. The standards task force. The American Society of Colon and Rectal Surgeons. *Dis Colon Rectum* 2000; 43: 290-297.
  28. Makela J, Vuolio S, Kiviniemi H, Laitinen S. Natural History of diverticular disease. When to operate? *Dis Colon Rectum* 1998; 41(12): 1523-1528.
  29. Bookey EL, Chapius PH, Pheils MT. Elective resection for diverticular disease and carcinoma. Comparison of postoperative morbidity. *Dis Colon Rectum*. 1981; 24: 181-184.
  30. Thaler K, Baig MK, Berho M, Weiss E, Nogueras JJ, Arnaud JP, Wexner SD, Bergamaschi R. Determinants of recurrence after sigmoid resection for uncomplicated diverticulitis. *Dis Colon Rectum*. 2003; 46(3): 385-388. Bordeianou L, Hodin RJ. Controversies in the surgical management of sigmoid diverticulitis. *Gastrointest Surg* 2007; 11: 542-548.
  31. Chateaus RC, Ambrosetti P, Ludwig A, Mermillod B, Morel PH, Soravia C. Long term follow up after acute episode of sigmoid diverticulitis: is surgery mandatory ? A prospective study of 118 patients. *Dis Colon Rectum* 2002; 45(7): 962-966.
  32. Bahadursingh A, Virgo K, Kaminski D, Longo W. Spectrum of disease and outcome of complicated diverticular disease. *Am J Surg* 2003; 186: 696-701.
  33. Fazio VW, Church JM, Jagelman DG, et al. Colocutaneous fistulas complicating. *Dis Colon Rectum* 1987; 30: 89-94.