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Diverticulitis: An Update From the Age Old Paradigm 憩室炎：古老範式的更新

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Abstract

For a disease process that affects so many, we continue to struggle to define optimal care for patients with diverticular disease. Part of this stems from the fact that diverticular disease requires different treatment strategies across the natural history- acute, chronic and recurrent.

To understand where we are currently, it is worth understanding how treatment of diverticular disease has evolved. Diverticular disease was rarely described in the literature prior to the 1900's. In the late 1960's and early 1970's, Painter and Burkitt popularized the theory that diverticulosis is a disease of Western civilization based on the observation that diverticulosis was rare in rural Africa but common in economically developed countries. Previous surgical guidelines focused on early operative intervention to avoid potential complicated episodes of recurrent complicated diverticulitis (e.g., with free perforation) that might necessitate emergent surgery and stoma formation. More recent data has challenged prior concerns about decreasing effectiveness of medical

management with repeat episodes and the notion that the natural history of diverticulitis is progressive. It has also permitted more accurate grading of the severity of disease and permitted less invasive management options to attempt conversion of urgent operations into the elective setting, or even avoid an operation altogether.

The role of diet in preventing diverticular disease has long been debated. A high fiber diet appears to decrease the likelihood of symptomatic diverticulitis. The myth of avoid eating nuts, corn, popcorn, and seeds to prevent episodes of diverticulitis has been debunked with modern data. Overall, the recommendations for "diverticulitis diets" mirror those made for overall healthy lifestyle – high fiber, with a focus on whole grains, fruits and vegetables.

Diverticulosis is one of the most common incidental findings on colonoscopy and the eighth most common outpatient diagnosis in the United States. Over 50% of people over the age of 60 and over 60% of people over age 80 have colonic diverticula. Of those with diverticulosis, the lifetime risk of developing diverticulitis is estimated at 10–25%, although more recent studies estimate a 5% rate of progression to diverticulitis. Diverticulitis accounts for an estimated 371,000 emergency department visits and 200,000 inpatient admissions per year with annual cost of 2.1–2.6 billion dollars per year in the United States. The estimated total medical expenditure (inpatient and outpatient) for diverticulosis and diverticulitis in 2015 was over 5.4 billion dollars. The incidence of diverticulitis is increasing.

Besides increasing age, other risk factors for diverticular disease include use of NSAIDS, aspirin, steroids, opioids, smoking and sedentary lifestyle. Diverticula most commonly occur along the mesenteric side of the antimesenteric taeniae resulting in parallel rows. These spots are thought to be relatively weak as this is the location where vasa recta penetrate the muscle to supply the mucosa. The exact mechanism that leads to diverticulitis from diverticulosis is not definitively known.

The most common presenting complaint is of left lower quadrant abdominal pain with symptoms of systemic unwellness including fever and malaise, however the presentation may vary widely. The gold standard cross-sectional imaging is multi-detector CT. It is minimally invasive and has sensitivity between 98% and specificity up to 99% for diagnosing acute diverticulitis. Uncomplicated acute diverticulitis may be safely managed as an out-patient in carefully selected

patients. Hospitalization is usually necessary for patients with immunosuppression, intolerance to oral intake, signs of severe sepsis, lack of social support and increased comorbidities. The role of antibiotics has been questioned in a number of randomized controlled trials and it is likely that we will see more patients with uncomplicated disease treated with observation in the future

Acute diverticulitis can be further sub classified into complicated and uncomplicated presentations. Uncomplicated diverticulitis is characterized by inflammation limited to colonic wall and surrounding tissue. The management of uncomplicated diverticulitis is changing. Use of antibiotics has been questioned as it appears that antibiotic use can be avoided in select groups of patients. Surgical intervention appears to improve patient's quality of life. The decision to proceed with surgery is recommended in an individualized manner.

Complicated diverticulitis is defined as diverticulitis associated with localized or generalized perforation, localized or distant abscess, fistula, stricture or obstruction. Abscesses can be treated with percutaneous drainage if the abscess is large enough. The optimal long-term strategy for patients who undergo successful non-operative management of their diverticular abscess remains controversial. There are clearly patients who would do well with an elective colectomy and a subset who could avoid an operation all together however, the challenge is appropriate risk-stratification and patient selection. Management of patients with perforation depends greatly on the presence of feculent or purulent peritonitis, the extent of contamination and hemodynamic status and associated comorbidities. Fistulas and strictures are almost always treated with segmental colectomy.

After an episode of acute diverticulitis, routine colonoscopy has been recommended by a number of societies to exclude the presence of colorectal cancer or presence of alternative diagnosis like ischemic colitis or inflammatory bowel disease for the clinical presentation. Endoscopic evaluation of the colon is normally delayed by about 6 weeks from the acute episode to reduce the risk associated with colonoscopy. Further study has questioned the need for endoscopic evaluation for every patient with acute diverticulitis. Colonoscopy should be routinely performed after complicated diverticulitis cases, when the clinical presentation is atypical or if there are any diagnostic ambiguity, or patient has other indications for colonoscopy like rectal bleeding or is above 50 years of age without recent colonoscopy.

For patients in whom elective colectomy is indicated, it is imperative to identify a wide range of modifiable patient co-morbidities. Every attempt should be made to improve a patient's chance of successful surgery. This includes optimization of patient risk factors as well as tailoring the surgical approach and perioperative management. A positive outcome depends greatly on thoughtful attention to what makes a complicated patient "complicated".

Operative management remains complex and depends on multiple factors including patient age, comorbidities, nutritional state, severity of disease, and surgeon preference and experience. Importantly, the status of surgery, elective versus urgent or emergent operation, is pivotal in decision-making, and treatment algorithms are divergent based on the acuteness of surgery. Resection of diseased bowel to healthy proximal colon and rectal margins remains a fundamental principle of treatment although the operative approach may vary.

For acute diverticulitis, a number of surgical approaches exist, including loop colostomy, sigmoidectomy with colostomy (Hartmann's procedure) and sigmoidectomy with primary colorectal anastomosis. Overall, data suggest that primary anastomosis is preferable to a Hartman's procedure in select patients with acute diverticulitis. Patients with hemodynamic instability, immunocompromised state, feculent peritonitis, severely edematous or ischemic bowel, or significant malnutrition are poor candidates. The decision to divert after colorectal anastomosis is at the discretion of the operating surgeon. Patient factors including severity of disease, tissue quality, and comorbidities should be considered. Technical considerations for elective cases include appropriate bowel preparation, the use of a laparoscopic approach, the decision to perform a primary anastomosis, and the selected use of ureteral stents.

Management of the patient with an end colostomy after a Hartmann's procedure for acute diverticulitis can be a challenging clinical scenario. Between 20 – 50% of patients treated with sigmoid resection and an end colostomy after an initial severe bout of diverticulitis will never be reversed to their normal anatomy. The reasons for high rates of permanent colostomies are multifactorial. The debate on the best timing for a colostomy takedown continues. Six months is generally chosen as the safest time to proceed when adhesions may be at their softest allowing for a more favorable dissection. The surgical approach will be a personal decision by the operating surgeon based on his or her experience. Colostomy takedown operations are challenging surgeries. The surgeon should anticipate and appropriately plan for a long and difficult operation. The patient

should undergo a full antibiotic bowel preparation. Preoperative planning is critical; review the initial operative note and defining the anatomy prior to reversal. When a complex abdominal wall closure is necessary, consider consultation with a hernia specialist. Open surgery is the preferred surgical approach for the majority of colostomy takedown operations. Finally, consider ureteral catheters, diverting loop ileostomy, and be prepared for all anastomotic options in advance.

Since its inception in the late 90's, laparoscopic lavage has been recognized as a novel treatment modality in the management of complicated diverticulitis; specifically, Hinchey III (purulent) diverticulitis. Over the last decade, it has been the subject of several randomized controlled trials, retrospective studies, systematic reviews as well as cost-efficiency analyses. Despite being the subject of much debate and controversy, there is a clear role for laparoscopic lavage in the management of acute diverticulitis with the caveat that patient selection is key.

Segmental colitis associated with diverticulitis (SCAD) is an inflammatory condition affecting the colon in segments that are also affected by diverticulosis, namely, the sigmoid colon. While SCAD is considered a separate clinical entity, it is frequently confused with diverticulitis or inflammatory bowel disease (IBD). SCAD affects approximately 1.4% of the general population and 1.15 to 11.4% of those with diverticulosis and most commonly affects those in their 6th decade of life. The exact pathogenesis of SCAD is unknown, but proposed mechanisms include mucosal redundancy and prolapse occurring in diverticular segments, fecal stasis, and localized ischemia. Most case of SCAD resolve with a high-fiber diet and antibiotics, with salicylates reserved for more severe cases. Relapse is uncommon and immunosuppression with steroids is rarely needed. A relapsing clinical course may suggest a diagnosis of IBD and treatment as such should be initiated. Surgery is extremely uncommon and reserved for severe refractory disease.

While sigmoid colon involvement is considered the most common site of colonic diverticulitis in Western countries, diverticular disease can be problematic in other areas of the colon. In Asian countries, right-sided diverticulitis outnumbers the left. This difference seems to be secondary to dietary and genetic factors. Differential diagnosis might be difficult because of similarity with appendicitis. However accurate imaging studies allow a precise preoperative diagnosis and management planning. Transverse colonic diverticulitis is very rare accounting

for less than 1% of colonic diverticulitis with a perforation rate that has been estimated to be even more rare. Rectal diverticula are mostly asymptomatic and diagnosed incidentally in the majority of patients and rarely require treatment. Giant colonic diverticula (GCD) is a rare presentation of diverticular disease of the colon and it is defined as an air-filled cystic diverticulum larger than 4 cm in diameter. The pathogenesis of GCD is not well defined.

Overall, the management of diverticular disease depends greatly on patient, disease and surgeon factors. Only by tailoring treatment to the patient in front of us can we achieve optimal outcomes.