Published in final edited form as:

Dis Colon Rectum. 2019 October ; 62(10): 1153–1156. doi:10.1097/DCR.0000000000001457.

Management of Freely Perforated Diverticulitis

Stephanie T Lumpkin, MD,

University of North Carolina, Department of Surgery, 4001 Burnett-Womack Building CB #7050, Chapel Hill NC 27599-7050, United States

Nicole Chaumont, MD [Assistant Professor of Surgery]

Division of Gastrointestinal Surgery, University of North Carolina, Chapel Hill, 4038 Burnett Womack Building, Chapel Hill, NC 27599-7081

CASE SUMMARY:

A healthy 65-year-old woman presents to the emergency room with a 12-hour history of sudden onset severe lower abdominal pain. This is her first episode. She reports nausea, vomiting, and anorexia. Her last colonoscopy was at age 60, and was normal, except for diverticulosis of the sigmoid colon. Physical examination is significant for fever, tachycardia, and generalized abdominal pain with rebound tenderness. Pertinent laboratory findings include a leukocytosis and metabolic acidosis. A computed tomography (CT) scan is obtained and is consistent with freely perforated diverticulitis, including a thickened sigmoid colon, free fluid in the pelvis and free air noted near the diaphragm (Figure 1). The surgeon completes the patient evaluation, recommends initiation of IV fluid resuscitation and antibiotics, and plans to go immediately to the operating room for surgical resection.

Keywords

Purulent diverticulitis; Feculent Diverticulitis; Graduate Medical Education; Hinchey Class 3 and 4 Diverticulitis

BACKGROUND

Diverticular disease affects 40% of Americans over 50 years, and 60% by the age of 80 years. Up to 25% of those with diverticulosis will develop symptomatic disease.¹ Over the last twenty years, there has been an increase in hospital admissions and emergency room visits for evaluation and treatment of diverticular disease.² Two thirds of all hospitalizations for acute diverticulitis in the United States are in patients under 65 years.² Diverticular disease is more common in men, while women appear to be more likely to be admitted to the hospital for acute episodes.¹ Additional risk factors that may be associated with diverticulitis include smoking, use of nonsteroidal anti-inflammatory drugs, obesity, sedentary lifestyles and diets low in fiber.

Corresponding Author: Phone: 919-590-9184, Stephanie.lumpkin@unchealth.unc.edu.

Disclaimers: The authors have no disclaimers or conflicts of interests.

PRESENTATION AND DIAGNOSIS

There are two major classifications of symptomatic diverticulitis, uncomplicated (or simple) and complicated diverticulitis. The most common classification is **uncomplicated**, which usually presents with left lower quadrant pain, fever, and a leukocytosis that improves with antibiotic therapy alone. These patients are commonly treated on an outpatient basis.

Complicated diverticulitis has a variable clinical presentation including abscess, fistula, obstruction, stricture and the 1-2% of patients with diverticular disease who present with free perforation.³

Patients that develop acute diverticulitis are often also classified according to the Hinchey classification system (Table 1). This system is helpful in describing the severity of disease, although its clinical utility may be limited. As the presentation and management of complicated diverticulitis can be quite diverse, we will focus primarily on Hinchey stage 3 and 4 disease, or freely perforated diverticulitis.

Symptoms –

Patients who present with Hinchey 3 and 4 disease, tend to do so on their initial presentation of diverticulitis. They may manifest with varying levels of sepsis with hemodynamic instability and signs of end organ failure. Their physical exam is usually consistent with diffuse peritonitis. Presentation with more advanced stages of diverticulitis can significantly impact the mortality associated with the disease.⁴ They often need intensive monitoring and prompt, aggressive medical support with fluid resuscitation and broad spectrum antibiotics, with or without cardiovascular support while awaiting surgery.

Diagnostic Evaluation –

While not diagnostic, in order to characterize a patient's current metabolic state, the following laboratory tests are necessary: a complete blood count, a full chemistry panel, and a blood gas. Imaging studies such as abdominal X-ray or ultrasound can be ordered to evaluate a patient with an acute abdomen, but these may be nonspecific, and are not particularly helpful in assessing diverticulitis. For this disease, CT scan has proven invaluable in diagnosis and assessing severity of disease with diagnostic sensitivity of 95% and specificity of 96%.⁵ If a patient presents in extremis with peritonitis, there may not be sufficient time for a CT scan before surgery. However, if the patient can be clinically stabilized and CT scan can be completed in an expeditious fashion, it can be very informative in the acute setting when the diagnosis is unclear. Endoscopic evaluation and retrograde contrast studies are not recommended for acute diagnostic evaluation.

MANAGEMENT

Hartmann's Procedure.

It is generally accepted that patients presenting with generalized peritonitis and free perforation from diverticular disease require emergent surgical intervention. Traditionally, the gold standard for the treatment of these patients has been segmental resection of the diseased colon and diversion with a proximal end colostomy, or a Hartmann's procedure

(HP). Ideally, this procedure is then followed by a second surgery to restore intestinal continuity. This operation has been touted for the speed with which it can be performed, which can be of vital importance in an unstable patient, and for its avoidance of an anastomosis and the associated risk of leak during the initial operation. However, the two-stage HP has been linked with considerable morbidity due to wound infections and stoma complications, as well as technical difficulties associated with colostomy takedown and a relatively high leak rate.⁵ Including both stages, the mortality associated with this procedure has been reported to be as high as 19.6%, and at least one third of patients never get their “temporary” colostomies reversed.⁶

Primary Anastomosis with Proximal Diversion.

Due to the concerns surrounding the two-stage HP, multiple studies have evaluated the safety of proceeding with primary anastomosis with proximal diversion (PAPD) for the treatment of Hinchey stage 3 and 4 diverticulitis.^{4,7} In 2012, Oberkofler et al. conducted a multicenter randomized clinical trial comparing HP to PAPD and found that there were no significant differences in terms of overall complication rate (80% vs 84%, $P=.813$) or mortality between the two groups. However, the HP had a significantly increased proportion of serious complications compared to the PAPD group (20% vs 0%) and had a lower stoma reversal rate (57% in HP vs 90% in PAPD, $P=.005$).⁷ Similarly, in 2017, the DIVERTI trial published results confirming that their own HP and PAPD groups had similar morbidity (39% vs 44%, $p=.4233$) and mortality (7.7% vs 4%, $p=.4233$), and that the HP patients were significantly less likely to get their stomas reversed (65% vs 96%, $p=0.0001$).⁴ These data suggests that PAPD is a safe procedure, and in some ways, favorable to HP. However, patient selection is paramount and the success of this approach depends on an experienced surgeon to assess various factors including hemodynamic stability, degree of contamination, bowel wall edema and vascularity, nutritional status, and the role of any chronic immunosuppression.

Laparoscopic Lavage.

Laparoscopic lavage without bowel resection for purulent diverticulitis has gained increasing attention. In this procedure, patients undergo laparoscopic lavage of the abdominal cavity, no attempt to mobilize the diseased colon is made, and a drain is left in the peritoneum. Proponents of this approach praise its potential to avoid major morbidity in high risk patients. Since 2015, multiple randomized control trials have compared outcomes between laparoscopic lavage (LL) and primary resection procedures with variable results.⁸⁻¹⁰ The Ladies trial was terminated early due to safety concerns in the LL group when the study showed significantly increased odds of major morbidity and mortality within the 12 months following surgery, (OR 1.28, $p=0.58$).⁹ Also in 2015, the SCANDIV trial comparing LL with resection procedures showed no difference between the groups in severe postoperative complications or mortality within 90 days, although the reoperation rate was significantly higher in the LL group (20.3%) than in the resection group (5.7%) ($p=.01$).⁸ While the previous two studies established some concerns over the safety of LL over resection for purulent peritonitis, the DILALA trial, recently published their two-year follow-up findings, showing that LL patients underwent fewer operations than the HP patients in the 24 months following surgery, with no significant differences in mortality or readmissions.^{10,11} The

authors admit that given their small sample size (40 LL and 43 HP), statistical analysis was limited for many outcomes of interest, but still concluded that LL was better than HP for Hinchey stage 3 diverticulitis. In 2018, a comprehensive systematic review and meta-analysis of randomized control trials comparing operative strategies for perforated diverticulitis was published by Acuna et al. The authors found that major post-operative complications were more frequent after LL compared with bowel resection (RR=1.68 (95% CI, 1.10-2.56), while rates of early reoperation and postoperative mortality were comparable between the two groups.¹² The evidence surrounding laparoscopic lavage is expanding and suggests that LL may be an option in a specific subset of patients, but this treatment is not aligned with current American Society of Colon and Rectal Surgeons clinical practice guidelines.

Follow-up.

Follow-up after surgery will depend on the surgical management pursued, post-operative course, and patient factors. All patients should undergo appropriate colon cancer screening after they have recovered from their initial operation. Ultimately, the decision to reverse a stoma it will depend on shared decision-making, weighing the risks of stoma takedown against the benefits of restoring bowel continuity.

EVALUATION AND TREATMENT ALGORITHM (Figure 2)

Acknowledgments

Sources of Support: Dr. Stephanie Lumpkin completed this work during for her postdoctoral research fellowship, for which she received two sources of support. This project was supported by grant number F32HS026363 from the **Agency for Healthcare Research and Quality**. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality. This project was also supported by the RESEARCH FOUNDATION of the **AMERICAN SOCIETY OF COLON AND RECTAL SURGEONS** – General Surgery Resident Research Initiation Grant – GSRRIG 042.

Bibliography

1. Heise CP. Epidemiology and pathogenesis of diverticular disease. *J Gastrointest Surg.* 2008; 12(8): 1309–1311. doi: 10.1007/s11605-008-0492-0 [PubMed: 18278535]
2. Nguyen GC, Sam J, Anand N. Epidemiological trends and geographic variation in hospital admissions for diverticulitis in the United States. *World J Gastroenterol.* 2011; 17(12): 1600–1605. doi: 10.3748/wjg.v17.i12.1600 [PubMed: 21472127]
3. Ricciardi R, Baxter NN, Read TE, Marcello PW, Hall J, Roberts PL. Is the decline in the surgical treatment for diverticulitis associated with an increase in complicated diverticulitis? *Dis Colon Rectum.* 2009;52(9): 1558–1563. doi:10.1007/DCR.0b013e3181a90a5b [PubMed: 19690482]
4. Bridoux V, Regimbeau JM, Ouaiissi M, et al. Hartmann's procedure or primary anastomosis for generalized peritonitis due to perforated diverticulitis: A prospective multicenter randomized trial (DIVERTI). *J Am Coll Surg.* 2017;225(6):798–805. doi: 10.1016/j.jamcollsurg.2017.09.004 [PubMed: 28943323]
5. Salem L, Flum DR. Primary anastomosis or Hartmann's procedure for patients with diverticular peritonitis? A systematic review. *Dis Colon Rectum.* 2004;47(11): 1953–1964. [PubMed: 15622591]
6. Salem L, Anaya DA, Roberts KE, Flum DR. Hartmann's colectomy and reversal in diverticulitis: a population-level assessment. *Dis Colon Rectum.* 2005;48(5):988–995. doi: 10.1007/s10350-004-0871-x [PubMed: 15785895]

7. Oberkofler CE, Rickenbacher A, Raptis DA, et al. A multicenter randomized clinical trial of primary anastomosis or Hartmann's procedure for perforated left colonic diverticulitis with purulent or fecal peritonitis. *Ann Surg.* 2012;256(5):819–26; discussion 826. doi:10.1097/SLA.0b013e31827324ba [PubMed: 23095627]
8. Schultz JK, Yaqub S, Wallon C, et al. Laparoscopic lavage vs primary resection for acute perforated diverticulitis: the SCANDIV randomized clinical trial. *JAMA.* 2015;314(13): 1364–1375. doi:10.1001/jama.2015.12076 [PubMed: 26441181]
9. Vennix S, Musters GD, Mulder IM, et al. Laparoscopic peritoneal lavage or sigmoidectomy for perforated diverticulitis with purulent peritonitis: a multicentre, parallel-group, randomised, open-label trial. *Lancet.* 2015;386(10000): 1269–1277. doi: 10.1016/S0140-6736(15)61168-0 [PubMed: 26209030]
10. Angenete E, Thornell A, Burcharth J, et al. Laparoscopic lavage is feasible and safe for the treatment of perforated diverticulitis with purulent peritonitis: the first results from the randomized controlled trial DILALA. *Ann Surg.* 2016;263(1):117–122. doi: 10.1097/SLA.0000000000001061 [PubMed: 25489672]
11. Kohl A, Rosenberg J, Bock D, et al. Two-year results of the randomized clinical trial DILALA comparing laparoscopic lavage with resection as treatment for perforated diverticulitis. *Br J Surg.* 2018;105(9):1128–1134. doi:10.1002/bjs.10839 [PubMed: 29663316]
12. Acuna SA, Wood T, Chesney TR, et al. Operative Strategies for Perforated Diverticulitis: A Systematic Review and Meta-analysis. *Dis Colon Rectum.* 2018;61 (12):1442–1453. doi:10.1097/DCR.0000000000001149 [PubMed: 30371549]

CLINICAL QUESTIONS

1. How does freely perforated diverticulitis present?
2. How is diverticulitis classified?
3. What is the surgical management of freely perforated diverticulitis?

Figure 1:

Computed tomography images of freely perforated diverticulitis

These three images are representative cross-sectional images of a patient with freely perforated diverticulitis (refer to case summary). In figure 1A (far left), we can visualize a thick-walled sigmoid colon with diverticula. In figure 1B (middle), we can visualize extraluminal air adjacent to the bowel. In figure 1C (far right), we can visualize free air surrounding the liver, confirming freely perforated diverticulitis, similar to that of the patient in the case summary.

Figure 2:

Evaluation and management of freely perforated diverticulitis algorithm, or Hinchey Class 3 or 4. All patients presenting with freely perforated diverticulitis should undergo surgical resection. At this time, laparoscopic lavage is not aligned with ASCRS 2014 guidelines and therefore not included here. (+) Hemodynamic stability should be reassessed throughout the procedure, if at any point prior to creating an anastomosis the patient becomes hemodynamically unstable, you should perform a Hartmann's Procedure. (*) The decision to divert proximally is based on expert surgeon assessment of patient, anastomotic and intraoperative factors. All patients should undergo appropriate colorectal cancer screening.

Table 1:

Modified Hinchey Classification of Diverticulitis

Modified Hinchey Classification of Diverticulitis	
Stage	Description
0	Mild clinical diverticulitis
1a	Confined pericolic inflammation, phlegmon
1b	Confined pericolic abscess
2	Pelvic, distant intra-abdominal, intraperitoneal abscess
3	Generalized purulent peritonitis
4	Generalized fecal peritonitis