

Outcomes of Percutaneous Drainage Without Surgery for Patients With Diverticular Abscess

Faisal Elagili, M.D. • Luca Stocchi, M.D. • Gokhan Ozuner, M.D.
David W. Dietz, M.D. • Ravi P. Kiran, M.D.

Department of Colorectal Surgery, Digestive Disease Institute, Cleveland Clinic, Cleveland, Ohio

BACKGROUND: Data on percutaneous drainage followed by observation for diverticular abscess is scant.

OBJECTIVE: The aim of this study is to assess outcomes of percutaneous drainage alone in the management of peridiverticular abscess.

DESIGN: This is a retrospective study from a prospectively collected database.

SETTING: This study was conducted in a high-volume, specialized colorectal surgery unit.

PATIENTS: All patients with a diverticular abscess of at least 3 cm in diameter, treated between 2001 and 2012, who had prohibitive comorbidities or refused surgery after percutaneous drainage were included.

MAIN OUTCOME MEASURES: The primary outcome measured was the treatment of diverticular abscess with percutaneous drainage alone.

RESULTS: A total of 18 patients (11 surgery refusal, 7 comorbidity) were followed up until death, surgery for recurrent diverticulitis, or for a median of 90 (17–139) months. The median abscess size was 5 (3.8–10) cm, and the location was pelvic in 8 cases and intra-abdominal in 10. The mean duration of drainage was 20 ± 1.3 days, with the exception of 2 patients who only had aspiration of the abscess because of technical difficulty in drain placement. Three patients died of preexisting comorbidities between 2 and 8 months after percutaneous drainage. Seven of

the surviving patients (7/15) experienced recurrent diverticulitis; 3 of these patients underwent surgery between 7 months and 7 years after the index percutaneous drainage. Of the remaining 4 cases of recurrence, one abscess was treated with repeat percutaneous drainage alone and 3 patients had uncomplicated diverticulitis treated with antibiotics. There were no significant associations between long-term failure of percutaneous drainage and the location of the abscess ($p = 0.54$) or previous episodes of diverticulitis ($p = 0.9$).

LIMITATIONS: This study was limited because of its retrospective nature, its nonrandomized design, and its small sample size.

CONCLUSIONS: Percutaneous drainage alone was successful in avoiding surgery in the majority of this selected patient population with sigmoid diverticular abscess. Future studies should assess the appropriate indications for a more liberal use of percutaneous drainage not followed by elective surgery.

KEY WORDS: Diverticular abscess; Sigmoid diverticulitis percutaneous drainage; Long follow-up.

Sigmoid diverticular disease is responsible for 312,000 hospital admissions per year in the United States,¹ and results in an estimated annual cost of treatment of over 2.6 billion dollars.² In particular, complicated diverticulitis accounts for 20% to 30% of the cases and is associated with significant morbidity and mortality,² particularly in the case of diverticular abscess. In this regard, there is evidence suggesting that both hospital admission rates³ and the use of percutaneous drainage (PCD) for diverticular abscess are increasing.⁴

According to the guidelines set forth by major surgical societies, PCD is the most appropriate initial treatment for the majority of patients with a large diverticular abscess to avoid an emergency operation and a multistage surgical approach requiring a stoma creation.^{5–7} Although an elective sigmoidectomy is the expected course of

Financial Disclosure: None reported.

Poster presentation at the meeting of The American Society of Colon and Rectal Surgeons, Phoenix, AZ, April 27 to May 1, 2013.

Correspondence: Luca Stocchi, M.D., Department of Colorectal Surgery, Digestive Disease Institute, 9500 Euclid Ave, A30, Cleveland, OH 44195. E-mail:stocchl@ccf.org

Dis Colon Rectum 2014; 57: 331–336
DOI: 10.1097/DCR.0b013e3182a84dd2
© The ASCRS 2014

treatment for most patients following successful PCD of a diverticular abscess, the question as to whether at least some patients could be adequately treated by PCD alone without planning surgery after removal of the drain has been raised.^{8,9} Unfortunately, the available data to address this issue currently consist of a short list of studies with a limited number of patients, often associated with a short follow-up, which is insufficient to definitely assess the durability of PCD as the mainstay of treatment for diverticular abscess.^{10–16}

The aim of our study was therefore to assess the outcomes of PCD followed by observation in the management of diverticular abscess.

METHODS

All cases of diverticular abscess with a diameter of at least 3 cm treated with PCD followed by observation instead of elective surgery, evaluated from 2001 to 2012, were identified from an institutional, institutional review board-approved, diverticular disease database and retrospectively examined. The cutoff of 3 cm was selected based on previous reports^{17,18} and on our interventional radiology institutional practice. Both the diagnosis of diverticulitis and the measurement of the abscess were based on CT imaging. Drainage procedures were performed by staff radiologists with extensive experience in both interventional procedures and GI disorders, using a combination of intravenous conscious sedation and local anesthetic injected at the drain insertion site. Inserted percutaneous drains were locking pig-tail catheters with diameters ranging from 10F to 14F, which were connected to a Jackson-Pratt bulb under negative pressure and sutured to the skin. All patients treated with PCD had synchronous treatment with either intravenous or oral wide-spectrum antibiotics for a duration of 1 to 3 weeks depending on the choice of the individual colorectal surgeon. Antibiotics were administered intravenously upon hospital admission and then switched to oral formulations once a patient could tolerate a solid diet and after discharge from the hospital. No intravenous antibiotics were used in the outpatient setting. Success of the initial treatment was defined as improvement in the clinical condition (pain, temperature, heart rate, abdominal examination) and white blood cell counts in the 24 to 48 hours immediately following PCD. Conversely, failure of treatment was defined as the lack of improvement in the clinical condition of the patient within 48 hours following the initial percutaneous intervention leading to the requirement for urgent surgery. The definition of recurrent diverticulitis was the documented absence of signs and symptoms of disease for at least 3 months following the index PCD. The decision to remove the percutaneously placed drain was based on a drain injection study, on the absence of drain output in an asymptomatic patient,

or on the individual surgeon's preference. At the time of drain removal, all patients were hemodynamically stable and had no clinical signs of acute diverticulitis. The actual drain removal was performed during an office visit or in the radiological suite following an outpatient drain injection study, unless the patients with resolved symptoms of acute sigmoid diverticulitis had remained in the hospital because of comorbidities. All patients either refused elective surgery following removal of their percutaneous drain or had prohibitive comorbidity based on the assessment by a colorectal surgeon. All patients, including those with severe comorbidities, retained full code status at the time of their diverticulitis treatment. Electronic medical records were reviewed for demographic data, comorbidity, size and location of abscess, previous episodes of diverticulitis, duration of PCD, use of drain injection study before drain removal, current status (deceased or alive), as well as the incidence and treatments of recurrent diverticulitis following PCD. Patients with diverticular abscess having a diameter of less than 3 cm and/or diverticular abscesses reported as incidental findings in the course of treatment for other presentations of complicated diverticular disease were excluded. The long-term patient follow-up was conducted by contacting the patients via telephone call and obtaining all the pertinent clinical notes on episode(s) of recurrent sigmoid diverticulitis subsequent to the initial approach with PCD, including all related hospital admissions and procedures performed. Considering the small sample size, a formal statistical analysis was not performed.

RESULTS

Of 133 patients with diverticular abscess initially approached with PCD, 22 experienced PCD failure and 111 had PCD successes. Of these 111 patients, 18 (12 men) either refused surgery ($n = 11$) or had prohibitive comorbidity ($n = 7$) based on the judgment of 16 different colorectal surgeons; these patients constitute the basis of the present study. Their mean age was 61 ± 16 years and mean BMI was 30 ± 5 kg/m². Their comorbidities and history of previous diverticulitis episodes are shown in Table 1. Five of 18 patients (27.7%) had a previously documented episode of uncomplicated diverticulitis. Patients were followed up until death, surgery for recurrent diverticulitis, or for a median of 90 (17–139) months. The median and mean follow-up when considering all patients were 55 and 60 months. The preferred technique to guide PCD was CT in 17 patients, whereas an ultrasound-guided approach was preferentially used in 1 patient at the discretion of the interventional radiologist. The median abscess size was 5 (3.8–10) cm. A total of 21 abscesses diagnosed in 18 patients were treated with PCD by insertion of a single catheter, including in 3 patients having multiple abscesses identified at CT imaging. In 8 patients, the abscess was

TABLE 1. Age, comorbidity, and history of previous diverticulitis episodes for patients undergoing PCD alone

Patient no.	Age at presentation	ASA classification	Comorbidities	Previous episodes of diverticulitis
1	71	3	DM/lung cancer	No
2	74	3	Breast cancer	No
3	86	4	DM/HTN/ESRD/CHF	Uncomplicated
4	65	2	HTN/hyperlipidemia	No
5	52	2	HTN	No
6	76	3	DM/HTN/bladder cancer	No
7	60	1	None	No
8	72	4	DM/HTN/CHF/ESRD	No
9	78	1	None	No
10	42	1	None	No
11	68	3	HTN/breast cancer	Uncomplicated
12	41	2	HTN/hyperlipidemia	No
13	65	2	DM/HTN/hyperlipidemia	Uncomplicated
14	73	3	DM/HTN/CAD	Uncomplicated
15	44	2	Morbid obesity	No
16	28	3	COPD	No
17	39	1	None	Uncomplicated
18	61	4	Heart-lung transplant	No

DM = diabetes mellitus; HTN = hypertension; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; ESRD = end-stage renal disease; CAD = coronary artery disease; PCD = percutaneous drainage.

located in the pelvis, whereas it was intra-abdominal in the remaining 10 patients (Table 2). The median length of hospital stay at the time of PCD was 3 (2–26) days. The mean duration of catheter drainage was 20 ± 1.3 days, with the exception of 2 patients who only had aspiration of the abscess owing to technical difficulty in drain placement. Eight patients had an injection study before the removal of the drain. In 1 patient, the drain was left in place for 68 days until there was not any drain output, based on the decision of the treating surgeon (Table 2). No patients developed colocutaneous fistulas in our study, but there was 1 case of small-bowel injury complicating PCD, which was incidentally noted at the time of the drain injection study in the

absence of any symptoms and was successfully managed by drain removal and hospital observation for 24 hours. One patient developed *Clostridium difficile*-associated diarrhea that was successfully treated with oral vancomycin, corresponding to an infection rate of 5%.

Fourteen patients underwent colonic evaluation, in general, with colonoscopy (n = 11) or barium enema (n = 3), after the resolution of their symptoms following PCD. In 1 patient who had undergone an unremarkable average-risk screening colonoscopy within 6 months before his diverticulitis attack, the colonoscopy was not repeated. In 4 patients, prohibitive comorbidity warranted against any attempt at elective colonic evaluations. Three

TABLE 2. Abscess location, duration of drainage, use of drain injection study before drain removal in patients treated with PCD alone

Patient no.	Site of abscess	Hinchey classification	Duration of drainage, days	Drain injection study before removal
1	Intra-abdominal	II	13	No
2	Pelvic	II	13	No
3	Intra-abdominal	I	31	No
4	Pelvic	II	10	No
5	Intra-abdominal	I	No drain left	No
6	Pelvic	II	19	Yes
7	Intra-abdominal	I	20	Yes
8	Intra-abdominal	I	17	Yes
9	Pelvic	II	15	Yes
10	Intra-abdominal	I	17	No
11	Pelvic	II	21	No
12	Intra-abdominal	I	10	No
13	Pelvic	II	27	Yes
14	Pelvic	II	18	Yes
15	Intra-abdominal	I	68	Yes
16	Intra-abdominal	II	No drain left	No
17	Pelvic	II	14	No
18	Intra-abdominal	I	7	Yes

PCD = percutaneous drainage.

TABLE 3. Follow-up of patients treated with PCD alone

Patient no.	Patient status	Follow-up, mo	Incidence, presentation, and time of recurrent diverticulitis	Treatment of recurrent disease following index PCD
1	Deceased	8	No	No
2	Deceased	2	No	No
3	Deceased	3	No	No
4	Alive	88	Uncomplicated diverticulitis, 63 mo	Antibiotics alone
5	Alive	49	Uncomplicated diverticulitis, 8 mo	Antibiotics alone
6	Alive	92	No	No
7	Alive	62	No	No
8	Alive	110	Diverticular abscess, 77 mo	Repeat PCD alone
9	Alive	17	No	No
10	Alive	31	No	No
11	Alive	124	No	No
12	Alive	109	Uncomplicated diverticulitis, 72 mo	Antibiotics alone
13	Alive	84	Diverticular abscess	Repeat PCD + elective surgery
14	Alive	45	No	No
15	Alive	108	No	No
16	Alive	139	No	No
17	Alive	15	Uncomplicated diverticulitis	Elective surgery
18	Alive	7	Diverticular abscess	Urgent surgery

Recurrent diverticulitis and follow-up times are calculated from the time of original PCD. Follow-up refers to phone interview, clinical visit, or surgery. PCD = percutaneous drainage.

of these 4 patients died of preexistent conditions (lung cancer, breast cancer, and congestive heart failure) between 2 and 8 months after PCD (Table 3), corresponding to an overall mortality of 16.6% (3/18). Seven of the surviving patients (7/15) experienced recurrent diverticulitis (Fig. 1), 3 of whom underwent surgery between 7 months and 7 years after the index PCD. The indications for surgery were uncomplicated diverticulitis in 1 patient, who underwent elective sigmoidectomy, and recurrent diverticular abscess in 2 patients. Of these, 1 patient underwent repeat PCD followed by an elective sigmoidectomy and 1 patient required an urgent Hartmann procedure (Table 3). Two of the pa-

tients who underwent surgery experienced postoperative morbidity, which consisted of 1 case of postoperative ileus and 1 wound seroma. There was no postoperative mortality. Of the remaining 4 cases of recurrent sigmoid diverticulitis following initial PCD, 1 recurrent diverticular abscess was again treated with PCD alone followed by observation, and 3 patients had uncomplicated sigmoid diverticulitis successfully treated with antibiotics (Table 3). Five of the 8 patients who did not experience disease recurrence following the index PCD had a follow-up exceeding 5 years.

DISCUSSION

Our study suggests that PCD without subsequent surgery may be a feasible management strategy for the treatment of large diverticular abscesses, and not only in those patients with comorbidities that preclude subsequent surgery. In this small cohort of patients undergoing PCD without planned sigmoid colectomy, 20% of the surviving patients (3/15) ultimately did require surgery, but there was no obvious evidence of an increased morbidity directly attributable to the decision to avoid an elective operation immediately after PCD, and only 1 patient required stoma creation. Among the remaining patients who did not undergo surgery for diverticulitis, some attained long-term cure of their disease, but others experienced recurrent diverticulitis, which was treated with antibiotics alone or repeat PCD, corresponding to an overall recurrence rate of 47%. In our study, we did not identify any association with abscess location and long-term failure of PCD, unlike Ambrosetti et al¹¹ who observed that pelvic abscesses were associated with a significantly increased risk of subsequent surgery compared with abscesses located cephalad

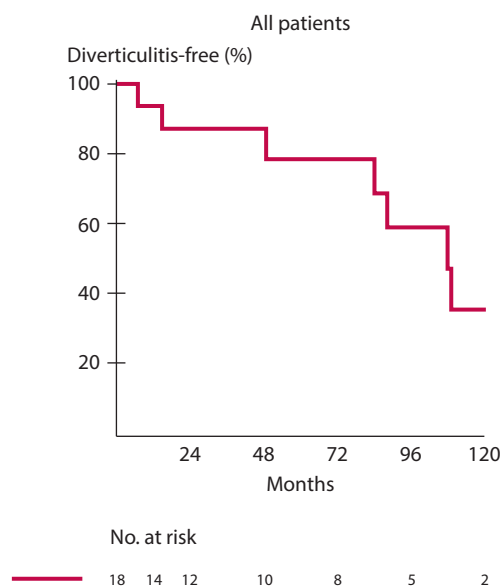


FIGURE 1. Follow-up and recurrent diverticulitis after PCD based on 18 patients. PCD = percutaneous drainage.

TABLE 4. Results of contemporary studies assessing PCD followed by observation (after year 2000)

Author	Year	Patient no.	Mean follow-up, mo	Avoidance of surgery for diverticulitis, %
Ambrosetti ¹¹	2005	19	N/A	N/A
Kaiser ¹²	2005	12	N/A	58
Brandt ¹³	2006	11	N/A	N/A
Singh ¹⁴	2008	8	35	100
Gaertner ^{b15}	2011	32	29	100
Current study	2012	18	60	83

N/A = not available; PCD = percutaneous drainage.

^a Two of the 11 patients required emergent surgery more than 7 years after the initial diagnosis. Aspirations without drain placement were excluded. Similar information also reported by Durmishi et al.¹⁶

^b The study by Gaertner was only available in abstract form at the time of our submission and has a reported follow-up of 2.4 years.

to the pelvic brim following nonoperative management with PCD or antibiotics alone. A study with a population more similar in terms of both sample size and treatment approach can possibly provide further clarification on this specific issue. Our relatively long follow-up corroborates the results of our analysis and is the main strength of our study, despite the small numbers and a somewhat heterogeneous population. Previous studies reporting on PCD have analyzed subsets of patients who did not undergo surgery with a follow-up ranging from 28 to 35 months (Table 4).^{11–15} However, such studies have often included patients with diverticular abscess also treated with other modalities, such as immediate surgery or antibiotics alone,¹¹ and, in some series, patients treated with PCD were only a small subset of a larger study population of patients with complicated diverticulitis.^{12,19} Under these circumstances, the specific information limited to those patients undergoing PCD without subsequent surgery inevitably tend to be less detailed and their follow-up shorter. In any case, although our numbers are not small relative to the paucity of the existing literature assessing PCD alone, they certainly remain insufficient to draw definitive conclusions on the effectiveness of nonoperative management of diverticular abscess, which remains a controversial issue.¹³ In addition, the selection criteria for nonoperative management could not be standardized in our retrospective cohort. The overall recurrence rate of 47% includes patients who required, at the minimum, additional antibiotic treatments, and in other patients who did not need repeat PCD or surgery over the course of their follow-up, not repeat PCD or surgery, over the course of their follow-up. It is therefore possible that in the long term, at least some good-risk patients might have been better served with an elective operation following initial PCD, an issue that our study cannot address. The other specific limitations of our study revolve on both patient and disease selection. With respect to patient selection, as alluded to in the introduction, the current recommendation by most surgical societies remains in favor of elective operation after PCD. Therefore, our study was necessarily based on a strictly selected number of patients who either categorically refused surgery, even after discussion of the currently recommended treatment

for their condition, or were considered to be at prohibitive risks. Our practice so far has therefore excluded good-risk patients with diverticular abscess undergoing PCD from a more frequent nonoperative approach consisting of drain removal followed by observation. Based on the results of the current study, we feel that, in the future, we should offer PCD alone more liberally, preferentially under study protocol. A study with a larger sample size might also be useful to investigate the possible factors associated with success vs failure of PCD followed by observation, which could further help tailoring a more systematic management approach for patients presenting with diverticular abscess.

With regard to disease selection, we limited our analysis to diverticular abscesses having a diameter of at least 3 cm, which allowed the exclusion of smaller abscesses that could be more difficult to distinguish from uncomplicated sigmoid diverticulitis. Moreover, our institutional practice has been to typically consider an initial approach with PCD for most abscesses measuring at least 3 cm in diameter, which generally makes it technically suitable for PCD. Other studies have also proposed this approach,^{14,17} which is supported by the high success rate of PCD associated with the minimal morbidity rates reported in the literature.²⁰ On the other hand, there is evidence indicating that even abscesses greater than 3 cm in diameter can be successfully treated with antibiotics alone, which suggests that we might have overtreated at least some of our patients. In this respect, Ambrosetti and colleagues¹¹ have proposed that systemic antibiotics be considered as the sole, initial treatment of diverticular abscess, resorting to PCD only in the case of failure of antibiotic treatment. Future studies will therefore be necessary to clarify which patients could benefit from treatment with antibiotics instead of PCD.

CONCLUSION

Long-term follow-up indicated that PCD alone could be successful in avoiding surgery in the majority of this selected patient population with sigmoid diverticular abscess. Future studies should assess the appropriate indications for a more liberal use of PCD not followed by elective surgery.

REFERENCES

1. Kozak LJ, DeFrances CJ, Hall MJ. National hospital discharge survey: 2004. *Vital Health Stat.* 2006;13:2006:1–209.
2. Sandler RS, Everhart JE, Donowitz M, et al. The burden of selected digestive diseases in the United States. *Gastroenterology.* 2002;122:1500–1511.
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;52:1558–1563.
4. Salem L, Anaya DA, Flum DR. Temporal changes in the management of diverticulitis. *J Surg Res.* 2005;124:318–323.
5. Rafferty J, Shellito P, Hyman NH, Buie WD; Standards Committee of American Society of Colon and Rectal Surgeons. Practice parameters for sigmoid diverticulitis. *Dis Colon Rectum.* 2006;49:939–944.
6. Fozard JB, Armitage NC, Schofield JB, Jones OM; Association of Coloproctology of Great Britain and Ireland. ACPGBI position statement on elective resection for diverticulitis. *Colorectal Dis.* 2011;13(suppl 3):1–11.
7. The Society for Surgery of the Alimentary Tract. Patient care guidelines for the surgical treatment of diverticulitis. Available at: <http://www.ssat.com>. Accessed March 7, 2013.
8. Farrell RJ, Farrell JJ, Morrin MM. Diverticular disease in the elderly. *Gastroenterol Clin North Am.* 2001;30:475–496.
9. Franklin ME Jr, Dorman JP, Jacobs M, Plasencia G. Is laparoscopic surgery applicable to complicated colonic diverticular disease? *Surg Endosc.* 1997;11:1021–1025.
10. Neff CC, vanSonnenberg E, Casola G, et al. Diverticular abscesses: percutaneous drainage. *Radiology.* 1987;163:15–18.
11. Ambrosetti P, Chautems R, Soravia C, Peiris-Waser N, Terrier F. Long-term outcome of mesocolic and pelvic diverticular abscesses of the left colon: a prospective study of 73 cases. *Dis Colon Rectum.* 2005;48:787–791.
12. Kaiser AM, Jiang JK, Lake JP, et al. The management of complicated diverticulitis and the role of computed tomography. *Am J Gastroenterol.* 2005;100:910–917.
13. Brandt D, Gervaz P, Durmishi Y, Platon A, Morel P, Poletti PA. Percutaneous CT scan-guided drainage vs. antibiotherapy alone for Hinchey II diverticulitis: a case-control study. *Dis Colon Rectum.* 2006;49:1533–1538.
14. Singh B, May K, Coltart I, Moore NR, Cunningham C. The long-term results of percutaneous drainage of diverticular abscess. *Ann R Coll Surg Engl.* 2008;90:297–301.
15. Gaertner W, Madoff R, Rothenberger D. Percutaneous drainage of colonic diverticular abscess: is colon resection necessary? [abstract] *Dis Colon Rectum.* 2012;55: e120.
16. Durmishi Y, Gervaz P, Brandt D, et al. Results from percutaneous drainage of Hinchey stage II diverticulitis guided by computed tomography scan. *Surg Endosc.* 2006;20:1129–1133.
17. Destigter KK, Keating DP. Imaging update: acute colonic diverticulitis. *Clin Colon Rectal Surg.* 2009;22:147–155.
18. Siewert B, Tye G, Kruskal J, et al. Impact of CT-guided drainage in the treatment of diverticular abscesses: size matters. *AJR Am J Roentgenol.* 2006;186:680–686.
19. Dharmarajan S, Hunt SR, Birnbaum EH, Fleshman JW, Mutch MG. The efficacy of nonoperative management of acute complicated diverticulitis. *Dis Colon Rectum.* 2011;54:663–671.
20. Schechter S, Mulvey J, Eisenstat TE. Management of uncomplicated acute diverticulitis: results of a survey. *Dis Colon Rectum.* 1999;42:470–475.