



Case Report

Encompassing an Emerging Laparoscopic Surgical Procedure for Hinchey III Diverticulitis Into Acute Surgical Care Practice: Our Experience With a Case Report and Review of Literature

Wijaya Ramesh, Teo Nan Zun, Tan Su-Ming

Department of General Surgery, Changi General Hospital, Singapore

In the past decade, there has been emerging data from the West supporting the use of laparoscopic lavage (LL) as a minimally invasive surgical (MIS) technique to treat Hinchey III perforated diverticulitis, rather than previous standard open surgical resection procedures. However, this can only be used in a select group of patients and also requires adequate knowledge and experience of colorectal and MIS techniques. This approach remains novel and rarely practiced in Asia. In this report, we review the current literature and discuss the considerations, outcomes, and limitations of this technique with an illustration of our case report. We report on a case of Hinchey III diverticulitis in a 51-year-old Asian woman who was successfully treated with LL after initial diagnostic laparoscopy in our institution and was discharged on the fifth postoperative day. LL is a colorectal MIS technique that has been evaluated and appears to be effective and has less morbidity compared with Hartmann procedure or primary resection with anastomosis. This technique should be incorporated into our practice for patients with Hinchey III diverticulitis who are suitable for laparoscopy at presentation. With the management of our case, we hence propose a clinical algorithm for adoption of this MIS technique by advocating routine diagnostic laparoscopy in hemodynamically stable patients presenting with gross peritonitis from perforated diverticulitis. This will promote the adoption of LL as a management option for perforated diverticulitis.

Key words: Laparoscopic lavage – Minimally invasive surgery – Colorectal surgery – Acute care surgery – Perforated diverticulitis

Corresponding author: Wijaya Ramesh, MBBS, MMed (Surgery), FRCS (Edin), Department of General Surgery, Changi General Hospital, 2 Simei Street 3, S529889, Republic of Singapore.
Tel.: +65 68503551; Fax: +65 2252844; E-mail: ramesh_wijaya@cgh.com.sg

Perforated diverticulitis with peritonitis is a complication of diverticular disease. The Hinchey classification groups patients with perforated diverticulitis into differing severities of the disease and its appropriate management (Table 1).¹ In patients with Hinchey III and IV diverticulitis, where there is purulent or feculent peritonitis, surgery is advocated.² The emergency surgical management for this group of patients continues to evolve.

A 3-stage procedure was often described in textbooks in the early 20th century. The procedure involved a first stage of drainage and diverting colostomy, a second stage of resection of diseased segment, and a third stage of colostomy reversal. This procedure was later dropped in favor of the Hartman procedure (HP). It does, however, involve a second operation for the reversal of stoma, which has its associated morbidity. Furthermore, several authors have reported that only 30% of patients with HP proceed with reversal of stoma.^{3,4} Others have advocated primary resection with anastomosis with or without proximal diversion as an alternative.⁵

Laparoscopic lavage (LL) has emerged as a suitable minimally invasive (MIS) surgical technique for a select group of patients with Hinchey III diverticulitis. Apart from the benefits of MIS technique, surgical resection of the bowel and creation of a stoma is avoided. We present our initial experience with LL in our institution and discuss our approach to the patient presenting with gross peritonitis from perforated diverticulitis, and we propose a working algorithm for adoption of this technique in select patients, with careful consideration and unit expertise of MIS colorectal surgery.

Case Report

Our patient was a 51-year-old woman who presented with left iliac fossa pain associated with fever and anorexia for 3 days. On physical examination she had pyrexia and tachycardia but was normotensive. She had generalized peritonitis on abdominal examination. Full blood count showed leukocytosis with neutrophilia. An erect chest X-ray did not reveal free air under the diaphragm suggestive of perforated viscus. Because she was hemodynamically stable, with clinical signs of acute abdomen but without radiographic evidence of viscus perforation on chest X-ray, a computed tomography (CT) scan of the abdomen and pelvis was performed (Fig. 1). This revealed perforated sigmoid diverticulitis with pockets of free gas and

Table 1 Hinchey classification of perforated diverticulitis and treatment

Hinchey classification	Features	Treatment
1	Pericolic abscess	Antimicrobial therapy
2	Pelvic abscess	with or without image-guided drainage
3	Purulent peritonitis	Resectional surgery
4	Feculent peritonitis	

free fluid in the pelvis and paracolic gutters. The patient was started on intravenous antibiotics, and she was prepared for diagnostic laparoscopy and LL with a view toward conversion and appropriate resectional surgery if necessary.

At induction, the patient remained hemodynamically stable for diagnostic laparoscopy; therefore, she was placed in the supine position and pneumoperitoneum was established with a 10-mm umbilical port. Two 5-mm ports were placed in the suprapubic and right lower quadrants to facilitate assessment and lavage. The peritoneal cavity was thoroughly examined, and an inflammatory phlegmon was seen over the sigmoid colon with purulent peritonitis noted. There was no evidence of fecal peritonitis. In view of the findings of Hinchey III diverticulitis, LL was performed. Lavage was performed in all 4 quadrants with 3 L of warm saline until the effluent drainage was clear. A Jackson-Pratt drain was placed in the pelvis and another was placed in the left paracolic gutter.

The patient was started on clear feeds on the first postoperative day (POD) and was gradually introduced to regular diet on the third POD. The left paracolic drain was removed on the fourth POD, and the drain in the pelvis was removed on the sixth POD. Intravenous antibiotics were converted to oral Co-amoxiclav on the fifth POD. She was discharged on the sixth POD. She was reviewed 1 week later at the outpatient clinic and was well, with good postoperative recovery. She had an interval colonoscopy 6 weeks later that revealed cecal and sigmoid diverticula. The patient remained well after 3 years of follow-up without further episodes of recurrent diverticulitis.

Discussion

LL is an emerging surgical technique for perforated diverticulitis, conferring the benefits of MIS, reduced operating time, avoidance of stoma and also an avoidance of the high morbidity and mortality



Fig. 1 Coronal section of CT showing perforated sigmoid diverticulitis with small pockets of free air in the inflamed region.

rates associated with resectional surgery.⁶ It is thought that in Hinchey III diverticulitis, the peritonitis is due to a rupture of pericolic abscess, compared with free perforation with resultant feculent peritonitis in Hinchey IV diverticulitis; therefore, intuitively, washout of the peritoneal cavity should suffice.⁷ This method was first described by O'Sullivan *et al*⁸ in 1996 in a case series of 8 patients with Hinchey III diverticulitis and subsequently in numerous other studies.^{9–13} It is still currently being investigated in large randomized controlled trials.^{14–17} There are still no clear guidelines on which group of patients would be best suited for this procedure. Furthermore, to date there has been a lack of published literature of adoption of this technique in Asia.

Currently, strict inclusion criteria for LL have not been described. Most studies recommend that this approach be reserved for patients with Hinchey III and not Hinchey IV diverticulitis who should still have resectional surgery.^{8–10,13} In the first case series describing LL, O'Sullivan *et al*⁸ demonstrated that all 8 patients with Hinchey III diverticulitis were successfully treated with LL. In the largest prospective cohort study to date of 100 patients, Myers and

colleagues⁹ opted for LL only in patients with Hinchey II and III diverticulitis, and they chose resectional surgery for those with Hinchey IV diverticulitis after initial laparoscopic assessment. Myers *et al*⁹ successfully treated 87 of 92 patients with LL, and all 8 patients with Hinchey IV diverticulitis underwent an HP. A recent systematic review by Toorenvliet *et al*¹⁸ showed that of the 231 patients from 13 studies between 1996 and 2009 on LL, most of the patients (178) treated by LL had Hinchey III diverticulitis. Selection of patients who would benefit from LL is probably of utmost importance; a recent small, multicenter, retrospective Dutch study suggests that feculent peritonitis (Hinchey IV) and the presence of overt perforation are absolute contraindications to LL.¹⁹

In an acute surgical care unit planning to introduce this technique, diagnostic laparoscopy for patients with generalized peritonitis and radiologically proven perforated diverticulitis should be undertaken first. This allows the MIS colorectal surgeon to determine the Hinchey stage and therefore plan the subsequent surgical management. However, this can only be performed if the patient is assessed to be suitable for pneumoperitoneum after

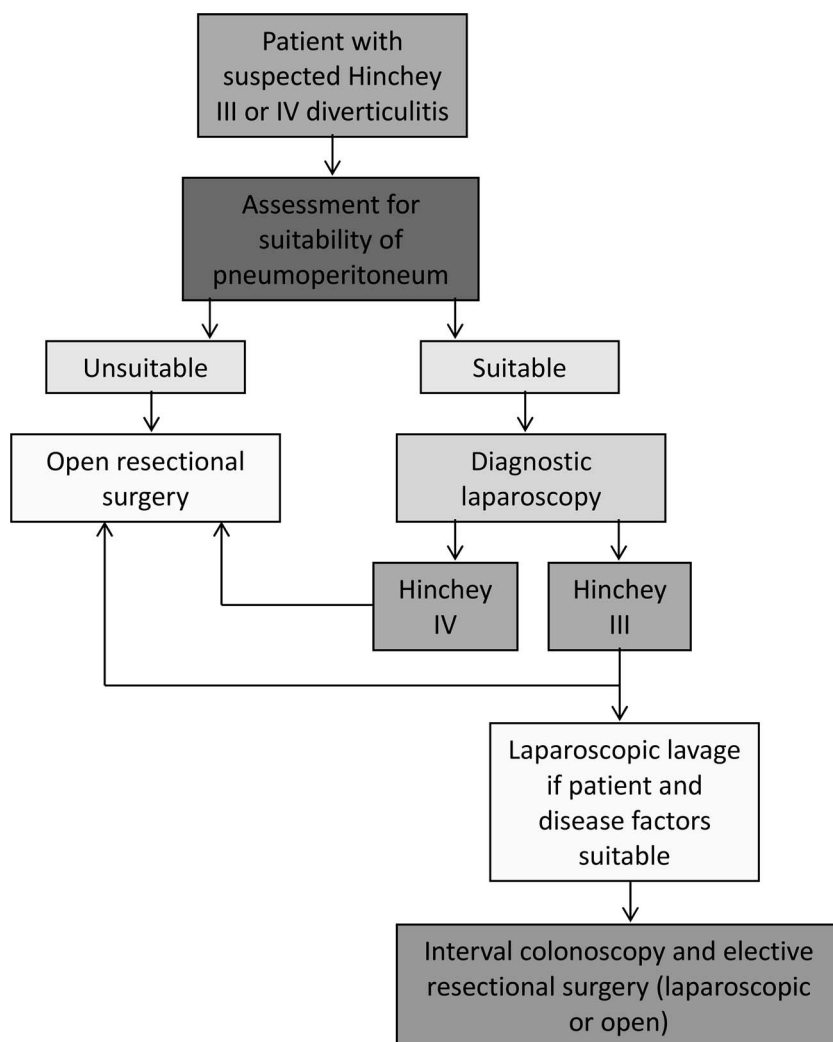


Fig. 2 Management algorithm incorporating LL for patients presenting with suspected Hinchey III or IV diverticulitis.

initial resuscitation. We demonstrated this in the initial management of our patient; there was both clinical evidence of generalized peritonitis and radiologic confirmation of perforated diverticulitis. This was later confirmed on laparoscopy, with evidence of intraperitoneal pus along with an inflammatory phlegmon over the sigmoid colon, indicative of Hinchey III diverticulitis. We propose a working algorithm for patients presenting with suspected Hinchey III or IV diverticulitis in an emergency setting for an acute surgical care practice with MIS colorectal expertise to consider adoption of this technique (Fig. 2).

LL has an inherent rate of failure or nonresolution. Toorenvliet *et al*¹⁸ reported a lavage failure rate of 4.3% in a systematic review of 13 relevant studies. The previously mentioned Dutch study by Swank *et al*¹⁹ identified multiple comorbidities, immunosuppression, a high C-reactive protein level, and/or a

high Mannheim Peritonitis Index as patient factors that predict for high risk of failure of LL and recommend HP in these patients. Therefore, patients who are selected and undergo LL need to be closely monitored for resolution of signs and symptoms of sepsis and return to normal bowel function. Early reoperation should be considered in patients who fail to improve clinically after LL. Patients need to be fully counseled on this risk prior to LL.

The other caution surgeons should be cognizant of when adopting LL is that perforated cancers do present similarly and sometimes might be mistaken for complicated diverticulitis.^{9,10} This can be suggestive from the history of the patient or identified on the preoperative scan or at laparoscopy. Some authors advocate inserting a rigid sigmoidoscope intraoperatively to assess for malignancy.¹⁰ In our patient, there was no suspicion based on the preoperative CT scan, and the patient underwent

an interval colonoscopy at 6 weeks after LL, which revealed sigmoid and caecal diverticula and no evidence of malignancy.

Current practice parameters set by the American Society of Colon and Rectal Surgeons suggest an elective resection of diseased colon after an episode of complicated diverticulitis is treated nonoperatively.² This practice parameter has, however, been drawn into a debate for patients treated with LL. Myers *et al*⁹ followed up 92 patients who underwent LLs, with only 2 patients having recurrent diverticulitis at a median follow up of 36 months (range, 12–84 months). The authors therefore suggested that elective resection may not be necessary. However, there has been no further prospective evidence regarding recurrence rates of diverticulitis after initial LL to justify avoidance of elective resectional surgery of diseased colon after initial LL. Therefore, we still advise that patients be counseled regarding resection of diseased colon, and this can possibly be performed with MIS colorectal surgical technique after LL. We kept our patient on active follow-up for 36 months and had warned her about this risk of recurrence and the need for elective resection. However, she has declined surgery and has not had subsequent episodes of recurrent diverticulitis.

LL is a colorectal MIS technique that appears to be effective and has less morbidity and mortality compared with HP or primary resection with anastomosis for Hinchey III diverticulitis. In addition, it has the benefit of avoidance of emergency resectional surgery or a stoma. Its adoption in the West for the past decade has currently resulted in 4 ongoing European randomized controlled trials comparing the outcomes of LL with those of conventional resectional surgery.^{14–17} The final results of these trials may be useful in the future to further define the clear indications of LL in the management of perforated diverticulitis. However, in the meantime, with the learning curve of MIS procedures, this technique can be considered in patients with Hinchey III diverticulitis who are suitable for laparoscopy at presentation and with suitable patient and disease factors predicting favorable outcomes. The patient and surgeon also need to be aware of the risks and possibility of early reoperation should there be nonresolution of symptoms, which can be as high as 4.3%.¹⁹ Interval colonoscopy should be performed after the acute phase to exclude the possibility of a more sinister cause of perforation, like malignancy. Furthermore, before evidence for the role of elective resection after LL becomes clearer with maturity of data, both the

patient and surgeon should, at this point, be aware of the possibility of recurrent diverticulitis and offer to perform elective resection after successful treatment with LL. LL requires adequate MIS resources and surgeons trained for MIS colorectal surgery. We hope with this article and the working algorithm proposed, surgeons in both acute care surgical and colorectal units will increase adoption of this technique with the summary of considerations for management and risks of this procedure.

Acknowledgments

This article was accepted as an abstract and presented as a poster at the following meetings/conferences: the CGH-Eastern Health Alliance Scientific Meeting 2013, Singapore; the 3rd Biennial Eurasian Colorectal Technologies Association (ECTA) Meeting, Singapore; and the Annual College of Surgeons Combined Surgical Meeting – ASEAN Federation of Surgical Colleges 2nd Summit Meeting. This study did not receive any funding or support in any form and is not currently undergoing review for consideration in any other journal.

References

1. Hinchey EJ, Schaal PG, Richards GK. Treatment of perforated diverticular disease of the colon. *Adv Surg* 1978;**12**:85–109
2. Feingold D, Steele SR, Lee S, Kaiser A, Boushey R, Buie WD *et al*. *Dis Colon Rectum* 2014;**57**(3):284–294
3. Seetharam S, Paige J, Horgan PG. Impact of socioeconomic deprivation and primary pathology on rate of reversal of Hartmann's procedure. *Am J Surg* 2003;**186**(2):154–157
4. Seah DW, Ibrahim S, Tay KH. Hartmann procedure: is it still relevant today? *ANZ J Surg* 2005;**75**(6):436–440
5. Constantinides VA, Tekkis PP, Athanasiou T, Aziz O, Purkayastha S, Remzi FH *et al*. Primary resection with anastomosis vs. Hartmann's procedure in nonelective surgery for acute colonic diverticulitis: a systemic review. *Dis Colon Rectum* 2006;**49**(7):966–981
6. Rogers AC, Collins D, O'Sullivan GC, Winter DC. Laparoscopic lavage for perforated diverticulitis: a population analysis. *Dis Colon Rectum* 2012;**55**(9):932–938
7. Collins D, Winter DC. Laparoscopy in diverticular disease: controversies. *Best Pract Res Clin Gastroenterol* 2014;**28**(1):175–182
8. O'Sullivan GC, Murphy D, O'Brien MG, Ireland A. Laparoscopic management of generalized peritonitis due to perforated colonic diverticula. *Am J Surg* 1996;**171**(4):432–434
9. Myers E, Hurley M, O'Sullivan GC, Kavanagh D, Wilson I, Winter DC. Laparoscopic peritoneal lavage for generalized

- peritonitis due to perforated diverticulitis. *Br J Surg* 2008;**95**(1): 97–101
10. White SI, Frenkiel B, Martin PJ. A ten-year audit of perforated sigmoid diverticulitis: highlighting the outcomes of laparoscopic lavage. *Dis Colon Rectum* 2010;**53**(11):1537–1541
 11. Franklin ME, Portillo G, Trevino JM, Gonzalez JJ, Glass JL. Long-term experience with the laparoscopic approach to perforated diverticulitis plus generalized peritonitis. *World J Surg* 2008;**32**(7):1507–1511
 12. Bretagnol F, Pautrat K, Mor C, Benchellal Z, Hutten N, Calan L. Emergency laparoscopic management of perforated sigmoid diverticulitis: a promising alternative to more radical procedures. *J Am Coll Surg* 2008;**206**(4):654–657
 13. Taylor CJ, Layani L, Ghosn MA, White SI. Perforated diverticulitis managed by laparoscopic lavage. *ANZ J Surg* 2006;**76**(11):962–965
 14. Thornell A, Angenete E, Gonzales E, Heath J, Jess P, Lackberg Z *et al.* Treatment of acute diverticulitis laparoscopic lavage vs. resection (DILALA): study protocol for a randomised controlled trial. *Trials* 2011;**12**:186
 15. Swank HA, Vermeulen J, Lange JF, Mulder IM, van der Hoeven JA, Stassen LP *et al.* The ladies trial: laparoscopic peritoneal lavage or resection for purulent peritonitis and Hartmann's procedure or resection with primary anastomosis for purulent or faecal peritonitis in perforated diverticulitis (NTR2037). *BMC Surg* 2010;**10**:29
 16. Hogan A, Winter DC. The LapLAND Trial: Laparoscopic Lavage for Acute Non-Faeculent Diverticulitis. Available at: <http://www.clinicaltrials.gov/show/NCT01019239>. Accessed July 21, 2015
 17. Schultz JK, Oresland T. Scandinavian Diverticulitis Trial (SCANDIV) <http://www.clinicaltrials.gov/show/NCT01047462>. Accessed July 21, 2015
 18. Toorenvliet BR, Swank H, Schoones JW, Hamming JF, Bemelman WA. Laparoscopic peritoneal lavage for perforated colonic diverticulitis: a systematic review. *Colorectal Dis* 2009;**12**(9):862–867
 19. Swank HA, Mulder IM, Hoofwijk AG, Nienhuijs SW, Lange JF, Bemelman WA. Early experience with laparoscopic lavage for perforated diverticulitis. *Br J Surg* 2013;**100**(5):704–710