

Review Article

Emergency surgical treatment in complicated diverticulitis: a systematic review

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ABSTRACT

The traditional treatment approach for complicated diverticulitis with purulent or fecal peritonitis is an open surgery procedure with resection of the perforated colon and colostomy (Hartmann's surgery). Less invasive, laparoscopic surgery techniques have been established but the decision whether patients should undergo open or laparoscopic treatment remains challenging and has to take into account individual factors such as the surgeon's skillset and available resources. Selection of the adequate procedure is further hampered by heterogeneity of the literature. We conducted a systematic review following PRISMA guidelines of studies of efficacy on open and laparoscopic surgical approaches for complicated diverticulitis using databases SciELO, LILACS and MEDLINE. We included prospective controlled studies published from 2005 to 2015. Out of 896-screened articles, 6 articles met our criteria and were included in the systematic review. Included studies tended to support the laparoscopic treatment over conventional open surgery. In particular, two staged laparoscopic surgery with lavage and subsequent follow up surgery to remove the pathological tissue appears to be superior to open surgery in both short and long term outcomes.

Keywords: Diverticulitis, Treatment, Open surgery, Laparoscopic

INTRODUCTION

Bowel diverticula are caused by mucosal herniation's that protrude through points of the bowel wall weakened by entry of blood vessels. Increase of life expectancy in the world, has led to growing prevalence of diverticular diseases. It is estimated that 30% of the population over the age of 60 and perhaps 60% of the population over the age of 80 may be affected. Only 20% of cases are diagnosed in patients younger than 50 years old. In these patients prognosis is poor and treatment is challenging often-requiring surgery. Diverticulitis refers to the presence of inflammation in the diverticula, often located in the sigmoid.¹⁻⁴

Diverticulitis is an acute process developed by the inflammation or perforation of one or more diverticula. 15-30% of patients admitted for management of diverticulitis will need surgery during their admission, with an 18% mortality rate.⁵

Uncomplicated diverticulitis comprises per diverticulitis and phlegm on; while cases with bowel obstruction, formation of abscess, peritonitis or fistulas are defined complicated diverticulitis.⁴

Treatment for uncomplicated and complicated diverticulitis extends from conservative measures to emergency surgery. Non-surgical measures include bowel rest, antibiotics and medical surveillance. These treatments are generally effective in uncomplicated

diverticulitis and complicated diverticulitis, Hinchey I and II (Table 1). However, treatment of complicated diverticulitis, Hinchey III and IV (Table 1). requires resection of the perforated colon.

Table 1: Hinchey's classification for complicated diverticulitis.

Stage	Finding
I	Localized abscess (para-colonic)
II	Pelvic abscess.
III	Purulent peritonitis (the presence of pus in the abdominal cavity)
IV	Feculent peritonitis

Guidelines recommend based on moderate-quality evidence (1B) urgent sigmoid colectomy for patients with diffuse peritonitis. Moreover, they recommend based on low-quality evidence (1C) that in patients with purulent or feculent peritonitis, operative therapy without resection is generally not an appropriate alternative to colectomy.⁶

Laparoscopic surgery (or minimally invasive surgery) is an attractive modality, which is increasing popularity because of its low morbidity and mortality. Within time, laparoscopic surgery has shown superiority in various procedures such as cholecystectomy, adrenalectomy, esplenectomy, Roux-en-Y gastric bypass.^{6,7}

The safety of a laparoscopic approach has not been proven or disproven in the treatment of emergency diverticulitis. Therefore there are frequently doubts when minimally invasive techniques are considered.

We conducted a systematic review of safety and efficacy of conservative vs. laparoscopic techniques in emergency diverticulitis.

METHOD

Following the PRISMA Guidelines a literature search was conducted using SciELO (Scientific Electronic Library Online), LILACS (Latin American and Caribbean Health Sciences), MEDLINE (Medical Literature Analysis and Retrieval System Online) and the journal of the American college of surgeons for purpose of this study. The key words under search were: diverticulitis and treatment, diverticulitis and surgery, emergency and diverticulitis, diverticulitis and open surgery, diverticulitis and laparoscopic or minimally invasive surgery. The search was limited to articles published between 2005 and 2015, published in English, Spanish or Portuguese, with abstracts and full articles available of the selected database.

Research was conducted between November 2014 and January 2015. The inclusion criteria were: Full papers of prospective and cross-sectional studies and full papers of

retrospective studies with over 1000 cases mentioning surgical treatments in emergency diverticulitis. For the selection of the articles, abstracts were read, verifying that the information met the inclusion criteria. Lastly, selected articles were subdivided into studies that examined open versus laparoscopic approach and those that compared different laparoscopic techniques.

RESULTS

From the 896 selected articles, 6 articles were selected for the systematic review (Figure 1). Out of the 6 selected articles, 3 assessed open versus laparoscopic approaches and 3 assessed different laparoscopic techniques.

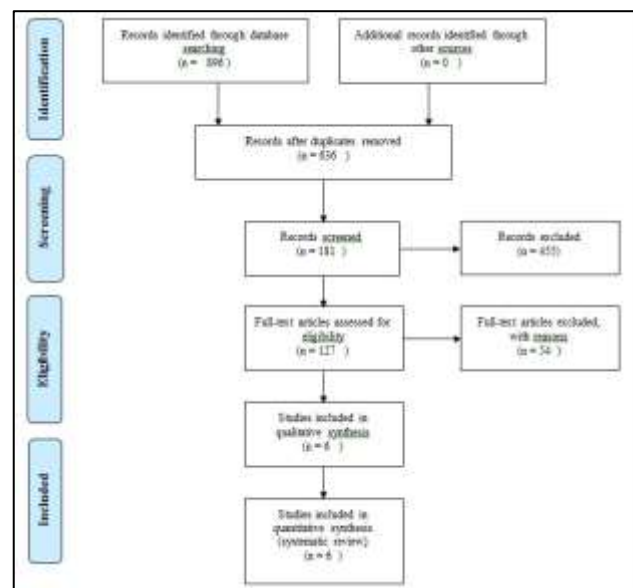


Figure 1: PRISMA flow diagram of selected articles.

DISCUSSION

The ideal treatment for diverticulitis is still controversial. Surgical treatment may be laparoscopic or open. Open surgical alternatives come from a surgical procedure with resection and primary anastomosis of the colon, Hartmann procedure in two stages and colostomy, resection and anastomosis in three stages.^{3,8,9}

Klarenbeek B et al (Table 2) conducted a prospective, multicenter, double-blind, randomized trial, to compare laparoscopic sigmoid resection (LRS) vs. open sigmoid resection (ABRS) in patients with acute diverticulitis. 104 patients underwent surgery between the years of 2002 and 2006, 52 of them experienced laparoscopic sigmoid resection and 52 open sigmoid resection. Mortality and complications were classified as major and minor. Anastomotic leakage, intra-abdominal abscess, severe postoperative and reoperations were classified as major complications. Where deep venous thrombosis, pneumonia, urinary tract infection and wound complications were classified as minor. A significant difference was found in patients with major

complications who underwent open resection (9.6% versus 25.0%; $P = 0.038$), while the difference in minor complications did not reach statistical significance (LRS 36.5% versus 38.5% ABRS; $P = 0.839$). Patients who

underwent laparoscopy had less postoperative pain and fewer days of hospitalization, however they had to overcome more surgical time.

Table 2: Analyzed publications comparing open surgery versus laparoscopic in emergency complicated diverticulitis.

Title	Authors	Method	Conclusions
Laparoscopic sigmoid resection for diverticulitis decreases major morbidity rates: a randomized control trial.	Klarenbeek BR, Veenhof AA, Bergamaschi R, et al	RCT 104 patients	LSR was associated with a 15.4% reduction in major complication rates, less pain, improved quality of life, and shorter hospitalization at the cost of a longer operating time
Laparoscopic versus open sigmoid resection for diverticulitis: long-term results of a prospective, randomized trial	Gervaz P, Mugnier-Konrad B, Morel P, et al	RCT 113 patients	Both open and laparoscopic approaches for sigmoid resection achieve good long-term results in terms of gastrointestinal function, quality of life and patient's satisfaction. Significant long-term benefits are restricted to cosmetics.
Laparoscopic versus open hartmann procedure for the emergency treatment of diverticulitis: a propensity matched analysis.	Turley RS, Barbas AS, Lidsky ME, et al	Comparative effectiveness 1186 patients	A laparoscopic approach to the Hartmann procedure for the emergency treatment of complicated diverticulitis does not significantly decrease postoperative morbidity or mortality in comparison with the open technique.

Gervaz P et al (Table 2) published a prospective, randomized study comparing long-term outcomes between laparoscopic and open sigmoid resection for diverticulitis. 113 patients underwent laparoscopic (LAP) or open sigmoid resection (AB). 105 (LAP: $n = 54$, AB: $n = 51$) agreed to participate in the follow-up study; a clinical examination was conducted by one of the surgeons and where ask to complete the "Gastrointestinal Quality of Life Index" (GIQLI) with a follow-up of 30 months after the surgery.¹⁰ Both laparoscopic and open sigmoid resection had a score of a positive gastrointestinal function, a good quality of life and presented a long-term satisfaction rate. The only significant difference between the two approaches was a better cosmetic result for the laparoscopic resection.¹¹

In a comparative study, published by Turley RS et al (Table 2), 1186 medical records of patients undergoing partial colectomy with terminal colostomy due to acute diverticulitis, between 2005 and 2009 where evaluated. This study included a propensity-matched comparison of laparoscopic and open approaches using the data from "American college of surgeon's national surgical quality improvement program participant user files". They found that the group of laparoscopic procedures had fewer complications (26% versus 41.7%, $p = 0.008$) and shorter hospital stay (8.9 versus 11.6 days, $p = 0.0008$).¹² Similarly to the multicenter study of Klarenbeek the groups that underwent laparoscopic surgery had shorter

hospital stay. Morbidity, mortality and surgical time were not significantly different between the groups.¹³

Laparoscopic treatment is continuously evolving; this has motivated a tendency to an early remission of the acute inflammatory episode to proceed with a definitive surgery in an elective condition.¹⁴ The standardized treatment of complicated diverticulitis without peritonitis consists in clinical management with broad-spectrum antibiotics and bowel rest. Performing percutaneous abscess drainage when finding an abscess greater than 5 cm in diameter.¹⁵ On the other hand treatment of a perforated diverticulum with consequent peritonitis is an early indication for surgery.

There are several laparoscopic techniques available for the management of perforated diverticulitis. Due to higher patient safety, the classic treatment consists in a two stages surgery with temporal derivation of the colonic transit. Under these circumstances, the goal is to respect the diverticulum and the perforated sigmoid, afterwards create a colostomy from the descending colon and close the stoma in a second surgical procedure. Only 56% of the colostomies made because of diverticulitis are reversing. Furthermore this surgery is associated with a high morbidity and mortality (34% and 19% respectively). The most common complications are associated with the surgical wound.¹⁶⁻¹⁸ These complications can be avoided by using an alternative therapy referred as "damage control surgery.

Table 3: Analyzed publications about laparoscopic surgery in complicated emergency diverticulitis.

Title	Authors	Method	Conclusions
Damage control strategy for the management of perforated diverticulitis with generalized peritonitis: laparoscopic lavage and drainage versus laparoscopic Hartmann's procedure	Liang S, Russek K, Franklin EM	Prospective 88 patients	Both LHP and LHD can be performed safely and effectively for managing severe diverticulitis with generalized peritonitis. Compared with LHP, LLD does not remove the pathogenic source; however, the clinical application of this damage control showed significantly better short and long-term clinical outcomes for managing perforated diverticulitis with various Hinchey classifications.
Laparoscopic peritoneal lavage for generalized peritonitis due to perforated diverticulitis	Myers E, Hurley M, O'Sullivan GC, Kavanagh D, Wilson I, Winter DC	Prospective 100 patients	Laparoscopic management of perforated diverticulitis with generalized peritonitis is feasible, with a lower recurrence risk in the short term.
Emergency Laparoscopic Management of Perforated Sigmoid Diverticulitis: A Promising Alternative to More Radical Procedures.	Frederic, Bretagnol, Pautrat K, Mor C, Benchellal Z	Prospective 24 patients	Laparoscopic treatment of generalized peritonitis secondary to diverticulitis is feasible and safe and may be a promising alternative to more radical surgery in selected patients, avoiding fecal diversion and allowing a delayed elective laparoscopic sigmoid resection.

This concept has been extended to patients without trauma with severe sepsis in critical condition.^{19,20} Nevertheless, this technique has been criticized for possible negligence during the decision making process and by the lack of surgical regulations.²¹ This treatment consists of peritoneal laparoscopic lavage and drainage; followed by an elective surgery (intestinal resection) after the resolution of the acute diverticulitis (3-4 months later). The theoretical basis is that when free or localized pus is present, the limited laparoscopic procedure of lavage and drainage changes a generalized peritonitis to a localized and allows scheduling a final laparoscopic surgery for intestinal resection in an elective better-control situation.^{15,22,23}

Liang S et al (Table 3) published a prospective, non-randomized study with 88 patients, with the objective of comparing laparoscopic Hartman's procedure (LHP) versus laparoscopic lavage and drainage (LLD). The results of this study indicated that both approaches are safe and effective. LLD does not remove the source of disease, however the technique demonstrated a superior clinical outcome including less morbidity (LLD: 2.4% versus LHP: 17.1%, $p = 0.045$), shorter surgical time (LLD: 99.7 versus 39.8 +/- LHP: 182.9 +/- 54.7; $p < 0.0001$) less blood loss (LLD: 2 versus 34.4 +/- 21.2 LHP: 210 +/- 170.5, $p = 0.012$), lower conversion rate (LLD: 2.1% versus LHP: 14.6%, $p = 0.046$) and shorter hospital stay (LLD: 6.6 +/- 2.4 versus LHP: 16.3 +/- 10.1, $p < 0.0001$). Other studies have shown that LLD is also associated with an improved quality of life because the colostomy is not needed.^{24,25}

Myers et al (Table 3) conducted a prospective multi-institutional study in 100 patients with perforated diverticulitis causing generalized peritonitis. 92 patients underwent laparoscopic peritoneal lavage and presented a 4% morbidity and 3% mortality. The authors concluded that laparoscopic peritoneal lavage is feasible with a low short-term recurrence risk.

Bretagnol et al (Table 3) evaluated 24 patients who underwent emergency laparoscopic surgery for secondary peritonitis due to diverticulitis with sigmoid perforation. Patients underwent emergency laparoscopic surgery, which included full lavage with at least 10L of irrigation and drainage. No colostomy was performed. 2 to 3 months after the surgery, elective prophylactic sigmoid resection surgery was executed. The results suggested that laparoscopic lavage and drainage is feasible and safe and might be a promising alternative to radical surgery in selected conditions, avoiding fecal diversion and allowing an elective laparoscopic resection.²⁶

In contrast, other authors propose that sigmoid resection in one stage with primary anastomosis can be done safely if the patient and the team share optimal conditions. In fact, some studies suggest that patients may present a lower rate of morbidity.^{27,28}

CONCLUSION

Treatment of emergency diverticulitis remains controversial. The tendency is that most surgeons support

the laparoscopic treatment over conventional open surgical approach.

There is a need for prospective studies; in order to elucidate what is the best surgical approach, however currently the laparoscopic approach seems to have less complications and shorter hospital stay rates.

Laparoscopic surgery in two stages; lavage and drainage and subsequent elective prophylactic colectomy, shows the best short and long term results with lower morbidity, less blood loss, shorter hospital stay and better quality of life than the classical laparoscopic Hartmann surgery. While laparoscopic surgery appears to be a safe and effective alternative to open surgery in selected patients with complicated diverticulitis with peritonitis, it's superiority over the traditional approach needs warrants confirmation.

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