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Long-Term Outcomes of Laparoscopic Peritoneal Lavage for Complicated Diverticulitis in a Dedicated Emergency Surgery Service

*Rhodes K and Behar N**

Emergency Surgery Department, Chelsea and Westminster Hospital, UK

Abstract

Aim: A dedicated emergency surgery service allows for faster accumulation of experience in procedures that are otherwise infrequent; laparoscopic peritoneal lavage (LPL) of complicated diverticulitis is one such procedure. We describe our long-term outcomes on an intention to treat basis with LPL.

Method: Data was collected on 31 consecutive patients undergoing LPL in our unit between 2011 and 2015. Outcomes assessed were post-operative complications including the requirement for further interventions, length of stay and mortality. All patients requiring surgery underwent initial laparoscopy with a view to lavage without resection.

Results: In the early outcomes, across all Hinchey grades, there were 6 further radiological or operative interventions out of 31 (19%). There were no deaths.

In the late outcomes (median 34 months follow up), across all Hinchey grades, there were 7 further operative interventions out of 31 (23%). There were 5 deaths overall (16%) with mean days to death of 498 days. All deaths were of non surgical causes. Two cancers were detected due to our routine policy of colonoscopic follow up. 3 out of 22 (14%) remaining patients with non-respected colon were admitted with uncomplicated diverticulitis during median follow up period of 34 months.

Conclusion: Laparoscopy with a view to washout on an intention to treat basis appears safe, across all Hinchey grades of diverticulitis within the context of close post-operative monitoring and colonoscopic follow up. LPL also allows laparoscopic relief of small bowel obstruction in patients presenting with this bystander complication of diverticulitis. Further radiological drainage after LPL in this study appears feasible without resorting to resection although 1 of 3 patients progressed to a Hartmann's procedure which was uneventful. Based on our findings of subsequent malignancy in two patients, we would advise timely post-operative colonoscopy and follow up in all patients.

Introduction

Laparoscopic peritoneal lavage (LPL) has become a recognised and useful procedure for managing complicated diverticulitis [1-4].

Within the context of a dedicated emergency surgery service, experience can accumulate faster than would otherwise be possible. Furthermore, close monitoring of these patients may enable the surgeon to recognise complications and failures early, resulting in successful salvage.

In our department, all patients presenting with diverticulitis are admitted under a single team dedicated to management of emergency surgical patients without the distraction of elective surgery. Patients with significant peritonitis undergo prompt CT scanning and decisions are made early at a consultant level whether to proceed to surgery or not.

Those patients with CT diagnosis of Hinchey I diverticulitis with a consistent clinical picture, are managed conservatively with antibiotics. Patients with Hinchey II diverticulitis diagnosed on CT scan are considered for radiological interventional drainage (IR) in the first instance; whereas patients, in whom IR is unfeasible or unsuccessful, are offered LPL. All patients suspected to be Hinchey III or IV are offered LPL and those found to be Hinchey IV at the time of LPL are converted to laparotomy and resectional surgery.

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Correspondence:
Nebil Behar, Department of Surgery, Chelsea and Westminster Hospital, 369 Fulham Road, London, SW10 9NH. UK, E-mail: nebil.behar@chelwest.nhs.uk

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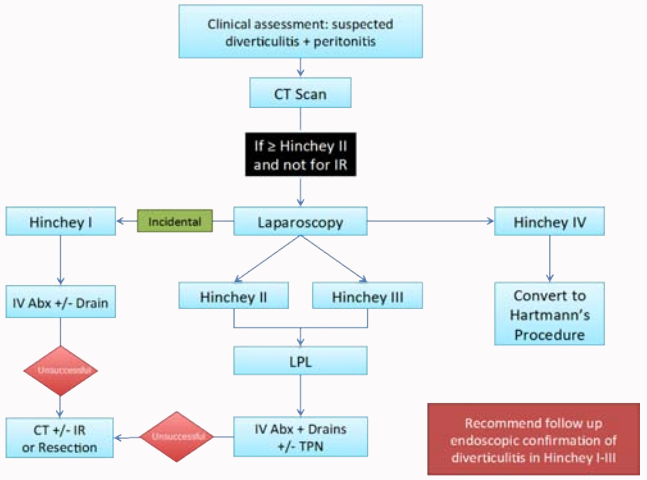

Figure 1: Algorithmic approach to patient's presenting with acute diverticulitis.

Aims

In this study, we aim to demonstrate our early and late outcomes adhering to a LPL first approach in all patients requiring surgery. We also describe our use of antibiotics, drains, parental nutrition and intensive care bed stay in this group of patients.

Methods

Data was collected on 31 consecutive patients undergoing LPL in our unit between 2011 and 2015.

Decision to operate was undertaken based on patient's clinical picture (peritonitis and sepsis) in conjunction with CT scan findings. If either of these implicated Hinchey III or Hinchey IV diverticulitis then patient was taken to theatre for LPL. If Hinchey II was suspected on CT scan, then patient was referred for IR drainage and only offered LPL if this was not feasible. Patients felt to be Hinchey I was managed conservatively with antibiotics. See Figure 1. Despite this algorithmic approach, we have performed LPL on 10 patients with finding of Hinchey I diverticulitis at the time of laparoscopy. Our decision to include all patients undergoing LPL was based on our aim to analyse outcomes on an intention to treat basis. We believe that including Hinchey I in this context is important; as operations performed in patients who could otherwise improve without surgery must be included to fully assess the role of LPL in diverticulitis.

We have collected data on the post-operative progress of all patients who were managed with LPL. We have also followed these patients up in the months following discharge using GP records, outpatient letters and subsequent admissions, to determine the need for further interventions.

Results

In total 31 patients underwent LPL; 4 patients were noted to have Hinchey IV diverticulitis at laparoscopy and were converted to laparotomy and Hartmann's procedure. Of these patients, 2 required further surgical intervention within the same admission and 2 subsequently as an elective procedure (1 for incisional hernia repair and 1 for reversal of Hartmann's).Of the remaining 27 patients, 10 were found to have Hinchey I diverticulitis, 9 Hinchey II and 8 Hinchey III (Table 1).

8/27 (30%) patients were given TPN for 7 days or more.

Table 1: Table of patient demographics.
8/27 (30%) patients were given TPN for 7 days or more.
8/27 (30%) patients had small bowel obstruction relieved at the time of LPL as evidenced by a clear transition

Patient	Hinchey Grade	Age	ASA Grade	Length of survival postpone (months)	Cause of death
1	2	83	2	9	Alzheimer's
2	2	56	3	22	Pneumonia
3	2	67	4	6	Leukaemia
4	3	90	2	10	Alzheimer's
5	3	60	3	36	Pneumonia

Table 2: Adjuncts to Laparoscopic Peritoneal Lavage.

Hinchey Grade	Median Post-op stay in days	TPN	Antibiotics (median)	High-dose Probiotics	ITU admission	Relief of SBO	No. of drains (median)
1	5	0%	10	30%	0%	30%	1
2	19	33%	15	22%	22%	11%	2
3	18	63%	17	63%	63%	50%	2

Table 3: Overall Mortality at Median 34 Months.

Hinchey Grade (n)	Sex (M:F)	Age (median)	ASA grade (median)	Previous episodes (%)	Length of Stay in days (median)
1 [10]	7:3	45	1	10%	4 (range 2-9)
2 [9]	5:4	58	2	33%	11 (range 4-65)
3 [8]	5:3	84	3	13%	16 (range 7-37)
4 [4]	1:3	61	2.5	25%	50 (range 10-215)

8/27 (30%) patients had small bowel obstruction relieved at the time of LPL as evidenced by a clear transition point related to septic focus.

Antibiotics were given to all patients, Hinchey I for median length of 10 days (range 5-13), 15 days for Hinchey II (range 12-43) and 17 days for Hinchey III (range 7-37).

High-dose probiotics were given in 10/27 patients and no patients were found to have toxin positive C diff infection post-operatively Table 2.

There were 5 deaths in total in long term follow up; these were of non-surgical causes and not related to diverticulitis. These are detailed in Table 3.

Early outcomes, same admission

- 1/10 Hinchey I required IR drainage in post-op period
- 1/9 Hinchey II required sigmoid colectomy
- 2/8 Hinchey III required IR drainage
- 2/4 Hinchey IV required further laparotomy and washout
- No deaths within same admission, across all Hinchey grades

Late outcomes, at median 34 months (range 1-60)

- 2/10 Hinchey I required further resection. 1 cancer, 1 benign
- 2/9 Hinchey II required further resection. 1 cancer, 1 benign
- 0/8 Hinchey III required further resection.

Table 4: SORT predicted mortality.

	Mean Predicted Mortality using SORT (%)		
Hinchey Grade	Intention to Treat	1st Line Hartmann's	Elective Resection
1	0.75	1.09	n/a
2	3.14	4.44	0.94
3	6.89	9.61	2.09
4	6.49	6.49	n/a

Table 5: Patients requiring IR drainage and further surgery post LPL.

Hinchey Grade (n)	Radiological Drainage	Early Emergency Surgery	Late Elective Surgery
Hinchey 1 (10)	1	0	2
Hinchey 2 (9)	0	1	2
Hinchey 3 (8)	2	0	0
Hinchey 4 (4)	1	2	2

- 2/4 Hinchey IV/Hartmann's required further elective operations

- 5/31 deaths overall at long-term follow up (16%), 3 Hinchey II, 2 Hinchey III. Mean days to death 498 days. All deaths were of non-surgical causes.

- Only 3 patients were readmitted with uncomplicated diverticulitis (Hinchey I)during the follow up period across all groups despite a relative policy of non-resection.

'Surgical Outcomes Risk Tool' (SORT) Predicted Mortality

In our case series, 30-day mortality was zero. However we decided to compare the predicted mortality associated with our departmental protocol of intention to treat laparoscopy against that of a first line Hartmann's procedure (For Hinchey II and III patients), to do this we used the SORT Surgery score. Further to this, we also assessed the risk associated with an elective resection, which may be required in the future by some patients with recurrent disease (Table 4).

Discussion

In our unit, further elective resection was offered only to patients with future complications such as fistulating disease, obstruction or cancer. Despite this policy, only 3 patients had uncomplicated diverticulitis which was successfully managed with antibiotics at median follows up of 34 months. This is in contrast to other studies that have used LPL as a bridge to elective resection [5]. In our study 2 patients required subsequent elective surgery; 1 patient for obstruction at 11 months in whom it could be argued that earlier surgery would have prevented the deterioration to obstructing disease and one patient for colovesical fistula at 4 months. Both patients recovered from elective surgery without complications. Of the 2 patients with cancer both were diagnosed post LPL at colonoscopy at 1 month and 2 months and managed palliatively with defunctioning colostomy in view of advanced disease and co-morbidities (Figure 2).

In our hospital, we have excellent access to interventional radiology. As a result, many of our Hinchey II cases would not have progressed to LPL. Furthermore, if a patient developed a sequential drainable collection after LPL we were able to employ radiological drainage in the first instance rather than undertaking resection. In total 3 patients required post-LPL radiological drainage; although one of these patients later required Hartmann's procedure within the same admission for on-going sepsis.

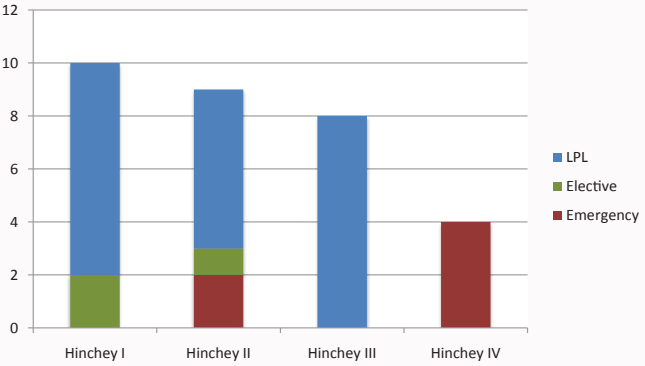

Figure 2: Resectional surgery following initial Laparoscopic Peritoneal Lavage.

On the other hand, based on our outcomes for Hinchey II patients, it could be argued that if IR is not available then LPL appears to be a safe alternative to resection in Hinchey II patients.

Studies have shown that mortality in complicated diverticulitis requiring surgery ranges from 12-36% [6-9]. Whilst we accept that Hinchey I patients might not have needed LPL or resection; some of these patients, if laparoscopy is not performed, end up with a laparotomy and resection in an emergency setting with associated increased mortality. In our pragmatic study, no patient died in the short or long-term follow-up period from surgery for diverticulitis when following the algorithm in Figure 1.

In total, 4 patients had to undergo further elective surgery after LPL. These operations were conducted either for further complications of disease or for finding of cancer at subsequent colonoscopic examination. Of these, 2 were early elective operations for cancer, 1 anterior resection for diverticular stricture at 11 months and 1sigmoid colectomy and defunctioning ileostomy for colovesical fistula at 4 months. Only 1 patient required further emergency surgery after successful LPL; this was for poor control of sepsis which required Hartmann's Procedure at day 4 (Table 5).

Interestingly our study reveals prolonged hospital stay and antibiotic usage despite the minimally invasive nature of LPL. We believe that in the context of complicated diverticulitis our study shows the benefits of LPL to be reduction in mortality and morbidity compared with the standard resectional surgery rather than the commonly used outcomes in laparoscopic surgery of shorter hospital stay and earlier return to daily activities.

Conclusion

Low mortality is achievable with LPL first approach in an unselected group of patients presenting with peritonitis and/or CT findings of complicated diverticulitis. LPL allows good initial control of sepsis and does not appear to compromise the outcome of future interventions such as radiological drainage or resectional surgery in our study.

Patients in Hinchey II and III categories required prolonged hospital stay (19 and 18days respectively) and antibiotics (15 and 17 days respectively). In total, 23% (7/31) of patients required further emergency interventions across all Hinchey grades during the index admission. In this context, we believe continuity of care by a team of dedicated Emergency Surgery Service is essential for daily monitoring and early decisions that lead to timely changes in management.

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