A Systematic Review Of The Role Of Laparoscopic Peritoneal Lavage In Hinchey III Peritonitis

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Rosaria Scarpinata and Savvas Papagrighiadi

Abstract

BACKGROUND Although standard methods of treatment seem to have gained large consensus for Hinchey I-II and IV, the management of Hinchey III peritonitis still remains an object of debate. Laparoscopic peritoneal lavage is a novel technique reported to lead to resolution of generalized purulent peritonitis in most cases. However it has not yet been recognised as a mainstream treatment option for patients with generalized purulent peritonitis. OBJECTIVES The aim of this paper is to examine whether laparoscopic peritoneal lavage represents adequate primary treatment for Hinchey III peritonitis. DATA SOURCES We carried out a systematic review by using electronic databases (Pubmed, Science Direct, Google Scholar) for the period 2002-2012, using the key words ‘perforated diverticulitis’, ‘peritonitis’, ‘Hinchey III’, ‘laparoscopic’, ‘peritoneal lavage’. All searches were based on English language publications. STUDY SELECTION All studies reporting data on laparoscopic peritoneal lavage were included. MAIN OUTCOMES MEASURES 230 patients from 10 studies were selected for data extraction. All patients had purulent peritonitis (Hinchey III) and were treated with laparoscopic peritoneal lavage. Morbidity was 12.73% and overall failure rate of 1.3%. Furthermore 2.6% patients were readmitted in acute setting after discharge and only 0.8 % required surgery. CONCLUSION Peritoneal lavage has not been recognised as standard procedure in patients with Hinchey III peritonitis yet. The published papers showed promising results, with high efficacy, low morbidity and mortality despite patient comorbidity and disease severity. It remains unproven whether secondary resections need to be performed in those patients who had a successful laparoscopic peritoneal lavage.

KEYWORDS: Perforated diverticulitis, Peritonitis, Hinchey III, Laparoscopic, Peritoneal lavage
INTRODUCTION

The emergency treatment of perforated diverticulitis has evolved over the past two decades. The advent of CT-guided percutaneous drainage has allowed up to 80% of patients with pelvic abscess to avoid emergency surgery\(^1,2\). Currently only patients with abscess unsuitable for drainage and diffuse peritonitis or free air on abdominal imaging are brought to the operating room immediately\(^3,4\). These patients are found to have generalized purulent or faecal peritonitis, both conditions requiring emergency surgery. Regardless of the selected strategy, emergency operations for acute perforated diverticulitis are associated with substantial morbidity (up to 50%) and mortality (15% to 25%). As many surgeons are reluctant to risk anastomosis in this setting, Hartmann’s procedure remains the favoured option for patients with generalised peritonitis\(^3,5\). However restoration of bowel continuity after Hartmann’s procedure is a technically difficult operation, with high morbidity and mortality. Furthermore stoma reversal is performed only in 50% to 60% of the patients because of fitness issues, with subsequent impact in their quality of life and costs\(^6,7,8\).

Recently, laparoscopic peritoneal lavage (LPL) has emerged as an effective alternative for some patients with perforated diverticulitis with purulent peritonitis (Hinchey III classification). However the use of this technique has not become the standard of treatment yet. The laparoscopic approach with lavage, drainage and avoidance of colonic resection seems to have a low morbidity and mortality despite patient comorbidity and disease severity. There is a low risk of readmission and in many cases subsequent elective sigmoid resection may be unnecessary\(^9,10\). Several studies have demonstrated that peritoneal lavage is feasible and it can be safely performed for perforated diverticulitis complicated by purulent peritonitis\(^10,11,12\). However it is still unclear whether its application in patients with Hinchey III may potentially lead to better outcomes than Hartmann’s resection or sigmoid colectomy with anastomosis.

The aim of this review is to provide a comprehensive and critical analysis of the available data in the literature on peritoneal lavage performed in patients with Hinchey III peritonitis. We aim also to examine whether the choice of LPL in Hinchey III peritonitis can only serve as a temporary solution for the acute phase or represent the definitive treatment in those patients who remain asymptomatic.

METHODS

The method used was a systematic literature review.

*Studies identification and inclusion criteria (Figure 1)*
Primary outcomes examined were: mortality, morbidity, hospital stay. Secondary outcomes examined were: readmission, secondary colonic resection.

Two reviewers (R.S., S.P.) completed a comprehensive search of electronic databases (Pubmed, Science Direct, Google Scholar) for the period 2002 to 2012, using the key words ‘perforated diverticulitis’, ‘peritonitis’, ‘Hinchey III’, ‘laparoscopic’, ‘peritoneal lavage’. All searches were based on English language publications. Two combinations of key words were constructed. The first one consisted on Hinchey III AND laparoscopic AND peritoneal lavage the second one on perforated diverticulitis AND peritonitis AND laparoscopy. The reference lists provided by the identified papers was additionally hand-searched for additional studies missed by the search strategy, and this method of cross-referencing was continued until no further relevant publications were identified. The reviewers extracted the following data from eligible studies according to a pre-specified protocol: first author, publication year, study design, number of subjects, complications, readmission rate, secondary resection rate and follow up. All studies with minimum 5 cases reporting outcomes on laparoscopic peritoneal lavage for Hinchey III were included in the review process; all studies on resection-anastomosis in two or three stages were excluded. One of the largest study reporting data on laparoscopic peritoneal lavage was excluded from this analysis as there was no clear distinction between Hinchey II and III in the patient selection process. 

All patients included in this review presented clinical signs of generalized peritonitis and radiological evidence of perforated diverticulitis confirmed on CT. We also included unstable patients with preoperative localised pericolic extraluminal gas on CT and intraoperative findings of purulent peritonitis.

RESULTS

After an initial screen of 62 titles, 10 studies met the predefined inclusion criteria. The review included 6 case series and 4 cohort studies. A total of 230 patients were identified, with a mean age of 59 and ASA grade ranging I-IV (Table 1).

Technique

The surgical procedure consisted in all cases of inspection of the entire abdominal cavity to confirm the diagnosis, culturing and aspirating free purulent fluid in the peritoneal cavity, identifying and bluntly dissecting out the diseased sigmoid colon, opening all purulent cavities and washing with copious warmed saline (range 4-10L) until clear return was achieved. If macroscopic perforation of the sigmoid colon was identified it would be
closed by using delayed absorbable suture material and further reinforced with a piece of epiploic appendiceal patch. The procedure was completed by drains placements adjacent to the inflamed colon, pelvis and any other area of significant contamination. Intravenous broad spectrum antibiotic therapy is continued after LPL for at least 5 days before being changed to oral therapy to complete 10 days course.\textsuperscript{9,10,11}

Morbidity and mortality (Table 2)

None of the articles reviewed described if data on morbidity and mortality were for 30 days, 60 days, 90 days or the entire duration of the study. It is likely that the morbidity was within 30 days following laparoscopic peritoneal lavage. There was no mention about morbidity classification in the articles selected. After systematic analysis of the data, the authors of this review graded the complications in accordance to the Clavien-Dindo classification (CD). The incidence of complications ranged from 0\% to 33\%. The complications included prolonged ileus\textsuperscript{12}, respiratory infection, and urinary tract infection\textsuperscript{14} (grade II CD), pelvic collection. Two studies reported pelvic collections, Karoui and Bretagnol 1 and 2 cases respectively, treated successfully with CT scan drainage (grade IIIa CD). Favuzza described 1 case of failure of CT scan drainage of pelvic collection which required resection and anastomosis (grade IIIb CD). Taylor reported 1 case of resection and anastomosis on a obese man who remained with significative tenderness and fever on the third post-operative day (grade IIIb CD). Myers reported 1 case of CT drainage failure requiring Hartmann’s procedure (grade IIIb CD). This gives an overall failure rate of 1.3\% (3/230) for those who required surgery on the same admission. Myers reported 3 deaths (grade V CD) due to 2 cases of multiple organ failure and 1 pulmonary embolism but it is unclear if those deaths were on patients with Hinchey II or III peritonitis.\textsuperscript{10} No deaths occurred in the other studies.

Hospital stay (Table 2)

The mean length of hospital stay ranged from 5 to 14 days. Liang compared laparoscopic peritoneal lavage vs. laparoscopic Hartmann’s procedure and he found that patients treated with Laparoscopic Hartmann’s procedure had significant longer hospital stay compared with those underwent laparoscopic peritoneal lavage (16.3±10.1 vs.6.6±2.4 days, P< 0.01). Karoui compared laparoscopic peritoneal lavage to resection with primary anastomosis and defunctioning stoma for Hinchey III and he described a median shorter hospital stay in patients who underwent laparoscopic lavage (8 vs.17 days, P< 0.0001). The same author found no differences in postoperative morbidity or mortality between patients treated with laparoscopic peritoneal lavage and patients treated with open primary resection with diverting colostomy (historical controls matched for Hinchey...
stage).

Readmission (Table 2)

Hospital readmissions are reported in 5 studies\textsuperscript{10,14,15,16,17} and the overall readmission incidence for Hinchey III was 2.6% (6/230) for the entire duration of the study. The main cause described for acute hospital readmission was intra-abdominal sepsis. Lam and Mutter reported 1 hospital readmission post-discharge due to generalized peritonitis treated with resection and anastomosis in the first case and resection and anastomosis with covering stoma in the second one. One study\textsuperscript{15} described 1 readmission for pelvic abscess which was successfully managed by CT percutaneous drainage. Myers and Karoui reported 2 and 1 readmissions respectively for acute recurrent attack of diverticulitis which resolved with antibiotic therapy.

Secondary resection (Table 2)

The studies selected in this review reported a mean incidence of elective readmissions for resection and anastomosis of 60.3%. The main indication for the elective procedure was prophylaxis of relapsing attacks. Only one study\textsuperscript{15} described a readmission rate of 100% for elective resection. Elective procedures were not performed if patients refused surgery\textsuperscript{11} or were considered unfit for general anaesthesia due to severe comorbidities\textsuperscript{14}. Patients who did not have secondary resection remained asymptomatic without requiring any further surgical intervention\textsuperscript{16}. In our review 1 study reported zero hospital admissions for elective secondary colonic resection\textsuperscript{10}. No episodes of recurrence were described in this study during the follow up period.

Follow up (Table 2)

The follow-up period was reported in 7 out of 10 studies. The patients were monitored after laparoscopic drainage with a range of follow-up period of 6-96 months. Most studies reported post-operative investigations including double contrast enema and colonoscopy to define the extend of the disease and to rule out an underlying neoplasia. Myers highlights the importance of vigilance in cases where diseased colon is not resected as there is a potential for missing malignant disease. In our review only 1 study reported an incidental descending colonic carcinoma in one patient, who subsequently underwent elective left hemicolectomy for a T1 N0 M0 tumour\textsuperscript{10}.

DISCUSSION

Complicated diverticulitis with perforation is frequently encountered
in the emergency and its management is guided, in the majority of cases, by the extension of the disease as well as the general condition of the patient\textsuperscript{17}. Many cases of perforated diverticulitis do not require immediate resection. 15-20\% of diverticulitis cases develop abscesses (Hinchey I and II) which are potentially drainable radiologically\textsuperscript{18} \textsuperscript{19}. Data from the literature suggest that CT-guided abscess drainage is a well-established treatment avoiding the hazards of emergency surgery in at least 30 to 40\% of cases. Smaller abscesses (\( \leq 3 \) cm) can often be treated successfully with antibiotics alone, larger abscesses by combined drainage and antibiotics\textsuperscript{20}. However conservative management based on antibiotics alone is often inadequate and percutaneous drainage of an abscess is only indicated for those patients without peritonitis. Immediate colonic resection with stoma formation is widely supported for patients with perforated diverticulitis complicated by faecal peritonitis (Hinchey IV)\textsuperscript{20}. Although methods of treatment seem to have gained large consensus for Hinchey I-II and IV, the management of Hinchey III peritonitis still remains object of debate dividing surgeons between resective procedures and minimally invasive approach. Laparoscopic peritoneal lavage, firstly described by O’Sullivan in 1996, has been demonstrated as safe and feasible procedure in patients with Hinchey III peritonitis. Many authors report successful outcomes after LPL with complete resolution of generalized purulent peritonitis in most cases\textsuperscript{10,12,16,20}. However it is still unclear whether LPL represents adequate primary treatment in generalized purulent peritonitis. In our review LPL was performed in 230 patients, it was associated with low risk (12.73\% - mean percentage rate) of post-operative complications and overall failure rate of 1.3\% (3/230) for those who required further surgical treatment during the same admission. Furthermore 2.6\% (6/230) patients were readmitted in acute setting after discharge and only 0.8 \% (2/230) required surgery (Table 2).

The technique seems to be highly promising for all patients with Hinchey III and it should represent the first choice treatment for those with severe comorbidities where unnecessary laparotomies could be life threatening. Furthermore the advantage of stoma avoidance reduces the need for surgical reversal and subsequently the risk of related morbidity and mortality\textsuperscript{20}.

An important issue is whether the patients should have a subsequent planned elective surgical procedure after successful LPL and whether those who did not have secondary resection would be readmitted if they are monitored longer. During a follow up period ranging from 6-96 months we found a high readmission rate for secondary resection compared to acute readmission post-LPL. The low readmission rate in acute setting did not justify the high number of patients who were planned for secondary resection. In fact 60.3\% (mean percentage rate) of the patients were readmitted for elective resection with no evidence of recurrence of acute attacks of diverticulitis in the interval period between hospital discharge and date of elective surgery (Table 2). That suggests that LPL could represent a definitive
treatment for selected patients who remained asymptomatic in the follow up period. Reduced morbidity and mortality together with shorter hospital stay would translate in significant saving of resources.

In this regard Karoui reported a significantly shorter hospital stay (8 vs. 17 days, P< 0.0001) in patients with Hinchey III who underwent LPL compared to those who received colonic resection. Similarly Liang reported a longer hospital stay in patients treated with laparoscopic Hartmann’s procedure compared to those who underwent laparoscopic peritoneal lavage (16.3±10.1 vs. 6.6±2.4 days, P< 0.01). However these data are not sufficient to clearly define the impact of LPL on cost/benefit rapport.

CONCLUSION

Laparoscopic peritoneal lavage combined with intravenous antibiotics is a safe and feasible procedure and it is associated with low morbidity and mortality in patients with Hinchey III peritonitis from diverticulitis. The control of the source of sepsis without major surgical resection and fashioning of colostomy in the emergency setting reduces the hospital stay with significantly decreased morbidity-mortality and economical costs. This approach may represent a definitive treatment of purulent peritonitis secondary to perforated diverticulitis. It is also a safe procedure, especially for those patients with severe comorbidities for which a major resection could be high risk. The evidence we reviewed in this study suggests that peritoneal lavage may represent a successful alternative to more radical procedures. It remains unproven whether secondary elective colonic resection needs to be performed as current guidelines have changed and there is no more recommendation for elective surgery after 2 or 3 attacks of diverticulitis. Longer follow up is necessary to better define the role of peritoneal lavage and whether it can be recognised as standard procedure in patients with Hinchey III. Without a prospective randomized trial it cannot be determined whether the grade of disease or the procedure itself leads to improved short-term outcomes. There are currently randomized studies in progress using peritoneal lavage for Hinchey stage 3 disease such as LAPland, DILALA, SCANDIV. Their future results may provide indications and standardisation of the technique.

REFERENCES

1 Stabile BE, Puccio E, vanSonnenberg E, Neff CC (19909. Preoperative percutaneous drainage of diverticular abscesses.


Table 1 Study design and patient characteristics

<table>
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<tr>
<th>Year</th>
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<th>Type of study</th>
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Table 2: Authors' experience for laparoscopic peritoneal lavage in Hinchey III peritonitis

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<th>Authors</th>
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NR: not reported
Figure 1. Screening process

Records identified through databases searching n=62

Additional records identified through other sources n=0

Articles after duplicates removed n=41

Guidelines (n=1)
Reviews (n=1)
Commentaries/letters (n=6)
Articles not relevant for the topic (n=12)
Articles containing < than 5 cases (n=4)

Records screened n=41

Full text articles assessed for eligibility and included in quantitative and qualitative synthesis (systematic review) (n=10)