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Chapter 7

Laparoscopic peritoneal lavage for perforated colonic diverticulitis: a systematic review

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Abstract

Aim: This systematic review aimed to evaluate the efficacy, morbidity and mortality of laparoscopic peritoneal lavage for patients with perforated diverticulitis.

Method: We searched PubMed, EMBASE, Web of Science, the Cochrane Library and CINAHL databases, Google Scholar and five major publisher websites without language restriction. All articles which reported the use of laparoscopic peritoneal lavage for patients with perforated diverticulitis were included.

Results: Two prospective cohort studies, nine retrospective case series and two case reports reporting 231 patients were selected for data extraction. Most (77%) patients had purulent peritonitis (Hinchey III). Laparoscopic peritoneal lavage successfully controlled abdominal and systemic sepsis in 95.7% of patients. Mortality was 1.7%, morbidity 10.4% and only four (1.7%) of the 231 patients received a colostomy.

Conclusion: There have been no publications of high methodological quality on laparoscopic peritoneal lavage for patients with perforated colonic diverticulitis. The published papers do, however, show promising results, with high efficacy, low mortality, low morbidity and a minimal need for a colostomy.

Introduction

Peritonitis caused by perforated diverticulitis is a particularly serious condition and is classified according to Hinchey¹ into purulent (Hinchey III) or fecal (Hinchey IV). It is commonly treated by sigmoid resection with or without a colostomy. These operations are characterized by a high mortality^{2,3} and morbidity⁴. In many patients, the stoma is never reversed.

Several recent articles have reported laparoscopic peritoneal lavage, drainage and antibiotic treatment as an alternative to acute colonic resection⁵⁻⁷. The authors concluded that laparoscopic peritoneal lavage was a safe and effective treatment, with a low mortality, low morbidity and without the need for a stoma.

This systematic review evaluates the efficacy, mortality and morbidity of laparoscopic peritoneal lavage for patients presenting with perforated colonic diverticulitis.

Method

The following databases were searched: PubMed, EMBASE (OVID version), Web of Science, the Cochrane library, CINAHL databases, Google Scholar and the ScienceDirect (Elsevier), LWW-journals@OVID (Lippincott Williams & Wilkins), HighWire (Society journals), SpringerLink and Wiley/Blackwell publisher website search engines. All searches were performed without language restriction. Two combinations of key words were constructed. These were applied to all databases taking into account the terminological differences between them. The first one consisted of a combination of diverticulitis AND laparoscopy AND lavage. The second consisted of the combination of diverticulitis AND peritonitis AND laparoscopy. Two reviewers (BT and HS) independently screened titles and abstracts for their relevance. All articles that reported the use of laparoscopic peritoneal lavage for patients with perforated diverticulitis were included except for commentaries and correspondence. The bibliographies of all included articles were then searched for relevant references. References citing all included articles were finally retrieved. Data extraction and quality assessment were independently conducted by two reviewers (BT and HS). Disagreements were reconciled by discussion.

Results

The search produced 411 publications, of which 28 were considered relevant to the topic (figure 1). Three articles⁸⁻¹⁰ and three abstracts¹¹⁻¹³ were excluded because of the double publication of results as were nine publications including comments and correspondence¹⁴⁻²². Thirteen remaining articles were selected for further data analysis.

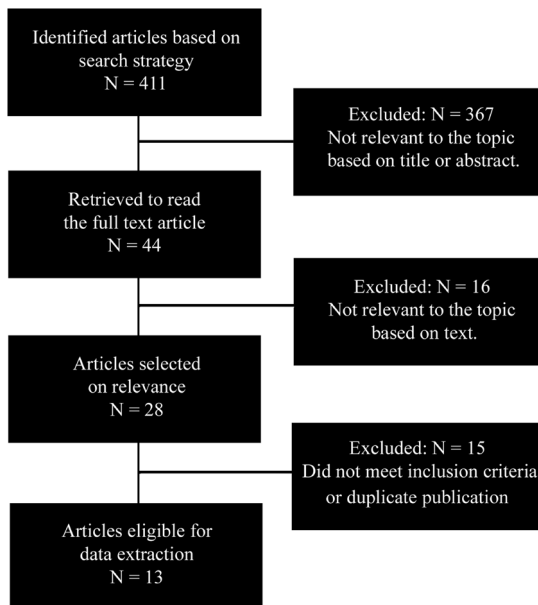


Figure 1. Summary of the literature search and exclusion process.

Quality assessment

There were no randomized controlled trials. There were two prospective cohort studies^{5,7}, nine retrospective case series^{6,23-30} and two case reports^{31,32}. In the selected papers, different variables on patient characteristics and 'materials and methods' were reported. All publications gave figures on conversion, failure of lavage, mortality, morbidity and the number of colostomies and secondary resections performed. Confirmation of diverticular colonic disease was usually acquired by colonoscopy

or a double contrast barium- or water-soluble contrast enema. Only five studies reported on the length of patient follow up^{5,6,23-25} (table 1). A meta-analysis could not be performed, but a summary of the data is presented in table 1, with pooled estimates and averages where possible.

Patient characteristics

The thirteen included publications reported 231 patients with acute colonic diverticulitis who were treated by laparoscopic peritoneal lavage. The majority (77%) had purulent peritonitis (Hinchey III). The male:female ratio was 1.7:1. Four articles stated the ASA grades in a total of 86 patients^{6,7,24,28}. Of these, 24 were classified as ASA grade 1, 42 as grade 2, 15 as grade 3 and 5 as grade 4. Forty-six of 189 (24%) patients were reported to have had a previous history of colonic diverticular disease in six studies^{5-7,24,26,32}, and eight reported that 173/187 (93%) patients had generalized peritonitis^{5,6,23-26,30,31}. Abdominal computed tomography prior to surgery was mandatory in four studies^{6,25,27,30}, was never used in one²⁴, and not reported in eight. Eleven articles reported the presence of free abdominal air, which was present in 156/225 (69%) patients (table 2).

Treatment

Between two and five trocars were used for the laparoscopic procedure and the volume of irrigant used varied from 3 to 25 l. Warmed saline solution was generally used, but in one institute, additional diluted iodine and heparin were administered⁶. In some institutions, adhesions were left intact^{5,7,27} while others divided adhesions and searched for the perforation which was either glued or sutured^{6,24,25}. Nearly all patients were given one or two drains (closed suction or nonsuction) at the end of the procedure. The mean operating time was 70 min (range 40–150 min) for 69 patients from four studies^{6,24,25,28}. All patients received antibiotics which were usually given intravenously pre- and postoperatively and changed to oral medication after 4–7 days. Eleven articles reported the mean hospital stay which was 8.5 days (range: 4–35 days)^{5,7,23-28,30-32}.

Table 1. Quality assessment of the included articles.

Author	Year	Country	N	Study design	Study type	Confirmation of diverticular disease	Length of follow-up in months
O'Sullivan	1996	Ireland	8	Case Series	Retrospective	C/BE	12-48
Aouad	1997	France	1	Case Report	Retrospective	GE	NR
Faranda	2000	France	18	Case Series	Retrospective	BE	(4)
Da Rold	2004	Italy	7	Case Series	Retrospective	NR	6-70 (38)
Taylor	2006	Australia	14	Case Series	Retrospective	C	NR
Mutter	2006	France	10	Case Series	Retrospective	NR	NR
Galleano	2007	Italy	4	Case Series	Retrospective	GE	NR
Lippi	2007	Italy	5	Case Series	Retrospective	NR	NR
Myers	2008	Ireland	92	Cohort study	Prospective	C/BE	12-84 (36)
Franklin	2008	USA	40	Case Series	Retrospective	NR	1-168 (96)
Jaffer	2008	UK	1	Case Report	Retrospective	BE	NR
Bretagnol	2008	France	24	Cohort study	Prospective	C	NR
Favuzza	2009	USA	7	Case Series	Retrospective	NR	NR

Values in parentheses are mean follow-up periods.

NR, not reported; C, colonoscopy; BE, barium enema; GE, gastrograftin enema.

Table 2. Patient characteristics (ages are given in means).

Author, year	N	Hinchey classification				Age	Age range	Male	Female	Generalized Peritonitis	
		I	II	III	IV					Free air	Free air
O'Sullivan, 1996	8	0	0	8	0	57	30-67	5	3	7	1
Aouad, 1997	1	0	0	1	0	37		1	0	1	1
Faranda, 2000	18	0	0	16	2	54	37-74	8	10	11	12
Da Rold, 2004	7	1	1	5	0	65	45-95	5	2	7	7
Taylor, 2006	14	0	2	10	2	57	36-86	8	6	9	10
Mutter, 2006	10	0	0	10	0	60	38-76	9	1	NR	3
Galleano, 2007	4	0	2	2	0	68	60-79	2	2	Local	1
Lippi, 2007	5	0	2	3	0	80	72-90	NR	NR	Local/Gen	NR
Myers, 2008	92	0	25	67	0	63	39-94	61	31	92	92
Franklin, 2008	40	0	5	32	3	60	28-99	26	14	40	13
Jaffer, 2008	1	0	1	0	0	50		1	0	Local	NR
Bretagno, 2008	24	0	5	18	1	56	26-82	11	13	NR	16
Favuzza, 2009	7	0	1	6	0	49	35-66	5	2	6	0
Total/Mean/Range	231	1	44	178	8	60	26-99	142	84	173	156

NR, not reported; Local, local peritonitis is all patients; Local/Gen, local or generalized peritonitis in all patients.

Table 3. Pooled outcome data for laparoscopic peritoneal lavage in 231 patients.

Author, year	N	Conversion to laparotomy	Lavage failure	Mortality	Morbidity	Stoma	Secondary resection
O'Sullivan, 1996	8	0	0	0	2	0	0
Aouad, 1997	1	0	0	0	0	0	1
Faranda, 2000	18	0	0	0	3	0	15
Da Rold, 2004	7	1	0	0	2	0	0
Taylor, 2006	14	0	3	0	0*	2	8
Mutter, 2006	10	0	1	0	0	1	6
Galleano, 2007	4	0	0	0	0	0	4
Lippi, 2007	5	0	0	1	1	0	1
Myers, 2008	92	0	2	3	5	1	0
Franklin, 2008	40	0	0	0	8	0	24
Jaffer, 2008	1	0	0	0	0	0	0
Bretagno, 2008	24	0	2	0	2	0	24
Favuzza, 2009	7	0	2	0	1	0	4
Total	231	1	10	4	24	4	87
Percentage		0.4	4.3	1.7	10.4	1.7	37.7

* no major morbidity.

Outcome

Table 3 provides an overview of the pooled data on conversion, failure of lavage, mortality, morbidity, the number of colostomies and secondary resections. Eighty-seven (38%) of the 231 patients underwent delayed elective resection of the diseased portion of the colon usually laparoscopically. Recurrent diverticulitis was reported in 5/128 patients who did not undergo secondary resection. Follow-up periods were given as a mean in four studies with a weighted mean total of 48 months for 153 patients^{5,6,24,25}.

Discussion

Patients with acute colonic diverticulitis present with differing severity of disease. The Hinchey classification is often used to categorize these patients and some subsequent modifications have been published since it was described^{1,33,34}. The recommended treatment for patients with purulent or fecal peritonitis (Hinchey III and IV) is an urgent sigmoid resection³⁵. In this situation, a Hartmann's procedure is favoured by most surgeons although colonic resection with a primary anastomosis with or without a defunctioning colostomy is also feasible^{36,37}. Regardless of the selected strategy, emergency operations for patients with acute perforated diverticulitis are associated with substantial morbidity (up to 44%)⁴ and mortality. In a recent prospective analysis of 200 patients who underwent emergency resection for acute diverticulitis, the mortality was 27%², whilst another recent publication on the incidence of perforated diverticulitis in the UK reported a mortality of 24%³. Furthermore, reversal of Hartmann's procedure is not performed in 25–70% of the patients³⁸⁻⁴², thus compromising the quality of life and leading to increasing costs. This may be attributable to the fact that reversal is associated with a high morbidity and even mortality⁴³.

This systematic review identified 231 patients with acute colonic diverticulitis who were treated by laparoscopic peritoneal lavage, drainage and antibiotics. Abdominal and systemic sepsis was successfully controlled using this minimal invasive strategy in 95.7% of the patients, with minimum mortality (1.7%), morbidity (10.4%) and

stoma formation (1.7%). A delayed elective laparoscopic resection was feasible in most patients, but, significantly, those who did not undergo subsequent resection had a long recurrence free follow-up period.

Laparoscopic peritoneal lavage seems to provide adequate control of the acute inflammatory episode in most patients, but it failed to do so in 10 (4.3%) of the 231 patients^{26,30}. Two of these required a Hartmann's resection for faecal peritonitis and two underwent open resection and primary anastomosis for purulent peritonitis. Four of five patients with pelvic abscess formation inadequately treated by laparoscopic peritoneal lavage underwent radiological drainage and one had a Hartmann's resection^{5,7,30}. One other patient had an early recurrence necessitating surgery 3 weeks later²⁷. The overall mortality (1.7%) was low. Two patients died of multiorgan failure, one because of pulmonary embolism and one because of cardiogenic shock. At present, in most institutions, a delayed elective laparoscopic resection is advised after resolution of an attack of acute diverticulitis. The current practice of elective resection after two episodes of acute diverticulitis has, however, recently been challenged⁴⁴ and was not applied in the institute that reported most of the patients treated by laparoscopic peritoneal lavage reported in this review. In this study, no patient underwent a subsequent elective resection and excellent results were obtained during long-term follow up⁵.

The studies published on this topic have mostly been retrospective, nonconsecutive and of low methodological quality. Inclusion and publication bias may partially have been responsible for the favourable results. The pooling of data from heterogeneous studies, as has been done in this review, can also lead to bias.

The thirteen selected articles indicate that laparoscopic peritoneal lavage, for patients with peritonitis caused by perforated diverticulitis, is an effective and safe treatment that may be preferable to colonic resection. There appears to be a general consensus, however, that laparoscopic peritoneal lavage should not be used for patients with Hinchey grade IV diverticulitis^{5,7,23,24,26,27}. Other patients who may not benefit from laparoscopic peritoneal lavage include those with pelvic abscess formation. This is consistent with the observation that half of the patients who had a failure of lavage had a pelvic abscess.

There have been different reactions to this new approach. Some remain skeptical²¹, whilst others indicate a preparedness to change practice¹⁸ or to reconsider current management of complicated diverticulitis as a result of the publication by Myers et al.²⁰. Laparoscopic peritoneal lavage is recommended for selected patients with perforated diverticulitis by the European Association for Endoscopic Surgery (grade of recommendation C)⁴⁵ and has been included in a proposed management algorithm for patients with acute colonic diverticulitis³². Others, however, believe that this technique warrants further investigation in a controlled prospective setting^{14,46}. As laparoscopic peritoneal lavage may be an important new treatment for patients with peritonitis caused by perforated diverticulitis, it is important to establish its value in randomized controlled trials. Such a trial randomizing patients with purulent diverticulitis to either lavage or resectional surgery will start at the end of 2009.

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