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Laparoscopic Lavage and Drainage in the Management of Complicated Diverticulitis: Review of the Literature

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Abstract

Introduction: Diverticular disease affects more than 60% of adults aged older than 70. The lifetime prevalence of diverticulitis is 4%-25%, 20% of which will experience severe complications, and 1% will require emergent surgery. We review the most relevant literature regarding the management of complicated acute diverticulitis with laparoscopic lavage and drainage (LLD).

Discussion: Hartmann Procedure (HP) is considered the current gold standard for treating complicated diverticulitis; it is associated with a high mortality and morbidity. LLD is reported to improve outcomes. In addition, it may act either as a definitive procedure or as a bridge and allow for a latter elective sigmoidectomy. There is only one preliminary report of a prospective randomized trial regarding this matter (DILALA trial) which fails to demonstrate decreased morbidity and mortality between LLD vs. HP.

Conclusion: Longer follow up and results of other trials will be necessary to draw an adequate conclusion.

Keywords: Complicated diverticulitis; Laparoscopic lavage; Hartmann's procedure

Abbreviations: HP: Hartmann's Procedure; LHP: Laparoscopic Hartmann's Procedure; LLD: Laparoscopic Lavage and Drainage

Introduction

This paper reviews the current literature on the management of complicated sigmoid diverticulitis: laparoscopic lavage and drainage (LLD) vs. Hartmann's procedure (HP) with the purpose of identifying advantages and disadvantages of each procedure.

Background

Diverticular disease is common, it affects more than 60% of adults aged older than 70 in the western world [1-3]. Diverticulosis is known as the disease of the industrial revolution, since there is no evidence or pathological reports of this entity prior to the 1900s [4]. In the late 1800s, the process of roller-milling wheat was introduced and it consisted of removing two thirds of the fiber content of wheat. Coincident with this condition, diverticular disease was observed in the first decade of 1900s [4]. It is well known that a low fiber diet contributes to diverticular disease [4-8]. Most patients remain asymptomatic, but acute diverticulitis is a common complication. Diverticulitis is an inflammation of the colon that occurs as a result of the perforation of a diverticulum [5]. The life time prevalence of diverticulitis among patients with diverticulosis has been reported from 4%-25%, some believe this difference may be attributable to changes in diet, rising rates of obesity, and an aging population [9-11].

Among the patients who develop diverticulitis, 15-20% will experience severe complications such a formation of abscess, fistula, obstruction or perforation [12]. Approximately 1% will require emergent surgical intervention [13].

The most commonly used grading system for complicated diverticulitis is the Hinchey classification (Table 1) [9,14]. The management of diverticulitis depends on the severity and extent of disease. Patients with a localized abscess Hinchey grade I and II are candidates for percutaneous drainage. Most of the patients with generalized peritonitis (Hinchey grade III-IV), have a life-threatening condition which requires emergent surgical management, however the ideal surgical procedure in these situation remains controversial [1,2,10,11,15-18].

Discussion

In the last 15-20 years the management of perforated diverticulitis has changed tremendously, from Hartmann's procedure described originally for the management of colorectal cancer and later used for complicated diverticulitis [5,18,19], to less aggressive procedures known as "damage control surgery" [8,11,20,21].

Hartmann's procedure has a high rate of procedure-associated mortality and morbidity. In addition, a large number of patients never undergo restitution of intestinal transit (30-84%) [1,2,5,8,11,16-18,21-31]. Percutaneous drainage and LLD make it possible to defer emergent

Hinchey classification	Description
I	Colonic inflammation + Pericolic abscess or phlegmon (confined)
II	Colonic inflammation + Retroperitoneal or pelvic abscess (distant)
III	Colonic inflammation + Purulent peritonitis
IV	Colonic inflammation + Fecal peritonitis

Table 1: Hinchey classification

surgical resection in some patients. Both of these procedures allow the peritoneal inflammation to subside and permit a subsequent elective sigmoid resection and primary anastomosis with decreased morbidity and mortality [20]. LLD and drainage has been proposed as an alternative to Hartmann's procedure for Hinchey stage III and IV diverticulitis [10,20,32]. In 1996 O'Sullivan and colleagues (Ireland) [33] described this procedure for acute non-feculent peritonitis. It involves copious washout of the peritoneal cavity and the placement of drains [11,17], with no colonic resection, nor colostomy [1].

Currently, LLD is accepted in the guidelines proposed by the European Association of endoscopic surgeons [29] as well as the Dutch for the management of perforated diverticular disease [11] however it is still not endorsed in the guidelines of the American Society of Colon and Rectal Surgeons (ASCRS).

This procedure, considered a damage control surgery, has shown to have decreased operating time, decreased blood loss and, in some studies, decreased post-operative complications when compared with HP. However, to date there are no prospective randomized controlled trials to provide an adequate level of evidence on which to base a clinical decision. Furthermore, to make the issue more complex, it is unclear what the fate of the patients who undergo LLD is… (Do they require later elective sigmoid resection or observation only?). We will review the most relevant studies addressing this issue. It is important to note the heterogeneity of the studies (including selection criteria) and the bias inherent to the retrospective nature of each of them. Table 2 summarizes the results of the trials reviewed.

Faranda et al. [34] report their experience with LLD for patients with generalized peritonitis that included 16 patients with Hinchey stage III disease and 2 patients with Hinchey stage IV with successful outcomes [35]. The procedure involved spreading biologic fibrin glue directly in the inflamed zone (18 cases), suture repair in 4 cases and omentoplasty in 6 cases. No conversion to laparotomy was needed, there was no mortality and the mean hospital stay was 8 days. Fifteen patients underwent posterior elective laparoscopic sigmoid resection at an interval of 3 to 4 months from the first surgical intervention [31]. This study contrasts sharply with Swank et al. [16] results. They observed 5% mortality and 32% morbidity. Ongoing abdominal sepsis after LLD which required emergent surgery occurred in 13% of the patients. They included only patients with Hinchey stage II and III disease [16].

Liang et al. [17] prospectively compared LLD vs. laparoscopic Hartmann's procedure (LHP) in 88 consecutive patients; unfortunately they do not provide the selection criteria for either LLD (n=47) or LHP (n=41). They found a statistically significant decrease in operating times (100 vs. 182 min), blood loss (35 vs. 210 ml) and conversion rate (2.1 vs. 14.6%) among the LLD cohort. They report morbidity and mortality together; at 4.3% and 12.5% (only 1 death in the LHP group) it was statistically significant. At long term follow up (time not specified) 44% of the patients in the LLD underwent posterior elective sigmoidectomy, the remaining patients had favorable outcome [17]. In the LHP 72% underwent laparoscopic colostomy closure. The reader of this study must also bear in mind that a LHP in grade III diverticulitis is a complex procedure requiring an experienced laparoscopic surgeon for its completion.

Karoui et al. [24] retrospectively compared LLD vs. laparotomy and primary anastomosis with defunctioning ileostomy (n=35 vs. 24 respectively) in the management of Hinchey III diverticulitis. In the LLD group no conversion to laparotomy was necessary. In the Laparotomy with primary anastomosis no patient required colostomy [23]. No post-operative mortality was reported in either group. When compared to the patients who underwent primary resection and anastomosis with ileostomy post-operative morbidity was higher in the latter group (42%). In this study 26.5% of patients successfully treated by LLD did not undergo further elective sigmoidectomy only one was readmitted 3 weeks after their first event because of recurrent diverticulitis (mean follow up of 21 months). Of the remaining 25 patients all but one underwent elective laparoscopic sigmoid resection [24].

Interestingly Karoui et al. [24] compare the result of those patients who underwent LLD and a later laparoscopic resection (n=25) with those who underwent resection with ileostomy and subsequent ileostomy closure (n=24) and found no mortality in either group. Morbidity was 24% vs. 50% respectively. Although this did not reach statistical significance, it could be attributable to the small sample size. Hospital stay was considerably shorter among the former group (14 vs. 23.5 days in total) [24].

Taylor et al. [18] report a retrospective case series of 14 patients with diverticulitis (2 grade II; 10 grade III; 2 grade IV) initially managed with LLD. 11 patients were discharged without further intervention. 3 remaining patients (2 Hinchey IV; 1 Hinchey III) required reoperation. Eight of these patients underwent further elective sigmoid resection without the need of stoma, 7 of which were performed laparoscopically [18]. Although other authors [34] reported successful outcomes of LLD in feculent peritonitis, Taylor et al. [18] report poor outcomes in these patients.

Author (year of publication)	No. of patients	Hinchey grade LLD II/ III/IV	Hinchey grade HP II/III/IV	Morbility LLD/HP (%)	Mortality LLD/HP (%)	OR time LLD/ HP	Blood loss (ml) LLD/ HP	Success of LLD (%) [1]	Hospital stay (days) LLD/HP
Faranda (2000) [34][2]	18	0/16/2	NA	16.7/NA	0/NA	NA	NA	NA	8
Taylor (2006) [18] [2]	14	2/10/2	NA	0/NA	0/NA	NA	NA	11 (79)	6.5
Myers (2008) [37][3]	100	25/67/0	0/0/8	11/?	3/?	NA	NA	91	8/18
Swank (2013) [16] [2]	38	5/29/4	NA	44.7	10.5	68	NA	31 (84)	10
Liang (2011) [17] [3,4]	88	5/36/6	3/31/7	4.3/10.9	0/2.4	**99.7/182.9**	**34.4/210**	NA	**6.6/16.3**
Gentile (2014) [36] [2]	30	14/2/0	11/3/0	21.4/31.2	7.1/25	**75/173**	NA	NA	**11/19**

Table 2: Trials summary

[1]Success of LLD is defined as control of sepsis, no need for further intervention during same hospital stay.
[2]Retrospective study
[3]Prospective study. Only case series, no comparison vs. Hartmann procedure
[4]Laparoscopic Hartmann procedure
[5]NA: Data not available or not recollected
In bold results that are statistically significant

Gentile et al. [36] made a retrospective cohort study that included 30 patients >60 years old with grade II/III diverticulitis. 14 patients underwent LLD and 16 patients open HP. Their analysis favored LLD with improved outcomes in regards to: total operative time, ICU recovery in the early postoperative period, restoration of bowel functions and length of hospital stays (when compared with HP). There was no difference between groups with regards to postoperative morbidity. Although the short-term mortality for LLD vs. HP was 7%, vs. 25%, and mortality at 12 months was 31% vs. 7% respectively, it failed to reach statistical significance. This could be attributable to the small sample size [33]. There was only 62.5% of reversal Hartmann's procedure [36].

Myers et al. [37] prospectively reviewed a case series of 92 patients that underwent LLD for Hinchey II and III diverticulitis. They report morbidity 11% and a mortality of 3%. In this report Myers et al. [37] exclude patients with grade IV diverticulitis, treating them with a HP. Their study mentions the management pathway for their patients, which we agree with, in which grade IV diverticulitis will undergo HP initially, and grade II or III diverticulitis is managed with laparoscopic lavage and drainage with strict in hospital follow up and in whom failure to improve leads to HP.

Rossi et al. [38] retrospectively analyze their data collected from a prospective database in which they included 46 patients who underwent LLD for Hinchey III diverticulitis. In this series 44 of the 46 patients who were chosen to undergo LLD actually underwent LLD (2 were converted). 5 of the 44 patients treated with LLD failed to achieve adequate control of sepsis with the procedure and required further intervention [38].

Cirocchi et al. [39] performed a systematic review in which they conclude that the results from prospective randomized controlled trials are necessary to determine the role of LLD. However, they suggest that LLD can function either as a 1) definitive procedure or 2) as a "bridge" with a later elective sigmoidectomy. The success rate of LLD which they define as patients alive without surgical treatment for recurrent diverticulitis or complications from diverticular disease is 24.3%. They report a 30 day postoperative mortality rate of 4.8% (HP mortality of 19%) [39].

The results of these studies in general favor management of patients with complicated diverticulitis with LLD because of the low morbidity and mortality rates. However, because of their study design the grade of evidence they provide does not support an evidence-based decision. An important bias present in most of the articles regarding this subject is the failure to disclose the selection process by which a patient was taken either to LLD or HP. Moreover, it is not possible converge their results for Meta analysis, as their methodology is far too heterogeneous for comparison.

That said Feingold DL [40] includes in his analysis multiple smaller studies and attempts to make a cumulative analysis of 8 retrospective and 2 prospective case series. This includes 228 patients, 85% were managed with LLD, with a cumulative mortality of 1%. Although long-term follow up is lacking, the author reports a low recurrence rate. In this analysis 24% of the patients had either grade I or II diverticulitis [40].

Various ongoing randomized (Ladies, DILALA, SCANDIV and LapLAND trials) will hopefully shed more lightly on the issue. Preliminary outcomes of the DILALA trial (comparing LLD with open HP for Hinchey grade III diverticulitis) fail to demonstrate a statistically significant difference in regard to morbidity. Their reoperation rate was 13.2 and 17.1% respectively (P=0.634). They also found no difference in mortality at 30 and 90 days (7.7% vs. 0% (P=0.094), 7.7% vs. 11.4% (P=0.583) respectively). The authors do report a statistically significant decrease in operating time (68 vs. 154 min), and hospital stay (6 vs. 9 days) in the LLD patients. Of the patients treated with LLD non-required reoperation due to ongoing sepsis. The analysis performed is based on a short term follow up, and issues regarding morbidity and mortality of stoma reversal vs. management of patients treated successfully with LLD are still unaddressed [41].

Conclusion

Numerous retrospective studies reported regarding LLD and LLD vs. HP seem to be in favor of LLD for the management of grade II/III diverticulitis, with decreased operating time, decreased in hospital stay and, in some reports decreased morbidity. However, because of the limited nature of these trials no valid conclusions can be made. The only prospective randomized trial which to date has been reported fails to show any difference in regards to morbidity and mortality between LLD and HP. Moreover, numerous issues are yet to be resolved: do patients who undergo LLD require elective surgical intervention or follow up? How do the complications of a colostomy and colostomy reversal compare to the long-term results of patients managed with LLD? As more randomized trials become available, we expect to gain further insight as to which surgical strategy offers most benefit.

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