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Perioperative and postoperative outcomes of perforated diverticulitis Hinchey II and III: Open Hartmann's procedure vs. laparoscopic lavage and drainage in the elderly

Valentina Gentile, Alessia Ferrarese, Silvia Marola, Alessandra Surace, Alessandro Borello, Yuri Ferrara, Stefano Enrico, Valter Martino, Mario Nano, Mario Solej

Abstract

Hartmann's procedure (HP) is the most performed technique for acute diverticulitis. Laparoscopic lavage and drainage (LLD) is an option evaluated as definitive treatment for diverticulitis Hinchey grade II–III. Aim of the study is to analyze and compare LLD vs HP outcomes.

From January 1st 2009 and December 31st 2012 we prospectively enrolled 30 patients with diagnosis of acute diverticulitis Hinchey grade II–III. Fourteen patients underwent to LLD (LLD group, LLDG) and 16 patients to HP (Hartmann group, HG). We evaluated: demographic variables, comorbidities, admission clinical status, radiological imaging, intraoperative outcomes (operative time), postoperative outcomes (admission to ICU, timing of drainage removal, restore of bowel functions, timing of oral solid intake), mortality rate (perioperative and after 12 months) and morbidity rate (surgical, infectious, cardiovascular, renal and systemic complications). Exclusion criteria were: other diseases, colon cancer's suspect or diagnosis, conversion to HP.

Patients' mean age was 64.8 years in HG and 62.6 in LLDG. M:F ratio was 6:10 in HG, 8:6 in LLDG. Data showed improved outcomes in LLDG for: total operative time ($p < 0.0001$), admission to ICU ($p 0.0447$), restoration of bowel functions ($p 0.0035$ for gases, $p 0.0152$ for feces), mobilization ($p 0.0087$) and length of hospital stay ($p 0.0132$).

According to literature, LLD is related to operative risk, morbidity and mortality rate and length of stay lower than HP. LLD also gives the possibility to avoid stoma. Despite limits of our study, we consider LLD as a “safe and effective” treatment for Hinchey grade II–III acute diverticulitis.

Abbreviations

HP, Hartmann's procedure; LLD, Laparoscopic lavage and drainage

1. Introduction

There are different options to treat acute diverticulitis: medical therapy, interventional radiology and surgery [1].

Surgical treatment of acute perforated diverticulitis is the most radical approach but it is still under debate: actually there is no procedure that has unanimous consent [2] and [3].

Surgical treatment for perforated diverticulitis counts a two stages procedure (Hartmann procedure) and a single-stage resection (primary resection and anastomosis) [2] and [3]. Actually HP is the most commonly performed technique [2], [3] and [4].

In the last two decades laparoscopic surgery (LS) and its progressive application in abdominal emergencies [5] and [6] demonstrated significant reduction of morbidity and mortality rates [3], [5],[6] and [7]. Furthermore LS improved number of recanalization after colonic resection [3] and [5].

Hinchey grade IIa, IIb and III diverticulitis can be treated by a recent surgery technique: laparoscopic lavage and drainage (LLD). This procedure can avoid colonic resection and/or stoma [5].

At first LLD was proposed as “bridge to surgery” in order to allow a subsequent elective resection. In the last years, instead, many trials demonstrated that LLD can be a definitive treatment of perforated diverticulitis [5], [8] and [9].

The aim of this study is to analyze and compare the outcomes of LLD versus HP as treatment for acute complicated diverticulitis series of San Luigi Gonzaga Teaching Hospital.

2. Materials and methods

Our study is a retrospective observational analysis of 50 patients >60 years old with acute perforated diverticulitis between 1st January 2009 and 31st December 2012.

Patients included in the study had clinical examination and imaging suggestive for sigmoid perforation. Patients with IIA, IIB and III Hinchey grade diverticulitis were included.

For each group we evaluated: demographic variables (age, sex), comorbidities (diabetes, hypertension, dyslipidemia, cardiovascular disease, nephrological disease, respiratory disease, liver disease, abdominal disease and neoplasia), admission clinical status (clinical evaluation, ASA score), radiological imaging, intraoperative outcomes (operative time), postoperative outcomes (admission to intensive care unit, timing of the drainage removal, restore of bowel functions, timing of oral solid intake), mortality rate (perioperative and after 12 months) and morbidity rate (surgical, infectious, cardiovascular, renal and systemic complications).

Exclusion criteria were: inflammatory situation due to other diseases, preoperative neoplastic suspect, intraoperative diagnosis of colon cancer, conversion of LLD to HP.

Twenty patients were excluded: 8 with preoperative imaging suspected for cancer, 5 because of Hinchey grade IV disease and other 7 for converted to open HP.

Thirty patients were included: 16 underwent to open Hartmann's resection (Hartmann group, HG) and 14 to laparoscopic lavage and drainage (Laparoscopic lavage and drainage group, LLDG).

3. Statistical analysis

Statistical analysis was performed using GraphPad 14.0 software. Statistical significance was set at p -value<0.05. Continuous parametric variables were expressed as mean and non-parametric variables were expressed as median. Differences between groups were analyzed by Mann Whitney t -Student or the Fisher-exact test.

4. Results

Patients' mean age was 64.8 years for the HG and 62.6 years for the LLDG. The M:F ratio was 6:10 for HG and 8:6 for LLDG.

Thirteen patients in HG and 9 patients in LLDG had significant comorbidities as expressed in Table 1.

	Comorbidity	No comorbidity	p
HG	13	3	ns
LLDG	9	5	ns

Table 1 Comorbidities' distribution.

Groups were comparable for demographic characteristics, BMI, comorbidities (p -value 0.4171), and Hinchey classification (p -value 0.6831) (Table 2).

	Open	Laparoscopy	p
Sex:			
M	6	8	ns
F	10	6	
Age	64.81 ± 4.54	62.64 ± 4.46	ns
BMI	26.99 ± 1.56	27.28 ± 2.12	ns
Previous abdominal surgery (%)	50	16.7	ns
Comorbidity (%)	81.25	64.28	ns
Hinchey grade:			
Ila	8	5	ns
Iib	6	6	
III	2	3	
ASA score	2.81 ± 0.26	2.28 ± 0.34	ns

Table 2 Population's characteristics.

Data analysis showed improved outcomes in the LLDG for: total operative time (p -value <0.0001), ICU recovery in the early postoperative period (p -value= 0.0447), restoration of bowel functions (p -value= 0.0035 for gases and p -value= 0.0152 for feces), mobilization (p -value = 0.0087) and length of hospital stay (p -value= 0.0132) (Table 3).

Intraoperative outcomes	Open	Laparoscopy	p
Total intervention's time (min)	173.1 ± 11.16	75.71 ± 4.50	<0.0001
Postoperative outcomes			
Intensive Care Unit (%)	31.25	0	0.0447
Perioperative mortality (%)	25	7.14	ns
Restoration of bowel's functions: gas (day)	4	2	0.0035
Restoration of bowel's functions: feces (day)	5	3.5	0.0152
Mobilization (days)	3	1	0.0087
Time of drainage removal (days)	6.87 ± 0.72	6.2 ± 7.4	ns
Oral solid Intake (days)	5.64 ± 0.51	4.77 ± 0.61	ns
Complications (%)	31.25	21.43	ns
Length of hospital stay (days)	19.13 ± 2.84	10.50 ± 1.25	0.0132
Mortality after 12 months (%)	31.25	7.14	ns

Table 3 Intraoperative and postoperative outcomes.

There were no differences between the two groups in: timing of abdominal drain removal (p -value= 0.5605), timing of restoration of oral solid intake (p -value= 0.2801), perioperative morbidity (p -value= 0.6887), perioperative mortality (p -value= 0.3359) and after 12 months (p -value= 0.1755).

For patients underwent to HP, recanalization was performed in 62.5% of cases. Only one patient in the LLDG has a recurrence; this case was submitted to resection, anastomosis and loop ileostomy.

5. Discussion

Diverticular disease is common in industrialized countries with an age-related prevalence less than 10% in patients younger than 40 years old, up to 50–66% in patients with more than 80 years old [10] and [11]. Only 20% of these patients have complicated disease [12].

In our study all patients had preoperative diagnosis of complicated diverticulitis.

Total operative time for LLD was less than HP, compatibly with complexity of the resective procedure.

Many trials are according to these data and also demonstrate an economic advantage using LLD [8] and [13]. Costs of surgical procedures have always been object of interest; in fact economic evaluation is one of the secondary outcomes included in a recent randomized multicentric study

about surgical management of complicated diverticulitis, called DILALA (Diverticulitis Laparoscopic Lavage) [14].

In HG, ICU hospitalization in the immediate postoperative period was more frequent.

Mortality rate was lower in LLDG than HG (7:14% vs. 25%). Although not statistically significant this result is suggestive for conservative procedure improved outcome. Literature confirms these results: Alamili [8] reported a postoperative mortality rate <2% after conservative surgery compared to 10–30% after HP [7],[8] and [15], Myers et al. reported a rate of morbidity and mortality <5% in their LLD series [16].

LLD postoperative outcomes are better than HP ones; according to literature, restorage bowel functions' is earlier in LLDG [7], [8] and [15].

Although not statistically significant, postoperative complications rate is different between the two groups: 31.25% in HG vs 21.43% in LLDG. Many studies are according to our result [13], [14], [15] and [16].

LLD is related to a shorter length of hospital stay than HP; this is very important for recovery of physical and mental condition of the patient, for reduction of infections rate and costs [8].

Alamili et al. [8] reported a mean hospital stay of 20–38 days compared to 9 days after LLD. Vermeulen et al. [3], Liang et al. [17] and ACOI 2010 guidelines [13] confirm these results.

Although mortality rate after 12 months was not statistically different between the two groups, it was higher in the HG than in LLDG (31.25% in HG vs 7.14% LLDG). Our result is supported by literature [6], [13],[14] and [15].

Our rate of stoma reversal rate after HP was 62.5%; this data is according with Toorenvliet [7] and Liang et al. [17] reports.

We agreed with authors who emphasized the laparoscopic approach, if possible, in presence of adequate laparoscopic learning curve [4], [6] and [13] and clinical reasons.

In our study, we excluded patients converted from LLD to HR because data were not comparable.

Conversion rate was 23.3%.

According to Myers et al. [16] sigmoidectomy was not necessary in more than 50% patient underwent to LLD procedure because of the low risk of diverticulitis recurrence [13] and [18]. This multicenter analysis suggested that LLD is one of the best treatments for perforated Hinchey grade II and III diverticulitis[5] and [16].

6. Conclusion

Despite the limits of our retrospective study and the low sample series, we suggest that LLD procedure can be considered “safe and effective” also in over 60's.

The conservative approach is related to operative risk, morbidity and mortality rate and length of stay lower than resective procedure. We consider laparoscopy as feasible in emergency [19] and [20] and it is a secure technique in young patients and in the elderly [19], [21], [22], [23], [24], [25], [26] and [27].

Furthermore LLD gives the possibility to avoid packaging of stoma. For all these reasons LLD should be a valid alternative to HP for the surgical treatment of Hinchey grade II and III diverticulitis.

Ethical approval

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Author contribution

Valentina Gentile: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Alessia Ferrarese: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Silvia Marola: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Alessandra Surace: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Alessandro Borello: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Yuri Ferrara and in the analysis and interpretation of data.

Stefano Enrico: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Valter Martino: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Mario Nano: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Mario Solej: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Conflicts of interest

All authors have no conflict of interests.

References

- [1] B.R. Klarenbeek, N. de Korte, D.L. van der Peet, M.A. Cuesta, Review of current classification for diverticular disease and a translation into clinical practice, *Int. J. Colorectal Dis.*, 27 (2012), pp. 207–214
- [2] John RT. Monson, Management of acute diverticulitis: is less more?, *Dis. Colon Rectum*, 54 (2011), pp. 126–128
- [3] J. Vermeulen, J.F. Lange, Treatment of perforated diverticulitis with generalized peritonitis: past, present, and future, *World J. Surg.*, 34 (2010), pp. 587–593
- [4] M.S. Jafferji, N. Hyman, Surgeon, not disease severity, often determines the operation for acute complicated diverticulitis, *J. Am. Coll. Surg.*, 218 (2014), pp. 1156–1161
- [5] L. Stocchi, Current indications and role of surgery in the management of sigmoid diverticulitis, *World J. Gastroenterol.*, 16 (2010), pp. 804–817
- [6] S. Sauerland, F. Agresta, R. Bergamaschi, et al., Laparoscopy for abdominal emergencies: evidence-based guidelines of the European Association for Endoscopic Surgery, *Surg. Endosc.*, 20 (2006), pp. 14–29
- [7] B.R. Toorenvliet, H. Swank, J.W. Schoones, J.F. Hamming, W.A. Bemelman, Laparoscopic peritoneal lavage for perforated colonic diverticulitis: a systematic review, *Colorectal Dis.*, 12 (2010), pp. 862–867
- [8] M. Alamili, I. Gogenur, J. Rosenberg, Acute complicated diverticulitis managed by laparoscopic lavage, *Dis. Colon Rectum*, 52 (2009), pp. 1345–1349
- [9] M.E. Franklin Jr., G. Portillo, J.M. Treviño, J.J. Gonzalez, J.L. Glass, Long-term experience with the laparoscopic approach to perforated diverticulitis plus generalized peritonitis, *World J. Surg.*, 32 (2008), pp. 1507–1511
- [10] J. Lopez-Borao, E. Kreisler, M. Millan, et al., Impact of age on recurrence and severity of left colonic diverticulitis, *Colorectal Dis.*, 14 (2012), pp. 407–412
- [11] S.T. Bogardus, What do we know about diverticular disease? A brief overview, *J. Clin. Gastroenterol.*, 40 (2006), pp. 108–111
- [12] B.G. Wolff, J.W. Fleshman, D.E. Beck, J.H. Pemberton, S.D. Wexner (Ed.), *The ASCRS Textbook of Colon and Rectal Surgery*, Springer, New York (2007)
- [13] F. Agresta, L. Ansaloni, G.L. Baiocchi, et al., Laparoscopic approach to acute abdomen from the Consensus Development Conference of the Società Italiana di Chirurgia Endoscopica e nuove tecnologie (SICE), Associazione Chirurghi Ospedalieri Italiani (ACOI), Società Italiana di Chirurgia (SIC), Società Italiana di Chirurgia d'Urgenza e del Trauma (SICUT), Società Italiana di Chirurgia nell'Ospedalità Privata (SICOP), and the European Association for Endoscopic Surgery (EAES), *Surg. Endosc.*, 26 (2012), pp. 2134–2164

- [14] A. Thornell, E. Angenete, E. Gonzales, et al., Treatment of acute diverticulitis laparoscopic lavage vs. resection (DILALA): study protocol for a randomised controlled trial, *Trials*, 12 (2011), p. 186
- [15] H.A. Swank, J. Vermeulen, J.F. Lange, et al., The ladies trial: laparoscopic peritoneal lavage or resection for purulent peritonitis and Hartmann's procedure or resection with primary anastomosis for purulent or faecal peritonitis in perforated diverticulitis (NTR2037), *BMC Surg.*, 10 (2010), p. 29
- [16] E. Myers, M. Hurley, G.C. O'Sullivan, D. Kavanagh, I. Wilson, D.C. Winter, Laparoscopic peritoneal lavage for generalized peritonitis due to perforated diverticulitis, *Br. J. Surg.*, 95 (2008), pp. 97–101
- [17] S. Liang, K. Russek, M.E. Franklin, Damage control surgery of perforated diverticulitis with generalized peritonitis: laparoscopic lavage and drainage vs laparoscopic Hartmann's procedure, *Surg. Endosc.*, 26 (2012), pp. 2835–2842
- [18] A. Sanna, G.L. Adani, G. Anania, A. Donini, The role of laparoscopy in patients with suspected peritonitis: experience of a single institution, *J. Laparoendosc. Adv. Surg. Tech. A*, 13 (2003), pp. 17–19
- [19] A.G. Ferrarese, V. Martino, S. Enrico, A. Falcone, S. Catalano, E. Gibin, S. Marola, A. Surace, M. Solej, Laparoscopic repair of wound defects in the elderly: our experience of 5 years, *BMC Surg.*, 13 (Suppl. 2) (2013) Art. no. S23
- [20] A.G. Ferrarese, S. Enrico, M. Solej, A. Falcone, S. Catalano, E. Gibin, S. Marola, A. Surace, V. Martino, Transabdominal pre-peritoneal mesh in inguinal hernia repair in elderly: end point of our experience, *BMC Surg.*, 13 (Suppl. 2) (2013), p. S24
- [21] A. Ferrarese, V. Martino, A. Falcone, M. Solej, I. Destefano, Perforated duodenal diverticulum: case report and short review of the literature, 27 (2) (2014), pp. 129–131
- [22] M. Solej, V. Martino, P. Mao, S. Enrico, R. Rosa, M. Fornari, I. Destefano, A.G. Ferrarese, E. Gibin, F. Bindi, A. Falcone, U. Ala, M. Nano, Early versus delayed laparoscopic cholecystectomy for acute cholecystitis, *Minerva Chir.*, 67 (5) (2012), pp. 381–387
- [23] A. Ferrarese, V. Martino, M. Nano, Elective and emergency laparoscopic cholecystectomy in the elderly: early or delayed approach, *BMC Geriatr.*, 11 (Suppl. 1) (2011), p. A14
- [24] A. Ferrarese, V. Martino, M. Nano, Wound defects in the elderly: our experience, *BMC Geriatr.*, 11 (Suppl. 1) (2011), p. A15
- [25] A.G. Ferrarese, M. Solej, S. Enrico, A. Falcone, S. Catalano, G. Pozzi, S. Marola, V. Martino, Elective and emergency laparoscopic cholecystectomy in the elderly: our experience, *BMC Surg.*, 13 (Suppl. 2) (2013) Art. no. S21
- [26] A.G. Ferrarese, V. Martino, S. Enrico, A. Falcone, S. Catalano, G. Pozzi, S. Marola, M. Solej, Laparoscopic appendectomy in the elderly: our experience, *BMC Surg.*, 13 (Suppl. 2) (2013) Art. no. S22

[27] A.G. Ferrarese, M. Solej, S. Enrico, A. Falcone, S. Catalano, G. Pozzi, S. Marola, V. Martino, Diagnosis of incidental gallbladder cancer after laparoscopic cholecystectomy: our experience, *BMC Surg*, 13 (Suppl. 2) (2013) Art. no. S20.