



The role of laparoscopy in acute sigmoid diverticulitis

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Laparoscopy has shown benefits in terms of reduced morbidity and mortality and rapid recovery in many different districts of application over the last 30 years. However, the role of laparoscopy in colorectal surgery is still widely debated. After the first declaration of laparoscopic colectomy in 1991 (1), its use was proposed for the treatment of diverticular disease in an elective or emergency context in several reports showing its feasibility since 1996 (2). Some studies have proposed laparoscopy as a more conservative approach to the emergent treatment of patients with complicated diverticular disease (3).

Surprisingly, a recent Cochrane review (4) has shown that laparoscopy has little advantage in terms of safety and effectiveness compared to open surgery in the treatment of subjects with sigmoid diverticulitis requiring resection. Three studies were identified, including 392 participants that demonstrated that laparoscopic surgical resection does not modify the length of hospital stay compared to open surgery. The operating time was significantly longer under laparoscopy of about 1 hour. On the other hand, no significant difference was observed in terms of postoperative mortality at 30-day, early initial morbidity, minor and major complications, surgical complications, post-operative periods for liquid and solid oral intake, second surgery for anastomotic leaks and quality of life. Laparoscopic surgery for colon resection is now widely accepted after several studies and reviews of colorectal cancer patients that have shown a clear advantage in terms of morbidity, mortality and early recovery, and it is very likely that a large number of centers use laparoscopy in cases of elective surgery following acute diverticulitis (AD) despite a scientific demonstration of benefit in this subset is still lacking. It

may be accepted that laparoscopic resection in complicated diverticulitis is secure and cautious and allows for a shorter time to recovery in simple cases, but it must be performed by well-trained and experienced surgeons, despite evident benefits have not been proven, and the data concerning the safety of laparoscopic resection are insufficient.

However, that was the situation in which elective surgery was offered to patients with previous diagnosis of AD. The setting of emergency surgery for AD, such as Hinchey III and IV at the time of their acute attack, is different. Here, the indications range from sigmoid resection with or without the conditioning of a primary anastomosis (RPA) with or without protective stoma. The subject became intriguing when the laparoscopic lavage (LL) technique was first proposed in the 1990s to treat patients with peritonitis for perforation of AD (5). Early results pushed surgeons to undergo LLs with favorable success rates (6-8). In the last decade, four randomised controlled trials (RCTs) were initiated to determine results of this procedure; three (9-11) were completed, but with contradictory results. The laparoscopic lavage observation (LLO) study was designed in 2015 to evaluate the results of LL on the basis of results available of consecutive patients treated at large case-load institutions, recruiting an increasing number of cases (12). The objective was to assess the results of LL and identify a subgroup of patients likely to benefit the most from this treatment. Thus, 231 patients were analyzed with a diagnosis of stage III Hinchey intraoperatively. Sepsis control was achieved in $\frac{3}{4}$ patients and was associated with low grades of Mannheim Peritonitis Index and American Society of Anesthesiologists (ASA) scores, no assessment of free perforation, no performance

of extensive adhesion dissection and no earlier episodes of diverticulitis. Immediate conversion to surgery occurred in less than 10% of cases, demonstrating the reliability of the technique. In addition, morbidity occurred in approximately $\frac{1}{3}$ of patients, while reoperation was performed in less than 15% of patients. The only uncertainty is related to mortality, which occurs in about 2% of patients, which still seems too high for a benign disease treated after all in cases selected quite conservatively. The rate in the current multicentre study is similar to that of other studies (1.4% and 1.6%) (6,13) and lower than that of previous cohort and RCT studies (3–6.7%) (7,9-11,14-18). In addition, the treatment is not yet considered a unique and convincing treatment for diverticular disease, requiring no new surgery for bowel resection, since more than 25% of patients had a recurrent episode of AD at an average of 1 year after treatment. These results indicate that LL without extended adhesion dissection might be considered a possible initial treatment of a significant rate of individuals with Hinchey III diverticulitis, without ignoring that the presence of a visible perforation, a high ASA score, a high Mannheim Peritonitis Index score and lack of previous episodes of diverticulitis are significant risk factors for LL failure, suggesting the need for immediate bowel resection. Therefore, it could be agreed that LL might be considered as an alternative to primary resection and anastomosis in only selected cases of purulent peritonitis.

Nevertheless, different surgical treatment may be appropriate, the choice depending primarily on the grade of the peritonitis. Rather than a simple LL, the choice is between resection and RPA and non-restorative resection, up to the possibility of a surgical control of the damage in cases of generalized diverticular peritonitis. Two new randomized trials have shown that RPA with or without proximal stoma are not inferior to non-restorative resection, i.e., the Hartmann's procedure, as for safety and efficacy (19,20). In addition, the reversal of a colostomy after Hartmann's procedure, compared with the reversal of an ileal stoma, adds a more difficult surgery, affected by a significant morbidity and mortality; as a consequence, it will not be practiced in a large rate of patients who end up with a permanent stoma (19). Therefore, RPA should be preferred in the majority of patients with Hinchey III peritonitis. In this context, the paper of Cirocchi *et al.* published in this issue of *Annals of Laparoscopic and Endoscopic Surgery (ALES)* (21) focuses on laparoscopy for sigmoid resection in AD. This analysis aimed to evaluate the efficacy and safety of laparoscopy compared to open sigmoidectomy in an

acute environment. The evidence presented here is based on the meta-analysis of four non-RCTs comprising 436 patients with laparoscopic returns (181 patients, 41.51%) compared to open sigmoid resection (255 patients, 58.49%) reporting Mannheim Peritonitis Index or P-POSSUM gravity score systems. The study shows that laparoscopy slightly improves the overall rates of postoperative complications and postoperative hospital stay, but does not appear to improve other clinical outcomes such as the rate of Hartmann's *vs.* primary anastomosis (PA), the operating time, the reoperation rate and the postoperative mortality at 30-day. This allows us to conclude that the adoption of laparoscopy does not alter the preferences of the technique to be adopted, whether it is a PA with protective stoma or a Hartmann's procedure. However, a reduction in morbidity would be sufficient to justify a normal adoption of laparoscopy, provided that the team experience is sufficient. Unfortunately, the quality of the studies, the fact that they have been performed during a long period of time, the lack of data regarding hemodynamics, and the reasons for the operative approach preclude the data interpretation, suggesting that patients undergoing open surgery are possibly more ill. Therefore, these results should be viewed with extreme caution, as correctly stated by the authors. The hypothesis that laparoscopic sigmoid resection should be preferred to the open technique in an acute environment for perforated diverticulitis, which seems to contradict the results of the Cochrane review although in a different scenario, needs to be confirmed by future prospective randomized controlled trials which are currently lacking.

Looking at the results of these different approaches to AD at different intervals of the acute episode, it should be considered that a temporary strategy needs to be decided before surgery. This should first answer the question of whether you have to start with a laparoscopic procedure or an open approach. Despite limited, both in elective and in emergent setting, laparoscopy seems to offer a potential advantage compared to conventional open surgery. Therefore, the limitation seems that of being capable of recognising in time intraoperatively good indications for any of the techniques discussed above and of verifying the feasibility laparoscopically, ready to convert to open surgery if inappropriate. This should also take into account the possibility of damage control surgery in case of generalized diverticular peritonitis, a life-threatening condition requiring rapid emergency intervention, with the goal of reducing the colostomy rate with lavage, limited closure of

perforation, and second look surgery to restore intestinal continuity (22,23) in hemodynamically unstable patients, who are therefore not optimal candidates for complex and immediate surgical procedures.

Regardless of the strategy being considered, the goal of reducing colonic stoma formation now seems realistic in most cases, and the systematic adoption of laparoscopy for intraoperative staging and possible treatment now seems crucial (23). Although technically feasible, laparoscopic resection for perforated diverticulitis should be limited to certain cases and to expert laparoscopic surgeons. Current evidence is insufficient to warrant urgent laparoscopic resection of the colon and rectum for perforated diverticulitis. This approach should be reserved for centers and surgeons with expertise in laparoscopic techniques. The evidence for laparoscopic resection surgery in cases of perforated AD is limited to a series of retrospective cases and case-match studies including mainly perforations with confined peritonitis. Compared to elective colorectal resection, emergent laparoscopic colectomy for diverticulitis shows to be a difficult procedure resulting in a steady increase in conversion rate (24).

Although the majority of studies have not shown a significant increase in postoperative mortality after urgent laparoscopic resection, the evidence currently available is insufficient to indicate a routine use of this approach. The use of laparoscopy should be limited to centers and surgeons experienced laparoscopy, eventually as part of clinical trials.

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appropriately investigated and resolved.

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