

# A Simplified Operative Technique for Single-Staged Resection of Left-Sided Colon Obstructions: Report of a 9-Year Experience

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## Abstract

**Purpose.** The operative strategy for left-sided large bowel obstruction remains controversial. Because a safe and definitive single-staged operation that avoided a colostomy would clearly be in the patients' best interest, we conducted a prospective study to compare the efficacy of single-staged surgery (SSS) supplemented by the milking and swabbing technique (MST), with the conventional Hartmann's procedure (HP).

**Methods.** In group 1 ( $n = 37$ ) we performed traditional HP by resecting the site of obstruction and constructing an end colostomy. In group 2 ( $n = 33$ ), after resecting the site of obstruction, instead of on-table lavage, we cleaned out the fecal content from the proximal and distal parts of the obstruction by milking the colon with the fingers, then swabbing the proximal and distal 10 cm of lumen of the colonic anastomosis with povidone iodinated stick sponges. Finally, we performed a primary one-layer anastomosis without fecal diversion.

**Results.** The mortality, morbidity, and postoperative hospital stay after emergency left-side colonic resection and primary anastomosis by MST was comparable with those after HP ( $P > 0.05$ ).

**Conclusions.** We believe that SSS with MST is a viable choice in the surgical management of selected patients with obstructing lesions of the left colon. The advantages of SSS with MST lie in its good long-term results, and short-term reduced surgical intervention and hospital stay.

**Key words** Left colon carcinoma · Single-staged surgery · Colonic obstruction · Hartmann's procedure

## Introduction

Colorectal cancer is the cause of 8%–29% of all intestinal obstructions,<sup>1,2</sup> accounting for 85% of colonic emergencies. The treatment of lesions in the left side of the colon that require an emergency operation is still controversial. The traditional management of left-sided large bowel obstruction involves a two- or three-staged procedure; however, these staged procedures, which originated from considerations of safety,<sup>3</sup> have lost their conventional appeal due to their disadvantages. Multiple hospital admissions are necessary and because patients who require emergency colonic operations are often old and have several coexisting diseases, the second stage procedure of "colostomy closing" is often unable to be performed and they are left with a permanent colostomy.

Since 1950,<sup>4</sup> there has been an increasing preference for primary resection in emergency colon surgery; however, most reports are retrospective descriptions of a personal series of patients treated selectively for either obstructions or perforation.<sup>5–7</sup> When one-stage procedures are performed for obstructing lesions in inadequately prepared bowel, a leakage rate of 18% and a mortality rate of 22% has been reported, compared with 2%–13% and 3%–9%, respectively, when the procedures are elective.<sup>8–10</sup> Moreover, the mortality rate following primary resection with delayed anastomosis (Hartmann's procedure) is 10%.

In most series on single-staged surgery (SSS) for left colon emergencies, on-table lavage was carried out; however, Koruth and colleagues<sup>10,11</sup> reported that this lavage added 1 h to the procedure and the consequent mean operating time of 3 h cannot be tolerated by elderly, ill patients. Therefore, we decided to perform SSS for left colon obstructions, without increasing the operative risks by prolonged cleaning. Instead of on-table lavage, we cleaned out only the solid fecal content from the proximal and distal parts of the obstruction by milk-

ing the colon manually, then swabbing the proximal and distal 10cm of lumen of the colonic anastomosis with povidone iodinated stick sponges, after which primary anastomosis was performed with a one-layer technique. In addition, we gave pre- and postoperative antibiotic therapy with careful cardiac, pulmonary, circulatory, and nutritional monitoring. Herein, we present the results of our 9-year experience of using this technique.

## Patients and Methods

Seventy patients with acute large bowel obstruction underwent left-sided colonic resection during the 9-year period between January 1993 and October 2001 at Cumhuriyet University Faculty of Medicine General Hospital or Kayseri Social Security Hospital. The diagnosis of mechanical large bowel obstruction was based on clinical features supported by abdominal X-ray films with water-soluble contrast enema in all patients.

For sigmoid volvulus, we first tried to devolvulate endoscopically. If we were successful, elective surgery was performed later, and if we were not successful, emergency surgery was performed. For low-level obstructions we also initially tried to cannulate the obstruction endoscopically with a 21- or 23-F flexible rectosigmoid tube, 55cm in length, inserted through a rigid rectosigmoidoscope, then operate later on an elective basis after decompression. When we were not successful, emergency surgery was performed. All patients were resuscitated with nasogastric aspiration, intravenous fluids, and prophylactic antibiotics.

The patients were randomized into two groups according to the procedure performed. Group 1 consisted of 37 patients who underwent Hartmann's procedure (HP) and group 2 consisted of 33 patients who underwent SSS with the milking and swabbing technique (MST). Patients with one or more of the following conditions were excluded from this study: perforation of the colon, advanced peritonitis, interloop abscess, circulatory instability, poor general condition (American Society of Anesthesiologist grade IV),<sup>12,13</sup> immunosuppression, or sepsis.

All laparotomies were performed through a midline incision. The abdomen was explored to assess the stage and resectability of the lesions and colonic resections were done by conventional methods. The bowel proximal to the obstruction was clamped with two noncrushing clamps beyond the proposed site of anastomosis. The same procedure was done to the bowel distal to the obstruction. The bowel was then divided between the clamps at the sites chosen for anastomosis. After removing the clamps, we emptied the feces from the proximal and distal parts of the obstructed colon by manual milking. We then swabbed the proximal and

distal 10cm of lumen of the bowel adjacent to the colonic anastomosis with povidone iodinated (Betadine) stick sponges. This procedure took no longer than 12 min. Primary anastomosis was performed end-to-end with a continuous inverting one-layer suture technique using 3-0 polydeoxanone, without fecal diversion. In the period between decompression and anastomosis, the bowel wall at the resection margin was confirmed to be well vascularized, healthy, and not thin-walled or friable. All patients were given perioperative antibiotics (ceftriaxone and metronidazole), which continued for 4 days postoperatively. All operations were performed by a senior surgeon.

From the time of surgery to discharge from hospital, the mortality and morbidity of the patients were recorded. The postoperative hospital stay was calculated from the day of surgery until discharge. Wounds were inspected daily during routine wound care, with wound infection defined as serous or purulent discharge at any time during recovery.

Comparisons between the two groups were made with the Mann-Whitney *U*-test. A *P* value of less than 0.05 was accepted as significant. Postoperative mortality, morbidity, and hospital stay were compared between the two groups.

## Results

The patients in the HP and SSS groups ranged in age from 45 to 79 years (mean 59.2 years) and from 48 to 75 years (mean 60.9 years), respectively. There were 17 women and 20 men in the HP group, and 14 women and 19 men in the SSS group. The cause of obstruction in the HP group were carcinoma of the descending colon and sigmoid colon in 20 patients, and volvulus of the sigmoid colon in 17 patients. The causes of obstruction in the SSS group were carcinoma in 20 patients, volvulus in 12 patients, and Behçet's syndrome involving the sigmoid colon in 1 patient (Table 1). All obstructing lesions were proven histologically to be adenocarcinomas ( $n = 40$ ) or Behçet's syndrome ( $n = 1$ ). The mean operative time was 120min (range 90–190min) in the HP group and 118min (85–172min) in the SSS group.

There were no postoperative deaths in the SSS group and one postoperative death in the HP group. This patient was an 80-year-old man, operated on for an obstructing sigmoid cancer, who died of cardiac and pulmonary complications 10 days after his operation (Table 2). There was no statistically significant difference between the two groups. The postoperative hospital stay in the HP group ranged from 7 to 38 days (mean 14.9 days) and that in the SSS group ranged from 7 to 28 days (mean 13.1 days). There was no statistically significant difference between the two groups (Table 2). The

**Table 1.** Causes and sites of left colon obstruction in the two groups of patients

	Cause of obstruction						Site of obstruction		
				Descending colon			Sigmoid colon		
	Group 1	Group 2	Total	Group 1	Group 2	Total	Group 1	Group 2	Total
Carcinoma	20	20	40	5	8	13	15	12	27
Volvulus	17	12	29	—	—	—	17	12	29
Behçet's disease		1	1					1	1
Total			70			13			57

Group 1, Hartmann's operation; group 2, single-staged-surgery (SSS) plus milking and swabbing (MST)

**Table 2.** Mortality, hospital stay, and morbidity rates of groups 1 and 2

	Hartmann's procedure (group 1) ( <i>n</i> = 37)	Single-staged surgery with MST (group 2) ( <i>n</i> = 33)
No. of deaths	1 (2.7%)	0
Hospital stay (days)	14.9 (7–38)	13.1 (7–28)
Morbidity		
Wound infection	8 (21%)	6 (18%) NS
Intra-abdominal abscess	1 (2.7%)	0 NS
Chest infection	6 (16%)	5 (15%) NS
Atelectasis	2 (5.4%)	2 (6%) NS
Anastomotic leakage	—	1 (3%) <sup>a</sup>
Urinary tract infection	2 (5.4%)	2 (6%) NS
Prolonged ileus	0	1 (3%) NS
Total	19	17

NL, not significantly different

<sup>a</sup>This complication could not be compared statistically because of the difference in operative techniques

main reason for a prolonged hospital stay was wound infection.

The postoperative complications are listed in Table 2. Anastomotic leakage occurred in one patient from the SSS group and, as her condition was unstable after leakage, she underwent reoperation to resect the anastomosis and perform HP. This patient suffered from prolonged ileus. Wound infections developed in 8 (21%) patients from the HP group, and in 6 (18%) from the SSS group. These infections were treated with appropriate wound care. An intra-abdominal abscess developed in one patient from the HP group, necessitating relaparotomy. Postoperative chest infections were recorded in 6 (16%) patients from the HP group and in 5 (15%) from the SSS group. The other complications were atelectasia and urinary tract infections, which occurred in two patients each from the HP and SSS groups (5.4% and 6%), respectively. Statistical analyses of these results did not show any significant difference between the two groups.

## Discussion

Leakage of large bowel anastomosis is a major complication of colonic surgery, with a reported incidence of

up to 40%, which significantly increases mortality and morbidity rates.<sup>8,14</sup> Many factors have been reported to contribute to the healing and integrity of anastomoses, such as adequate blood supply, a tension-free anastomosis, inflammation, type of suture or staples, bowel preparation, and advanced age.<sup>8,15</sup> There is more than one way to anastomose the intestine and some disagreement exists as to whether the anastomosis should be performed in one or two layers. We think that more than one complete row of sutures is unnecessary if sufficient intestine is infolded. Collagen is the major structural protein of the colon wall and excess collagenase activity was first implicated in the dehiscence of colonic anastomosis by indirect evidence from measurements of collagen. Yeşilkaya et al.<sup>16</sup> reported that OH proline levels are higher in one-layer anastomoses than in two-layer anastomoses in colonic suture lines. Ceraldi et al.<sup>17</sup> also reported that a continuous single-layer polypropylene anastomosis after colon resection is a reasonable and safe alternative to double-layer or stapled anastomoses. Therefore, we perform the anastomosis end-to-end using a continuous inverting one-layer suture technique with 3-0 polydioxanone.

Traditionally, the management of distal colonic emergencies consists of a staged series of operations

involving initial decompressive colostomy followed by resection and anastomosis of the colon, and finally, closure of the colostomy. In recent years, there has been increasing awareness that conventional three-stage operative procedures are not only poorly tolerated by many patients, but they also prolong the hospital stay.<sup>18</sup> Furthermore, the planned sequence of operations is not always able to be completed, for a variety of reasons, and an unsatisfactory permanent stoma is left. In some patients, the problem of managing a transverse colostomy or cecostomy is an additional burden during terminal illness from advancing malignant disease that is considered too widespread to merit a further operation. Although the three-stage approach to acute left-sided colonic lesions may be associated with low mortality rates of 5%–11%,<sup>19–21</sup> much higher rates of 19%–48%<sup>18,22–24</sup> have been reported. One prospective study showed that in cases of obstruction distal to the splenic flexure, primary resection carried a 14% mortality rate compared with a 35% mortality rate for conventional three-stage treatment.<sup>25</sup>

Primary resection of the tumor with delayed anastomosis, either as HP or Mikulicz resection, is being performed more commonly both for obstruction and perforation. The advantages of these procedures are immediate resection of cancer, relative safety of avoiding an anastomotic leakage, and more rapid convalescence with a shorter hospital stay. Although the closure of an end colostomy requires more time and there is greater blood loss than with closure of a loop colostomy, the mortality rates of the two procedures are similar. HP is almost always preferable to a three-stage procedure, being particularly appropriate for perforation of the left colon and the elderly patient.

The accumulated results of many reports show a mortality rate of 10% in patients managed by two-stage procedures.<sup>7,9,10,20,26,27</sup> However, colostomy closure is not a minor procedure and the second-stage procedure for closing the colostomy is often never done for a variety of reasons, and patients are left with a permanent colostomy. Therefore, a safe and definitive SSS avoiding a colostomy would clearly be in the patients' best interest. Primary resection of the left colon with immediate anastomosis as an emergency procedure has been sporadically reported since 1950.<sup>11</sup> Right hemicolectomy and extended right hemicolectomy are now accepted procedures for managing obstructing tumors of the right and transverse colon,<sup>25,28</sup> but primary resection and anastomosis has not gained universal acceptance in the treatment of left colon emergencies. The mortality rates range widely from 6.6% to 50%<sup>5–7,19,20</sup> and most deaths seem to result from anastomotic leakage. Smith et al.<sup>29</sup> stated that anastomotic dehiscence occurs significantly more often when the bowel is loaded with feces at the time of the operation than when it is empty. Thus,

intraluminal contact with fecal loading at the colonic anastomosis is a very significant factor in anastomotic complications,<sup>30</sup> but it is possible to deal with fecal loading by performing intraoperative colonic irrigation and manual MST as described in this report.

In 1980, Dudley et al.<sup>31</sup> described the technique of resection, on-table lavage, and primary anastomosis. In 1993, Stewart et al.<sup>32</sup> reported that resection, on-table lavage, and primary anastomosis constitute the operation of choice for most patients with acute obstruction of the left colon. The operative mortality rate associated with primary anastomosis using on-table lavage has been reported to range from 4% to 10%,<sup>32–34</sup> but anastomotic leakage rates following primary anastomosis are low, at 0%–6%.<sup>32,35</sup> This compares favorably with the mortality rates associated with colostomy alone and with those associated with primary resection with colostomy and delayed anastomosis.<sup>36</sup> On the other hand, Koruth and colleagues<sup>10,11</sup> reported that lavage added 1 h to the procedure, and a mean operating time of 3 h is difficult for an elderly, ill patient to tolerate. Moreover, intraoperative irrigation requires meticulous care to avoid spillage, converts solid manageable feces into uncontrollable liquid contamination, necessitates the use of large volumes of irrigation fluid with the possibility of electrolyte and fluid maladjustment, causes temperature control problems, and involves a prolonged operating time. Therefore, this technique is not universally practiced.

Several recent studies have failed to demonstrate any relationship between anastomotic dehiscence and the method or adequacy of bowel cleansing,<sup>8,37,38</sup> which suggests that "perfect" preparation of the colon may not be necessary. Furthermore, thorough cleaning of the colon with preoperative or on-table lavage techniques is often impossible and may simply decrease the fecal content. Decompression of the main bulk of colonic contents, especially hard stools, could be sufficient to allow a safe anastomosis. A previous report suggested that one-step primary repair can be performed for left colon injuries.<sup>39</sup> In 1994, Burke et al.<sup>40</sup> reported that bowel preparation does not influence outcome after elective colorectal surgery, while Schein et al.<sup>41</sup> stated that in the light of recent clinical reports and their experimental study, the ritual of mechanical bowel preparation should be further scrutinized. Recent reports also describe that an anastomosis can be performed safely after decompression of the obstructed colorectum alone, without the need for intraoperative irrigation.<sup>42–45</sup> Therefore, in carefully selected left-sided colonic obstructions, we decided to empty the fecal content of the proximal and distal part of the obstructed colon by milking the colon with the fingers. We then swabbed 10 cm of the bowel lumen, proximal and distal to the colonic anastomosis, with povidone iodinated

(Betadine) stick sponges, and gave routine antibiotic therapy with ceftriaxone and metronidazole. The residual bacterial contamination did not appear to influence the healing of the anastomosis. Moreover, the improved anesthetic techniques, antibiotic therapy, full monitoring of the cardiac, pulmonary, and circulatory systems, and nutritional management, as well as postoperative pain control, chest physiotherapy, and ventilatory and inotropic support helped us to succeed with this kind of operation, which is fast, practical, and acceptable for elderly, ill patients.

Generally, there is no advantage in deferring tumor resection by performing a cecostomy or a colostomy as part of a staged procedure, except in some very frail patients. Moreover, long-term survival may be adversely affected by the delay that ensues and the planned sequence will not be completed in many patients. In those undergoing primary resection, the mortality rate is similar, at around 10%, whether bowel continuity is restored immediately or delayed. The mortality rate in our SSS group was 0% whereas it was 2.7% in our HP group. The hospital stay after SSS was comparable to that after HP, and there was no significant difference in the complication rates of the two groups ( $P > 0.05$ ).

In conclusion, this study showed that the mortality, morbidity, and postoperative hospital stay after emergency left-sided colonic resection and primary anastomosis using MST were comparable with those using HP. Thus, we believe that SSS with MST is a suitable choice of operation for many patients with obstructing lesions of the left colon, depending on the available resources and local circumstances.

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