

The controversy of management of left-sided colon obstructions: our experience

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Purpose

The controversy of treatment of acute colonic obstruction between the classical Hartmann's procedure (HP) and the on-table lavage technique with primary colorectal anastomosis (PCA) for a safe, tolerable, and definitive operation with the least complications is still standing. So we conducted this prospective study to distinguish between both techniques as regards the efficacy and safety.

Methods

In group A ($n = 30$) the conventional Hartmann's procedure was done by colonic resection and construction of left-sided stoma. In the B group ($n = 30$), colonic resection was followed by colonic lavage, then a primary two-layered anastomosis with covering ileostomy was performed.

Results

The whole postoperative outcomes were comparable between both techniques.

Conclusions

We believe that on table lavage technique with colorectal anastomosis is a notable choice during the treatment of acute obstruction of the left colon.

Keywords:

colonic, left-sided, obstruction

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Hartmann's procedure vs Primary Colorectal Anastomosis for Management of Left-Sided Colon Obstructions: A prospective study

Introduction

Colonic and rectal carcinomas are the cause of nearly 8–29% of all intestinal obstructions and represent 85% of colonic emergencies [1,2]. The treatment of acute obstruction of the left colon is still a matter of discussion. The classic treatment involves the famous two-stage procedure known as Hartmann's procedure (HP) which originated from considerations of safety [3].

Since 1950 [4] primary resection with stoma in emergency colonic surgery is preferred. Although, most series are retrospective of patients operated on for either obstructions or perforations, but still the ideal choice with a mortality rate of about 10% [5–7]. Emergency one-stage procedures in unprepared left colon showed an 18% incidence of leakage and a 22% incidence of mortality, in comparison with 2–13% and 3–9%, respectively, in elective procedures [8–10].

Methods and patient criteria

Sixty patients in emergency left-sided colonic obstruction had colonic resection between January

2018 and May 2021 in Tanta Emergency Hospital, General Surgery Department, Faculty of Medicine, Tanta University. The diagnosis included clinical examination and radiological examination using radiography and computed tomography in all patients.

In patients with sigmoid volvulus, endoscopic untwisting was first tried. With successful untwisting, patient was prepared for elective surgery later, but failure indicates emergency surgery.

Resuscitation was initiated in all patients with intravenous fluids, nasogastric intubation and prophylactic antibiotics. Randomization was done using closed envelope method into either one of the two groups. Group 1 which included of 30 patients underwent classic HP and the other 30 patients of group 2 underwent on table lavage technique with primary colorectal anastomosis (PCA) and covering ileostomy. We excluded patients with colonic perforation, peritonitis, circulatory collapse, bad health status (grade IV in the standard American

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Society of Anesthesiologist) [11,12] or Immunosuppressed patients from our study.

Stage (1): Through the classic exploratory midline incision, the abdomen was entered and thoroughly examined for staging of colonic tumors and assessing the respectability then colonic resection was done by the conventional technique followed by either creation of terminal colostomy in HP or initiating on table colonic lavage through the stump of the appendix using Foley catheter 24F using 4–6 liters on normal saline and the colon was emptied through the proximal end of the colon after resection followed by colo-rectal double-layer hand-sewn anastomosis then we finish our technique by creating a covering ileostomy 30 cm from the ileocecal valve in the right iliac fossa, then the abdomen is closed in layers after peritoneal toilet and insertion of abdominal drain in the pelvis.

Stage (2): The patients in group A underwent elective colorectal anastomosis through the same midline incision for regaining bowel continuity after 3 months interval, while the other group patients underwent 6 weeks interval extracorporeal closure of ileostomy after checking the integrity of the PCA by contrast enema.

All patients received preoperative I.V antibiotics in form of third generation cephalosporine and metronidazole and for other 4 days postoperatively. Operative data and postoperative outcomes for the two groups were recorded during the two stages. During hospitalization, the wounds were inspected daily for wound infection that was defined as serous or purulent discharge together with redness and fever.

Results

The mean age was 50.0 and 49.2 years for the patients in the HP and PCA groups, respectively. Thirteen females and 17 males included in the HP group, while nine females and twenty one males in the PCA group with was no significant difference between the two groups in the statistical analysis as regard patient demographic data (Table 1).

Colonic obstruction in the HP group was due to carcinoma of the descending colon and sigmoid colon in 21 patients, and sigmoid colon volvulus in eight patients and diverticular benign sigmoid stricture in one patient, while obstruction in the PCA group was in 24 patients due to carcinoma and volvulus in the other six patients (Table 2). All carcinomas were found

Table 1 Comparison between the two studied groups according to demographic data

Demographic data	Anastomosis (n=30)	Hartmann (n=30)	Test of Significance	P
Age (y)				
Mean±SD.	49.2±6.7	50.0±5.8	U=427.50	0.739
Median (Minimum–maximum)	50.0 (38.0–60.0)	50.5 (36.0–60.0)		
Sex				
Male	21 (70.0%)	17 (56.7%)	$\chi^2=1.148$	FE _P =0.284
Female	9 (30.0%)	13 (43.3%)		
BMI (kg/m ²)				
Mean±SD.	33.1±8.2	35.0±8.1	U=377.50	0.283
Median (Minimum–maximum)	32.5 (22.0–52.0)	35.0 (22.0–52.0)		
Comorbidities				
None	17 (56.7%)	16 (53.3%)		
Asthmatic	2 (6.7%)	2 (6.7%)		
Diabetic	2 (6.7%)	5 (16.7%)		
Hypertensive	3 (10.0%)	2 (6.7%)	$\chi^2=2.627$	MC _P =0.872
Ischemic heart	1 (3.3%)	0		
Ischemic heart, hypertensive, diabetic	5 (16.7%)	5 (16.7%)		
Previous abdominal surgery				
None	16 (53.3%)	14 (46.7%)		
Appendectomy	4 (13.3%)	4 (13.3%)		
Inguinal mesh hernioplasty	3 (10.0%)	2 (6.7%)	$\chi^2=1.350$	MC _P =0.895
Lap cholecystectomy	3 (10.0%)	3 (10.0%)		
Cesarean section	4 (13.3%)	7 (23.3%)		
ASA score				
1	18 (60%)	17 (56.7%)		
2	7 (23.3%)	8 (26.7%)	$\chi^2=0.095$	MC _P =0.953
3	5 (16.7%)	5 (16.7%)		

FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; U, Mann Whitney test; χ^2 , Chi square test. P: P value for comparing between the studied groups.

Table 2 Comparison between the two studied groups according to operative data (stage 1)

Operative data (stage 1)	Anastomosis (n=30)	Hartmann (n=30)	Test of Significance	P
Cause of obstruction				
Volvulus	6 (20%)	8 (26.7%)	$\chi^2=1.436$	MC _P =0.555
Carcinoma	24 (80%)	21 (70%)		
Diverticular stricture	0	1 (3.3%)		
Operating time				
Mean±SD.	199.7±16.7	145.3±21.8	U=10.50 [†]	<0.001*
Median (Minimum–maximum)	200 (180–250)	145 (110–180)		
Intraoperative adverse events				
No	30 (100%)	29 (96.7%)	$\chi^2=1.017$	FE _P =1.000
Small bowel injury	0	1 (3.3%)		
Estimated blood loss				
Mean±SD.	154±38.5	129±46.9	U=265.0*	0.005*
Median (Min. – Max.)	150 (100–250)	105 (80–300)		
Surgery to discharge time				
Mean±SD.	4.2±1.3	4.8±1	U=306.0*	0.023*
Median (Minimum–maximum)	4 (3–10)	4 (4–8)		

to be adenocarcinomas in histopathological exam ($n = 45$).

Stage (1) operative data: The mean operative time was about 145 min in the HP group and 199 min in the PCA group with statistically significant difference between the two groups. No Intraoperative adverse events occurred in the PCA group, while one patient in the HP procedure group had iatrogenic small bowel injury that was repaired immediately with no postoperative complications.

There was more blood loss in the PCA group with statistically significant difference between the two groups (Table 2). The postoperative hospital stay in the HP group ranged from 4 to 8 days (mean 4.8

±1days) and that in the SSS group ranged from 3 to 10 days (mean 4.2±1.3 days) with statistically significant difference between the two groups (Table 2). The main reason for prolonged postoperative hospital stay in both groups was wound infection.

Table 3 listed the postoperative complications for both groups. There was no statistically significant difference between the two groups in any of the postoperative complications. Superficial wound infection occurred in three patient from the HP group and one in PCA group and all were managed conservatively by local wound care and antibiotic according to culture and sensitivity. One patient in PCA group presented by unexplained fever in the third postoperative day and abdominal ultrasound showed left subphrenic

Table 3 Comparison between the two studied groups according to postoperative complications (stage1)

Postoperative complications (stage1)	Anastomosis (n=30)	Hartmann (n=30)	χ^2	P
Superficial wound infection				
No	29 (96.7%)	27 (90%)	1.071	FE _P =0.612
Yes	1 (3.3%)	3 (10%)		
Intra-abdominal abscess				
No	29 (96.7%)	30 (100%)	1.071	FE _P =1.000
Yes	1 (3.3%)	0		
Heart and lung complications				
No	29 (96.7%)	27 (90%)	1.940	MC _P =0.741
Chest infection	1 (3.3%)	3 (10,0%)		
Urinary tract infection				
No	29 (96.7%)	29 (96.7%)	0.0	FE _P =1.000
Yes	1 (3.3%)	1 (3.3%)		
Ileus				
No	27 (90%)	28 (93.3%)	0.218	FE _P =1.000
Yes	3 (10%)	2 (6.7%)		
Stoma complications				
No	30 (100%)	29 (96.7%)	1.017	FE _P =1.000
Yes	0	1 (3.3%)		

FE, Fisher Exact; MC, Monte Carlo; χ^2 , Chi square test. P: P value for comparing between the studied groups.

Table 4 Comparison between the two studied groups according to operative data(stage 2)

Operative data (stage 2)	Anastomosis (n=30)	Hartmann (n=30)	Test of Significance	P
Operating time				
Mean±SD.	68.9±7.5	149.6±20.4	U=0.0*	<0.001*
Median (Minimum–maximum)	70 (50–87)	146 (117–189)		
Estimated blood loss				
Mean±SD.	35±11.1	95.6±16.5	U=0.0*	<0.001*
Median (Minimum–maximum)	35 (20–50)	92 (56–128)		
Intraoperative adverse events				
No	30 (100%)	26 (86.7%)		
Small bowel injury	0	3 (10%)	$\chi^2=3.825$	MC _P =0.117
Stapler misfire and leakage during test	0	1 (3.3%)		
Hospital stay				
Mean±SD.	4.8±0.9	5.8±2	U= 240.50*	0.001*
Median (Minimum–maximum)	5 (4–7)	5 (4–15)		

FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; U, Mann Whitney test; χ^2 , Chi square test. P: P value for comparing between the studied groups. *: Statistically significant at P less than or equal to 0.05.

collection that was aspirated by ultrasound guided drain. Chest infections developed in three (10%) patients from the HP group, and in one (3.3%) from the PCA group. These infections were treated with proper antibiotics and chest physiotherapy. Urinary infections developed in one patient from the HP group, and the same for the PCA group. All patients started oral clear fluids on the second postoperative day. Five patients in both groups developed ileus and all were managed conservatively by nasogastric tube insertion, correction of electrolyte imbalance and bowel rest with close follow up. One patient in the HP group showed mild stomal retraction that needed stoma revision. No mortality was recorded in both groups as shown in Table 3.

Stage (2) operative data: The mean operative time was about 149.6 min in the HP group and 68.9 min in the PCA group with statistically significant difference between the two groups. No Intraoperative adverse

events occurred in the PCA group, while three patient in the HP procedure group had iatrogenic small bowel injury that was repaired immediately with no postoperative complications and one patient had Stapler misfire and leakage during test that was repaired by sutures. There was more blood loss in the HP group with statistically significant difference between the two groups (Table 4). The postoperative hospital stay in the HP group ranged from 4 to 15 days (mean 5.8 days) and that in the PCA group ranged from 4 to 7 days (mean 4.8 days) with statistically significant difference between the two groups (Table 4). The main reason for prolonged postoperative hospital stay in both groups was wound infection and anastomotic leakage.

Table 5 listed the postoperative complications for both groups. There was no statistically significant difference between the two groups in any of the postoperative complications.

Table 5 Comparison between the two studied groups according to postoperative complications (stage 2)

Postoperative complications stage2	Anastomosis (n = 30)	Anastomosis (n = 30) Hartmann (n = 30)	χ^2	P
Anastomotic leakage				
No	30 (100.0%)	29 (96.7%)	1.017	FE _P =1.000
Yes	0	1 (3.3%)		
Wound infection				
No	28 (93.3%)	29 (96.7%)	0.351	
Yes	2 (6.7%)	1 (3.3%)	1.000	
Intra-abdominal abscess (management)				
No	30 (100%)	30 (100%)	–	–
Yes	0	0		
Heart and lung complications				
No	30 (100%)	29 (96.7%)	1.071	FE _P =1.000
Chest infection	0	1 (3.3%)		
Ileus				
No	28 (93.3%)	28 (93.3%)	0.0	FE _P = 1.000
Yes	2 (6.7%)	2 (6.7%)		

Superficial wound infection occurred in one patient from the HP group and two in PCA group and all were managed conservatively by local wound care and antibiotic according to culture and sensitivity. Chest infections developed in one (3.3%) patient from the HP group. These infections were treated with proper antibiotics and chest physiotherapy. No Urinary infections developed in both groups. All patients started oral clear fluids on the second postoperative day.

Four patients in both groups developed ileus and all were managed conservatively by nasogastric tube insertion, correction of electrolyte imbalance and bowel rest with close follow-up. One patient in the HP group showed high grade fever with tachycardia and tachypnea on the 5th postoperative day. Pelvi-abdominal ultrasound showed pelvic collection and ultrasound guided aspirate confirmed leakage from the colorectal anastomosis and was managed by emergency exploration, peritoneal toilet and revision of the anastomosis with covering ileostomy. No mortality was recorded in both groups.

Discussion

Emergency surgery in those with colonic obstruction carries a potential high incidence of inevitable adverse events that may threaten the patient's life due to bad general status in most circumstances [13]. The HP has been considered always the safer in those patients and the first choice operation that gives the excellent resection of the obstructing lesion together with the minimum complications that may endanger the condition as anastomotic leakage [14,15].

No mortality after both PCA and HP, but with more morbidity for HP group. PCA was associated with a shorter hospital stay. These data support the idea of safe and effective PCA as alternative to HP in case of acute left sided colonic obstruction.

Colonic lavage inside the operating theater is used in many studies [16–18] to help clean, tension free and proper anastomosis in those with colonic obstruction of the left sided colon because of the fact that the possibility of leakage from the anastomotic site is more in case of primary anastomosis of colon loaded with feces [19,20]. Another animal study support these data [21]. The feces accumulation above the site of the anastomosis appears to cause anastomotic disruption [21] especially in the early anastomotic healing period [22]. Colonic lavage prevent loading feces proximal to the anastomosis without affecting the mucosal microflora [23] that found to be helpful for the

healing of colonic anastomoses as concluded by Okada *et al.* in a study of rats [24].

Also, several similar researches documented high possibility of leakage in colonic anastomosis if associated peritonitis is present [25–27], but probably these results arise from improper colonic lavage. Moreover, animal studies failed to confirm that peritonitis predispose to anastomotic failure [28,29]. A high complication rate in HP patients is usually found ranging between (23 and 69%) and between 1% and 28% incidence of mortality [30,31]. Moreover, the colonic anastomosis after HP is technically difficult and associated with higher incidence of iatrogenic bowel injury because of the need for dissection between the dense adhesions already formed during the primary resection stage. Also unfortunately, about 30% of HP patients are left with permanent stoma because of the bad general condition of mostly old patients with multiple comorbidities that lead them to be confronted with the fact that they have to live with the stoma and be adapted to it. This stoma becomes more burden for those mostly elderly patients with decreased survival. PCA gives the solution for this dilemma because of the safe easy technique for extracorporeal closure of ileostomy that can even done under local anaesthesia in patients incompatible with general anesthesia.

This study was randomized and carefully documented the patients' co-morbidities and general condition. This fact excluded the surgeon's bias and this explains the symmetric distribution of patients thus allowing the comparison between them.

Data in our study is comparable with that in the study of Biondo *et al.* [32] who treated 21 patients (37% of the studied cases) with PCA. 39% of patients in their study, had postoperative adverse events (23.3% in the present study); of which 4% had anastomotic leakage (0% in the present study), and 9% was the incidence of mortality (0% in this study). Nearly the same results were reported in similar other studies [33–35].

The mean duration of the hospital stay during the main first stage for patients was 4.2 and 4.8 days for PCA and HP groups, and this data compare well with other similar series [36–38]. The wound infection rate was 3.3% and 10% for the PCA and HP groups successively that is comparable to 10.3% documented by Nigeria [33], and 7% to 8% in other European series, one of them had 60% wound infection incidence [39]. Also, our results regarding the operative time, hospital stay and incidence of both intra and postoperative complications was favorable in contrast with similar studies [40–42].

In a conclusive way, both PCA and HP are successful techniques for acute left sided colonic obstruction. As a result of the high morbidity documented in the second stage of the HP, the delayed return to normal daily life, and the high incidence of permanent stoma, we prefer PCA for the treatment of these patients. However, HP is still considered a good operation especially in very old critical patients that can not tolerate the prolonged anesthesia time of PCA.

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Conflicts of interest

There are no conflicts of interest.

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