Laparoscopic Hartmann reversal: A single center experience in a developing country

Original Article

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ABSTRACT

Background: In colorectal surgery, one of the trickiest techniques is the Hartmann reversal. The rate of anastomosis leaking varies. Minimally invasive surgeries like laparoscopic Hartmann reversal (LHR) have become more popular because of lower morbidities. The aim of this study was to report our institutional experience in LHR.

Patients and Methods: The current prospective randomized study included 62 patients who were eligible for HR. Patients were randomly allocated into two equal groups. Group A (n=31) underwent LHR, while group B underwent open Hartmann reversal. Follow-up was planned for at least 6 months.

Results: The mean age was 45.72±15.12 and 42.66±14.91 in groups A and B, respectively. There was a statistically significant longer mean operative time with more mean blood loss in group B (*P≤0.001*) with a significantly longer hospital stay. The postoperative complications, including wound infection, dehiscence, seroma, intestinal leak, ileus, and incisional hernia, were evident in group B when compared to group A (*P≤0.001*).

Conclusion: Well-chosen patient makes (HR) a safe and beneficial technique for improving a patient's quality of life. Patients can get substantial benefits with minimally invasive procedures, such as a quicker recovery with fewer operating hours, less projected blood loss, a shorter time to flatus, less pain following surgery, and a shorter hospital stay.

Key Words: Hartmann procedure, laparoscopic Hartmann reversal, open Hartmann reversal.

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INTRODUCTION

Henri Albert Hartmann developed the extensively used Hartmann's procedure (HP) in 1923 to treat conditions involving the rectosigmoid colon. Its application included, among other conditions, complex diverticulitis, obstruction or perforation of the left colon, and ischemic colitis exacerbated by edema or fecal contamination[1,2].

Hartmann's reversal (HR), especially with the use of stapling devices from the mid-1980s has become a highly recommended operation since HP has a negative influence on quality of life. For certain patients, HR has shown to be an appealing choice[3,4].

In colorectal surgery, one of the trickiest techniques is the HR. The rate of anastomosis leaking varies. Minimally invasive surgeries like laparoscopic Hartmann reversal (LHR) have become more popular because of lower morbidities[5].

About 30 years ago, LHR was initially reported. Studies assessing the less invasive method of HR have been conducted throughout the past 20 years to reduce mortality and morbidity compared to open Hartmann's reversal (OHR)[6]. Data indicates a high average conversion rate of 25% because of numerous thick adhesions and challenges in rectal stump identification[7]. According to recent data, there are still gaps in the literature about analytical research that has compared the results of these two methods[8].

The gray area about the most beneficial modality for HR has motivated the authors to conduct this study to compare the outcomes of LHR with OHR.

PATIENTS AND METHODS:

The current prospective randomized study was conducted at the General Surgery Department at Benha University Hospital following the ethical perspectives of the Helsinki declaration, where approval was obtained from the research and ethical committees, Benha University.

Fully informed written consents from all patients regarding the procedure and complications.

The current study included 62 patients who were eligible for HR following HP for complicated diverticular disease, obstructed or perforated cancer colon, volvulus sigmoid colon, or trauma. Patients with disseminated

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malignancy or those with ASA class more than III were excluded.

Eligible patients were randomly allocated into two equal groups. Group A (n=31) underwent LHR, while group B underwent OHR from January 2021 to July 2023.

Randomization was done by specific software (Random Allocation Software 1.0, 2011, developed by M. Saghaie, University of medical science, Isfahan, Iran).

Preoperative assessment includes detailed history taking especially about the initial indications for HP. Preoperative investigations included endoscopy and contrast enema for evaluation of rectal stump length as well as the remaining proximal colon. The patients were on clear fluids on the day before surgery and underwent a rectal enema on the day of surgery. Third-generation cephalosporin with metronidazole was given intravenouly for prophylaxis as routine.

The procedure

Group A (laparoscopic Hartmann reversal)

The patient was placed in a modified lithotomy posture. The first port entry was created above the level of umbilicus to be away from lower midline scar with a 12 mm vissiport trocar or using the open Hasson technique. Pneumoperitoneum at 12–15 mmHg was established. Additional port entries were applied. In Trendelenburg position (30°), abdominal cavity exploration was done. Adhesiolysis was done (Fig. 1). In females, for better visualization and mobilization of rectal stump, the uterus was sutured to the abdominal wall. Dissection and mobilization of the rectal stump were done (Fig. 2).

Then, deflation of the abdomen with mobilization of the stoma from the abdominal wall till reaching the fascia with complete detachment from the abdominal wall was done. The edge of the stoma was revised, then insertion of the anvil of a circular stapler was secured with a purse-string polypropylene suture, then returned to the peritoneal cavity, then the fascia of the old stoma site was closed to avoid a gas leak, the pneumoperitoneum was re-established.

Then, mobilization of the descending colon to the level of splenic flexure (Fig. 3) was done to ensure colorectal anastomosis without any tension. The circular end-to-end anastomosis (Ethicon Circular Stapler) stapler was inserted transanally and manipulated to the top of the rectal stump and an end-to-end colorectal anastomosis was created (Fig. 4). The stapler was gently removed once the anastomosis had been effectively formed. Interrupted seromuscular sutures were taken over the anastomosis using PDS sutures. A leak test was done.

All port sites were closed, and the stoma site was sealed over a tube drain.

Group B (open Hartmann reversal)

The same principles were used but through a midline incision. Adhesiolysis was done, and then identification of the rectal stump was done. This was followed by dissection of the stoma and mobilization of the splenic flexure. Restoration of the gastrointestinal tract continuity was done using a stapler or hand-sewn anastomosis. Closure over the pelvic drain was done

Follow-up and outcomes

The primary outcome was safe HR with minimal early postoperative complications.

The secondary outcome was decreased hospital stay together with early recovery.

Follow-up was planned for at least 6 months.

Postoperative care

Antibiotics was described in the form of ceftriaxone 1 g once daily for 5 days with metronidazole 500 mg/100 ml intravenous infusion twice daily for 3 days. Patients start oral fluids once intestinal sounds become audible and start a soft diet after 72 h.

The duration of hospital stay from the day of admission until the patient was deemed medically suitable for discharge was reported.

Statistical analysis

The G*power 3.1 program (Universities, Dusseldorf, Germany) was used to calculate the sample size. There were 31 patients from each group of 62 patients, with an effect size of 0.9, 95% power, and a 0.05 type 1 error (two-tailed).

For quantitative parameters that were specified using range (minimum and maximum), mean, and SD, statistical analysis was carried out using the Student's t test. For qualitative characteristics expressed as the frequency with percent, the χ^2 test was employed . Version 21 of the Statistical Package for Social Sciences, or SPSS-20, was employed (IBM Corp., Armonk, NY, USA). Less than 0.05 as the probability value was deemed significant.

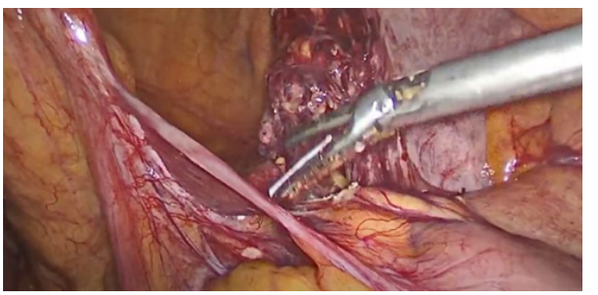

Fig. 1: Adhesiolysis.

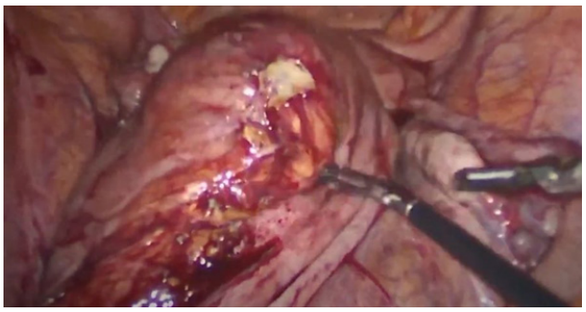

Fig. 2: Dissection and mobilization of the rectal stump.

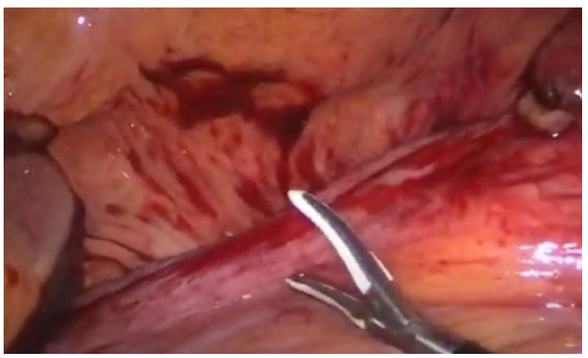

Fig. 3: Mobilization of descending colon.

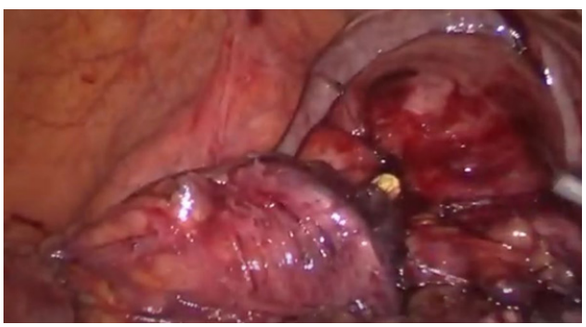

Fig. 4: Colorectal anastomosis.

RESULTS:

In the current investigation, 62 patients were divided into two equal groups with a mean age of 45.72±15.12 and 42.66±14.91 in groups A and B, respectively. No statistically significant difference was reported between both groups as regards the sociodemographic data or the comorbidities (Table 1).

Table 2 presented that the main indication of HP was for benign lesions in 67.74% of group A and 64.5 in group B, with no statistically significant difference. The mean time interval was longer in group B than in group A but without a statistically significant difference (*P=0.061*). The method of anastomosis was done mainly using a stapler in most cases in group A, with a significant difference when compared to group B (*P<0.001*). There was a statistically significant longer mean operative time with more mean blood loss in group B (*P≤0.001*) with a significantly longer hospital stay. The postoperative pain score was statistically significant less in with early return of the bowel activity group A when compared to group B (*P≤0.001*).

Table 3 showed no statistically significant difference between both groups as regards the intraoperative bowel, rectal, or bladder injury, while the postoperative complications, including wound infection, dehiscence, seroma, leak, ileus, and incisional hernia, were evident in group B when compared to group A (*P≤0.001*).

Table 1: Sociodemographic data and patient comorbidities

Variables	Group A: LHR (*N*=31)	Group B: OHR (*N*=31)	*P* value
Age			
Mean±SD	45.72±15.12	42.66±14.91	0.24
Sex [*n* (%)]			
Male	17 (54.85)	18 (58.1)	0.085
Female	14 (45.15)	13 (41.9)	0.078
ASA score	1.83±0.86	1.92±0.81	0.12
HTN [*n* (%)]	5 (16.1)	4 (12.9)	0.062
DM [*n* (%)]	4 (12.9)	4 (12.9)	1.00
IHD [*n* (%)]	3 (9.6)	2 (6.4)	0.71
Smoking [*n* (%)]	11 (35.5)	13 (41.9)	0.056
BMI	34.52±5.97	33.12±6.23	0.19

DM, diabetes mellitus; HTN, hypertension; LHR, laparoscopic Hartmann reversal; OHR, open Hartmann reversal.

Table 2: Pathological criteria and operative data

Variables	Group A: LHR (*N*=31) [*n* (%)]	Group B: OHR (*N*=31) [*n* (%)]	*P* value
Indication for HP			
Complicated diverticular disease	12 (38.7)	10 (32.26)	0.16
Trauma	5 (16.1)	6 (19.35)	0.09
Perforated or obstructed cancer colon	10 (32.26)	11 (35.5)	0.073
Others	4 (12.9)	4 (12.9)	1.00
Time interval before revision (months)			
Mean±SD	3.76±0.72	4.12±0.83	0.061
Procedure			
Type of anastomosis			
Stapler	29 (93.7)	17 (54.85)	<0.001*
Hand Sewen	2 (6.4)	14 (45.15)	<0.001*
Operative time (min)			
Mean±SD	127.23.2±46.2	139.35±58.2	<0.001*
Hospital stay (days)			
Mean±SD	3.2±1.1	4.12±1.83	<0.001*
Conversion to open	3 (9.6)	–	
Blood loss			
Mean±SD	119.6±63.67	243±71.2	<0.001*
Postoperative pain score			
VAS			
Mean±SD	1.96±0.87	3.21±1.12	<0.001*
Bowel movement (days after surgery)			
Mean±SD	2.72±1.65	3.81±1.72	<0.001*

HP, Hartmann's procedure; LHR, laparoscopic Hartmann reversal; OHR, open Hartmann reversal.

Table 3: Intraoperative and postoperative complications

Variables	Group A: LHR (*N*=31) [*n* (%)]	Group B: OHR (*N*=31) [*n* (%)]	*P* value
Intraoperative complications			
Small bowel injury	3 (9.6)	2 (6.4)	0.71
Rectal injury	2 (6.4)	2 (6.4)	1.00
Bladder injury	1.83±0.86	1.83±0.86	1.00
Intraoperative bleeding	3 (9.6)	4 (12.9)	0.056
Postoperative complications			
Ileus	3 (9.6)	6 (19.35)	<0.001*
Leak	1.83±0.86	1.83±0.86	1.00
Wound infection	3 (9.6)	5 (16.1)	<0.001*
Wound dehiscence	1.83±0.86	4 (12.9)	<0.001*
Seroma	3 (9.6)	6	<0.001*
Incisionl hernia	1.83±0.86	5 (16.1)	<0.001*

LHR, laparoscopic Hartmann reversal; OHR, open Hartmann reversal.

DISCUSSION

HP usually involves sigmoid colon resection, formation of rectal stump, and a colostomy. Bowel continuity enhances the quality of life. However, not everyone who underwent HP is eligible for restoration[1,9].

In the current study, the main indication of HP was for benign diseases, including diverticular disease and trauma matching. Cho *et al*.[1] reported that 57% of HR was done for benign lesions, although other authors reported a higher incidence of HR following sigmoidectomy for cancer colon and this is assumed to be due to conduction of their study on Asian population where the incidence of colonic carcinoma is more prevalent[10,11].

In the current study, there was no significant difference between the two groups as regards the sociodemographic data, with no correlation between the ASA score and the age and the incidence of postoperative complication, and these findings matched the reports of Cho *et al*.[1] and Lin *et al*.[12]. However, this comes against what was reported by Park *et al*.[13] and Vermeulen *et al*.[14], who reported that many factors can affect the outcome following HR, including age and ASA score.

The mean operative time of LHR and OHR vary among the studies. In the two large meta-analysis conducted by Celentano *et al*.[15] and van de Wall *et al*.[16] where the operation time was comparable between the two groups, and this comes against the results of the current study that showed a statistically significant longer operative time in patients underwent OHR, and this can be simply explained by the longer time consumed in incision and closure of the abdomen as well as the time consumed in hand sewen anastomosis that can be done in restoration of gastrointestinal tract continuity which is relatively longer than the time consumed when using a stapler which is a mandatory step in the LHR this is matched the reports of Guerra *et al*.[17] who compared 26 studies reporting a statistically significant less operative time in LHR. Also, severe abdominal adhesions often required OHR, contributing to a longer operation time.

The perioperative benefits of laparoscopic surgery in colorectal surgery were clearly demonstrated by the improved recovery programmes after surgery recommendations, which included less postoperative discomfort, a quicker return to normal bowel function, a quicker return to a regular diet, and a shorter hospital stay[18,19]. Shorter hospital stays and reduced complications rates were noted by van de Wall *et al*.[16] in LHR.

In the current study, there was a statistically significant less postoperative pain, less time to pass flatus, and less hospital stay, matching the reports of De'angelis *et al*.[20] and Vorobiev *et al*.[21].

In their investigation, Zimmermann *et al*.[22] discovered that in three of the 24 patients, or 12.5%, the change from laparoscopic to open technique was required. They claimed that in one patient, the cause was profound enteric adhesions with the anterior abdominal wall and the inability to insert the optical trocar under direct vision; in the other two patients, the reason was the inability to identify the rectal stump because of extensive adhesions of small intestine loops within the lesser pelvis.

This was similar to the reports of the current study, where conversion occurred in two patients for the same reasons. However, this was opposed to none in the findings of Cho *et al*.[1], who reported no conversion to OHR. The surgeon learning curve and the surgical technique are the two main causes of our low conversion rate[23].

Studies comparing LHR and OHR have vastly differing definitions of early and late problems, which makes comparisons erroneous and challenging. Higher complication and reoperation rates were noted during the 6-month follow-up in the OHR group by Haughn *et al*.[24], primarily due to incisional hernia. The 30-day total morbidity, reoperation rate, and readmission in the OHR group were reported by Celentano *et al*.[15]. van de Wall *et al*.'s[16] meta-analysis revealed that the OHR group had a greater mean overall morbidity rate, particularly for wound infection, anastomosis leakage, and cardiac problems. Ileus was the most frequent early postoperative complication in the current study, affecting nine patients (six of whom had OHR and three had LHR).

Chen *et al*.[25] reported seroma, wound infection, and intra-abdominal infection were more common in OHR group which is similar to the reports of the current study and this can be explained by the larger incision and subcutaneous dissection. Surprisingly, incisional hernia occurred in two patients in each group, but midline incision occurred in the OHR group only, and this comes against Cho *et al*.[1], who reported more incidence of colostomy site incisional hernia in LHR than OHR and this is assumed to be due to inclusion of patients with higher ASA score and comorbidities in their study impairing wound healing and predisposing incisional hernia[15,16,26].

Studies comparing LHR and OHR have vastly differing definitions of early and late problems, which makes comparisons erroneous and challenging.

Higher communication was noted by Haughn *et al*.[24]. In our investigation, accidental damage to neighboring organs occurred more frequently in the LS group than in the OS group; however this difference did not achieve statistical significance. This result is consistent with the literature and validates the higher rate of unintentional damage to neighboring structures during laparoscopic than open colorectal surgeries[13,27].

Leakage is a serious postoperative complication following HR. In the current study, there was no statistically significant difference in leakage in OHR than LHR, matching the results of Abueta *et al*.[2], who reported a 1.3% leakage rate in OHR, which is much less than what was reported in the current study and this is assumed to bed due to the small sample size in the current study. Apart from the small sample size, our results were similar to Nguyen *et al*.[28] and other authors[29], who reported an average anastomotic leak rate in the range of 3.7–16%

CONCLUSION

In summary, well-selected patient makes (HR) a safe and beneficial technique for improving a patient's quality of life. Patients can get substantial benefits with minimally invasive procedures, such as a quicker recovery with fewer operating hours, less projected blood loss, a shorter time to flatus, less pain following surgery, and a shorter hospital stay.

CONFLICT OF INTEREST

There are no conflicts of interest.

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