

Classification of Hartmann's procedure reversal complications according to the Clavien-Dindo System



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Adnan Hut*, Okan Murat Aktürk*, Mikail Çakır*

*University of Health Sciences Istanbul Hamidiye Vocational School of Medical Sciences, Turkey

**Department of Surgery, University of Health Sciences, Istanbul Haseki Training and Research Hospital, Turkey

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BACKGROUND: *Hartmann's Procedure (HP) is performed for cancer, trauma or benign diseases of the left colon. It is regarded as a solution to avoid a risky anastomosis with the intent to reverse after the diseased colon is given time to recover. This reversal has been associated with a potential morbidity and mortality.*

OBJECTIVES: *Our objective was to investigate the complications and morbidities associated with HP reversal.*

METHODS: *The Hartmann reversal operations performed in the general surgery department were reviewed between January 2014 and January 2018 in the Istanbul Haseki Training and Research Hospital.*

RESULTS: *During the evaluation period, 41 patients underwent a HP reversal with the mean age of 57.45 ± 15.75 . The majority of the patients were male (73%; $n = 30$). The overall complication rate was 44%. There were seven (17%) cases of reoperation with high-grade complications, and four (9.8%) of the patients were re-hospitalized due to complications.*

CONCLUSIONS: *HP reversal can be considered a relatively safe operation for a selected group of patients including those with preoperative comorbidities, yielding an anastomotic leakage rate of 7.3% and a hospital readmission rate of less than 10%. The repair of an incisional hernia at the same time does not increase the complication rate.*

KEY WORDS: Complications, Colostomy, Clavien-Dindo classification, Hartmann's procedure reversal, Hartmann's system procedure reversal

Introduction

Hartmann's procedure (HP), which comprises a resectosigmoid resection, closure of the rectal stump, and the formation of an end colostomy, was first defined in 1921 to solve anastomotic leakage and mortality problems after

resection and primary anastomosis of left-sided obstructing colonic cancer ^{1,2}. The initial aim of the procedure was to decrease the morbidity and mortality rate of sigmoid colon resection for cancer by avoiding colorectal anastomosis ³. The procedure has an additional advantage of permitting the early start of oral intake postoperatively ⁴. Common indications for HP consist of perforated tumors, severe diverticulitis, trauma, or patients with comorbidities where primary anastomosis is deemed risky ⁵. After a period of postoperative colon recovery, bowel continuity is regained by the reversal of the colostomy. Since HP is a reversible operation, problems related to an end colostomy and stoma closure have become major concerns for surgeons. However, because of the associated morbidity and mortality of the operation and the general health status of patients, many patients are unfortunately at risk of being left with a permanent colostomy ⁶.

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Correspondence to: Okan Murat Aktürk, MD, Department of Surgery, University of Health Sciences, Aksaray, Dr. Adnan Adıvar Cd. No: 9, 34130 Fatih/Istanbul, Turkey (e-mail: omakturk@gmail.com)

Objectives

We hypothesized that HP reversal is an operation that can be achieved with an acceptable rate of complications. To assess this hypothesis, we reviewed the HP reversal operations performed in our department and produced a primary output of its complications classified according to the Clavien–Dindo grading system ⁷.

Methods

This study was conducted in the General Surgery Department of the University of Health Sciences Istanbul Haseki Training and Research Hospital.

STUDY DESIGN

In this retrospective cohort study the medical files of patients who underwent Hartmann's procedure with successful or unsuccessful reversal between January 2014 and January 2018 were evaluated. In addition to the demographic data, laboratory parameters, the pathology reports obtained at the primary operation (elective or emergency), the period taken between the initial operation and the restoration, the ASA score (American Society of Anesthesiologists Physical Status Classification) ⁸ and complications following the restorative procedures were documented and classified according to the Clavien–Dindo grading system. All patients underwent colonoscopic examination and thorough medical evaluation prior the reversal.

ETHICAL ISSUES

This study was granted permission by the Ethics Committee of University of Health Sciences, Istanbul Haseki Training and Research Hospital (No. 2020/21) with full compliance to Declaration of Helsinki as revised in 2000.

STATISTICAL ANALYSIS

Descriptive data analysis was conducted using JASP statistical software (Version 0.11.1, JASP Team 2019, University of Amsterdam). Baseline variables were summarized using percentages for categorical variables and means or medians for continuous variables. The Mann–Whitney U test was used to compare to independent samples, and a chi-squared test was used for categorical variables. The Shapiro–Wilk test was employed to investigate normality.

COMPLICATIONS

Short-term (30 days) postoperative outcomes included lack of bowel movement, wound infection, hematoma, anastomotic leakage, postoperative length of hospital stay,

and reoperation. Overall morbidity, reoperation, and readmission rates were identified. Both surgical and medical complications were retrospectively graded using the Clavien–Dindo classification system. If a patient had more than one complication, the highest-graded complication was taken into consideration. Major complications were determined as grade 3 or higher (i.e. requiring endoscopic, radiographic, or surgical intervention or mortality). For intensive-care unit stays, a period of more than 24 hours was considered a grade 4 complication.

Results

During the evaluation period, 41 patients underwent a HP reversal consecutively. The mean age of the patients was 57.45 ± 15.75 years (Table I). The median time between the index operation and the reversal was 8 (IQR 7–11) months (Table II). The median time to follow-up was 11.5 (IQR 6.25–14.50) months. The majority of the patients were male (73%; $n = 30$).

The overall complication rate was 44% (18:41) (Tables III, IV). There were seven (17%) cases of reoperation with high-grade complications, and four (9.8%) of the patients were re-hospitalized due to complications. There were four (9.8%) cases of intestinal injury during the reversal procedure, with one undergoing resection and anastomosis. One (2.4%) patient underwent colonic resection during the reversal procedure. One (2.4%) patient had a prolonged ileus in the postoperative period that was resolved by medical therapy. Three cases (7.3%) required re-operation for anastomotic leakage, and one had a protective ileostomy. Two of the three anastomotic leakage cases after HP reversal occurred in patients over the age of 65. Both patients underwent

TABLE I - Patient demographics

	Male	Female	P
Number (n)	30 (73%)	11 (27%)	
Age (years)	59 ± 15.28	51 ± 15.51	0.131
Hospital stay (days)	10 (7-15)	8.5 (8-9.75)	0.915
Alb (g/dL)	3.74 (3.5-4.10)	3.85 (3.62-4.17)	0.548
Hemoglobin (g/dL)	13.50 (12.00-14.65)	12.55 (11.97-13.10)	0.342
RDW (%)	14.85 (13.20-15.75)	14.33 (13.25-14.55)	0.529

TABLE II - Indications for the Hartmann colostomy (index operation)

Descending colon and sigmoid cancer	20 (49.0%)
Diverticulitis	7 (17.0%)
Volvulus	2 (4.8%)
Mesenteric ischemia	1 (2.4%)
Colonic Trauma	5 (12.2%)
Anastomotic leakage	5 (12.2%)
Ovarian cancer	1 (2.4%)

colostomy reformation procedures. One of them was successfully reversed seven months later, and the other was still in the follow-up period. Both cases were non-malignant: one was due to diverticulitis and the other case, due to traumatic perforation of the sigmoid colon, was a 43-year-old female, who underwent re-anastomosis and a protective ileostomy.

A patient with a colovesical fistula, originating from a remnant segment of the colon with diverticular disease, had to be re-operated on for colonic resection. One patient underwent multiple debridements and wound suturing (Grade 3a). Another patient with a wound infection turned out to have an evisceration and underwent surgical correction (grade 3b). At the time of reversal, five patients had incisional hernias that were corrected during closure.

Handsewn cases comprised 39% (16:41) of the cases. There was no significant difference in overall complication rate considering handsewn or whether the index operation was carried out for malignancy, $P=0.268$, $P=0.678$, respectively (Table V). There was no mortality.

TABLE III - Postoperative complications after Hartmann procedure reversal in our study

Anastomosis leakage grade 3b	3 (7.3%)
Colovesical fistula grade 3b	1 (2.4%)
Wound infection (grade 3a)	1 (2.4%)
Wound infection grade 1-2	9 (22%)
Bleeding grade 2	1 (2.4%)
Evisceration (grade 3b)	1 (2.4%)
Subileus that resolves with medical therapy (grade 2)	1 (2.%)
Respiratory problems that cause Prolonged ICU stay (>48 hours) (grade 4a)	1 (2.4%)

TABLE IV - Overall complications according to the Clavien-Dindo classification in 41 patients. (percentages are approximated)

Grade I	7 (17%)
Grade II	4 (9.8%)
Grade III	6 (14.6%)
Grade IV	1 (2.4%)
Grade V	0

TABLE V - The relationship of demographic and laboratory parameters to the presence of any complication.

Parameters	P
Sex	0.479
Albumin (g/dL)	0.201
RDW (%)	0.539
Hemoglobin (g/dL)	0.014*
Age (years)	

*significant

Discussion

HP, a life-saving surgical operation, has been employed since the beginning of the 20th century for the treatment of benign and malign diseases relating to the left colon. Although, initially, the procedure was defined for obstructive cancers of the distal left colon, it is now used for benign pathologies, such as diverticulitis, volvulus, and trauma⁹. The procedure is also used for the emergency treatment of colonoscopy and stenting complications¹⁰.

However, maintaining gastrointestinal continuity after an HP is challenging and such an attempt can result in high rates of morbidity and mortality. The reversal procedure can result in complications, such as intestinal injury from adhesiolysis, a necessary part of the operation, and the risk of anastomotic leakage, wound infections, and, to a lesser degree, incisional hernia¹¹. With the increased employment of HP, problems with patients' quality of life and mental and physical conditions arise once the acute disease is overcome¹². Restoration of the continuity of the digestive system has become even more important as benign diseases are more frequent and life expectancy has improved.

The rate of reported anastomotic leakage varies greatly among studies. Banjaree et al.¹³ reported an incidence of 4 (6.34%) among 66 patients, but could not identify any specific parameter related to the anastomotic leakage. In the same study, they also reported that after an HP, 40% of the patients did not undergo reversal because of age and associated morbidities. A French study that identified factors influencing HP reversal morbidity and postoperative mortality reported 7.1% serious complications relating to Clavien–Dindo III-IV-V, a mortality of 4.2%, and 42.8% overall morbidity, with an anastomotic leakage rate of 5.7% (with no significant parameters in the multivariate analysis, such as age and high ASA)¹⁴.

Tan et al.¹⁵ reported no anastomotic leakage in an Asian patient group with a median age of 69 over 16 years with 46 operations, including 9 (18.4%) patients who underwent ileostomy creation with HP reversal at the same time. For the index operation, they reported a higher incidence of malignancy than for diverticulitis (49% vs. 19.4%, respectively), in line with our rates (49% vs. 17%, respectively).

However, Tokode et al.¹⁶ reported a 7.8% (4:51) rate of anastomotic leakage and a morbidity rate of 37.3% in a series of 51 patients. The majority of the complications were wound infections. Hallam et al.¹⁷ reported a series of 108 patients who underwent reversal with 10 (9.2%) having defunctioning ileostomies created at the same time with no mortalities. The overall complication rate was 21%, in which wound infection was the most common (8%). Anastomotic leakage occurred in five patients (5%), which is comparable to our study. Age is an important factor in the reversal process, in a

study of 168 patients, predictors of reversal were male sex, non-neoplastic disorder, younger age and lower anesthetic risk¹⁸. As a general rule, the majority of patients with a colostomy after HP are too old and are considered as ASA III or higher¹⁹. In a revision study of 646 patients who underwent HP reversal, only 2% were ASA IV and 67% were ASA I-II⁹. Although 6 (15%) patients had an ASA score of 4 in our study, there was no significant increase in complications in this patient group ($P = 0.554$). This is in line with Schmelzer et al.²⁰ who demonstrated that a selected population of patients aged over 60 years and with ASA scores of more than II had limited postoperative morbidity and mortality after colostomy reversal and reported one case of anastomotic leakage in 113 patients.

In a study reviewing 168 cases of colostomy reversal, end colostomy was the most common index operation especially in the emergency settings. They found no significant difference in anastomosis leakage rate in the postoperative period between loop sigmoidostomy and HP reversal operations and wound infections were the most common complication with no significant difference in overall complication rates for both procedures²¹.

A total of five (12%) patients underwent concurrent incisional hernia repair, and among these patients, one (20%) had an intraabdominal hematoma and underwent reoperation (Grade 3b). In a large retrospective cohort study, Curran et al.²² investigated the postoperative outcomes of ventral hernia repair carried out in the same operation as the reversal and found that the reoperation rate following the combined procedure was two to three times higher than that of a HP reversal alone. However, we could not find any significant difference between the complications and the reoperations ($P = 1$).

Laparoscopic reversal is a hot topic. Laparoscopic intervention has been associated with faster recovery and reduced rates of surgical site infection in appendectomies and cholecystectomies^{23,24}. Park et al.²⁵ evaluated 68 patients (29 started open, 20 laparoscopic, and 19 converted to open) and reported an overall postoperative complication rate of 35.3%; however, the main complication was postoperative ileus (13 patients; 19.1%) with no anastomotic leakage. The open and converted group had a wound infection rate of 22% (11:48)²⁵. Laparoscopic adhesiolysis can be challenging and, even, placing a port can be problematic²⁶. However, Maitra et al.²⁷ found no difference in hospital readmission and reoperation rates between these two procedures, although they were slightly higher for the laparoscopic procedure, but with less morbidity. In a review of 681 patients, 113 (16.6%) experienced postoperative complications, the most frequent being wound infection (36.3%; 41 patients)²⁸. Therefore, the laparoscopic approach may be efficient for a selected group of patients, probably as an initiation that can be turned to open procedure anytime. In a study which consisted both laparoscopic and open surgery for HP reversal operation, the authors identified

higher ASA grade and body mass index (BMI) as a reason for morbidity (34%). A higher BMI was also a risk factor for anastomotic leakage. Another significant factor for complications was the experience of the attending surgeon²⁹.

The data-size limitation of this study is moderate, but it is good enough compared to many other studies. There is also a selection bias in our study, but this is an unavoidable outcome of the reversal procedure, which is only used for patients who have survived postoperative therapy and are fit enough to undergo another major operation. Our patient series included a higher number of ASA IV patients than most other studies, which makes our study interesting. Additionally, wound infections that occurred after 8-10 days of hospital stay may have been represented at a lower rate because small discharges from wounds may have been deemed unimportant and consequently understated in the follow-up notes.

Conclusion

HP reversal can be considered a relatively safe operation for a selected patient group, having an anastomotic leakage rate of 7.3% and a hospital readmission rate of less than 10%, although the operation has a high rate of wound infections and low-grade complications. The operation has a low complication rate among patients selected as high ASA patients. The repair of an incisional hernia at the same time as the reversal does not increase the complication rate.

Riassunto

La procedura secondo Hartmann (HP) viene eseguita per cancro, traumi o malattie benigne del colon sinistro. È considerata una soluzione per evitare un'anastomosi rischiosa con il programma di restaurare la continuità enterica dopo che il colon malato ha il tempo di riprendersi, e questa riconversione chirurgica è associata a una potenziale morbilità e mortalità. Il nostro obiettivo è stato quello di studiare le complicanze e le morbilità associate alla riconversione dell'HP.

Per questo sono state ricontrattate retrospettivamente le operazioni di riconversione dopo Hartmann eseguite nel reparto di chirurgia generale. La finalità principale è rappresentata dalle complicanze della riconversione di HP classificate secondo il sistema Clavien-Dindo.

Nell'intervallo del periodo di valutazione, 41 pazienti con un'età media di $57,45 \pm 15,75$ sono stati sottoposti a riconversione dell'HP. La maggior parte dei pazienti era di sesso maschile (73%; $n = 30$). Il tasso di complicanze complessivo è stato del 44%. Ci sono stati sette (17%) casi di reintervento per complicanze di grado elevato e quattro (9,8%) pazienti sono stati successivamente nuovamente ricoverati a causa di complicanze.

In conclusione la riconversione della HP può essere considerata un'operazione relativamente sicura per un gruppo selezionato di pazienti, compresi quelli con comorbidità preoperatorie, con un tasso di deiscenza anastomotica del 7,3% e un tasso di riammissione in ospedale inferiore al 10%. La riparazione contemporanea di un laparocele non aumenta il tasso di complicanze.

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