

Laparoscopic Reversal of Hartmann's Procedure

¹K Kilic, ²K Ulker

¹Medical Faculty, Department of General Surgery, Kafkas University, Kars, Turkey

²Medical Faculty, Department of Obstetrics and Gynecology, Kafkas University, Kars, Turkey

Correspondence: K Kilic, Medical Faculty, Department of General Surgery, Kafkas University, Tip Fakultesi Genel Cerrahi ABD 36200, Kars, Turkey, Phone: 90-505745-68-30, e-mail: kilic8@hotmail.com

Abstract

Objective: To assess the outcomes of laparoscopic and open reversal of Hartmann's procedure.

Methods: Studies of laparoscopic reversal of Hartmann's procedure with comparison of open approaches are searched from medical literature and outcomes of the approaches made.

Results: Laparoscopic reversal of Hartmann's procedure with the advantages of smaller incisions, decreased postoperative pain, shorter recovery time, and early return to normal activity may reduce morbidity rates. And laparoscopic approach has a clear advantage over open approach for mobilization of the splenic flexure by avoiding an upper abdominal incision and its potentially increased respiratory complications when mobilization is mandatory. The most commonly reported reason for conversion to laparotomy was the failure to identify the rectal stump and conversion rate is between 4 to 22%. There are only two studies directly comparing laparoscopic and open reversal approaches, up-to-date.

Conclusion: Laparoscopic reversal of Hartmann's procedure for restoration of intestinal continuity can be performed with low morbidity and a short hospital stay.

Keywords: Reversal of Hartmann's procedure, laparoscopy, open, laparotomy, outcomes, complications.

INTRODUCTION

After the description of Hartmann's procedure in 1923, by Henri Albert Hartmann for the treatment of proximal rectal cancer, Hartmann's procedure has been commonly used for conditions like distal large bowel obstruction, complicated diverticulitis and colonic injuries that may be difficult and unsafe for repair (ischemic and inflammatory colitis, traumatic perforation of the colon, volvulus and anastomotic leaks).¹ Following the initial surgery of Hartmann's procedure, after the recovery of the patient, reversal of the procedure for bowel continuity maintenance is indicated. Reversal procedure is a major abdominal surgery and has risks of mortality and morbidity.^{2,3}

After the expansion of Minimal Access Surgery (MAS) techniques for colorectal surgery, with clear advantages of low morbidity, less postoperative pain, shorter hospital stay, and an earlier return to normal life; articles about other procedures such as reversal of Hartmann's procedure were published.^{4,5} Although the successive studies support the improved outcomes of the laparoscopic Hartmann's reversal, when compared with other laparoscopic surgeries this procedure's improvement is being lagged.

Purpose of this review is to compare the outcomes of laparoscopic and laparotomic Hartmann's reversal procedure to enlighten the surgeons while selecting the approach.

METHODS

Recent medical literature for the complications of laparoscopic reversal of Hartmann's procedure was searched. Data were collected by using the online search engines like Pubmed, Highwire, Google and Google Scholar. In the search we included the prospective, retrospective studies and review articles. All the procedures that began laparoscopically, even then converted, were included in the study. Patients' age at reversal, gender, anesthesiologic risk, initial operation indication, comorbidities, operative time, complications, postoperative bowel movements and hospital stay time were the concerns. Previous articles and their results were compared at the base of these parameters.

SURGICAL TECHNIQUE

In the study of M Khaikin et al in 2006,⁶ all patients underwent preoperative mechanical bowel preparation, and a Fleet enema Fleet, Lynchburg, Virginia, USA was administered to empty the rectal stump. In addition, perioperative broad spectrum parenteral antibiotics and subcutaneous low-molecular-weight heparin were routinely used. No ureteric catheters were used in this study. A Jackson-Pratt drain was placed through the lower abdominal trocar site. The patients were placed in a modified lithotomy position with the legs only slightly flexed. Two video monitors were placed on the left side of the patient. The surgeon and first assistant stood on the right side of the

patient, with the second assistant standing on the left. The initial port insertion was performed by one of two techniques depending upon the surgeons' preference. The first technique involved mobilization of the colostomy site through a peristomal incision, with the anvil of a circular stapling device inserted into the lumen. For the left colon, the anvil was placed into the abdominal cavity, and the colostomy site was used as the port site for the establishment of pneumoperitoneum. The fascia at the colostomy site was closed using two continuous 0 Prolene sutures, and the Hasson cannula was placed between these sutures, creating an airtight port site. The second approach involved placement of a Hasson trocar into the right lateral abdomen, away from the previous incision. This approach allowed dissection of adhesions before mobilization of the colostomy from the abdominal wall. Two to three additional ports were then inserted under direct vision. A 12 mm port was placed in the lower right iliac fossa, and a 5 mm port was inserted into the right upper quadrant. The colostomy site was closed primarily. The skin wound was closed using a skin stapler without suturing of the subcutaneous tissues. Intra-abdominal adhesions were dissected free by sharp dissection. The descending colon and the splenic flexure were routinely mobilized to ensure a tension-free colorectal anastomosis. In patients with diverticular disease, any residual distal sigmoid colon was resected to the level of the rectosigmoid junction using a laparoscopic linear stapler. The steep Trendelenburg position with a tilt to the right was useful for keeping the small bowel out of the pelvis. Identification of the rectal stump and its mobilization might be facilitated by the transanally inserted circular stapler or Hegar dilator. The transanal end-to-end anastomosis was performed using a circular stapling device. In this study, all surgeries were performed by six experienced attending surgeons, each of whom had performed more than 20 laparoscopic colorectal procedures and extensive noncolorectal laparoscopic procedures. Hand-assisted laparoscopic surgery was not used for Hartmann's reversal.

In the study of H Mazeh et al,⁷ they placed pneumatic compression boots in all cases, and gave intravenous antibiotics approximately 30 minutes preoperatively. A urinary catheter was routinely inserted and patients were placed in either split-legged or modified lithotomy position. Video monitors were placed on the left side of the patient, with the surgeon and assistant standing on the right. Initial port insertion was accomplished by the open Hasson technique in the right lateral abdomen. Two to three additional ports were used in the upper abdomen and right

lower quadrant as needed. Lysis of adhesions was done to allow mobilization of the colostomy and identification of the rectal stump. This was carried out using scissors, monopolar diathermy, or ultrasonic activated devices according to surgeon's preference. When necessary to identify the rectal stump, a dilator, stapling device or sigmoidoscope was inserted into the rectum. The colostomy was freed from the abdominal wall and the anvil of a circular stapling device was inserted into the lumen. The colostomy was then delivered into the abdomen, and either a 12 mm trocar placed at this site or fascial closure performed. Mobilization of the left colon, splenic flexure, and resection of proximal sigmoid or left colon were done as needed. A transanal, end-to-end anastomosis was performed using a circular stapling device. Anastomotic integrity was confirmed by using insufflations of air and colored saline. Hand-assisted technique was not used in any case.

RESULTS

Kohler et al in their study⁸ had 18 patients for laparoscopic reversal of Hartmann's procedure. They had to convert in two cases (11%). They found the median operative time of 114 (65 to 180) minutes. Only three patients had immediate postoperative wound infections. Their patients had first evacuation 3.3 (3 to 5) days after procedure, and complete oral nutrition was started 3.6 (3 to 5) days after operation. Hospital stay was 7.5 (5 to 12) days. Duration of postoperative hospital stay was 7.5 (5 to 12) days. Clinically significant anastomotic stricture which needed endoscopic dilatation was seen only in one patient.

Holland JC et al⁹ published their experience of laparoscopic reversal of Hartmann's procedure. They had success of reversal in 3 of 4 cases.

Michael J Rosen et al.¹⁰ analysed the results of twenty-two laparoscopic reversal of Hartmann's procedure (all but one with left colon colectomies, the remainder right colectomy). They had a success rate of 91% (20 cases) with laparoscopic approach. There were 2 conversions to open (9%) secondary to dense adhesions around the rectal stump. The mean time to closure of the colostomy and the mean operative time were 168 days (range 69 to 385 days) 158 minutes (range 84 to 356 minutes), respectively. Blood loss was estimated as averaged 114 ml (range 30 to 250 ml). Hospital stay was 4.2 days (range 2 to 6 days). 3.5 (range 2 to 5) days after the operation bowel function returned. Three patients (14%) developed postoperative wound infections. Anastomotic leaks and mortality were not seen. A small hernia at a colostomy site was the only long-term complication in a mean 14.7 months follow-up.

M Khaikin et al,⁶ studied 27 patients underwent laparoscopic reversal of the Hartmann's procedure. 17 (63%) of their patients with a mean age of 58.1 (23 to 88) years were males and 10 (37%) with a mean age of 62.9 (17 to 80) years were females. There were 2, 13 and 12 patients classified for anesthesia risk as ASA 1, 2, 3 respectively. 81.5% (22 cases) of the initial surgery was for benign indications (19 perforated diverticulitis, 1 iatrogenic sigmoid perforation, 1 sigmoidal gun shot wound and 1 colon sigmoid volvulus) and 18.5% (5 cases) for obstructing sigmoid carcinoma. Reversal procedures were done 3 to 10 months after the initial operation. They used the colostomy site as the initial port in 21 patients and used Hasson technique in the 6 remaining cases. Their median operative time and median follow-up period were 226 (83 to 329) minutes and 8.5 (2 to 14) months, respectively. Laparoscopic completion success rate was 85.2% (23 cases). Extensive adhesions in three patients and rectal perforation during transanal insertion of the circular stapler in one patient caused conversion. Complications of enterotomy during adhesiolysis and incomplete stapled anastomosis in two patients were repaired successfully laparoscopically. The median bowel movement and the median hospital stay were 4 (1 to 7) days and 6 (3 to 20) days respectively. In 9 (33%) patients, postoperative complications occurred. 5 colostomy-site infection, 2 acute upper gastrointestinal bleeding, 2 intra-abdominal bleeding, 1 pseudomembranous colitis and 1 small bowel obstruction were seen. Three patients had more than one complication. One patient with extensive adhesiolysis underwent reoperation on postoperative day 2 for intra-abdominal bleeding. No anastomotic leaks, ureteral injuries, or intra-abdominal abscesses were recorded, and there was no operative mortality. In one patient late complication of the anastomotic stricture 3 months after surgery, successfully dilated endoscopically was observed.

In 2007, Faure JP et al¹¹ compared the 14 cases of laparoscopic reversal of Hartmann's procedure with 20 cases of open reversal of Hartmann's procedure. They found a conversion rate of 14.28%. Operating time was shorter for the laparoscopic group 143 (90 to 240) vs 180 (90 to 350) minutes. Hospital stay length was shorter for the laparoscopic group 9.5 (4 to 18) vs 11 (6 to 39) days. Use of patient-controlled analgesia was not significantly shorter in the laparoscopic group 3 (0 to 4) vs 3.5 (0 to 8) times. Morbidities observed in the laparoscopy group include a parietal abscess and an anastomotic stenosis without surgical treatment. The open group had 6 complications of 1 anastomotic leak and 5 incisional hernias.

Carus T Et al¹² in their study succeeded to perform 28 of 34 reversal of Hartmann's procedure laparoscopically.

Results were as follows: A short operative time (69 minutes), a conversion rate of 17.9%, wound complications in 10.7% and an anastomotic leak in 1 patient (3.6%). On average the patients were discharged after 8.6 (6 to 17) postoperative days.

Chouillard E et al¹³ compared 44 patients who had laparoscopic Hartmann's reversal with the 44 patients who had open Hartmann's reversal. Conversion rate in this was 9.1%. Operative incidents were comparable in both groups. Operative duration was not significantly shorter in open group (195 minute in laparoscopic versus 160 minutes in open group). Mortality rate was 2.2 % and 0% in laparoscopic group and open group, respectively. Overall morbidity rate was 11.4 % and 28.6 % in laparoscopic and open group, respectively (P < 0.05). The mean length of hospital stay was significantly shorter in laparoscopic group (4.8 days when compared to open group 6.8 days), respectively. An efficiency analysis was performed and demonstrated that laparoscopic reversal did not generate a significant additional cost.

Haggi Mazeh et al⁷ selected 41 open case of reversal of Hartmann's procedure with the best matched criteria of the 41 laparoscopic reversal cases to compare the outcomes. Diverticulitis was the most common initial operation indication in both groups. Perforation, volvulus (four patients), anastomotic leak (three patients), obstructing colorectal carcinoma, ischemic colitis (three patients), Fournier's gangrene (two patients), trauma (two patients), and rectovaginal fistula (one patient) were the other indications. Conversion rate was 19.5% (8 patients) in laparoscopic group due to dense adhesions or failure to identify the rectal stump. In three of these cases a stapling device that was inserted into the rectum failed to assist in identification of the rectum. In the other five cases dense adhesions were the reason for conversion. There were significant differences in operative time [193.1 (89 to 460) minutes vs 209.2 (57 to 335) minutes], blood loss [166.6 (50 to 900) ml vs 326.6 (50 to 950) ml], time to bowel movement [4.2 (2 to 5) days vs 5.3 (3 to 17) days], time to solid diet [4.6 (2 to 9) days vs 5.8 (2 to 10) days] and length of hospital stay [6.5 (3 to 16) days to 8.1 (4 to 22) days], in respective to the first values laparoscopic and second values open group. Postoperative morbidity was 37.8%, most commonly surgical site infection and ileus. Reoperation for two patients was needed in the open group: One for debridement of a deep surgical site infection, and another who developed an incarcerated inguinal hernia on postoperative day 3. Two other patients in this group were admitted to the surgical intensive care unit (SICU) post-

peratively. One of these patients had severe pulmonary comorbidities and required short postoperative mechanical ventilation. The second patient was admitted to SICU for observation for 24 hours due to the surgeon's request because of the patient's age and comorbidities. Three (7.3%) major complications occurred in the open group (deep vein thrombosis and reoperations) and one (2.4%) major complication occurred in the laparoscopy group (enterocutaneous fistula). The overall complication rate in the laparoscopy group was significantly lower than in the open group (26.8% vs 47.8%). There were no anastomotic leaks, uretral injuries or intra-abdominal abscesses in this series, and there were no mortalities. Findings at both the index and the reversal procedures were analyzed to compare differences between the laparoscopic completed and converted groups. No statistically significant difference was found when these criteria were compared between the two groups.

DISCUSSION

Despite its obvious advantage for intestinal continuity, reversal of Hartmann's colostomy is a major abdominal surgery with prolonged recovery. In open reversal morbidity of 4 to 43% was reported, with a wound infection rate of 5 to 24%, and anastomotic dehiscence seen in up to 12%.¹⁴⁻¹⁶ And the mortality rate was reported to differ from 0 to 4%.¹⁷ Because of these risks 40 to 60% of patients refuse reversal. Laparoscopic reversal with the advantages of smaller incisions, decreased postoperative pain, shorter recovery time, and early return to normal activity may reduce morbidity rates. And laparoscopic approach has a clear advantage over open approach for mobilization of the splenic flexure by avoiding an upper abdominal incision and its potentially increased respiratory complications when mobilization is mandatory.^{18,19} In laparoscopic approach clear view of the sigmoid and descending colon is possible avoiding the unnecessary dissection. After the description of Gorey et al. and Anderson et al of laparoscopically assisted Hartmann's reversal,^{4,5} case reports and small series of laparoscopic reversal have followed. But consensus about the preferred surgical technique is lacking. For safe access to the peritoneum, some suggests insertion of the initial port in the colostomy site once it is reduced into the abdomen. But Hasson technique at the right side or in the upper midline left to the rectus sheath was reported in most studies. The most commonly reported reason for conversion to laparotomy was the failure to identify the rectal stump.^{6,7,10} When we searched the medical literature we found a conversion rate between 4 to 22%. But there are only two studies directly comparing laparoscopic and open reversal approaches, up-to-date.^{7,10} In both study the groups were similar in the demographic

and clinical data, along with distinct advantage for laparoscopic group having shorter time to bowel function and hospitalization. Both studies demonstrated lower morbidity rates in laparoscopy group. Mazeh et al analyzed laparoscopy group patients that were converted to laparotomy. And they found that these patients had a higher surgical site infection rate than those that were not converted, suggesting that surgical site infection was not solely related to the colostomy site, but also associated with a long midline incision which is avoided in laparoscopy group. And establishment of scheduled and specified training programs of laparoscopic approach in clinic practices and residency programs, gaining of the surgeons the familiarity of various laparoscopic instruments and their operating principles (bipolar, monopolar coagulation, different energy sources, camera, light source, insufflators and hand instruments), laparoscopic ergonomics, anatomy and various operative techniques will aid in lowering the complication rates.

CONCLUSION

Laparoscopic reversal of Hartmann's procedure for restoration of intestinal continuity can be performed with low morbidity and a short hospital stay. The need for conversion to open surgery is not depended the patients' previous surgeries but the presence of dense adhesions and inability to mark the rectal stump. But more and large serious of randomized, prospective studies are needed to clarify the outcomes of laparoscopic and open approaches of reversal of the Hartmann's procedure. Surgical teams adequately and skillfully trained will open the doors of surgery with minimal (may be non) complications.

REFERENCES

1. Desai DC, Brennan EJ, Reilly JF, Smink RD. Utility of the Hartmann procedure. *Am J Surg* 1998;175:152-54.
2. Schilling MK, Maurer CA, Kollmar O, Buchler MW. Primary vs. secondary anastomosis after sigmoid colon resection for perforated diverticulitis (Hinchey stage III and IV): A prospective outcome and cost analysis. *Dis Colon Rectum* 2001;44:699-703.
3. Ghorra SG, Rzczycki TP, Natarajan R, Pricolo VE. Colostomy closure: Impact of preoperative risk factors on morbidity. *Am Surg* 1999;65:266-69.
4. Anderson CA, Fowler DL, White S, Wintz N. Laparoscopic colostomy closure. *Surg Laparosc Endosc* 1993;3:69-72.
5. Gorey TF, O'Connell PR, Waldron D, Cronin K, Kerin M, Fitzpatrick JM. Laparoscopically assisted reversal of Hartmann's procedure. *Br J Surg* 1993;80:109.
6. M Khaikin, O Zmora, D Rosin, B Bar-Zakai, Y Goldes, M Shabtai, A Ayalon, Y Munz. Laparoscopically assisted reversal of Hartmann's procedure, *Surg Endosc* 2006;20: 1883-86.

7. Haggi Mazeh, Alexander J, Greenstein, Kristin Swedish, Scott Q. Nguyen, Aaron Lipskar, Kaare J. Weber, Edward H. Chin, Celia M. Divino. Laparoscopic and open reversal of Hartmann's procedure: A comparative retrospective analysis. *Surg Endosc* 2009;23:496-502.
8. Köhler L, Lempa M, Troidl H. Laparoscopically guided reversal of Hartmann's procedure *Chirurg*. Oct 1999;70(10):1139-43.
9. Holland JC, Winter DC, Richardson D. Laparoscopically assisted reversal of Hartmann's procedure revisited: *Surg Laparosc Endosc Percutan Tech*. Aug 2002;12(4):291-94.
10. Michael J Rosen, William S Cobb, Kent W Kercher, Ronald F Sing, B Todd Heniford. Laparoscopic restoration of intestinal continuity after Hartmann's procedure. *The American Journal of Surgery* June 2005;189(6):670-74.
11. Faure JP, Doucet C, Essique D, Badra Y, Carretier M, Richer JP, Scépi M. Comparison of conventional and laparoscopic Hartmann's procedure reversal. *Surg Laparosc Endosc Percutan Tech* Dec 2007;17(6):495-99.
12. Carus T, Bollmann S, Lienhard H. Laparoscopic reversal of Hartmann's procedure: Technique and results. *Surg Laparosc Endosc Percutan Tech* Feb 2008;18(1):24-28.
13. Chouillard E, Pierard T, Campbell R, Tabary N. Laparoscopically assisted Hartmann's reversal is an efficacious and efficient procedure: A case control study. *Minerva Chir* 28 Nov, 2008.
14. Schilling MK, Maurer CA, Kollmar O, Buchler MW. Primary vs. secondary anastomosis after sigmoid colon resection for perforated diverticulitis (Hinchey stage III and IV): A prospective outcome and cost analysis. *Dis Colon Rectum* 2001;44:699-703.
15. Ghorra SG, Rzczycki TP, Natarajan R, Pricolo VE. Colostomy closure: Impact of preoperative risk factors on morbidity. *Am Surg* 1999;65:266-69.
16. Khosraviani K, Campbell WJ, Parks TG, Irwin ST. Hartmann procedure revisited. *Eur J Surg* 2000;166:878-81.
17. Keck JO, Collopy BT, Ryan PJ, Fink R, Mackay JR, Woods RJ. Reversal of Hartmann's procedure: Effect of timing and technique on ease and safety. *Dis Colon Rectum* 1994;37:243-48.
18. Hasukic S, Mesic D, Dizdarevic E, Keser D, Hadziselimovic S, Bazardzanovic M. Pulmonary function after laparoscopic and open cholecystectomy. *Surg Endosc* 2002;16:163-65.
19. Hendolin HI, Paakonen ME, Alhava EM, Tarvainen R, Kempainen T, Lahtinen P. Laparoscopic or open cholecystectomy: A prospective randomised trial to compare postoperative pain, pulmonary function, and stress response. *Eur J Surg* 2000;166:394-99.