CASE REPORT

Laparoscopic reversal of Hartmann's procedure

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Reversal of Hartmann's procedure is a major surgical procedure associated with significant morbidity and mortality. Because of the difficulty of the procedure, laparoscopic reversal of Hartmann's procedure is not well established. We describe our experience with this laparoscopic procedure to assess its difficulty and safety. Five patients (4 men and 1 woman) underwent laparoscopic reversal of Hartmann's procedure (LRHP). The initial surgeries were performed to manage obstructive colorectal cancer for 4 patients, and rectovesical fistula for one patient. The procedure was laparoscopically completed for 4 patients. Conversion to open laparotomy was required for one patient, secondary to massive adhesion in lower abdomen. Transient ileostomies were made in 2 cases. Operative time ranged from 240 to 545 minutes. There was no operative mortality. LRHP can be performed safely by an experienced surgeon. However, it is still technically challenging and time consuming.

Key Words: Hartmann's procedure, Colostomy, Laparoscopy

INTRODUCTION

A Hartmann's procedure has been the standard operation in the treatment of complicated left side colon disease. It is most often performed in the emergency setting, usually with an unprepared bowel and in patients who are ill due to sepsis or multiorgan dysfunction. After recovery from the initial surgery, colostomy reversal and restoration of bowel continuity is indicated in selected patients. However, restoration of bowel continuity after a Hartmann's procedure is still considered a major surgical procedure and it carries serious risk of significant morbidity, with reported anastomotic leak rates of 4 to 16% and a mortality of up to 10% [1].

Therefore, laparoscopic techniques have been applied to colostomy reversal in an effort to reduce morbidity and mortality. The initial small laparoscopic series reported shorter lengths of hospitalization, lower morbidity, and no mortality compared with the open series [2].

Herein, we report our up-to-date experience of laparoscopic reversal of Hartmann's procedure (LRHP) in order to assess its difficulty and safety.

CASE REPORT

Five patients (4 men and 1 woman) underwent LRHP between October 2009 and September 2010 at Chung-Ang

University Hospital in Korea.

In this reports of surgical case series, all surgeries were performed by one experienced attending surgeon who had performed more than 70 laparoscopic colorectal procedures and 200 laparoscopic gastric procedures. In all patients, the primary Hartmann's procedure had been performed conventionally by midline laparotomy. During this 1-year period, all five procedures were attempted laparoscopically and no patients underwent reversal of Hartmann's procedure by laparotomy alone.

The initial surgery was performed to manage obstructive colorectal cancer that was not available for endoscopic stenting for 4 patients and for a rectovesical fistula related with iatrogenic rectal injury during prostatectomy for one patient.

Preoperatively, we examined the proximal colon and the rectal stump by stomal colonoscopy and rectal contrast radiography in all cases. The length of the rectal stump

was measured.

Surgical technique

Patients were placed in a lithotomy position to facilitate placement of an end-to-end anastomosis stapling device for the anastomosis. The operator and the first assistant stood on the patient's right side, while the second assistant stood on the left side. Monitors are placed on each side.

In general, access to the peritoneum was often gained with direct trocar placement with an optical-access trocar through which the layer of the abdominal wall could be observed, situated midway in the right upper abdomen, away from the previous incision. Two or three additional ports were placed under direct vision. Adhesiolysis was started at the colostomy site laparoscopically (Fig. 1). Then, colostomy stoma was dissected and completely detached from the abdominal wall. The anvil of a circular sta-

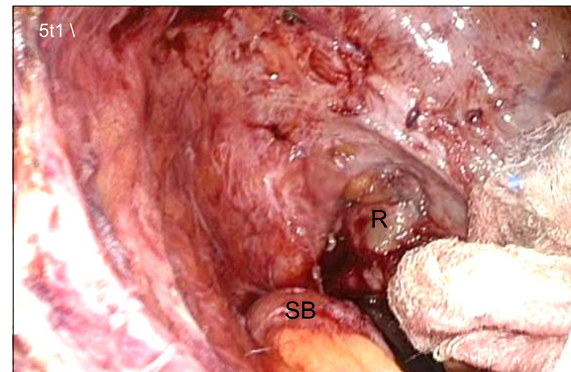**Fig. 1.** Laparoscopic view of the colostomy.

Fig. 3. Laparoscopic view of rectal stump after pelvic adhesiolysis. R, rectal stump; SB, small bowel.
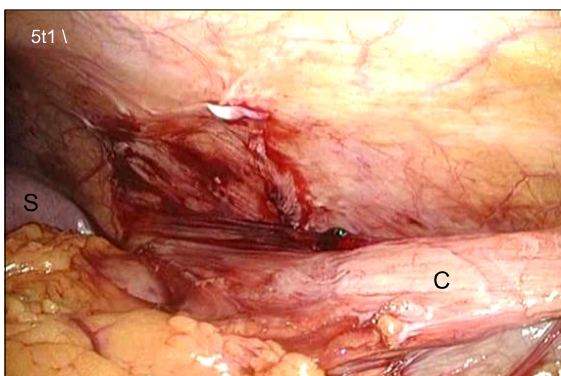

Fig. 2. Mobilization of the left colon and splenic flexure. S, spleen; C, descending colon.
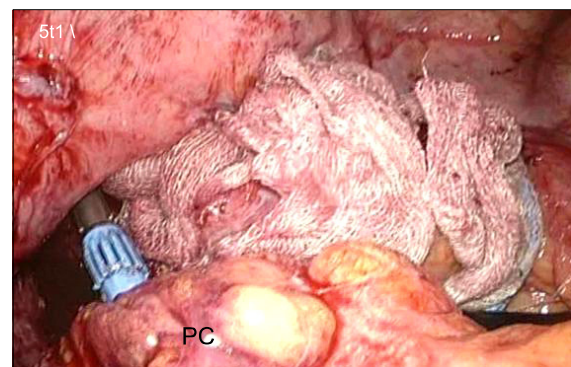

Fig. 4. End-to-end anastomosis with a circular stapling device. PC, proximal colon.

pling device was inserted into the proximal colon and returned into the peritoneal cavity and the colostomy site was closed.

Alternatively, mobilization of the colostomy site through the peristomal incision was performed first and access to the abdomen could then be done via the stoma site. Once the peritoneum was entered, some adhesiolysis was performed under direct vision. And anvil of a circular stapling device was inserted into the proximal colon and the colostomy site was used as the port site for the establishment of pneumoperitoneum. Two working trocars (5 and 12 mm) were placed on the right side of the abdomen.

The laparoscopic adhesiolysis was performed with scissors and a Harmonic scalpel to prevent damage to the bowel.

Mobilization of the left colon and the splenic flexure involved freeing the lateral attachments of the descending colon to ensure an appropriate length of proximal colon to achieve a tension-free anastomosis with the rectal stump (Fig. 2).

In one case in which the rectal stump was long and included the distal sigmoid colon, we excised the fibrotic apex of the rectal stump using a linear stapler (Autosuture Endo GIA, Covidien, Mansfield, MA, USA).

Identification of the rectal stump was facilitated by the transanally inserted dilator (Fig. 3). Suture thread which was placed on the rectal stump at the first surgery was helpful to find the rectal stump.

A transanal, end-to-end anastomosis was made with a circular stapling device (CDH 29, Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) (Fig. 4).

In the cases of an extremely low anastomosis level that was almost coloanal anastomosis and previous radio-therapy in the pelvis, transient ileostomies were made in order to protect the bowel anastomosis.

Surgical outcomes

This study included 5 consecutive patients who had undergone LRHP. The perioperative data are summarized in Table 1.

The time interval from the original surgery to the reversal of the colostomy was 6 to 24 months. The mean age of the patients was 61.4 years (range, 53 to 67 years).

The procedure was laparoscopically completed for 4 patients. There was one late conversion to an open laparotomy secondary to massive adhesions in the lower abdomen. Poor optical visualization and several small bowel perforations precluded continuation of the laparoscopic adhesiolysis. Therefore, we converted the procedure to open laparotomy with a low midline incision for safe mobilization of a small bowel loop adherent in the pelvis and we repaired perforated small bowels. Splenic flexure mobilization was completed by the laparoscopic technique before the conversion.

This patient had an iatrogenic perforation of the small bowel, which was not noticed during the operation. On the fifth postoperative day, we did a small bowel primary closure with a curved stapler through the laparotomy.

The mean operative time was 357 minutes (mean, 240 to 545 minutes). The longest case of 545 minutes was due to conversion to a laparotomy. A second difficult case had a 440 minute operative time which was associated with previous radiotherapy in the pelvis. This resulted in dense adhesions and fibrotic stricture of the rectal stump.

Two patients had a transient ileostomy for the purpose of protective fecal diversion. Six months after surgery,

Table 1. Summary of perioperative data of five patients who underwent laparoscopic reversal of Hartmann's procedure

No.	Age (yr)/sex	Time to reversal (mo)	Indication for initial surgery	Length of rectal stump (cm)	Operative time (min)	Time to diet (day)	Length of stay (day)	Conversion	Transient ileostomy
Case 1	53/male	6	Obstructive rectal cancer	10	250	3	8	No	No
Case 2	62/male	6	Obstructive rectal cancer	7.5	545	7	26	Yes	Yes
Case 3	67/male	7	Obstructive rectal cancer	8.5	310	3	9	No	No
Case 4	58/male	20	Rectovesical fistula	20	240	3	8	No	No
Case 5	67/female	24	Obstructive rectal cancer	20	440	2	8	No	Yes

transient ileostomies were closed without complication.

Patients began a liquid diet on postoperative day 3. The mean length of hospitalization was 11.8 days (range, 8 to 26 days).

Beside the conversion and reoperation case, there were no other operative complications or mortality.

DISCUSSION

Reversal of Hartmann's procedure is associated with substantial morbidity and mortality. For this reason, reanastomosis is performed in only 55 to 60% of those who survive the initial operation. For the patients who had undergone Hartmann's procedure because of malignant disease, the reversal rate was extremely low at 17% compared with those with benign disease [3]. Although the Hartmann's procedure was first developed to treat rectosigmoid carcinoma by Henry Hartmann in 1923, diverticulitis of the sigmoid colon complicated with peritonitis represents the main indication for this procedure in Western countries. But in Korea, diverticulitis of the sigmoid colon is an uncommon disease and therefore, rectosigmoid colon cancer with obstruction or perforation is still a major indication for the Hartmann's procedure. In our experience, there was no patient with sigmoid colon diverticulitis. Most of our cases were rectosigmoid colon cancer. Thus, reversal procedure after initial Hartmann resection for colorectal cancer is a challenging procedure for the colorectal surgeon.

As the laparoscopic technique become popular in the field of colorectal surgery, this minimally invasive technique has been attempted to reversal of Hartmann's procedure to reduce the morbidity and mortality of this procedure.

Although the LRHP is not a popular laparoscopic procedure, recent reports demonstrate the advantages of minimally invasive surgery in the reversal of Hartmann's procedure compared with the open procedure [2,4-6]. Laparoscopic reversal patients had decreased complications and reoperation rates at 6 month follow-up compared with their open counterparts [6]. The overall morbidity rate after LRHP was reported as 2.8 to 18% and the mortality rate

was 0 to 7.1%; these are significantly improved outcomes compared with previous reports for open Hartmann's reversal [2,4-6].

The open conversion in this study was secondary to dense adhesion and a short rectal stump. Previous reports for this procedure in the literature reported a conversion rate of 15 to 23.5% [3,4], generally secondary to the presence of dense adhesions. Khaikin et al. [7] reported that the success of the laparoscopic procedure depends largely on the extent of abdominal adhesions, mainly resulting from the inflammatory sequelae from the initial procedure performed for perforated diverticulitis. But, as in our experience, Hartmann's resection of the upper rectum with total mesorectal excision may be related to the short rectal stump and massive pelvic adhesion in the "empty" pelvic space. Thus, we believe that the reversal after rectal cancer surgery is technically more difficult than that after diverticulitis surgery. Further, several series have reported that the two predictive factors for conversion of LRHP are cancer patients and obesity [3,4]. It is our strong belief that a surgeon must readily convert to an open procedure if the dissection cannot be performed safely laparoscopically.

Adhesiolysis is the most important procedure in this surgery. We used both sharp scissor dissection and ultrasonic shears, but most surgeons are concerned of thermal injury from energy devices. It is very important to perform careful and meticulous adhesiolysis. However, regarding inevitable small bowel injury during the adhesiolysis, definite control of the injury is important and it is useful to suture any serosal tears or mark with clips on thread immediately for extracorporeal repair through the colostomy window. We routinely use a flexible laparoscope in all of our laparoscopic surgeries as we are confident that image optimization is vital to a safe and successful surgery. We also believe that timing of the reversal is crucial and we would generally recommend a minimum waiting period of 6 months, which has been recommended by others [8].

Two patients in this study required transient ileostomy because of incomplete or a very low level of anastomosis. A second stoma was needed in 3.4 percent of the patients undergoing open reversal of Hartmann's procedure in the previous literature [9].

Although we did not experience the anastomotic leak-

age in two cases with transient ileostomy, surgeons should not hesitate to make transient ileostomy for insecure anastomosis because it is not a failure of laparoscopic surgery. Making a secondary stoma for transient fecal diversion is also an option to be considered during the reversal procedure.

There is no consensus among surgeons about the preferred approach method for the first port insertion. In our experience, optical trocar method was used in 4 patients. This method allows for exploration of the abdominal cavity and adhesiolysis with dissection of the colostomy intracorporeally before mobilization of the colostomy.

Alternatively, in one case, we used the colostomy site for the first port insertion site. This method is also a safe and convenient option and allows the adhesiolysis around the colostomy under direct vision. However, the severity of abdominopelvic adhesion cannot be assessed before take down of the colostomy by this method. Thus, if the adhesion is severe and the reversal is not possible, the colostomy has to be placed at the same site again.

In our report, the mean operative time of 357 minutes is longer than the range of 69 to 360 minutes as reported in the literature [1-4,10]. This was due to two difficult cases including the conversion case. Another reason was that most of our patients had rectosigmoid colon cancer and the length of rectal stump was very short. Indeed, the long operative time is a weak point of our procedure that needs to be overcome.

In conclusion, our results suggested that LRHP is a technical challenging and difficult procedure. It is also time consuming, especially after initial rectal cancer surgery. However, it is feasible and safe, when performed by experienced laparoscopic surgeons, associated with acceptable conversion, morbidity and mortality rate based on our results. Thus, laparoscopic reversal is a recommended approach method for colostomy closure after Hartmann's procedure.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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