

ORIGINAL RESEARCH ARTICLE

Anticipation of umbistoma in laparoscopic anterior rectal resection: Ileostomy and ostomy closure

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Abstract:

Objective: The use of laparoscopic surgery for rectal disease is expected to provide good cosmetic benefits for patients postoperatively. However, this expectation is significantly reduced when a diverting ileostomy is created. We present a new technique that reduces the size of the skin wound by constructing a diverting ileostomy in the umbilicus. This procedure, diverting umbilical ileostomy (umbistoma) does not require special tools for its construction and closure. **Methods:** Twenty-nine patients underwent treatment with umbilical diverting stoma, including five women and 24 men, with a mean age of 70 years (range: 40-88 years). At the time of ostomy closure, a new umbilicus was formed by subcutaneously suturing the wound to the fascia. In addition, we did not close the new umbilical upper and lower spaces, so as to allow open drainage of the healing wound. **Results:** All procedures were completed successfully without any perioperative complications. **Conclusions:** Our findings suggest that the umbilical diverting stoma could provide improved safety and cosmetic advantages in laparoscopic rectal resection.

Keywords:

umbilical diverting stoma, rectal resection, laparoscopy

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Introduction

Laparoscopic surgery for rectal disease is widely used. As surgical wounds become smaller, patients have higher expectations for postoperative cosmetic outcome. The magnifying effect created by laparoscopic surgery reveals the anatomy around the anus, and as a result, a surgical technique is being established in which the anus is preserved¹⁾.

Diverting ileostomy was established to reduce complications after rectal resection, and is closed after the risk of complications is reduced. A number of useful consequences of diverting ileostomy have been reported²⁾. Diverting ileostomy results in additional scar formation, and wound-related complications increase. In other words, diverting ileostomy may lessen the advantages of laparoscopic surgery, in terms of cosmetic outcome. In laparoscopic surgery,

umbilical wounds are enlarged with extension to the head and caudal directions for lesion removal.

We were able to reduce the need for additional cutaneous wounds by constructing the diverting ileostomy in the umbilicus. The diverting umbilical ileostomy did not require special procedures for its construction and closure. Furthermore, the frequency of complications after closure is decreased. The results of this study showed that diverting umbilical ileostomy provides improved safety and tolerability in laparoscopic rectal resection.

We handled 29 cases of diverting umbilical ileostomy. Here we report the surgical procedure and clinical outcome of this diverting ileostomy technique which provides cosmetic advantages.

Methods

Study population:

A total of 29 patients underwent elective laparoscopic anterior resection (AR) requiring diverting ileostomy construction at the Koseiren Hospital between April 2014 and December 2015. The indication for surgery was rectal or pararectal neoplasm requiring laparoscopic AR with diverting stoma construction.

The lower edge of the tumor was within 10 cm of the anal verge in all cases. Tumors located between the inferior margin of the second sacral vertebra and the peritoneal reflection were considered to be in the upper rectum, while those located below the peritoneal reflection were considered to be in the lower rectum.

The location of the tumor was determined by pelvic computed tomography, colonoscopy, and/or barium enema preoperatively and was confirmed during surgery. The following patient-, tumor-, and surgery-related variables were included in the analysis: patient-related (age, sex, body mass index [BMI]), tumor-related (tumor disposition, maximum tumor diameter, UICC-TNM stage [7th edition]), and surgery-related (stoma management period, operative time, fasting period, hospital stay).

Surgical technique:

The patient was placed in the lithotomy position under general anesthesia. The first port for the camera was placed at the umbilicus using the open technique. Pneumoperitoneum was established with pressure maintained at 10-12 mmHg. A 12 mm port for the operator's right hand was inserted through the right lower quadrant, and three 5 mm ports were inserted through the right upper and left upper and lower quadrants, so that a total of five ports were placed.

The lymph nodes around the inferior mesenteric artery [IMA] were dissected using the electrocautery device and laparoscopic coagulating shears. The IMA was divided above the left colic artery, after ligation with the clip, and the inferior mesenteric vein was divided at the same level.

The mesorectum was mobilized into the pelvis to preserve the hypogastric nerves and pelvic plexus. The forcep inserted at the left lower quadrant was pulled cranially with the gauze tied around the rectum circumferentially, and total mesorectal excision was carried out down to the levator ani muscles. The rectum was transected using a linear stapler. The specimen was extracted through the umbilicus. Umbilical wound was enlarged to match the tumor size. After the anvil head part of the circular stapler was positioned in the proximal colon, the circular stapler was inserted through the anus, and then side-to-end double stapling technique anastomosis was completed intracorporeally. Air-tightness was rou-

tinely tested by the transanal instillation of air.

In the ISR cases, the puborectalis and the hiatal ligament were dissected to the intersphincteric plane. The pelvic dissection was thus complete. In the transanal dissection, a self-holding retractor (Lone Star Retractor Cooper Surgical Inc., Lone Star Medical Products Inc., TX, USA) was positioned in the anal canal. A circular incision of the mucosa and the internal anal sphincter was performed at the dentate line. After circular dissection of the rectum, the specimen was extracted through the anus. Reconstruction consisted of a hand-sewn coloanal anastomosis.

In these case series, the loop of ileum destined for the ileostomy was brought out without tension through the umbilical site. The skin incision was made vertically just below the umbilicus. It was important to widen the fascial incision to allow for a 5 cm gap as is done with a traditional ileostomy.

The loop of ileum destined for the ileostomy was brought out without tension through the umbilical port site. The ileum was elevated so that the height of the ostomy was 5 cm from the skin surface, and the intestinal serosa and fascia were fixed. Three points of the serosal muscular layer were sutured on the caudal side and on both lateral sides to prevent the intestinal tract from falling off.

The intestinal tract was opened, and the rotated umbilicus was fixed to the incision end of the stoma intestinal tract to assist in elevation of the intestinal tract (Figure 1).

Stoma management:

Treatment necessary for general ileostomy, such as prevention of dehydration, was performed in the routine manner. That is, the ostomy appliance was carefully removed. We gently and carefully wiped around the stoma. The stomach size was measured, and the size of the ostomy appliance was adjusted. Although an ostomy appliance is changed in 2-3 days, the brace should be changed at an early stage if there is any abnormality such as bleeding or erosion around the stoma, depending on the symptoms. No special precautions were taken in the exchange method, except for a drainage pouch for ileostomy being necessary (Figure 2).

Ostomy closure:

Ostomy closures were performed through a circumstomal approach with full mobilization of the stoma including the umbilicus. The loop of ileum was freed by sharp dissection to separate the bowel from the fascia and peritoneum followed by anastomosis. The method of anastomosis was stapled functional end to end.

The abdominal wall was closed with continuous stitching using monofilament yarn.

If the fascial edges of the wound could be approximated without tension using two Adson forceps, successful fascial closure was then obtained. If tension was noted, the poste-

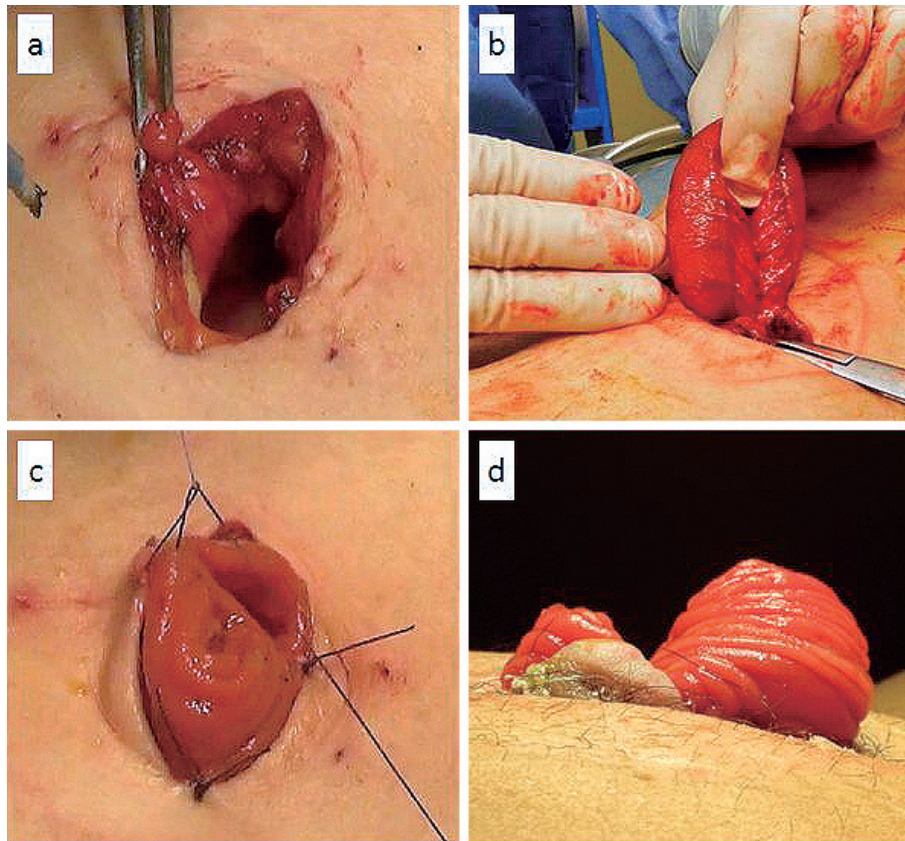


Figure 1.

- a. The umbilicus fascial incision is widened to allow 5 cm as is done with a traditional ileostomy.
- b. The ileum was elevated so that the height of the ostomy was 5 cm from the skin surface.
- c. Three points of the serosal muscular layer were sutured on the caudal side and on both lateral sides.
- d. Finished drawing



Figure 2. A drainage pouch was necessary for ileostomy.

rior rectus fascia was released one side at a time, checking the tension after each release. Using open components separation, the external oblique muscles were next released by exposing the semilunar lines with large subcutaneous undermining.

The skin was fixed to the muscle layer subcutaneously with two needles to form a new umbilicus. However, the spaces above and below the new umbilicus were not closed, to allow for open wound drainage (Figure 3).

Result

Patient population (Table 1):

Twenty-four males and five females were included. The median age was 70 years (range: 40-88). Their median BMI was 22.2 (range 16.7-26.7).

Tumor characteristics (Table 2):



Figure 3. The skin was fixed to the muscle layer subcutaneously with two needles to form a new umbilicus. The spaces above and below the new umbilicus were not closed so as, to allow for open wound drainage.

Twenty-seven patients had primary rectal cancer. Preoperative chemoradiotherapy was administered in one case. Postoperative chemotherapy was not performed between ileostomy and ostomy closure. Postoperative stage -0 rectal cancers was diagnosed in one case, stage -I in 7 cases, stage -II in 12 cases, stage -III in five cases, and stage -IV in one case. There were no cancer cells identified on pathologic examination in the patients who received preoperative chemoradiotherapy.

Progress after construction of stoma:

The median time to hospital discharge was 19 days (range: 11-34). Outlet obstruction developed in one case during hospitalization; this was successfully treated with insertion of the tube from the ileostomy. After discharge, three cases of skin erosion around the stoma occurred. One case involving stoma collapse required hospitalization and treatment, but optimizing the pouch exchange period was effective. In addition, two cases of stoma escape and one case of high output syndrome occurred. No intestinal obstruction or parastomal hernia was observed, and no cases required surgical treatment.

Ostomy closure (Table 3):

The median duration of the stoma management period was 101 days (range: 71-269), mean operative time was 80 min (range: 50-150), and mean hospital discharge was on POD 10 (range: 6-33).

Table 1. Patient Characteristics.

| Sex | |
|-------------------|----------------------|
| Male | 24 |
| Female | 5 |
| Age (year) | |
| median±SD (range) | 70±9.4 (40-88) |
| BMI | |
| median±SD (range) | 22.2±2.7 (16.7-26.7) |

Complications after ostomy closure

Superficial surgical site infection (redness of the wound and abscess formation) was not observed. There was no case of bowel obstruction, and no cases required surgical treatment.

Hearing of the closed ostomy wound was good, the four clamp port wounds of the abdominal wall were not noticeable, and cosmetic benefit after surgery was achieved.

Discussion

It has long been customary in laparotomy to avoid incising the umbilicus. However, embryonic natural orifice transumbilical endoscopic surgery³⁾, transumbilical single - port surgery (TSPS)⁴⁾ and single incision laparoscopic surgery (SILS)^{5,6)}, with the advancement of laparoscopic surgery, have been reported. The umbilicus has thus been evaluated as an embryonic natural orifice.

In laparoscopic colon surgery, the umbilical wound is widely used as a camera port for removal of lesions.

We hypothesized that it would be possible to avoid an additional cutaneous wound by constructing a diverting ileostomy in an open umbilicus wound, furthermore, this technique would make the ileostomy scar inconspicuous, maintaining the cosmetic advantage of laparoscopic surgery.

In conventional ileostomy, the elevator intestine penetrates the rectus abdominis.

One of the complications of ileostomy, and one of the causes of output obstruction, is the pressure differential between the intestinal tract and the rectus muscle⁷⁾.

Muscle injury due to surgical technique when penetrating the rectus abdominis muscle is also thought to play a role.

When the ostomy is closed, it is often difficult to sever the muscles that have adhered to the intestinal tract, sometimes causing intestinal damage.

Intestinal fluid leakage associated with intestinal injury can cause wound infection, delay wound healing, and ultimately terrible scar formations.

In the umbilical stoma, the rectum abdominal muscle does not penetrate, thus only the subcutaneous fat and the fascia

Table 2. Tumor Characteristics.

| | |
|---------------------------|---------------|
| primary colorectal cancer | 23 |
| post EMR/ESD | 3 |
| post CRT | 2 |
| recurrence | 1 |
| Tumor size (mm) | |
| median±SD (range) | 35±13 (14-70) |
| UICC-TNM stage | |
| 0 | 1 |
| I | 7 |
| II | 12 |
| III | 5 |
| IV | 1 |
| T category | |
| Tis | 1 |
| T1 | 3 |
| T2 | 3 |
| T3 | 11 |
| T4 | 5 |
| N category | |
| N0 | 20 |
| N1 | 6 |
| N2 | |
| M category | |
| M0 | 25 |
| M1 | 1 |

surrounding the elevated intestinal tract are present, and smooth intestinal tract separation is possible.

As a result, we did not experience intestinal damage in this study.

Closure is similar to the treatment of abdominal wall scarring hernias because closure of the ostomy causes a large fascia defect in the abdominal wall.

In abdominal wall scarring hernia, a more convenient hernia closure technique has been recently spreading with intraperitoneal mesh⁸⁾. However, in this condition, it is used to create an artificial anus, and this should be considered to play a role in contamination. Therefore, it is desirable to avoid the above-mentioned surgical procedure using.

In abdominal wall scarring hernia, direct suturing is recommended if the left and right separation opening width is approximately 3 cm.

For large abdominal wall scarring hernia, the Component Separation method (CS method) reported by Romirez et al. in 1990 (peeling between the fascia and subcutaneous fat) is useful⁹⁾.

They regarded obesity cases, artificial substances and unclear contamination wounds as good adaptation of CS method.

In addition, it is possible to reduce tenderness of the ab-

Table 3. Ostomy Closure-related Factors.

| | Median | SD | range |
|-------------------------------|--------|------|--------|
| stoma management period (day) | 101 | 47.6 | 71-269 |
| Operative time (min) | 80 | 22 | 50-150 |
| Fasting period (day) | 2 | 0.6 | 1-3 |
| Hospital stay (day) | 10 | 5.7 | 6-33 |

dominal wall by adding an incision to the outpatients oblique muscle outpost.

In conventional stoma closure, a wound is formed on the left or right lower abdomen, the inside of the stoma is on the midline abdomen, and it is difficult to detach the subcutaneous tissue and incise the fascia.

Therefore, passive movement is only present on the outside of the stoma, and the tension of the suture tends to become strong.

On the other hand, if the stoma is around the umbilicus, using the CS method described above, it is possible to relieve tension by bringing the fascia from both sides.

Infection of the stoma closure wound is an important issue.

In conventional ileostomy closure, the occurrence of wound infection is reduced with semi-closure of the wound by annular suturing rather than by complete closure after sufficient washing, and the hospital stay is subsequently shortened. Additionally, the wound becomes flat.

However, it is undesirable for the navel to be flat.

We performed umbilicus formation by resecting the surrounding skin including the umbilicus, fixing the left and right skin to the fascia and retracting.

When performing this technique prior to this study, only one fixed thread was used, but we experienced a case where the umbilicus was flattened because the fixed thread broke in the early postoperative period.

Even if the suture is absorbed while the fascia and the skin are not sufficiently fused, similarly, the umbilical recess may disappear, thus it is preferable to use two fixed sutures.

In addition, by holding the upper and lower portions of the formed umbilicus semi-closed, there is a drainage effect similar to that of annular suturing.

No postoperative wound infection was observed in this study.

The umbilical stoma has the following positive effects: reduced complications of diverting ileostomy, improved tolerability after ostomy closure, and reduction of postoperative infection.

There are few published reports of umbilical stoma^{10,11)}.

In addition, this study is the first report of the procedure of closing the umbilical stoma established at the time of laparoscopic rectal resection.

In this study, the safety and efficacy of this surgical pro-

cedure were preliminarily established. The retrospective design was one limitation of the present study. Furthermore, our results should be interpreted with caution because of the relatively small number of patients included in this study.

We hope that this surgical procedure will be adopted in the field of laparoscopic rectal resection.

Conflicts of Interest

There are no conflicts of interest.

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