

Single Port Laparoscopic Surgery and Transanal Specimen Retrieval for Sigmoid Colon Cancer

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Transumbilical single-port laparoscopic surgery (SPLS) is a newly emerged and rapidly evolving, minimally invasive treatment method. Transumbilical SPLS produces minimal parietal injury and can achieve cosmetic advantages by reducing additional trocar placement. The in-line or chopstick arrangement of laparoscopic instruments can make the operative procedures somewhat strange and inconvenient at first, but experienced laparoscopic surgeons can achieve the same coverage as conventional laparoscopic surgery with time. Here, we report the first case of transumbilical SPLS anterior resection (SPLS-AR) with transanal retrieval of a specimen and intracorporeal single stapling anastomosis. The operating time was 270 min. There were no intraoperative or postoperative complications. Transumbilical SPLS resulted in a 1.5-cm wound with early recovery. Transumbilical SPLS-AR with transanal retrieval and intracorporeal anastomosis for sigmoid colon cancer is feasible by experienced laparoscopic colorectal surgeons based on careful evaluation and selection of patients. This operation fulfills both oncological principles and cosmetic demand. (*J Korean Surg Soc* 2011;80:77-83)

Key Words: Single port laparoscopic surgery (SPLS), Minimally invasive surgery, Colon cancer

INTRODUCTION

Laparoscopic surgery has resulted in large-scale changes in surgical practice and is now the approach of choice for the majority of colorectal diseases that require operations. Despite the generally excellent results achieved with conventional laparoscopic surgery, such as shorter hospital stay, faster return of bowel function, decreased use of narcotics, and lower rates of wound complications,⁽¹⁾ there is still a need to minimize the extent of access for the better cosmetic results and lesser pain.⁽²⁾ Therefore, there is a great deal of research effort in the development of natural orifice transluminal endoscopic surgery (NOTES) and single-port laparoscopic surgery (SPLS).^(3,4) The feasibility

of NOTES for colorectal disease has been demonstrated, but many difficulties still remain to be overcome before extensive clinical application.⁽⁵⁾ In contrast, transumbilical SPLS is at an early stage of development as a method of minimally invasive surgery.⁽⁶⁾ The umbilicus is located in the center of the abdomen, where the abdominal wall is thinnest and has no specific vessels or nerves. Through this inborn ready-made wound, most intraperitoneal organs can be accessed easily. In addition, the surgical scar can be concealed postoperatively. And the colorectum has some beneficial characteristics for SPLS. It has long and tubular structure with redundancy and can be shrinkable at empty state. These conditions make it possible to be pulled through via narrow conduit. In this case, we used the anus as a route for the specimen removal, it reduced the possible peritoneal injury and the complication related to the trocar. Here, we present our first experience in transumbilical SPLS anterior resection (SPLS-AR) with transanal retrieval of the specimen and intracorporeal anastomosis for sigmoid colon cancer.

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CASE REPORT

The patient was a 75-year-old male (body mass index (BMI) 20.1 kg/m²; height 167 cm, weight 56 kg) with sigmoid colon adenocarcinoma. He had no history of previous surgery or underlying disease but leukoplakia. A malignant tumor measuring 3.5×3.5 cm in the sigmoid colon was detected at screening colonoscopy (Fig. 1). Abdominal computed tomography (CT) did not show any evidence of regional or distant metastasis. The clinical stage was T2N0M0 and the tumor was marked preoperatively via colonoscopy. The operation was performed with conventional laparoscopic (straight and rigid type) instruments and a new device (Anal trocar) that we manufactured ourselves for the specific purpose. We use this device as a conduit for transanal specimen retrieval to let the umbilical incision minimal for the maximal cosmetic result.

Under general anesthesia, the patient was placed in the supine position with the right arm adducted. The operator was located on the right side of the patient, and the patient's position was changed to the head down position with right side down-tilted. A 1.5-cm vertical umbilical incision was made and an 11-mm VersaStep trocar (Covi-

dien, Mansfield, MA) was introduced into the peritoneum. Peritoneal inspection with a 10-mm rigid 30° laparoscope was performed after carbon dioxide gas insufflation. The 11-mm trocar was then removed, the fascial incision was extended to 2.0 cm, and the peritoneum and fascia were sutured loosely with several stitches of 2-0 POLYSORB sutures (Syneture, Norwalk, CT). Curved hemostat clamps were applied to the ends of the untied sutures. We used a small ALEXIS wound retractor (Applied Medical, Rancho Santa Margarita, CA) and a small surgical glove to form the single port (Fig. 2). For convenience at removal, the inner rim of the wound retractor was sutured with 6-0 silk. The inner rim was inserted through the umbilical pathway and rendezvous between prepared surgical glove and outer rim of wound protector was made by rolling them down together tight to the skin. The 2nd, 3rd, and 5th fingers of the glove were used for 5-, 11-, and 5-mm trocars, respectively. The 11-mm trocar was used for the laparoscope and the two 5-mm trocars were for the working instruments. During the operation, no trocars were actually inserted into the abdominal cavity through the umbilicus, but only served as guides for the instruments to the umbilical pathway. We inserted a small piece of gauze with a radio-opaque marker into the abdominal cavity to serve as a protective barrier and retractor.

The general procedures and sequence were the same for conventional laparoscopic anterior resection (Fig. 3). Using

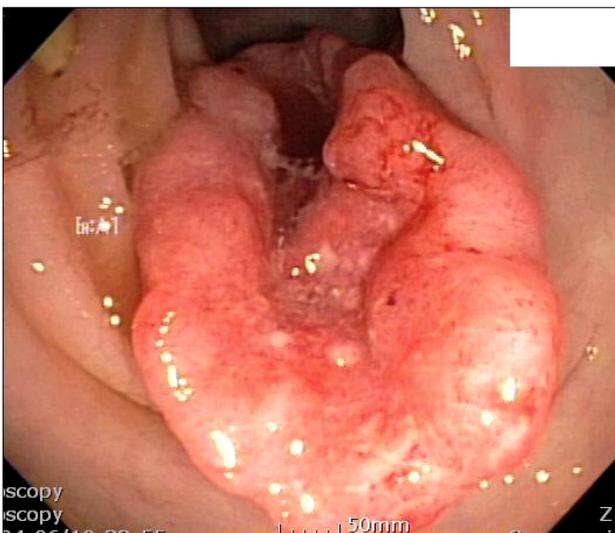


Fig. 1. At colonoscopy, an ulcerofungating moderately differentiated adenocarcinoma measuring 3.5×3.5 cm was seen in the sigmoid colon.



Fig. 2. Formation of a single port by combining a wound retractor and a surgical glove.

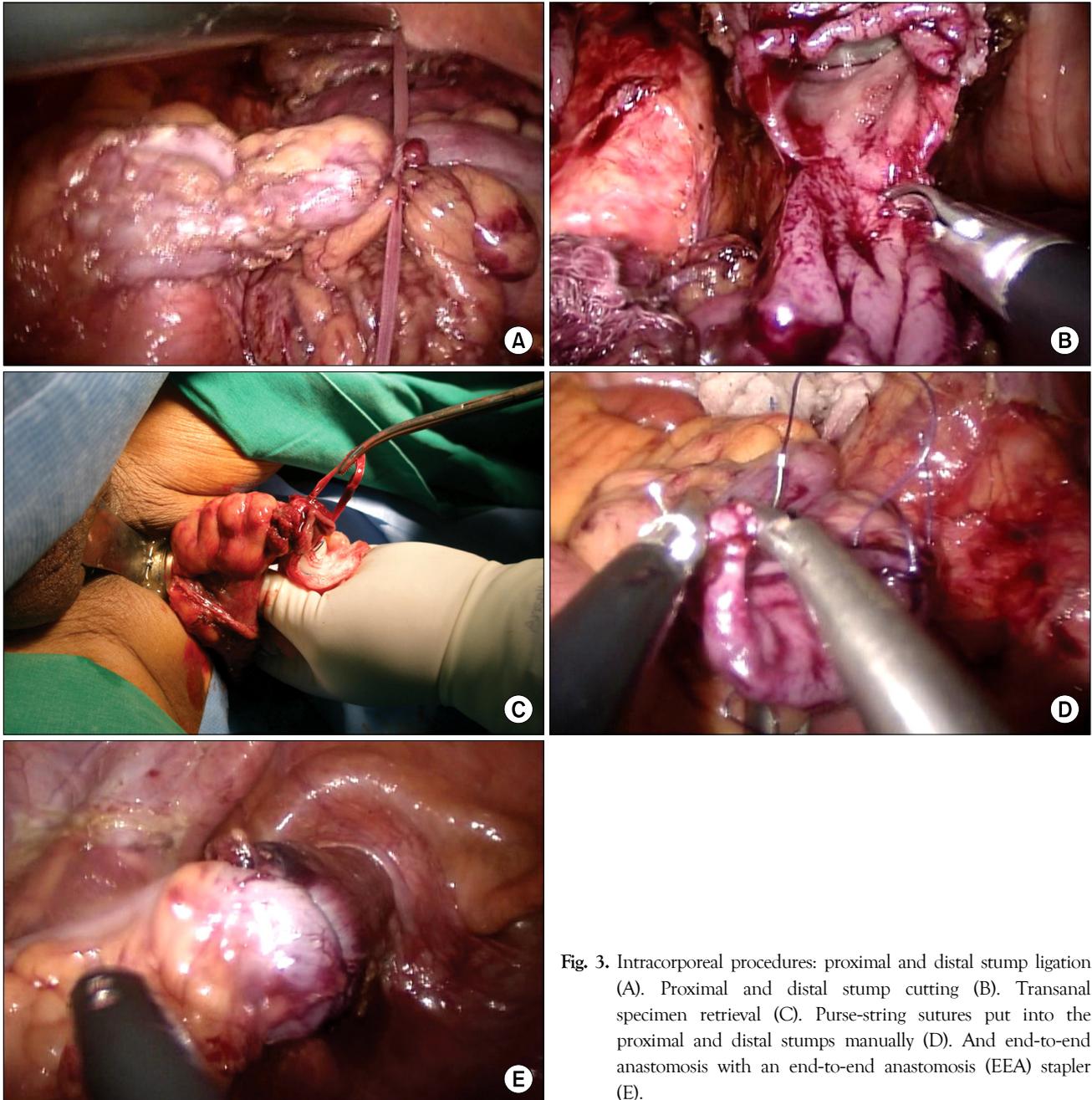


Fig. 3. Intracorporeal procedures: proximal and distal stump ligation (A). Proximal and distal stump cutting (B). Transanal specimen retrieval (C). Purse-string sutures put into the proximal and distal stumps manually (D). And end-to-end anastomosis with an end-to-end anastomosis (EEA) stapler (E).

the head down and right-side tilting positions, medial to lateral mesenteric dissection was performed upward from the pelvic promontory to the low pancreatic border with ligation of the inferior mesenteric artery and vein with hemolocks. Lateral dissection was continued following the fusion fascia of Toldt to the colon proper with verification of the left ureter and gonadal vessels. Downward dissection

was continued to 5 cm distal from the lesion following the mesorectal fascia with preservation of the hypogastric nerves. On dissection of the avascular plain, the colon was freely movable. Mesenteric resection with a Harmonic Scalpel (Ethicon Endo-Surgery, Cincinnati, OH) was performed to the appropriate level with transluminal countertraction using PPH (procedure for prolapsed and

hemorrhoids) (Ethicon Endo-Surgery) (Fig. 4A). Following the proximal and distal mesenteric resections, both sides of the colon were ligated with Nylon tapes (Fig. 3A). Transanal colonic irrigation with povidone solution and saline was performed. A laparoscopic intestinal bulldog clip was applied to the proximal colon and a specially designed device (anal trocar) was inserted into the anus. The proximal and distal colonic tubes were transected and totally isolated specimen was retrieved through the anal trocar (Fig. 3C, 4B, 5A, B). After purse-string sutures were placed in the proximal and distal stumps manually (Fig. 3D), a circular stapler (28 mm, DST series PCEEA,

Autosuture; Covidien, Norwalk, CT) was introduced through the anus. The previously purse-string sutured proximal stump capped the anvil and was tied up. The same procedures were also performed to distal stump and EEA (Fig. 3E). After the anastomosis, air leakage test was performed with good results.

After irrigation, fibrin glue was applied around the inferior mesenteric artery (IMA) and anastomosis site. A Jackson-Pratt drain was inserted into a Douglas pouch via the umbilical incision. After removing the surgical glove and wound retractor, the previously placed sutures were tightened and tied firmly. The wound was closed with an

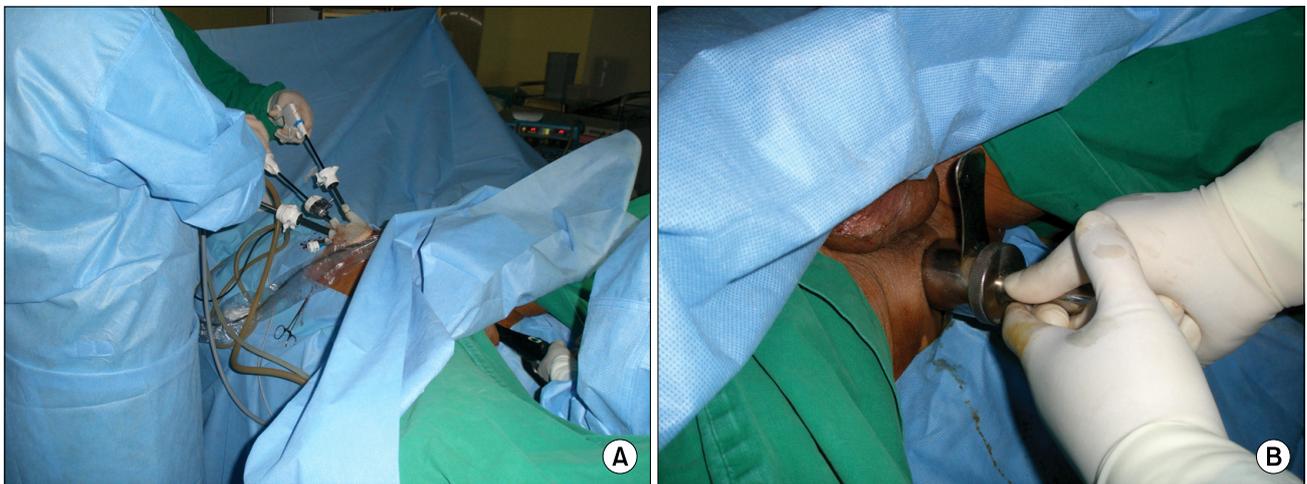


Fig. 4. Transluminal (transanal) traction using PPH (procedure for prolapsed and haemorrhoids) for countertraction during colonic dissection (A) and setting the anal trocar (B).

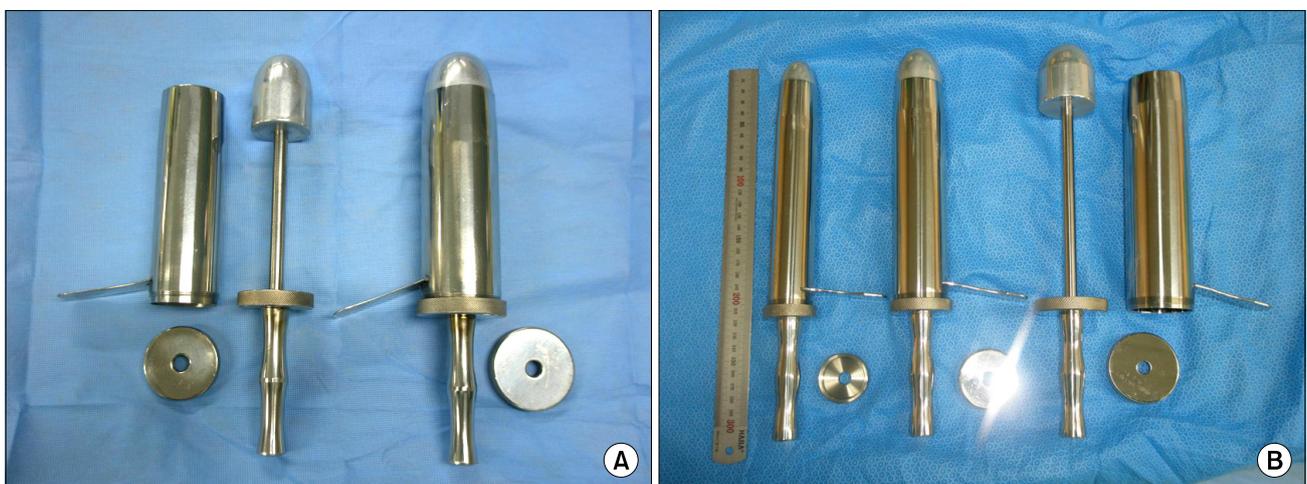


Fig. 5. Anal trocars for transanal specimen retrieval: prototype (A) and revised versions (B) with different diameters and lengths.

additional subcuticular suture (Fig. 6).

Transumbilical SPLS-AR with transanal retrieval and intracorporeal anastomosis proved technically feasible and safe. The operating time was 270 min. No intraoperative or postoperative complications occurred. A normal low-residue diet was started on the third postoperative day. The patient was discharged on the eighth postoperative day in good condition. Transumbilical SPLS resulted in a wound 1.5 cm in length confined to the umbilicus that left no visible scar (Fig. 7). Histological examination of the resected specimens indicated that 18 lymph nodes were retrieved without cancer cell involvement. The lengths of the proximal and distal resection margins were 9.5 and 5

cm, respectively (Fig. 8).

DISCUSSION

Laparoscopic surgery for colorectal cancer has become a successful alternative to open surgery. It's oncological safety and benefits have been demonstrated based on short-term outcomes in several studies, including multicenter study, and prospective randomized trials.(7) Based on these evidences, the application of laparoscopic surgery for colon cancer has been increasing. Under standard conditions, conventional laparoscopic surgery requires three to six



Fig. 6. Minimal umbilical incision with a JP drain is the only change postoperatively.



Fig. 7. Thirty days postoperatively, the umbilical scar is negligible.



Fig. 8. After retrieval via the anal trocar, both ends of the specimen are still tied with Nylon tapes (A). After opening of the specimen (B).

ports and an additional incision for extracting the specimen. Larger numbers of incisions increase the likelihood of parietal trauma, which causes temporary pain and muscle spasm. Epigastric vessel injury and incisional hernia are also potential problems.(8)

After presentation of the COST trial at the May 2004 meeting of the American Society of Colon and Rectal Surgeons, several novel methods emerged, including robotic surgery,(9) single-incision access surgery,(4) and NOTES.(3) Each arm has specific characteristics of benefits and disadvantages respectively.

The comparative benefits of SPLS are better cosmetic outcome, less pain, and fewer incisions with their associated potential problems of hernia and bleeding. Moreover, transumbilical SPLS may allow common laparoscopic procedures to be performed entirely through the umbilicus and permit conversion to conventional laparoscopic surgery at any point during the operation, if needed, by adding conventional laparoscopic ports.

Even with these benefits, there are some debates regarding the application of SPLS for colorectal surgery. Many surgeons worried about the lack of instrumental triangulation in the SPLS condition. But in performing the operative procedures, there is something besides triangulation. With in-line or chopstick arrangement, furthermore with reverse triangulation of working instruments almost procedures those performed in conventional laparoscopic surgery can be fulfilled without specific limitation. In concern about countertraction, limitation was ameliorated by using a new device for transanal transluminal traction or radio-opaque gauze as a retractor. The PPH (procedure for prolapsed and hemorrhoids) (Ethicon Endo-Surgery) was a suitable option for the transanal transluminal traction for the rectum, because it has its curve and length same as the pelvic curvature itself. And the anal dilator or sigmoidoscopic approach could be an alternative option for the transanal transluminal traction. We also used the gravitational effect resulting from the operating table angle to maneuver the intraperitoneal colon and small bowel. Another limitation is off-axis vision. This may be overcome with the development of more comfortable

angulated instruments.

With our technique, all of the procedures were performed through a single transumbilical port. We used a home-made port instead of an existing single port, which provided more space-efficient than a fixed-channel commercial port.

When the specimen was retrieved through the transumbilical wound, the incision had to be the size of the mass at least. But when it was removed through anus, the wound could be downsized up to 1.5 cm only for the working port placement. The "anal specimen retrieval" method could be a safe oncologically, because the specimen was passed out through the prepared anal trocar fit for the specimen size itself.

And also, the anal trocar was functioned as a protector for the rectal wall and anal sphincter muscle and this prevent from over stretching of the muscle. we retrieved the specimen using an anal trocar and performed intracorporeal end-to-end anastomosis, and then inserted a Jackson-Pratt drain through the umbilicus to reduce the chance of additional parietal injury. With this technique, the anus, which is one of the natural orifice, is used for specimen extraction. The merit of the anal trocar is that it can keep rectal tube and anal sphincters from injury. Metal cylinder protect them from increased pressure that might be produced during the transanal retrieval. If the specimen was a large mass which inappropriate for the "transanal retrieval", then the "transumbilical route" was a better option for the specimen removal. Therefore the retrieval route has to be decided case by case, based on the size of the tumor, patient's obesity, and patient's anal diameter. Although conventional laparoscopic colectomy with transanal specimen retrieval and colorectal anastomosis has recently been reported,(10) our technique is the first reported use of single-port surgery combined with a transanal technique in humans.

Based on our experience, transumbilical SPLS-AR with transanal retrieval and intracorporeal anastomosis for sigmoid colon cancer is feasible when performed by experienced laparoscopic colorectal surgeons based on a careful initial evaluation and patient selection. This operative

plotting meets both oncological principles and cosmetic demand. Against the expectation, interference among the instruments is negligible and there is no limited range of operation compared to conventional laparoscopic surgery. The further development of flexible, slimmer devices will make this operation easier and more comfortable, and can maximize the patients' satisfaction.

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