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Brief report

BRIEF REPORT

Laparoscopic radical right hemicolectomy with transrectal-specimen extraction: a novel natural-orifice specimen-extraction procedure

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Introduction

The main treatment for colon cancer is surgery; however, conventional surgery causes great suffering due to the huge abdominal incision. The advent of laparoscopic surgery has greatly reduced abdominal-wall damage and pain, but anastomosis and the specimen-removal process still require creation of an incision in the abdominal wall. In 1993, Franklin *et al.* [1] described a case of totally laparoscopic colectomy with transanal specimen extraction as the first natural-orifice specimen-extraction surgery (NOSES) and this has been considered the most preferable procedure owing to the absence of abdominal incision, mild post-operative pain, and rapid recovery. Since then, transvaginal specimen extraction in laparoscopic right hemicolectomy surgery has been frequently reported [2, 3]; however, reports of transrectal extraction are few. We herein describe a novel method of transrectal-specimen extraction for laparoscopic right hemicolectomy.

Case presentation

A 49-year-old male patient (body mass index, 23.8 kg/cm^2) presented with the chief complaint of right abdominal pain persisting for >1 month. Pelvic computed tomography examination revealed part of the unevenly thickening ascending colon wall. Colonoscopy and endoscopic biopsy were performed and revealed adenocarcinoma of the ascending colon. Tumor markers and routine laboratory blood tests were within the normal reference ranges.

The surgery was performed in accordance with the procedure of totally laparoscopic right hemicolectomy. The resected specimen was deposited in the collection bag and placed in the pelvis. Before the specimen extraction, the anus was fully dilated and the rectum was repeatedly rinsed with antiseptic (1% povidone-iodine). Povidone gauze was inserted into the rectum to support the intestinal wall and the full-thickness anterior wall of the upper rectum was cut open 3–4 cm lengthwise using an electrocautery device (Figure 1A). Oval forceps were inserted into the rectal incision to hold one end of the collection bag and the whole specimen was gently removed through the anus (Figure 1B). Continuous barbed suture was used to close the rectal-wall incision from the distal to the proximal end and the seromuscular layer was sutured to reinforce the incision (Figure 1C). Further, 3,000 mL of hyperthermic distilled water was used to repeatedly rinse the abdominal and pelvic cavities.

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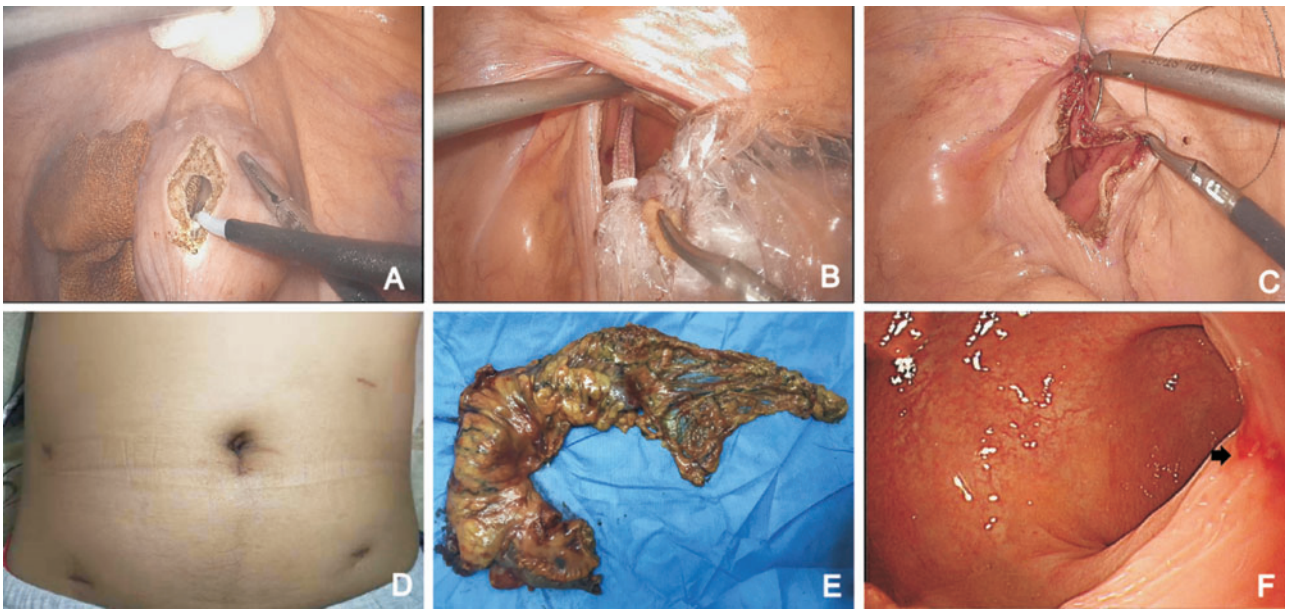

Figure 1. Laparoscopic radical right hemicolectomy with transrectal-specimen extraction. (A) The cut anterior wall of the upper rectum is opened 3–4 cm lengthwise using an electrocautery device. (B) Oval forceps are inserted through the rectal incision to pull the specimen out of the body. (C) Continuous sutures are placed on the rectal-wall incision from the distal to the proximal end. (D) Abdominal wall 1 month after surgery. (E) Surgical specimen. (F) Colonoscopy 1 month after surgery shows recovery of rectal incision (arrow).

The trocar holes were closed and the operation was completed (Figure 1D and E).

The patient's vital signs were stable during the surgery; total operating time was 184 minutes and intraoperative blood loss was ~50 ml. The patient could sit up on the bed unaided post-operatively and resumed normal daily living activities without pain within 18 hours. The first flatus occurred within 48 hours. He reported a Numeric Rating Scale for pain score of 3 and 1 on the post-operative first and third days, respectively. The patient was started on a liquid diet 3 days after surgery and discharged on the post-operative ninth day. Pathology of the surgical specimen showed moderately differentiated colonic adenocarcinoma. The number of lymph nodes retrieved was 50. A follow-up colonoscopy was performed 1 month later and no stenosis or scar contracture was observed in the intestinal cavity (Figure 1F). The patient recovered well with accurate anal sensation and smooth defecation.

Discussion

Laparoscopic surgery is popular because of smaller abdominal incisions, less pain, and faster recovery [4]. The specimen-extraction site is the main cause of post-operative pain, wound infection, and incisional hernia in conventional laparoscopic surgery [5, 6]. These incision-related complications inevitably have a negative effect on post-operative recovery, especially for the function and esthetics of the patient's abdominal wall. NOSES offers a solution to this problem by further improving totally laparoscopic techniques, allowing the entire operation to occur through 5- to 12-mm trocar ports without any abdominal incision or extension.

For female patients, the specimen can be removed through a transverse incision of the posterior vaginal fornix [7]. Compared with the transvaginal specimen extraction in laparoscopic surgery, this transrectal approach could be applicable for male patients and female patients with a history of previous vaginal surgery or vaginal stenosis. As for the current male case, we performed the surgical procedure via rectal incision. The process of specimen extraction was successfully completed with this approach.

The clinical application of the transrectal procedure has been limited by concerns about potential pelvic bacterial contamination and iatrogenic rectal-incision leakages. Zattoni *et al.* [8] reviewed a series of left-colon resections with transrectal specimen extraction similar to our procedure. Despite procedural difficulties and heterogeneity, no mortality and few complications (such as leakage and pelvic abscess) have been reported. The main difference between our procedure and left-colon resection with transrectal-specimen extraction is the additional rectal incision, which required rectotomy and closure. Studies suggest that the rectal incision for specimen extraction does not lead to higher complication rates [9, 10]. As the blood vessels of the rectum were not dissected, the blood supply was still adequate compared with the preoperative blood supply. Continuous sutures and serosal reinforcements were used to further reduce the possibility of leakage. Meanwhile, the whole removal process was carried out via the specimen bag without contacting the pelvic cavity, which was repeatedly rinsed with a large amount of hot distilled water to remove possible contamination and tumor-cell implantation.

According to the *International Consensus on Natural Orifice Specimen Extraction Surgery (NOSES) for Colorectal Cancer*, there are 10 methods of NOSES for colorectal-cancer treatment [11]. Laparoscopic right-colon cancer resection with transvaginal specimen extraction was termed 'CRC-NOSES-VIII (colorectal cancer-natural orifice specimen extraction surgery-VIII)'. Therefore, this transrectal procedure was named the 'CRC-NOSES-VIII B method'.

In conclusion, laparoscopic right hemicolectomy with transrectal-specimen extraction is a convenient and reliable method. It may effectively reduce post-operative pain, improve cosmetic effect, and avoid incision-related complications, which provides great benefit to the patients' recovery and mental health. Future studies will include randomized–controlled

trials focusing on the short- and long-term effects of the procedure to obtain more comprehensive and accurate results.

Authors' contributions

P.S. and X.S.W. contributed to the study concept and design. P.S., J.W.L., X.H. and X.S.W. performed the study. P.S., X.G., and S.L. collected the data and performed statistical analysis. P.S., and Z.L. drafted the manuscript. All authors reviewed and approved the final manuscript.

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Conflicts of interest

None declared.

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