



BRIEF REPORT

Single-operator-conducted natural orifice specimen extraction surgery (NOSES) for sigmoid colon cancer

Jun Huang^{1,2,3,*}, Sicong Lai^{1,2,3,†}, Qijun Yao^{1,2}, Fengyun Pei^{1,2}, Yang Zhao^{2,4} and Meijin Huang^{1,2,3}

¹Department of Colorectal Surgery, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, Guangdong, P. R. China, ²Guangdong Provincial Key Laboratory of Colorectal and Pelvic Floor Diseases, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, Guangdong, P. R. China, ³Guangdong Institute of Gastroenterology, Guangzhou, Guangdong, P. R. China and ⁴Department of Anesthesiology, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, Guangdong, P. R. China

*Corresponding author. Department of Colorectal Surgery, The Sixth Affiliated Hospital, Sun Yat-sen University, 26 Yuancun Erheng Road, Guangzhou, Guangdong 510655, P. R. China. Tel: +86-13926451242; Fax: +86-20-38250745; Email: haungj97@mail.sysu.edu.cn

†The authors wish it to be known that, in their opinion, J.H. and S.L. should be regarded as joint first authors.

Conventional laparoscopic surgery for colorectal cancer is usually performed by three operators, including a surgeon, an assistant, and a camera operator [1]. The assistant and camera operator help the surgeon to expose the accurate dissection plane [2, 3]. During the operation, however, because the camera-view image for the assistant is a mirror, the movement of the instruments is confusing and may lead to involuntary injuries. In addition, the image of the camera view is more in line with the habits of the camera operator and shaking of the image might make the surgeon uncomfortable. Practiced surgeons are able to perform reduced-port laparoscopic surgery without the assistant's help for selected cases. In theory, surgeons can also control the camera themselves. Here, we attempted natural orifice specimen extraction surgery (NOSES) performed by only one operator without an assistant or camera operator for a sigmoid colon cancer patient.

A 45-year-old female patient underwent screening colonoscopy in June 2022 and a neoplasm with a diameter of ~1.5 cm was found in the sigmoid colon with a distance of 20 cm to the anal verge. Biopsy revealed moderately differentiated adenocarcinoma. Enhanced computed tomography showed that the tumor had invaded the muscularis propria without regional lymph node or distant metastasis (stage cT2N0M0). She had no abdominal surgery history and was very concerned about scars

after surgery. Therefore, NOSES was performed. Considering the small size of the tumor, we marked it using carbon nanoparticles via colonoscopy before the operation.

Under general anesthesia with endotracheal intubation, the patient was maintained in an improved lithotomy position. Three trocars were placed, including a 12-mm subumbilical trocar through which the 30-degree oblique laparoscope was introduced, a 5-mm right middle-abdominal trocar, and a 12-mm right lower-abdominal trocar. The laparoscope was fixed on a pneumatic arm (NSK Ltd, Japan) and its position and angle of view could be adjusted by the surgeon (Figure 1). An abdominal cavity exploration was performed to exclude distant metastases. The left colon was separated and blood vessels were isolated according to the principles of radical tumor resection. An endoscopic linear cut stapler was used to cut off the bowel 10 cm proximal and distal to the tumor. The specimen was dragged out through the anus and stapler anastomosis was used to perform reconstruction. The total operation time was 150 min and intraoperative bleeding was 10 mL without intraoperative complications. The patient got down from the bed and recovered diet the day after surgery and was discharged from the hospital 4 days after surgery. Pathology of the specimen showed a T1N0 tumor with negative distal and circumferential margins. The surgical process is shown in the Supplementary Video.

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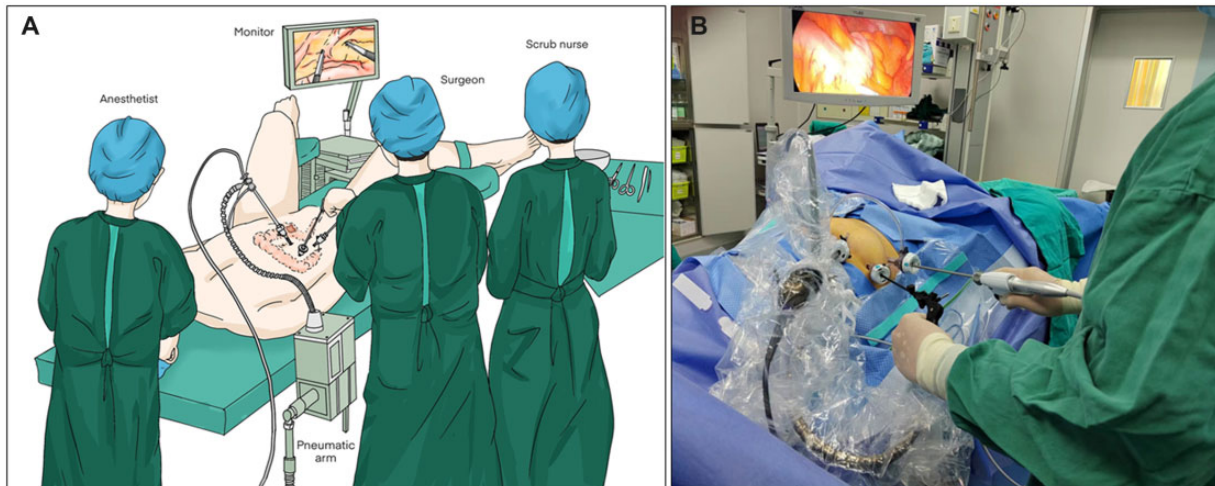


Figure 1. (A) Patient position and surgical equipment placement. (B) The laparoscope was fixed on a pneumatic arm.

The safety and effectiveness of laparoscopic colorectal surgery have been validated by clinical trials [4, 5]. Conventional laparoscopic surgery for colorectal cancer is normally performed by a surgeon, an assistant, and a camera operator, which requires five abdominal incisions for trocars and an extended incision for specimen extraction. Single-port laparoscopic surgery reduces the number of abdominal incisions. Nonetheless, it is technically challenging because of the clashing of instruments, inadequate exposure, and increased operative time and complications [6, 7]. Practiced surgeons are able to perform reduced-port laparoscopic surgery, which was defined as laparoscopic surgery performed with the minimum possible number of ports and/or small-sized ports, without the assistant's help for selected cases [8]. In this case, we replaced the camera operator with a pneumatic arm so that the surgeon could adjust the view of the laparoscope and fix it in place independently during surgery. We used three trocars to conduct NOSES. Reducing the total incision length led to less pain and improved perioperative outcomes [7, 9].

In this report, the entire procedure of the operation was performed by only one surgeon. The patient was maintained in a suitable position so that the surgeon could making full use of gravity to get a good surgical field. The surgeon pre-fixed the scope in place before each procedure. Furthermore, the surgeon performed transanal and transabdominal procedures simultaneously during the surgery, such as specimen extraction and anastomosis. To our satisfaction, the operative time and intraoperative bleeding were well controlled in this case.

We acknowledge that there are several limitations for single-operator-conducted NOSES. First, the surgery should be performed by an accomplished surgeon who has performed ≥ 100 conventional laparoscopic surgeries and >50 reduced-port laparoscopic surgeries. When an assistant or camera operator is junior or unskilled, single-operator surgery might be an option. Second, patients should be selected, for example, with tumors with small size and proper body mass index. Third, we only performed the single-operator-conducted NOSES for a sigmoid colon cancer patient. Tumors in different locations, such as the ascending colon, or lower rectal cancer may not be suitable for this surgical approach.

In conclusion, single-operator-conducted laparoscopic NOSES might be a considered procedure for sigmoid colon cancer. Further studies with more cases are warranted to evaluate

the safety and effectiveness of this new surgical approach for colorectal cancer.

Supplementary Data

Supplementary data is available at *Gastroenterology Report* online.

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J.H. was responsible for the conception and design of the study; S.L., Q.Y., F.P., and Y.Z. were responsible for data acquisition; S.L. and Q.Y. analysed and interpreted the data; S.L. and J.H. were responsible for the writing and revision of the manuscript; J.H. and M.H. reviewed the manuscript. All authors read and approved the final manuscript.

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Conflict of Interest

None declared.

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