Robotic single-incision right hemicolectomy with extended lymphadenectomy using the da Vinci SP Surgical Platform

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INTRODUCTION

With the technical evolution of minimally invasive surgery, single-incision laparoscopic surgery (SILS) has been performed to minimize parietal trauma, which might have benefit of less incision-related pain, quicker patient recovery [1–3]. However, adoption of SILS has been slow by its technical challenges arise from the restriction in triangulation and retraction. To overcome this limitation, Intuitive Surgical (Sunnyvale, CA, USA) launched the da Vinci SP surgical system (dVSP) in 2018, which was developed to perform robotic single-incision surgery. Since we reported the first use of dVSP in colorectal surgery, many institutions adopted this system and its use has been increasing [4]. And, in accordance with the increment of adoption of dVSP, the indication to apply this platform has been expanding. Herein, we report a technique of right hemicolectomy with extended lymphadenectomy beyond conventional lymph node dissection using dVSP.

PROCEDURES

Patient

A 51-year-old female was diagnosed with cecal cancer on the
screening colonoscopy, which showed a 7-cm sized laterally spreading mass with multiple ulceration in cecum. Biopsy revealed it as a well-differentiated adenocarcinoma. On the following computed tomography, cecal wall thickening without pericolic infiltration was identified, and metastatic lymph node in precaval area was suspicious. On the positron emission tomography, a hypermetabolic mass in the cecum and hypermetabolic lymph nodes in the peritumoral and precaval area were presented. We planned to perform single-incision robotic RHC and paraaortic lymph node dissection with dVSP. The relevant video clip is provided with this article (Supplementary Video 1).

Installation and docking

The patient underwent standard bowel preparation and received prophylactic antibiotics. Surgery was performed under general anesthesia and endotracheal intubation. A vertical transumbilical incision, 40 mm in length, was made and an access port was established using Uniport (Dalim Medical, Seoul, Korea). This access port had four entries to access a multichannel robotic cannula, a linear stapler, and two accessory assistant devices, which was 25 mm, 12 mm, and 5 mm in size, respectively. After achieving pneumoperitoneum with insufflations of carbon dioxide to 12 mmHg, the patient was placed in Trendelenburg position at 15° and tilted left side down. After patients’ positioning, laparoscopic exploration was undertaken using laparoscopic instruments through robotic and assistant ports. After completing laparoscopic exploration, the robot was docked with a 0° flexible endoscope, monopolar curved scissors, bipolar grasper, and Cadiere forceps (Intuitive Surgical). All robotic endoscope and instruments were inserted through a 25 mm single robotic cannula.

Surgical procedure

Mobilization of the ascending colon and mesocolon was first performed via an inferior approach. The peritoneal reflection of the small bowel mesentery was incised and the mesocolon was detached from the retroperitoneum. Exposing duodenum, it was lifted and right paraaortic and precaval lymph nodes were harvested, which were corresponded to the suspicious metastatic lymph node on the preoperative study. After sampling the corresponding lymph node, dissection into the surgical plane above the duodenum and Gerota fascia was performed to mobilize the entire ascending colon mesentery from the retroperitoneal structures. Leaving the lateral attachment of ascending colon, the duodenum and pancreatic head were exposed and lesser sac was opened. Then, lateral attachment of ascending colon and hepatocolic ligament were excised, and ascending colon and hepatic flexure were mobilized completely. After mobilizing ascending colon, omentectomy was performed at the level inferior to the gastroepiploico vessels. Securing right gastroepiploico vessels, omentum was excised laterally to the root of right gastroepiploico artery and lymphadenectomy around right gastroepiploico artery was performed. Subsequently, remained hepatocolic and hepatoduodenal ligament were excised and proximal transverse colon was fully mobilized. Lymphadenectomy along the superior mesenteric vessels was performed with individual exposure and ligation of the ileocolic and right branch of middle colic vessels at their origin from the superior mesenteric artery, vein, and middle colic trunk. The gastrocolic trunk was exposed and the colonic branch was ligated while preserving the pancreatic branches. Subsequently, the mesocolon of the transverse colon and the mesentery of the ileum were divided until the desired resection margins were achieved. All these procedures were performed mainly by using three robotic arms and no additional incision for the assistant’s port was required. Laparoscopic instruments such as grasper, suction cannula, and stone holding forceps were used by the assistant to introduce/remove gauze pads, suck out smoke, and retrieve sampled lymph nodes, respectively. These laparoscopic instruments were applied through 5-mm and 12-mm sized accessory entries of single access port. Bowel resection and anastomosis were performed extracorporeally. After releasing the robot from docking mobilized bowel was exteriorized through an umbilical incision, and stapled ileocolic end-to-side anastomosis was performed.

Peri- and postoperative outcomes

The procedure was completed without significant problem using a single-incision approach. The requirement of an additional laparoscopic port was not present. Operative time, docking time, and console time were 280 minutes, 15 minutes, and 210 minutes, respectively. The estimated blood loss was 50.0 mL. On the pathologic report, 5.0-cm sized fungating mass infiltrating till lamina propria of the cecum (pathologic stage [p] Tis) was identified. Distance from tumor to the proximal and distal resection margins was 12.5 cm and 17 cm, respectively. Forty-four lymph nodes were harvested and no metastatic lymph node was identified (pN0). The patient passed gas on postoperative day 2, resumed a soft diet on postoperative day 3, and was discharged to home on postoperative day 6 without any complication.

DISCUSSION

Since the first report of SILS for colonic disease in 2008 by Bucher et al. [5], it has emerged as a feasible minimally invasive modality that could minimize parietal trauma and enhance patient recovery [1-3]. However, the adoption of SILS for colorectal surgery is still limited by its technical challenges of collisions of
The da Vinci SP Surgical System for colorectal surgery

The da Vinci SP Surgical System for colorectal surgery. Accumulation of data should be needed to confirm the validity of this surgical platform to expand its use.

NOTES

Ethical statements

We followed the principles of Declaration of Helsinki for health and the study was reviewed and approved by the Institutional Review Board of our institution, which waived the need for informed consent, given the retrospective nature of the study (No. 2021-04-049).

Authors’ contribution

Conceptualization: GTN, KHK
Writing-original draft: GTN
Writing-review and editing: All authors
All authors read and approved the final manuscript.

Conflict of interest

All authors have no conflicts of interest to disclose.

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Supplementary materials

Supplementary Video 1 can be found via https://doi.org/10.7602/jmis.2021.24.2.109.

REFERENCES

1. Kim SJ, Choi BJ, Lee SC. Overview of single-port laparoscopic surgery for colorectal cancers: past, present, and the future. World J Gastroenterol 2014;20:997-1004.
2. Maggiori L, Gaujoux S, Tribillon E, Bretagnol F, Panis Y. Single-incision laparoscopy for colorectal resection: a systematic review and meta-analysis of more than a thousand procedures. Colorectal Dis 2012;14:e643-e654.
3. Fung AK, Aly EH. Systematic review of single-incision laparoscopic colonic surgery. Br J Surg 2012;99:1353-1364.
4. Noh GT, Oh BY, Han M, Chung SS, Lee RA, Kim KH. Initial clinical experience of single-incision robotic colorectal surgery with da Vinci SP platform. Int J Med Robot 2020;16:e2091.
5. Bucher P, Pugin F, Morel P. Single port access laparoscopic right hemicolecotony. Int J Colorectal Dis 2008;23:1013-1016.
6. Salem JF, Agarwal S, Schoonyoung H, Martin C, Marks JH. Initial clinical experience with Single-Port robotic (SP r) left colectomy using the SP surgical system: description of the technique. Surg Endosc 2020 Nov 19 [Epub]. https://doi.org/10.1007/s00464-020-08159-2.
7. Marks JH, Kunkel E, Salem J, Martin C, Schoonyoung HP, Agarwal S. rSILS: initial clinical experience with single-port robotic (SPr) right colectomy. Tech Coloproctol 2020;24:817-822.
8. Marks JH, Salem JF, Adams P, et al. SP rTaTME: initial clinical experience with single-port robotic transanal total mesorectal excision (SP rTaTME). Tech Coloproctol 2021;25:721-726.
9. Kim JG, Heo YJ, Son GM, et al. Impact of laparoscopic surgery on the long-term outcomes for patients with rectal cancer. ANZ J Surg 2009;79:817-823.
10. Colon Cancer Laparoscopic or Open Resection Study Group, Buunen M, Veldkamp R, et al. Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. Lancet Oncol 2009;10:44-52.