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DYNAMIC MANUSCRIPT

Intracorporeal hemi-hand-sewn technique for end-to-end anastomosis in laparoscopic left-side colectomy

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Abstract

Background Recently, complete laparoscopic procedures with intracorporeal reconstruction were performed in laparoscopic colectomies; however, they were scarcely reported in left-side colectomies because of the anatomical reasons. Since the descending colon is extensively fixed to the retroperitoneum, the dissection range required for resection cannot always be enough for a safe extracorporeal anastomosis. We devised an intracorporeal hemi-hand-sewn (IC-HHS) technique for end-to-end anastomosis in laparoscopic left-side colectomies.

Materials and methods A total of 11 patients underwent IC-HHS anastomosis for the treatment of colon cancer around the sigmoid-descending (SD) junction. The posterior wall of the anastomosis was constructed with a linear stapler and subsequently, the anterior wall was sutured with an intracorporeal hand-sewn technique. Perioperative outcomes were evaluated.

Results IC-HHS reconstruction between the descending colon and sigmoid colon was performed in 11 cases. There were six males and five females with an average age of 66.5 years. The average body mass index was 26.1 kg/m^2. The averages of the operation time and intraoperative blood loss were 181.2 min (range, 154 to 210 min) and 13.9 ml (range 5–30 ml), respectively. There were no perioperative complications except for one patient with a superficial surgical site infection.

Conclusions IC-HHS anastomosis was successfully performed for colon cancer around the SD junction with acceptable perioperative outcomes and there were no procedure-related complications, indicating its feasibility. IC-HHS anastomosis could eliminate unnecessary splenic flexure mobilization in left-side colectomies. IC-HHS anastomosis can be an optional reconstruction for totally laparoscopic colectomies.

Keywords Laparoscopic surgery · Colon cancer · Intracorporeal anastomosis · End-to-end anastomosis · Hemi-hand-sewn technique

Currently, laparoscopic colectomy is widely practiced as the standard treatment method for colon cancer. A large number of studies revealed that laparoscopic surgery has better short-term results and similar oncological outcomes compared with conventional open surgery [1–3].

In a conventional laparoscopy-assisted colectomy, bowel mobilization and division of vessels are usually performed laparoscopically, whereas resection of the specimen and anastomosis are completed extracorporeally. In a colectomy, the difficulty of the procedure varies depending on the locations due to the anatomical features. Especially in the cases around the descending colon, the dissection range required for resection cannot always be enough for a safe extracorporeal anastomosis. It is often necessary to mobilize splenic flexure of the colon only for safe extracorporeal anastomosis. The splenic flexure mobilization is technically difficult as compared with the hepatic flexure because of the anatomical

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factors and can also lead to serious complications such as splenic injury and pancreas fistula.

Recently, complete laparoscopic procedures with intracorporeal reconstruction have been performed in laparoscopic colectomies. However, most of them have been reported in right-side colectomies and the procedures of the intracorporeal reconstruction in left-side colectomies were scarcely reported [4–6]. We previously devised an intracorporeal hemi-hand-sewn (IC-HHS) technique for end-to-end Billroth-I gastroduodenostomy after laparoscopic distal gastrectomy and reported its feasibility [7, 8]. The application of this technique to left-side colectomy could eliminate unnecessary splenic flexure mobilization and enable us to perform tension-free end-to-end anastomosis. In this report, we described our procedures in detail with a video (Supplement video) and reported perioperative outcomes of the patients.

Materials and methods

Surgical procedures

Lymph node dissection

Under general anesthesia, the patient was placed in a modified lithotomy position. The operator performed all procedures standing on the right-side of the patient. We applied a 4 port-laparoscopic procedure. After a routine abdominal examination, a medial approach was used at the start of the surgery. The proximal dissection was performed as minimally as necessary for resection and the mobilization of the splenic flexure was avoided. The lymph node dissection was performed preserving the left colic artery. The inferior mesenteric vein was preserved as a drainage vein for the distal intestine. After completion of lymph node dissection, the descending colon and sigmoid colon were transected with linear staplers. The resection range was determined according to the guidelines of the Japanese Society for Cancer of the Colon and Rectum [9]. After excision, the resected specimens were stretched and attached to the board, and the length of proximal and distal margins were confirmed.

Full-thickness posterior wall anastomosis

Sero-muscular stay sutures were placed between the descending colon and sigmoid colon (Fig. 1a). An entry hole was made by piercing the active blade of laparoscopic coagulating scissors at the anterior wall of the sigmoid colon; then, a tissue pad was put into the enteral cavity and the anterior wall was incised. A similar incision was made at the anterior wall of the descending colon (Fig. 1b). The assistant grasped a stay suture put on the excessive tissues and the operator simultaneously lifted up another stay suture. Then the posterior walls of the descending and sigmoid colon were approximated by an endoscopic linear stapler (Fig. 1c). During closure of the stapler forks, it was carefully confirmed that there was no excessive pinching of the anterior wall. The endoscopic linear stapler was fired to excise the excessive tissues and simultaneously constructing the posterior wall anastomosis (Fig. 1d). Then the staple line was observed to confirm that there was no bleeding or pinching of the anterior wall.

Full-thickness anterior wall anastomosis (Fig. 1e)

Subsequently, a full-thickness, continuous suture of the anterior wall was performed with a 3–0 absorbable thread. The first suture was started at the front edge of the posterior wall and the first knot was developed inside the lumen involving the staple edge. After three running stitches, the absorbable thread was locked. Using another 20 cm thread, continuous suturing was started from the opposite edge of the staple line. A continuous running suture was carried out and when the two sutures met each other, each end was ligated intracorporeally to finish the full-thickness anterior wall anastomosis.

Sero-muscular inverting anterior wall anastomosis (Fig. 1f)

Finally, interrupted sero-muscular layer suturing of the anterior wall was performed for a complete inverting anastomosis. Meanwhile, the assistant kept lifting up the distal stay suture. Approximately 10 sero-muscular sutures were required for complete inverting anastomosis. Then, an intracorporeal reconstruction by HHS technique was completed, which was almost the same shape as an extracorporeal hand-sewn anastomosis. The resected specimen was retrieved via the umbilical wound. After peritoneal lavage and hemostasis, the mesocolon was closed to prevent an internal hernia.

Indication of IC-HHS reconstruction

All patients underwent multi-detector-row computed tomography scans and a colonoscopy to determine the clinical stage of colorectal cancer. Additionally, a colonography was performed for the precise determination of the tumor location, if needed.

When the tumor was apparently located in the descending colon, the extracorporeal anastomosis was performed after splenic flexure mobilization. We also performed extracorporeal anastomosis if the sigmoid colon was long enough to safely allow extracorporeal anastomosis through a small laparotomy. The double stapling technique was applied for the tumors located at the distal half of the sigmoid colon. In the cases where the tumor was located around

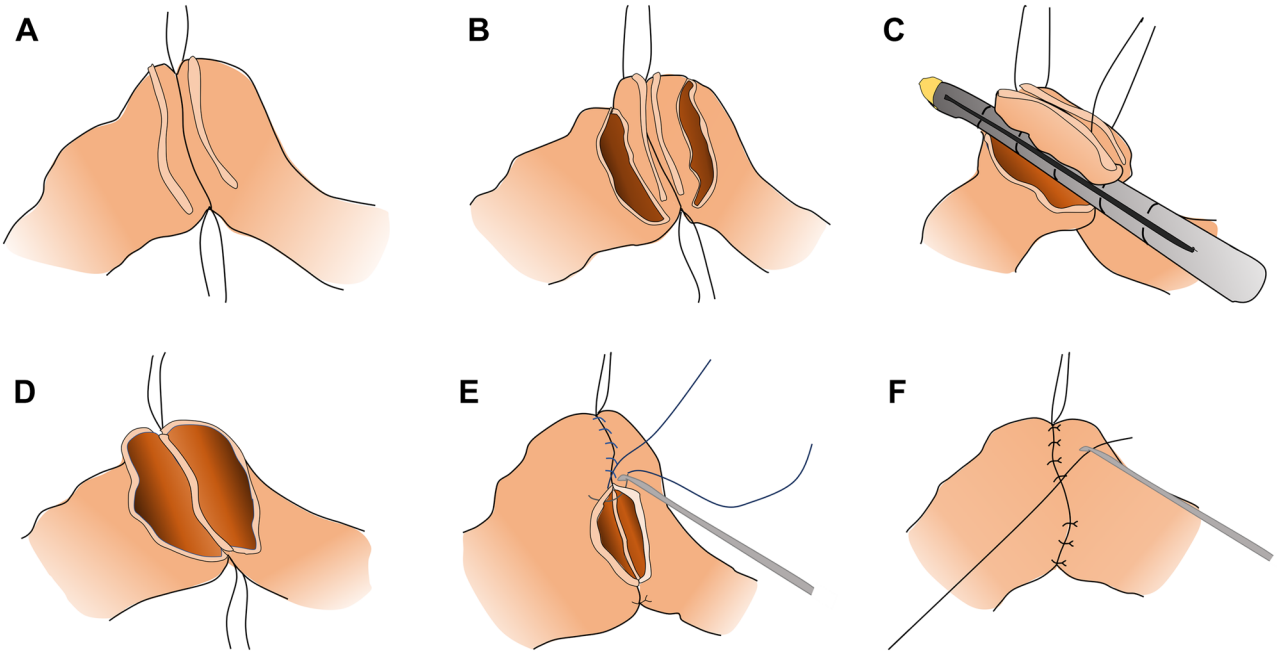

Fig. 1 Intracorporeal hemi-hand-sewn anastomosis between descending colon and sigmoid colon. Sero-muscular stay sutures were placed between the descending colon and sigmoid colon (**A**) and both of the anterior walls were incised (**B**). Then the posterior walls of the descending and sigmoid colon were approximated by an endoscopic linear stapler (**C**). The endoscopic linear stapler was fired to excise the excessive tissues and simultaneously the posterior wall anastomosis was constructed (**D**). Full-thickness continuous suture (**E**) and interrupted sero-muscular sutures were made for completion of two-layer inverting anterior wall anastomosis (**F**)

the sigmoid-descending (SD) junction and was expected to require an extra-dissection toward the splenic flexure for safe reconstruction, IC-HHS reconstruction was planned as an option. Eventually, the indication was determined after laparoscopic observation during surgery. This procedure was approved by the institutional review board. The detailed procedures were explained to all patients, and their written informed consent was obtained.

Results

A total of 312 patients underwent surgery for colorectal cancer in our hospital and related institutions between October 2013 and December 2017. Among them, IC-HHS reconstruction between the descending colon and sigmoid colon was performed in 11 cases (Table 1). There were six males and five females with an average age of 66.5 years (range 54–73 years). The average body mass index (BMI) was 26.1 kg/m^2 (range, 20.8 to 30.2 kg/m^2). The clinical stages were three for stage I, six stage II, and two cases of stage III, respectively. The averages of the operation time and intraoperative blood loss were 181.2 min (range 154–210 min) and 13.9 ml (range 5–30 ml), respectively. The average time to pass first flatus was 1.4 days (range 0–3 days), and the average frequency of the analgesic use was 3.6 times (range 1–7 times) 5 days after surgery. The length of hospitalization after surgery was 9.2 days in average (range 7–12 days). There were no perioperative complications except for one patient with a superficial surgical site infection (Clavien-Dindo classification Grade I). The median follow-up time after surgery of the 11 patients was 3.5 years, and there have been no late complications including incisional hernias, as well as tumor recurrences.

Table 1 Patient's characteristics and perioperative outcomes ($n = 11$)

Variables	mean ± SD	Range
Age (y.o)	66.5 ± 6.2	54–73
Sex (male/female)	6/5	
Body mass index (kg/m^2)	26.1 ± 2.8	20.8–30.2
Pathological stage (I/II/ III)	3/6/2	
Operation time (min)	181.2 ± 20.8	154–210
Blood loss (ml)	13.9 ± 8.8	5–30
Proximal margin (cm)	12.3 ± 2.0	8.5–15.3
Distal margin (cm)	14.1 ± 2.3	11.3–19.5
Harvested lymph node	16.8 ± 4.3	10–22
LOHS (days)	9.2 ± 1.6	7–12

SD standard deviation, *LOHS* length of hospital stay

Discussion

In the conventional laparoscopy-assisted colectomy, resection and reconstruction are performed through a small laparotomy; therefore, the degree of difficulty is greatly affected by the patient's figure. Especially in obese patients with thick abdominal walls, it is difficult to pull out the intestine enough to secure an appropriate resection range and to perform an anastomosis safely. Extracorporeal anastomosis sometimes requires excessive traction on the organs which increases intraoperative manipulation and sometimes causes unintended vessel or serosal injury. Additionally, unexpected bleeding due to congestion of the intestine was often experienced during the extracorporeal procedures. In particular, in the descending colon, which is extensively fixed to the retroperitoneum, a sufficient intestinal mobilization is recommended to avoid such complications.

Functional end-to-end anastomosis (FEEA) is one of the anastomotic techniques using automatic suturing devices that was first reported in 1968 [10]. Compared to the hand-sewn anastomosis, FEEA reduces the time for anastomosis, increases the anastomotic diameter, and permits anastomosis of ducts with different diameters. In recent years, FEEA has been generally implemented and its safety was established [11–13]. This reconstruction method can be used not only for open surgery but also for laparoscopy-assisted surgery and ultimately allowing intracorporeal reconstruction for totally laparoscopic colectomy [14, 15]. An increasing body of literature described the benefits of intracorporeal reconstruction by FEEA [16, 17]. Short-term outcomes favored intracorporeal anastomosis, confirming that a less traumatic surgical approach improved patient outcomes by providing a faster recovery of nutrition and intestinal function, as well as a shorter hospitalization over an extracorporeal anastomosis [18]. Moreover, a totally laparoscopic procedure might have the potential benefits of reducing the risk of surgical site infections, adhesive small bowel obstructions, and unrecognized anastomotic twists. Especially in obese patients, a totally laparoscopic procedure provides a wide and anatomically undeviated surgical field regardless of the patient's figure and eliminates the need to exteriorize heavy mesentery and large specimens through a small incision [19–21].

Although most previous reports have demonstrated the usefulness of a totally laparoscopic colectomy in right-side colectomies, there were few reports regarding left-side colectomies [5–7]. Originally, the incidence of the tumor around the descending colon is lower than that of right-side colon cancer. Furthermore, it is technically challenging to perform an intracorporeal anastomosis around the SD junction compared with right-side colectomy. For a reconstruction after right-side colectomy, we usually perform an extracorporeal end-to-end hand-sewn anastomosis via a small laparotomy and also apply extracorporeal reconstruction after sigmoidectomy when a sufficient length of the sigmoid colon was secured. During the resection of the tumor located around the splenic flexure or upper descending colon, the splenic flexure should be mobilized in all cases, however, even in sigmoid colon cancer, extra-dissection is required to extract the proximal intestine when the tumor is located around the SD junction. Due to the fact that the descending colon is extensively fixed to the retroperitoneum, the dissection range required for resection cannot always be enough for a safe extracorporeal anastomosis. In some cases, the splenic flexure mobilization is inevitable to achieve a safe, tension-free anastomosis, even though it is not necessary for the resection. As the splenic flexure is close to the spleen and the pancreas, the splenic flexure mobilization is technically difficult as compared with the hepatic flexure. And it can also be a cause of critical complications such as splenic injury and pancreas fistula [22, 23]. Additionally, the relatively poor vascularization status in the distal transverse colon (the Griffiths' point) is believed to increase the risk of anastomotic complications [24].

For a successful and safe anastomosis, it is important to secure a good surgical field, sufficient blood supply of the digestive tracts, an absence of excessive tension, and well-apposed tissues at the anastomotic site, as well as an appropriate anastomosis technique. Based on these ideas, we devised a new reconstruction method to create an end-to-end anastomosis by combining mechanical and manual anastomotic techniques. IC-HHS anastomosis is an end-to-end reconstruction equivalent to open surgery which we have already performed in more than 100 cases as an intracorporeal Billroth-I reconstruction after a laparoscopic distal gastrectomy [7, 8]. The application of this technique to left-side colectomy could eliminate unnecessary splenic flexure mobilization, because there is no need to exteriorize the intestine to the level of the abdominal wall. As for FEEA is anatomically side-to-side anastomosis, it is essential to secure a sufficient length of free intestine for a safe anastomosis. An end-to-end anastomosis is preferable to a side-to-side anastomosis to relieve tension between tissues during the anastomosis and requires a minimum dissection range. The HHS technique enables tension-free, anatomic position-free anastomoses in a natural position. We decided the reconstruction method based on the policy of performing hand-sewn anastomosis in cases where extracorporeal anastomosis could be performed safely, as a result, the HHS technique was applied to a relatively small number of obese patients. However, the amount of blood loss and operation time were acceptable, and the

postoperative course was uneventful. Anastomotic leakage and stricture were not observed in our experiences and the anastomotic sites were hardly recognized by the follow-up colonoscopies.

During the posterior wall construction by HHS technique, we paid thorough attention not to pinch the anterior wall together with the posterior wall by a linear stapler. Even if a small amount of the anterior wall was pinched, an ordinary anterior wall anastomosis could be performed by cutting the anterior wall along the staple line. In addition, in order to prevent an anastomotic defect formation between the posterior and anterior wall anastomoses, we routinely used two absorbable threads for the anterior wall full-thickness anastomosis, so that both edges of the posterior staple line could be involved by the first stitches.

Recently, with the advances of anastomotic devices, the opportunity to perform conventional hand-suturing techniques has been significantly reduced during gastrointestinal reconstruction. Completing a straight suture line perpendicular to the operation field is a great opportunity to acquire a basic intracorporeal suturing technique and the acquired technique will be useful in unexpected difficult situations, such as an unintended bowel injury. Today, pancreatic anastomosis and biliary reconstruction are also performed laparoscopically [25, 26]; thus, we believe that laparoscopic surgeons should not hesitate to perform intracorporeal suturing as a special technique. The ideal reconstruction methods established in the long history of open surgery deserve to be reproduced as much as possible in laparoscopic surgeries. We used the umbilical wound for organ extraction and there was no incisional hernia as a postoperative complication; however, some recent reports described that the incidence of SSI and an incisional hernia were less frequent when the resected specimen was extracted through other than the umbilical wound [27]. In the future, it is necessary to consider changing the extraction site.

In conclusion, intracorporeal end-to-end anastomosis by HHS technique was successfully performed for colon cancer around the SD junction with acceptable perioperative outcomes and there were no procedure-related complications, indicating its feasibility. IC-HHS anastomosis could eliminate unnecessary splenic flexure mobilization in left-side colectomies. Although it requires an advanced suturing technique, we believe that it is necessary to keep basic training for intracorporeal suturing in addition to using automatic suturing equipment. Although our experience is limited and appropriate indications must be set by future studies, we believe that IC-HHS anastomosis can be an optional reconstruction for a totally laparoscopic colectomy around the SD junction.

Compliance with ethical standards

Disclosures Drs. Yasushi Ohmura, Hiromitsu Suzuki, Kazutoshi Kotani, and Atsushi Teramoto have no conflicts of interest or financial ties to disclose.

References

1. Nelson H, Sargent DJ, Wieand HS, Fleshman J, Anvari M, Stryker SJ, Beart RW Jr, Hellinger M, Flanagan R Jr, Peters W, Ota D; Clinical Outcomes of Surgical Therapy Study Group (2004) A comparison of laparoscopically assisted and open colectomy for colon cancer. N Engl J Med 350:2050–2059
2. Jayne DG, Guillou PJ, Thorpe H, Quirke P, Copeland J, Smith AM, Heath RM, Brown; JM UK MRC CLASICC Trial Group (2007) Randomized trial of laparoscopic-assisted resection of colorectal carcinoma: 3-year results of the the UK MRC CLASICC Trial Group. J Clin Oncol 25:3061–3068
3. Buunen M, Veldkamp R, Hop WC, Kuhry E, Jeekel J, Haglind E, Påhlman L, Cuesta MA, Msika S, Morino M, Lacy A, Bonjer H; Colon Cancer Laparoscopic or Open Resection Study Group (2009) Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. Lancet Oncol 10:44–52
4. Araujo SE, Seid VE, Klajner S, Bertoncini AB (2014) Left colectomy with intracorporeal anastomosis: technical aspects. Einstein (Sao Paulo) 12:386–388
5. Pisani Ceretti A, Maroni N, Sacchi M, Bona S, Angiolini MR, Bianchi P, Opocher E, Montorsi M (2015) Laparoscopic colonic resection for splenic flexure cancer: our experience. BMC Gastroenterol 15:76. https://doi.org/10.1186/s12876-015-0301-7
6. Ceccarelli G, Biancafarina A, Patriti A, Spaziani A, Bartoli A, Bellochi R, Pisanelli MC, Casciola L (2010) Laparoscopic resection with intracorporeal anastomosis for colon carcinoma located in the splenic flexure. Surg Endosc 24:1784–1788
7. Ohmura Y, Kumano K, Watanabe S, Mitsuoka N, Watanabe T (2013) A new intracorporeal anastomosis method in laparoscopic distal gastrectomy: Billroth-I reconstruction by hemi-hand-sewn-technique. J Jp Soc Endosc Surg 18:407 **[in Japanese]**
8. Ohmura Y, Suzuki H, Kotani K, Teramoto A (2019) Intracorporeal hemi-hand-sewn technique for Billroth-I gastroduodenostomy after laparoscopic distal gastrectomy: comparative analysis with laparoscopy-assisted distal gastrectomy. Mini-invasive Surg 3:4. https://doi.org/10.20517/2574-1225.2018.69
9. Watanabe T, Itabashi M, Shimada Y, Tanaka S, Ito Y, Ajioka Y, Hamaguchi T, Hyodo I, Igarashi M, Ishida H, Ishiguro M, Kanemitsu Y, Kokudo N, Muro K, Ochiai A, Oguchi M, Ohkura Y, Saito Y, Sakai Y, Ueno H, Yoshino T, Fujimori T, Koinuma N, Morita T, Nishimura G, Sakata Y, Takahashi K, Takiuchi H, Tsuruta O, Yamaguchi T, Yoshida M, Yamaguchi N, Kotake K, Sugihara K (2012) Japanese society for cancer of the colon and rectum japanese society for cancer of the colon and rectum (JSCCR) guidelines 2010 for the treatment of colorectal cancer. Int J Clin Oncol 17:1–29
10. Steichen FM (1968) The use of staplers in anatomical side-to-side and functional end-to-end enteroanastomoses. Surgery 64:948–953
11. Sameshima S, Koketsu S, Yoneyama S, Miyato H, Kaji T, Sawada T (2009) Outcome of functional end-to-end anastomosis following right hemicolectomy. Int Surg 94:249–253
12. Goto T, Kawasaki K, Fujino Y, Kanemitsu K, Kamigaki T, Kuroda D, Suzuki Y, Kuroda Y (2007) Evaluation of the mechanical

strength and patency of functional end-to-end anastomoses. Surg Endosc 21:1508–1511
13. Choy PY, Bissett IP, Docherty JG, Parry BR, Merrie A, Fitzgerald A (2011) Stapled versus handsewn methods for ileocolic anastomoses. Cochrane Database Syst Rev. 7(9):CD004320. https://doi.org/10.1002/14651858.CD004320.pub3
14. Nors J, Sommer T, Wara P (2018) Leakage rate after laparoscopic ileocolic intracorporeal anastomosis. J Laparoendosc Adv Surg Tech A 28:1287–1293
15. Liu Z, Wang G, Yang M, Chen Y, Miao D, Muhammad S, Wang X (2014) Ileocolonic anastomosis after right hemicolectomy for colon cancer: functional end-to-end or end-to-side? World J Surg Oncol 12:306. https://doi.org/10.1186/1477-7819-12-306
16. Milone M, Elmore U, Di Salvo E, Delrio P, Bucci L, Ferulano GP, Napolitano C, Angiolini MR, Bracale U, Clemente M, D'ambra M, Luglio G, Musella M, Pace U, Rosati R, Milone F (2015) Intracorporeal versus extracorporeal anastomosis. Results from a multicentre comparative study on 512 right-sided colorectal cancers. Surg Endosc 29:2314–2320
17. Shapiro R, Keler U, Segev L, Sarna S, Hatib K, Hazzan D (2016) Laparoscopic right hemicolectomy with intracorporeal anastomosis: short- and long-term benefits in comparison with extracorporeal anastomosis. Surg Endosc 30:3823–3829
18. Anania G, Santini M, Scagliarini L, Marzetti A, Vedana L, Marino S, Gregorio C, Resta G, Cavallesco G (2012) A totally minivasive approach for colorectal laparoscopic surgery. World J Gastroenterol 18:3869–3874
19. Hellan M, Anderson C, Pigazzi A (2009) Extracorporeal versus intracorporeal anastomosis for laparoscopic right hemicolectomy. JSLS 13:312–317
20. Pikarsky AJ, Saida Y, Yamaguchi T, Martinez S, Chen W, Weiss EG, Nogueras JJ, Wexner SD (2002) Is obesity a high-risk factor for laparoscopic colorectal surgery? Surg Endosc 16:855–858
21. Lujan HJ, Plasencia G, Rivera BX, Molano A, Fagenson A, Jane LA, Holguin D (2018) Advantages of robotic right colectomy with intracorporeal anastomosis. Surg Laparosc Endosc Percutan Tech 28:36–41
22. Steffen C, Bokey EL, Chapuis PH (1987) Carcinoma of the splenic flexure. Dis Colon Rectum 30:872–874
23. Schlachta CM, Mamazza J, Poulin EC (2007) Are transverse colon cancers suitable for laparoscopic resection? Surg Endosc 21:396–399
24. Meyers MA (1976) Griffiths' point: critical anastomosis at the splenic flexure. Significance in ischemia of the colon. Am J Roentgenol 126:77–94
25. Zhang RC, Zhang B, Mou YP, Xu XW, Zhou YC, Huang CJ, Zhou JY, Jin WW, Lu C (2017) Comparison of clinical outcomes and quality of life between laparoscopic and open central pancreatectomy with pancreaticojejunostomy. Surg Endosc 31:4756–4763
26. Boggi U, Amorese G, Vistoli F, Caniglia F, De Lio N, Perrone V, Barbarello L, Belluomini M, Signori S, Mosca F (2015) Laparoscopic pancreaticoduodenectomy: a systematic literature review. Surg Endosc 29:9–23
27. Drosdeck J, Harzman A, Suzo A, Arnold M, Abdel-Rasoul M (2013) Husain S (2013) Multivariate analysis of risk factors for surgical site infection after laparoscopic colorectal surgery. Surg Endosc 27:4574–4580