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Case Report
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Robotic Resection for Neoplasm of the Mid-Transverse Colon with Bottom-Up Approach: A Case Report

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Abstract

Background: The role of robotic surgery for Transverse Colon Cancer (TCC) remains controversial. There are few reported cases using the Da Vinci robot. Following the CARE Guidelines, we report our early experience and technique using the robotic approach for TCC segmental resection and its potential advantages.

Case Report: A 74-year-old woman, diagnosed with transverse colon cancer, was referred to our department. The preoperative diagnosis was cT1N0M0, Stage I. We performed transverse colon resection using da Vinci Xi system without any complications. The operative time was 370 min and the blood loss was 100 ml.

Conclusion: We report our experience with robotic surgery for TCC with a suprapubic approach that resulted to be safe and feasible for low-stage mid-transverse colon cancer. We believe that this approach will find increasing use, allowing a safer application of minimally invasive robotic surgery. However, more research is required to draw firm conclusions on this topic.

Keywords: Robotic surgery; Transverse colon cancer; Segmental colectomy

Abbreviations

TCC: Transverse Colon Cancer; TC: Transverse Colectomy; FOBT: Fecal Occult Blood Test; TIA: Transient Ischemic Attack; PE: Physical Examination; ICG: Indocyanine Green; FSSA: Functional Side-to-Side Anastomosis; DRE: Digital Rectal Examination

Background

Transverse Colon Cancer (TCC) accounts for 10% of all colon cancers [1]. Compared to literature on left or right colectomy, literature concerning surgical management of transverse colon cancers is scarce. The incidence of TTC is low, and the operative management can include an extended right, extended left or a transverse colectomy [2]. This requires higher surgical technical skills to dissect the root of the mesocolon safely and to ensure a good quality oncological resection. According to literature, laparoscopic surgery for TCC is feasible and safe with no difference in 5-year overall and disease-free survival with open surgery, and comparable short-term outcomes [3-9]. In addition, in the current era of technical development, robotic surgery for transverse colon cancer has rarely been investigated [10]. The few existing studies show it to be a feasible technique [11-14]; however, more research is required to draw relevant conclusions on this subject. Here, we initially report successful robotic TTC surgery on a 74-year-old female with TCC.

Case Presentation

Patient information

The patient was a 74-year-old woman (height, 160 cm; weight, 64 kg; body mass index, 25.0) with family history of tumors (mother died for breast cancer, father died for gastric cancer). Referred to our department for treatment after two episodes of abdominal pain, Fecal Occult Blood Test (FOBT) positive, biopsy-proven adenocarcinoma of the transverse colon. She was not in distress (ECOG performance status, 2; American Society of Anesthesiologists score, 3). Her past medical history included hypertension, Transient Ischemic Attack (TIA), osteoporosis. Previously underwent cholecystectomy, appendectomy, hysterectomy and prosthetic replacement of proximal femur bone. The Role of lifestyle, and medication was not relevant. There were no drug allergies.

Clinical findings

Preoperative Physical Examination (PE) showed the following: Vital signs in range of normality,

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nontender abdomen, pain in the lower abdominal quadrants on palpation.

Diagnostic assessment

Preoperative blood tests revealed the following: White Blood Cells (WBC), 7170 cells/μl; hemoglobin, 14 g/dl; platelet count, 358 × 10^3 cells/μl; 84.08 nmg/dl; albumin, 3.06 g/dl. Tests assessing physiologic functions were not abnormal. Lower gastrointestinal endoscopy exposed a lesion of proximal/medium transverse colon that likely invaded submucosa (Paris Classification, 0-IIa), a metal clip was put to confirm the location of the tumor and colonoscopic submucosal ICG injection was performed 18 h before surgery. ICG injection protocol was the following: A canister containing 25 mg of ICG was diluted with 10 ml of sterile normal saline resulting in a concentration of 2.5 mg per 1 ml, then 0.6 ml ICG was directly injected into four sites of the submucosa of the colon that was slightly distal to the tumor [15]. Computed Tomography (CT) imaging also disclosed mural thickening and contrast effect at exactly mid-transverse colon. There were no signs of metastasis. Based on the Italian Association of Medical Oncology (AIOM) Guidelines for colorectal tumors (2018 edition), the preoperative diagnosis was Stage I (cT1, N0, M0) cancer of transverse colon. We then chose da Vinci Xi system for transverse colon resection.

Surgical procedure

The patient was placed in Trendelenburg position with an inclination of 10° for better transverse mesocolon exposure, under general anesthesia. A 12-mmHg pneumoperitoneum is created using a Veress needle inserted into the left upper abdominal quadrant (Palmer's point). One 12 mm optical assistant trocar is inserted 3 cm to 4 cm cephalad and 2 cm medial to the left iliac spine. Four robotic trocars are positioned on the Pfannenstiel's line: Each trocar is distant 6 cm from the other two on the right and two on the left of the median line. One 12 mm assistant trocar is inserted 3 cm to 4 cm cephalad and 2 cm medial to the left iliac spine (Figure 1). Then the robot was docked. The abdominal cavity presented several adhesions that were removed. The cavity was otherwise free of overt metastasis or ascites. Tumor location was verified as mid-transverse colon. Under robotic aid, colon was detached from hepatic and splenic moorings. After fully mobilization of the transverse colon and the exposure of the root of middle colic artery, lymph node dissection took place, including all adipose tissue to the point of bifurcation on the side resection. Intravenous ICG injection was performed in real-time to define vascular complex anatomy of Henle's Trunk, the junction of gastroepiploic and middle colic veins at the level of the pancreas. The middle arterial branch was then clipped (at bifurcation) and dissected, thereafter identifying and dissecting the venous trunk of Henle (gastrocolic trunk) at the same level. After intraoperatory ICG angiography for bowel perfusion, the transverse colonic mesentery was removed proximal and distal to the lesion, the colon was dissected for tumor resection using robotic stapler 45 blue. We then performed a Functional Side-to-Side Anastomosis (FSSA) using robotic stapler 45 blue, enterotomies were closed with double-strand V-lock 3/0. Then we assess anastomotic perfusion with ICG angiography. Then hemostasis was achieved. Having completed the robotic operative phase, we reverted to extracorporeal control. We performed a Pfannenstiel incision to extract the colon *via* Endobag using an Alexis wound protector-retractors. Finally, the wound was closed using Ethicon Vicryl rapid 3/0. No drain tube was left.

Operative time was 370 min, docking time was 11 min, duration of console operation was 320 min, and blood loss was 100 ml. No conversion to open or conventional laparoscopic technique was needed.

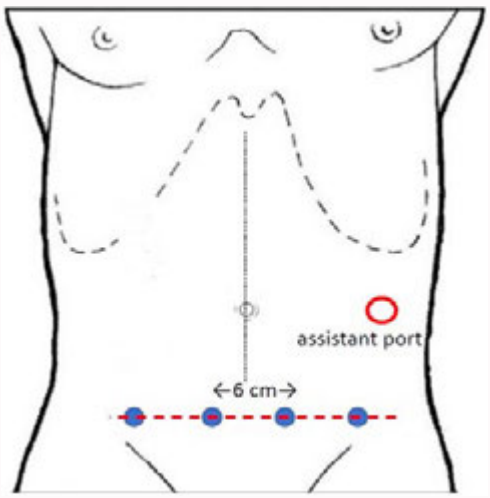

Figure 1: Trocar positioning for bottom-up approach with da Vinci Xi system.

Follow-up and outcomes

The postoperative course was almost uneventful and time to flatus was 1 days. The patient resumed eating on postoperative day 1. The patient was discharged on postoperative day 3. The final histopathologic diagnosis was Stage IIB (pT3, N1b, M0) adenocarcinoma of transverse colon. Proximal and distal resection margins were 9 cm and 12 cm, respectively. 19 lymph nodes were collected, 2 resulted positive in histological examination. The cosmetic results were good.

Discussion and Conclusion

The development of minimally invasive surgery, which is linked to a shorter hospital stay, a quicker recovery, a lower risk of surgical site infection, and less postoperative pain, has revolutionized surgical methods for treating colorectal cancer [6,16-18]. However, due to technical difficulties brought on by the lesions' proximity to the pancreas and duodenum, the bulk of research on laparoscopic colectomy have excluded patients with lesions of the transverse colon or colonic splenic flexure [3,5,19]. There could be a number of explanations for why TCC was left out of earlier research. Laparoscopic anterior resection or right hemicolectomies are generally regarded as being technically simpler to carry out than laparoscopic transverse colectomy. Dissection of the middle colic vessels separately [20,21] and the removal of lymph nodes, as well as the complete mobilization of the colon's hepatic and splenic flexure [22], which, compared to other laparoscopic colectomies, are more difficult but are necessary for laparoscopic transverse colectomy. Additionally, the number of patients who need a transverse colectomy is typically too small to overcome the challenging learning curve of a laparoscopic technique [23-25]. Robotic technology is crucial to ergonomics and has benefits like three-dimensional vision, motion scaling, tremor filtering, and seven degrees of wrist motion [26]. Numerous reports on robot-assisted colectomies have been made, and the majority of them have come to the conclusion that the surgery is both safe and practical [27-30]. However, reports of robotic transverse colectomies are rare, and the majority of the research has been on sequential series of right hemicolectomy, anterior resection, and low anterior resection. As a

result, there is currently no accepted method for transverse colectomy.

The benefits of robotic surgery can be maximized in transverse colectomy due to this high technical requirement. The implementation of the key concepts of excision for transverse colon cancer, such as exposure of the embryological planes, precise dissection of the mesocolic vascular root, and radical lymphadenectomy, benefits greatly from a stable camera view, three-dimensional magnified visualization, and EndoWrist instruments of the robotic system. Additionally, these technical aspects are quite helpful when making an intracorporeal bowel anastomosis. Most laparoscopic colectomies performed nowadays use an extracorporeal anastomosis. The mini-laparotomy site, which is often produced with a little extension of the umbilical incision for the camera port, must be reached with this technique, which requires full mobilization of the transverse colonic mesentery and flexion of both colonic flexures. We can prevent extensive dissection and colonic flexure removal when using an intracorporeal side-to-side anastomosis to retract the specimen with the mesenteries. [31]. According to data, intracorporeal anastomosis may have advantages including less mesentery dissection, tissue stretching for a tensionless anastomosis, a decreased risk of bowel twisting, a smaller incision for delivering specimens, and placing this incision in the best location [32-35]. Additionally, the specimen could be removed in a single linear shape rather than a double loop shape, which may result in a shorter incision. If a patient is obese and has a thick abdominal wall and a short transverse mesocolon, this beneficial feature can be amplified [31,36]. Moreover, traditional laparoscopy can be difficult for the hand-sewn anastomosis, whereas the robotic technique may offer particular benefits for this treatment because to its superior ergonomics [37].

Transverse colectomy is not a surgery performed frequently, because tumor location in mid-transverse colon is rare. Usually an extended right or left hemicolectomy is carried out for advanced mid-transverse colon cancer to eradicate possible lymph nodes metastases around the right colic or left colic artery, respectively [38,39]. However, precise localization of the tumor is a critical aspect of robotic transverse colectomy. In fact, we identified the lesion with preoperative tattooing and clipping. These procedures, followed by TC allowed us to preserve radicality criteria without further resection. Other procedures, such as intraoperative ultrasonography or intraoperative X-ray may represent possible options to correctly localize the actual position of the TCC. This is crucial, as the location of the tumor changes the placement of the ports and the approach of the surgery. We prefer suprapubic transverse incision since it is associated with less pain, improved cosmetic results and lower risk of incisional hernia after laparoscopic surgery [35,40].

The main limitations with da Vinci Xi Surgical System is that all procedures are performed in the peritoneal cavity without tactile sensation. Furthermore, robotic surgery is known to be associated with increased operative times. Future study should further investigate the direct association between operative time and perioperative morbidity between laparoscopic and robotic surgery.

Several limitations exist in this study. Firstly, it has a retrospective, practice-based design. Even though it has the potential to detect signals of causal relations, it lacks of protocols and controls so it cannot be excluded the possibility of a chance association. However, we tried to reduce this bias by following the CARE Guidelines [41]. We strongly believe that case reports following reporting guidelines have the potential to offer the correct intervention to the right patient at the right time, and that can be useful for clinical research, to inform clinical practice guidelines, and improve medical education.

In conclusion, in our case, robotic transverse colectomy was successfully performed and, despite being a rare case, we could find the theoretical benefits of robotic transverse colectomy combined with an intracorporeal anastomosis. We suggest that patients with early mid-transverse colon cancer could be good candidates for this type of surgery.

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