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Research Article

Totally Robotic Low Anterior Resection and Left Colectomy with Systematic Splenic Flexure Mobilization a Single Docking Procedure for Sigmoid and Rectal Cancer: Technical Notes and Results

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Abstract

Surgery with robotic systems is known to have several advantages despite laparoscopy, even in colorectal cancer. However, there is no standard procedure to maximize the advantages of the DaVinci® Si Surgical System. The authors describe their personal single stage totally robotic technique, applying the robotic system during all of the dissection steps in left colon and rectal cancer surgery with a single docking. From March 2012 to March 2016, 83 consecutive patients affected by left colon or rectal cancer were selected for robotic-assisted colorectal resection with DaVinci® Si Robotic System (Intuitive Surgical Inc., Sunnyvale, CA); clinical and pathological outcomes were prospectively collected and reviewed. All patient underwent left colectomy (LC) or low anterior resection (R-LAR) with a single stage, totally robotic dissection, performed following these steps from the top downwards in a clockwise direction to avoid arm collision, splenic flexure mobilization, legation of inferior mesenteric vessels and medial to lateral colon dissection, mobilization of descending and sigmoid colon, TME and rectal dissection, rectal transection and anastomosis. We treated 83 consecutive patients of which 41 (49%) were men and 42 (51%) were women, mean age was 70 (range, 42–92) years. All patients suffered from sigmoid (41pts) an rectal (42 pts) cancer. Clinical and oncologic outcomes, short term complications were analyzed: the circumferential margin, for rectal cancer, was positive in one patient, 17.9 (range, 6–48) lymph nodes were harvested, tumor's distance from distal margin's resection was 2.4 cm (range 1-9). The length of hospital stay after surgery was 6 (range, 4–33) days. Anastomotic leak rate was 1.2% and were managed by ileostomy. There were 4 major complications (4.8%); no mortality occurred. The global conversion rate to laparoscopic and/or open procedure for surgical reasons was 0%. The mean total operative time was 215 minutes, while the mean robotic time was 130 minutes. Single docking for left colon and rectal surgery can be a suitable procedure to reduce operative time and to maximize the advantages of robotic approach. More studies are needed to standardize the surgical procedure.

INTRODUCTION

Laparoscopic surgery for rectal cancer has in better outcomes than open surgery [1-3]. However, laparoscopic total mesorectal excision (TME) for rectal cancer is difficult and technically challenging and has been performed by skilled surgeons. The DaVinci® Si Surgical System (Intuitive Surgical, Sunnyvale, CA) provides a three-dimensional view, improved dexterity with an increased range of movements at the tips of the instruments, reduced tremor, enhanced ergonomics, and a stable camera view [4-5]. Some Authors claim that these advantages enable improved access, and therefore provide easier mobilization of a difficult splenic flexure, dissection of the inferior mesenteric vessels with identification of the nerve plexus, and dissection of a narrow pelvis [6]. Robotic left colectomy and anterior rectal resection can be conducted according to different approaches as there is not yet a standardized operative technique: it is possible to mobilize the splenic flexure then perform the vascular dissection of the inferior mesenteric vein (IMV) and inferior mesenteric artery (IMA), then the dissection of the descending colon from medial to lateral, and finally make the TME, reproducing the laparoscopic technique [7]. Many surgeons [8-10] perform as the first step, vascular IMV and IMA dissection, then colon mobilization from medial to lateral, the splenic flexure and sigmoid detachment and the TME with a single docking, but by repositioning the robotic arms and the trocar site for the pelvic phase. Others begin the intervention by the sacral promontory going in IMA and IMV dissection, mobilization of the splenic flexure and descending colon, completing the procedure with TME[11]. Often during these procedures, a redocking of one or two robotic arms is used to perform the pelvic time and without conflicts; another technique provides the use of only 3 robotic arms for the TME and 2 accesses for tractions performed by the assistant. As can be read in the literature, the operation can be conducted in a completely robotic mode by making 2 or 3 of the docking [4], with possible further reversal of the arms 2 and 3 or with the hybrid technique, in which the time of vascular dissection, splenic flexure and colon mobilization is conducted laparoscopically, followed by the robotic TME [12-15]. From the beginning of our experience with DaVinci® Si System in May 2012, we wished to perform totally robotic procedures in order to reduce operating time and using all the advantages offered by the robotic DaVinci® Si. We have, therefore, optimized the trocars placement in order to avoid conflicts and allow, at the same time, to complete all stages of the operation without moving the patient cart or robot arms, availing ourselves of the experience of skilled surgeons in robotics.

MATERIALS AND METHODS

TECHNICAL NOTES

Patient selection and preparation for surgery: All patients undergoing colorectal surgery are prepared according to ERAS guidelines (Enhanced Recovery After Surgery). Mechanical bowel preparation, which is currently not recommended for fast-track protocols, has been gradually abandoned; the patient takes Simeticone 4 cp the day before surgery, a diet without residue with progressive Maltodextrin replacement, beginning 4 days before surgery. All patients undergoes with the aid of the nursing staff, a cleansing enema the evening before surgery and 2 hours before the operation.

Operative room setup and perioperative phase: The operating room must be setup so as not to hamper the routine medical and nursing work. The patient is placed in a modified lithotomy position using adjustable stirrups. The arms are tugged in alongside the patient's body to prevent shoulder injury and to allow maximal space for the robot and the assistant. The patient is tilted into a deep Trendelenburg position with the left side maximally elevated (Figure 1). This position is not changed throughout the entire procedure once the robot is docked. The assistant surgeon remains on the right side of the patient to assist the console surgeon through one or two additional laparoscopic ports, whereas the surgeon operates from the console.

Bedsore pads especially designed to offset the effects of "extreme" positions of the operating table, needed to clear the field by the ileus should be used; they are useful to prevent injury or the patient's movements as well as are special cushions that prevent the patient's head movements varying the decubitus. It is essential to research the ideal position from the start of surgery as any subsequent changes invariably require the detachment and repositioning of DaVinciSi robotic arms, resulting in lengthening of the operative time.

Surgical technique

Trocar placement: The trocar site proposed by us comes from a careful evaluation of the schemas of Authors[9,10] skilled in robotic surgery, which, however, propose the addition of a fourth robotic trocar and / or the patient's cart or second and third arms re-docking for the TME. To perform a totally single docking technique, without repositioning the arms, such schemes have been modified to achieve an optimal positioning that has allowed us to perform left colectomy, R-LAR and Miles procedures without conflicts. The pneumoperitoneum is induced with the Veress needle in the left sub costal space (Palmer's point), with a pressure ranging between 10 to 14 mmHg; an optical 12 mm diameter trocar is inserted about 3 cm cephalad to the umbilicus and 2 cm to the right of the midline, in which the optical arm will be docked (O).

Figure 1 Patient's position. Deep Trendelemburg (20-25°) and right side rotation (15°).

It carries out an exploration of the abdominal cavity in order to assess the presence of possible adhesions, spread of disease and to assist, with direct vision, the insertion of the other accesses. Through the use of the dermographic pen, anatomical landmarks are marked as the midline, the bilateral median axillary line, the bilateral anterior superior iliac spine (ASIS), the costal arch, the pubis, the oblique lines of union between umbilicus and ASIS.

The trocar for the first robotic arm (R1) is positioned at the point where the line between the umbelicus and the SAIS crosses the median axillary line; according to the patient's conformation and the abdominal wall expansion from the pneumoperitoneum, the seat of this trocar can be 2-3 cm medial than the intersection point described in order to avoid movement limitations during the time of the splenic flexure mobilization and, subsequently, pelvic dissection. A 10-12 mm trocar will be inserted between the trocar for the optics and R1 that will be used by the assistant (A) for the traction, placement of vascular clips, washing, aspiration and for the insertion of the linear stapler for rectal section.

The trocar for the second robotic arm (R2) is inserted 1-2 cm to the left of the midline, in the epigastrium, while that for the third robotic arm (R3) on the left side in the middle between the costal arch and the left ASIS (Figure 2).

The robotic trocar must have a minimum distance between them of at least 8-10 cm to avoid the conflict between the arms (Figure 4-6). With the single docking technique it is very important to ensure that the trocar are not aligned with each other on the same axis in relation to the three anatomic target (the splenic flexure, mesenteric vessels, pelvis); if this were to occur, the conflict of arms would not allow the continuation of the procedure; in that case, the only remedy is to move the trocar during surgery or make more docking. it is a goaded to simulate the correct accesses positioning during to the various phases of the operation, before their insertion (Figure 3-4).

The robotic instruments used for left colectomy and R-LAR are the mono-polar scissors in R1, bipolar forceps in R2, the grasper (Prograsp or Cadiere) in R3, the robotic 30° scope oriented from top to bottom in the periumbilical 10-12 mm trocar, laparoscopic forceps, clips and the linear stapler all inserted in to the trocar in the right flank.

Figure 2 Robotic and assistant's trocars position.

Figure 3 Simulation to ensure that the trocar are not aligned with each other on the same axis to avoid conflict of the robotic arms.

Figure 4 Simulation to ensure that the trocar are not aligned with each other on the same axis to avoid conflict of the robotic arms.

Figure 5 Docking completed.

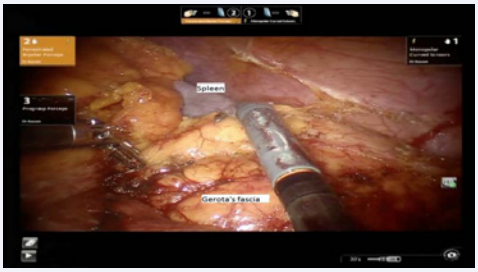

Figure 6 Splenic flexure mobilization.

The patient is tilted into a deep Trendelenburg position with the left side maximally elevated, thus an exploration of the abdominal cavity is performed and the small bowel loops are retracted and positioned in the right side of the abdomen in order to expose the Treitz's ligament, the IMA and IMV and pelvis. The patient cart is brought to the operating table following an oblique imaginary line joining the trocar of the camera, the left ASIS and the camera arm aligned with the support of the cart plant. The robotic arms are then docked (Figure 5).

Step1: Splenic flexure dissection

We start the surgery, compared as described in the literature, with the splenic flexure mobilization employing the bipolar forceps in R2 (corresponding to the left hand of the surgeon) and the mono polar scissors in R1 (corresponding to the right hand); R3 during this step is used to suspend sigma and put tension on the inferior mesenteric vessels. The assistant has a crucial role in this step in making the right traction to facilitate the surgeon's work.

The greater omentum is cranially retracted and lifted from R2 to expose the transverse colon that the assistant retracts downwards allowing the operator to proceed with the opening of the colo-epiploic ligament from the middle third of the transverse colon to the left corner. The spleno-colic ligaments are dissected with exposure of the pancreatic tail and Gerota fascia (Figure 6); we proceed with an initial detachment of the descending colon. In this phase, in the case by a very high flexure, R1 may not reach the anatomical target to dissect, it may therefore be necessary to advance the robotic trocar of a few centimeters in order to facilitate the dissection; the displacement of the trocar fulcrum will not impact the wall traumatism as its movements, away from the point of work, are minimal; the fulcrum of the trocar will be repositioned as soon as possible. A gauze is then inserted on the pancreas' tail which will serve as a marker addressing the subsequent dissection from medial to lateral.

Step 2: Vascular dissection and ligation

The Treitz's ligament is identified, the posterior parietal peritoneum is opened and the inferior mesenteric vein (IMV) is detected, dissected (Figure 7) and closed with hemostatic clips near the splenorenal mesenteric confluence; we proceed in the dissection of the medial side of the space underlying the IMV detaching the Toldt's fascia from the Gerota's fascia (Figure 8) and cranially to the lower border of the pancreas rejoining the epiploon cavity identified by the gauze previously placed; the IMV is then sectioned.

The incision of peritoneum is carried down by the IMV window to the promontory; in this step R3, (Cadiere or Prograsp) lifts the sigmoid-descending colon stretching the inferior mesenteric artery (IMA); the dissection of the preaortic space allows for the hypogastric branches identification and the IMA dissection approximately 1-1.5 cm from its origin. We routinely perform flush IMV and IMA ligation mainly to optimize mesenteric nodal dissection, to achieve better colon mobilization and splenic flexure takedown. The IMA is closed with hemostatic clips and sectioned (Figure 9). The detachment of the Toldt's fascia by gonadal vessels and ureter proceeds downward and laterally to complete the mobilization of the descending and sigmoid colon.

Step 3: TME

After the colon mobilization, the mesorectal plane is exposed; the assistant retracts the sigmoid upwards, R3 is used

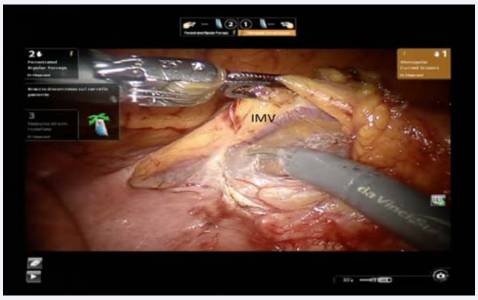

Figure 7 IMV dissection].

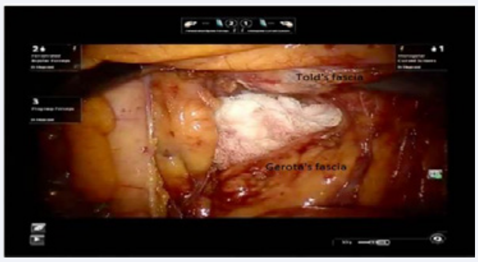

Figure 8 Dissection between Told's and Gerota's fascia.

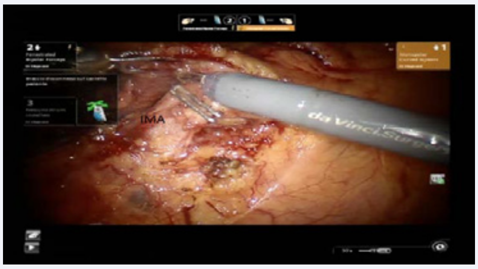

Figure 9 IMA dissection.

to raise the rectum forward and expose the plane between the mesorectum and the hypogastric nerves, while R2 and R1 are used for dissection; the instrument in R2 and R3 can be exchanged from the accesses, when necessary: if bipolar forcep in R2 collides with the sacral promontory we shift the bipolar forcep in R3 and the grasper is moved in R2, so R2 makes rectal retraction and R3 is used for the dissection. The holy plane between the mesorectal fascia and the presacral is dissected with monopolar scissors (Figure 10). The left and right branches of the inferior hypogastric plexus are identified and saved. Mesorectal dissection is performed posteriorly and on the right side (270°) down to the elevators muscles; the left lateral dissection is completed tractioning the rectum to the right side of the pelvis. The opening of the anterior peritoneal reflection is performed (Figure 11) and the dissection of the recto vaginal septum, in women, or of the seminal vesicles and Denonvilliers' fascia in men is completed. R3 in this step is used to suspend the uterus or to retract the anterior peritoneum upward, while R2 moves the rectum towards the sacrum making the opening of the anterior dissection plane easier.

Step 4: Rectal resection

Once the circumferential dissection of the rectum is completed, the assistant introduces the linear stapler for rectal section (Figure 12), which is not always easy, especially in cases of narrow pelvis; in these cases, it is possible to perform a vertical section of the rectum or use a 45 mm stapler instead of 60 mm.

The last step of the intervention, before the extraction of the surgical specimen, is the preparation of the descending mesocolon: starting from the IMA stump, the left colic artery is closed and sectioned, and proceed from the opening of the mesocolon to the bowels, by coagulating or closing the marginal vessels with clips.

Step 5: Specimen extraction

R1 is disconnected from the patient in order to make possible the execution of Pfannentiel mini-laparotomy and the insertion of a wall protector; the specimen is extracted and cut, the anvil of the circular stapler is inserted into the proximal colon stump, which is then reduced in the abdomen. The mini-laparotomy is sutured. In cases of Miles procedure, the specimen is extracted from the perineal wound.

Step 6: Robotic assisted anastomosis

R1 is docked to the trocar, the pneumoperitoneum is created

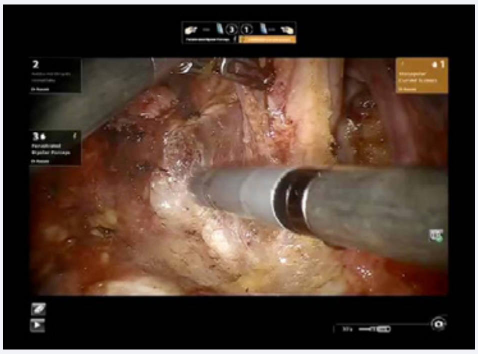

Figure 10 TME: the holy plane.

Figure 11 TME: anterior dissection plane.

Figure 12 Rectal resection with the linear stapler.

and a robot-assisted Knight - Griffen colo - rectal anastomosis is performed (Figure 13). The quality of the rectal stumps may also be controlled by indocyanine green fluorescence; when necessary it is easy to put some stitches on the suture line.

The operation is completed with the placement of a pelvic drainage, the identification of the last ileal loop for the ileostomy, which is always performed for ultra-low rectal resections and in patients who underwent neo adjuvant therapy.

RESULTS

From May 2012 to June 2016 we treated 83 consecutive patients with colorectal cancer: 41 with sigmoid – intra peritoneal rectal cancer and 42 with middle – low rectal cancer. In all cases it was carried out the splenic flexure mobilization, vascular ligation of the IMV and IMA, partial or total mesorectal excision and a colo - rectal anastomosis with totally robotic single docking technique. In 6 cases we performed mile procedure with perineal specimen extraction. The mean age was 69 years (42-92 years); 42 patients were men and 41 were women. 73.5% of patients were ASA 2 while 18% were ASA 3 and only 8.5% ASA 1, mean BMI was 25.7 (Table 1).

All patients were fed in the first postoperative day, the median days to first faltus was 1.5 dd (range 0-4) and the median days to first evacuation was 3.5 dd (range 1-8). The length of hospital stay after surgery was 6 (range, 4–31) days (Table 2). Short term clinical complications were one colorectal anastomotic leakage (1.2%) and the patient were managed by reoperation with ileostomy (ClavienDindo IIIb), two anastomotic minor bleeding occurred and were treated conservatively by endoscopic clips placement (ClavienDindo IIIa), no patients required transfusion; one patient had a stenosis of the ileostomy and required a reoperation (ClavienDindo IIIb), 4 patients had PONV. Readmission rate was 0%.

Regarding the overall oncologic outcomes the distance of the tumor from the anal verge was 9.8 cm (rang 1-40), 17.9 (range 6–48) lymph nodes were harvested and the UICC stage was 0 (Cancerized polyps and Tis) in 19.3%, I in 21.8%, II in 15.6%, III

Figure 13 Robotic assisted colorectal anastomosis.

Table 1: Patient's charactecristics.

Age (year)	
Mean ± DS	67 ± 10.9
Range	42 - 92
Sex	
Male	42 (50.6%)
Female	41 (49.4%)
Location of tumor	
Sigmoid	41 (49.4%)
Rectal	42 (50.6%)
Tumor Distance from the anal verge (cm)	
Mean ± DS	9.8 ± 4.4
Range	1 – 40
BMI	
Mean ± DS	25.7 ± 4.4
Range	16.8 – 40.4
ASA score	
1	7 (8.5%)
2	61 (73.5%)
3	15 (18%)
4	0%

in 36.1% and IV in 7.2%. Regarding mid and low rectal cancer the oncologic outcomes the tumor's distance from distal margin's resection was 2.4 cm (range 1-9), CRM was positive in one patient (2.4%). 9 patients with rectal cancer underwent neoadjuvant chemo radiation therapy (21.4%) (Table 3). The results does not differ from literature's data. The global conversion rate to laparoscopic and/or open procedure was 0%. The mean total operative time was 215 minutes (range 120 - 420 min), while the mean robotic time was 130 minutes (45 - 335 min); it decreased as the surgical team's experience increased. The mean time for trocar placement and laparoscopic exploration was 10 minutes with a range from 5 to 50 minutes: in some cases the longer time is due to associated procedure as adhesiolysis of omental and visceral adhesions, laparoscopic cholecistectomy, laparoscopic ultrasound or liver biopsy (21% of cases). The mean docking time was 5 minutes (range 2-20 min).

It has never been necessary to make two docking, to move the robotic arms or to add an additional trocar to complete surgical procedures. Moreover it has never been necessary to change the type of planned surgery.

Table 2: Clinical outcomes.

Diet Resumed (Day)	
Liquid	1
Solid	2
First flatus (Day)	
Mean ± DS	1.5 ± 0.8
Range	0 – 4
First evacuation (Day)	
Mean ± DS	3.5 ± 19
Range	1 – 8
Lenght of hospital stay (Day)	
Mean ± DS	6.6 ± 3.7
Range	4 – 31

Table 3: Pathologic results.

UICC Stage (n - %)	
0 (Neoplastic polyps or Tis)	16 (19.3%)
I	18 (21.8%)
II	13 (15.6%)
III	30 (36.1%)
IV	6 (7.2%)
Harvested Lymph nodes (n)	
Mean ± DS	17.9 ± 11.2
Range	6 - 48
Distal resection margin (cm) for rectal cancer	
Mean ± DS	2.4 ± 1.6
Range	1 - 9
Positive CRM for rectal cancer	1 (2.4%)

Abbreviations: BMI: Body Mass Index; DS: Standard deviation; ASA: American Society of Anesthesiologist; CRM: Circumferential Rectal Margin.

DISCUSSION

In literature many authors have proposed "single stage" robotic anterior rectal resection. The technique, however, is not standardized: the number of trocar is variable (5-6 trocar), the site of the trocar is different as well as the number of docking of the patient cart or the robotic arms displacement. The technique described by Choi9 is a single docking procedure with repositioning of the arms between the two stages of the operation: the vascular ligation, mobilization of the sigmoid colon, splenic flexure and the TME. The technique requires, in addition to a laparoscopic step, common to all techniques, a further laparoscopic phase for rectal section and for anastomosis at the end of the procedure. The first phase of the intervention consists in vascular ligation, in the mobilization of the sigmoid colon and then of the splenic flexure with omentum detachment from the transverse colon through the coloepiploic ligament incision and division of spleno-colic ligaments. The second phase of the intervention includes the pelvic time with TME: for this step the robotic arms are disconnected from the right (R2) and left (R3) upper quadrant trocar and reconnected to the trocar in the left upper quadrant (R2, bipolar forceps) and left side (R3, Cadiere forceps outlet), respectively. The assistant at this point has an additional accessory trocar available to retract the sigmoid-rectum or for the suction. Once the TME is completed, the robotic instruments are removed and the patient cart disconnected. The remaining steps are laparoscopically performed [16]. Pigazzi [14] and D'Annibale describe a single docking technique with a different use and positioning of the robotic arms and trocar; with this technique the exposure and the vascular control, mobilization from medial to lateral of the descending colon and the mobilization of the splenic flexure is performed as the first step: in this interventional phase only three robotic arms are used. TME is then performed using four robotic arms. Robotic trocars for R1 and R2 are placed at least 8 cm from the camera access on the line joining the umbilicus to the anterior superior iliac spine right and left at the mid-clavicular line. The third robotic trocar (R3) is positioned about 5 cm below the xiphoid process slightly to the left of the falciform ligament. If necessary a second accessory trocar in the right upper quadrant (5 mm) is placed. At the end of the vascular step dissection, and colon mobilization from medial to lateral, the surgeon returns upwards to continue with the mobilization of the splenic flexure that is completed through the gastro-colic and the spleno-cholic ligaments division. After completion of the colon mobilization, the second arm R2 is docked. After the rectal section, the patient cart is removed from the operating field to facilitate the extraction of the specimen with Pfannenstiel incision. The anastomosis is carried out under laparoscopic control. Our technique is derived from those described in the literature, which is single docking because the surgery is performed without changing the patient's cart position, without moving the robotic arms and without changing the patient's decubitus. The technical proposal is totally robotics and provides neither a laparoscopic phase (mobilization of flexure of the descending and vascular ligatures) before installing the robotic system for TME, as described by the "hybrid technique" 13, or the colorectal anastomosis [9-14].

We only use 5 trocars, 4 for the DaVinciSi system and one for assistent. The timing of the intervention proceeds harmoniously clockwise from top towards the pelvis without return to the operating field during the different surgical steps. We found some difficulty in cases of very high splenic flexure with the need to advance, a few centimeters in the wall, the R1 trocar to reach the anatomical target; in these cases, the team's and the assistant's expertise is crucial to minimize any inconvenience related to the extreme position of the robotic arms. After the splenic flexure mobilization, starting from the vascular step the robotic arms are already placed with a wide opening and no longer collide, leading progressively and in an easy manner to the most delicate surgery phase, the TME, which is performed in the most correct position of the patient's cart and the arms compared to the anatomical target. We believe it is safer and easier to make the dissection from medial to lateral and downward after having dissected the IMV and the plane between Toldt's and Gerota's fascia towards the flexure previously mobilized; in fact, after the IMA section we can follow the dissection plane of Gerota's fascia downwards without the risk of damaging the ureter and gonadal vessels that remain in a deeper plane. We believe that the artery dissection and the research of the correct cleavage plane, from medial to lateral, as the first surgical step is technically not intuitive and sometimes difficult to find and it can make the dissection dangerous with the potential risk of vascular and ureteral injury. The fourth robotic arm (R3) is essentially used to make the right visceral traction, the right vascular and ligamentous structures tension in various steps of dissection. Is not useful regarding the mobilization of the splenic flexure that is done only with R1 and R2; As already mentioned in this step, during which the patient is in a deep Trendelemburg position, the transverse colon goes upwards and the traction carried out from the assistant allows an optimal viewing for the surgeon who uses only 2 arms for the dissection. In cases of abdominal surgery where the surgical field is very wide, as in the left colectomy or anterior rectal resection, it is essential to standardize the technique in order to carry out the operative steps taking full advantage and benefits of the DaVinciSi system by limiting the inconvenience of the robotic arms conflict: once again the work done by the assistant at the operating table is crucial in positioning and following the movements of the robotic arms to prevent collisions or malfunctions. We also believe that robot-assisted colorectal anastomosis is easier compared to laparoscopy, in carrying out the divarication maneuvers or the pelvic peritoneum lifting. If necessary it is easier to put some reinforcement stitches on the anastomosis compared to laparoscopy.

CONCLUSIONS

Robotic technology provides a stable camera platform with 3D imaging; the robotic handles transfer the surgeon's hand movements to the tip of the instrument, overcoming the limitations of rigid laparoscopic instruments. It also offers the surgeon a comfortable, ergonomically ideal operating position. According to our experience we believe that left colectomy or anterior rectal resection performed sequentially from the top (splenic flexure) towards the bottom (pelvic time and TME) passing through the vascular dissection, with a progressive alignment of the robotic arms, make it easy to standardize surgical technique. The fully robotic approach did not affect the clinical and oncological outcomes: it did not result in longer operative time, which actually, with experience it has progressively reduced by the shortening of the docking and operating times, by the surgical standardization technique and by the team's skillness.

The technique proposed is not radically different from those proposed by the authors skilled in robotic surgery and it aims, thanks to minimum precautions and changes of the described techniques, to improve and standardize the steps of left colectomy or the lower anterior resection, awaiting further studies.

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