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Early results of novel robotic surgery-assisted low anterior resection for rectal cancer and transvaginal specimen extraction by using Da Vinci XI: initial clinical experience

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SUMMARY

OBJECTIVE: The aim of this study is to evaluate the early results of robotic surgery-assisted low anterior resection for rectal cancer and transvaginal specimen extraction, regarding the operative time, operative and early postoperative complications, hospital stay, and pathological reports in a series of 10 patients.

METHODS: From November 2016 to October 2019, case series study on patients diagnosed with RC was included in this study. All robotic-assisted low anterior resection of the rectum, vaginal removal of the specimen, colorectal anastomosis, and loop ileostomies were performed using the Da Vinci XI system.

RESULTS: The mean age of patient was 64.8 (58–72) years. Low anterior resection was performed to seven patients, and very low anterior resection was performed to three patients. Total mesorectal excision of the rectum, transvaginal specimen extraction, transanal anastomoses, and protective ileostomy were performed in all 10 patients. The mean operative time was 275±30.50 min, and estimated blood loss was 50±10.50 mL. No patient required conversion to conventional surgery. Negative circumferential resection, proximal, and distal margins were accomplished negative. Mean number of lymph nodes harvested was 20±5.5. According to the pathological reports, all were adenocarcinoma. T1 stage was 80.0%, and T2 stage was 20.0%. Lymph node metastasis accounted for 80.0%.

CONCLUSIONS: To our literature search, this is the first study reporting the early outcomes of the novel robotic surgery-assisted low anterior resection for rectal cancer and transvaginal specimen extraction by using the Da Vinci Xi system. It can be performed safely and successfully in selected patients by providing an excellent cosmetic body image, which may be important for women.

KEYWORDS: Robotic surgical procedures. Rectum cancer. Procedures, minimally invasive surgical.

INTRODUCTION

Minimally invasive surgery has been evolved rapidly in the field of colorectal surgery since the first description of laparoscopic colectomy for colon cancer by Jacobs in 1991[1]. Although colorectal resections can be performed with totally laparoscopic techniques, an additional incision is required for specimen extraction from the abdominal cavity. Every additional skin incision could increase the risk for postoperative complications such as pain, infection, hematoma, and incisional hernia. Extraction of the specimen *via* natural orifices such as the vagina or rectum may decrease the risk related to a skin incision. In recent years, natural orifice transluminal endoscopic surgery[2,3] has come on the scene. New techniques were applied to reduce the incision sizes[4-7]. However, the majority of the colorectal surgeons are not familiar with surgical access *via* the vaginal route and transvaginal specimen extraction (TVSE).

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The aim of this study is to present the initial experience on specimen extraction from the vagina after performing robotic surgery for rectal cancer (RC). We concluded that robotic-assisted low anterior resection (LAR) with lymphadenectomy for RC and TVSE was safe and feasible and gave good cosmesis but not justified for routine use due to its higher cost and lack of clinical benefits. In this study, we described our novel technique with an assessment of the short-term outcomes in a series of the first 10 patients who underwent this surgical approach at our institution.

METHODS

Study design

From November 2016 to October 2019, 10 patients with resectable RC without distant metastasis underwent LAR or very low anterior resection (VLAR) using the Da Vinci Xi system by two surgeons. All patient characteristics data were collected, retrospectively. We offered robotic resection and natural orifice specimen extraction (NOSE) *via* vagina to all patients. Exact details of the procedure were explained, and written informed consent was obtained from all patients.

Surgical technique

All the patients received mechanical bowel preparation and a single dose of prophylactic antibiotic (cefuroxime axetil 1 g) 1 h before the skin incision, and antithrombotic prophylaxis was administered with low-molecular-weight heparin 12 h before. A urinary catheter was inserted.

The procedure was performed using the Da Vinci Xi surgical system (Intuitive Surgical, Sunnyvale, CA, USA). We used Maryland fenestrated bipolar forceps, tip-up double fenestrated grasper, and monopolar scissors.

The operation was performed in two phases, namely, abdominal and pelvic phases. In the abdominal phase, after giving general anesthesia, the patient was placed in a modified dorsolithotomic position, with a 26 Trendelenburg position during the procedure. The Veress needle was inserted at the 10 cm lateral, the umbilical level, to insufflate the abdomen. After pneumoperitoneum was obtained, an 8 mm incision was made, the trocar was placed through the incision, and three other 8 mm lateral ports were placed under direct visualization. An additional 10 mm trocar for the assistant is placed in the right upper quadrant. Pneumoperitoneum was kept at 8–12 mm Hg. The robotic surgical system was docked using fours arms. After induction of pneumoperitoneum and insertion of the 30° robotic camera and placing all the instruments, the routine whole abdominal cavity exploration was performed. First, medial-to-lateral dissection, i.e., ligation of the inferior mesenteric artery, was performed at the root of the inferior mesenteric artery, and then, splenic flexure, sigmoid, and descending colons were mobilized medially. Then, rectal mobilization down to the pelvic floor was performed to achieve total mesorectal excision (TME). In this LAR case, division of the distal rectum was performed using two Laparoscopic Endo-Gia linear staplers (green cartridge, 60 mm, Ethicon Endo-Surgery, Inc., Cincinnati, OH, USA).

In the pelvic phase, after placing a vaginal speculum, an ovarian clamp was placed to the posterior fornix of the vagina. The posterior fornix of the vagina was opened intracorporeally with the electrocautery scissors over the clamp. Then, the distal side of the specimen was clamped and pulled throughout the vagina. Specimen was divided 15 cm proximal of the tumor with electrocautery, and the anvil of the circular stapler was put inside the colon and fixed with purse-string 2/0 PROLENE suture. After this procedure, the colon enters the abdomen. A sponge was pushed through the vagina to the posterior fornix. After the digital rectal examination, circular stapler (31 mm) was inserted inside the rectum. With the robotic assistance, both the anvil and the stapler entered together. After squeezing and firing the stapler, the colorectal anastomoses were performed. Finally, a diverting ileostomy was established at the right lower side of the abdomen to all patients. Following the placement of a vaginal tamponade and an abdominal drain to the pelvis, abdominal trocar site incisions were closed with 3/0 PROLENE sutures.

RESULTS

Table 1 shows the characteristics of the female patients (n=10). The mean age of patient was 64.8±6.46 (58–72) years, and the mean body mass index (BMI) was 28.4±2.32 kg/m^2.

The mean operation time was 275±30.50 min (range, 180–360), and the mean estimated blood loss was 50±10.50 mL (Table 1). The time to clear liquid intake in all patients was three days after operation. The mean length of hospital stay after surgery was 5±0.50 days. No patient required conversion to open or conventional laparoscopic surgery. There were no perioperative complications, morbidity, or mortality.

According to the pathology report, the mean tumor size was 15±2.40 (7–20) mm. The mean number of harvested lymph nodes and positive lymph nodes was 20±5.50 and 6.0±1.50, respectively. Two patients were at stage II, and eight patients were at stage I according to the 7th edition of the *American Joint Committee on Cancer* system. No other complications or mortality occurred during surgery and early postoperative follow-up. Patients were followed up for six months or longer postoperatively.

Table 1. Characteristics of the patients.

Number of cases (n)	10
Gender	Female
Age (years)	64.8±6.46 (58–72)
Body mass index (kg/m²)	28.4±2.32 (25.2–30.0)
Tumor histology: Adenocarcinoma	10
Tumor T1 T2	 8 2
Node N0 N1 N2	 2 7 1
Metastases	None
Stage I II	 8 2
Surgery Low anterior resection Very low anterior resection	 7 3
Mean operation time (min)	275±30.50 (180–360)
Mean estimated blood loss (mL)	50±10.50 (25–150)
Mean tumor size (mm)	15±2.40 (7–20)
Mean lymph nodes removed	20±5.50 (12–26)
Mean positive lymph nodes removed	6±1.50 (0–8)
Mean hospital stay (days)	5±0.50 (5–7)
Morbidity	None
Mortality	None

DISCUSSION

Since the concept of TME has become a standard of care for low RC surgery[8], there has been an increasing interest in new minimally invasive techniques, reducing the size of abdominal incisions to the minimum required for abdominal specimen extraction, although extraction specimen site infections and hernia are described in the literature[9-11]. NOSE has aroused a great interest among colorectal surgeons as a way to reduce abdominal incision still further. Indications for NOSE procedures are strict and include T2–T3 tumors, with a maximum circumferential diameter (CD) of 3 cm and a BMI less than 30 kg/m² for transanal extraction and a CD of 3–5 cm and a BMI less than 35 kg/m² for transvaginal extraction[12,13]. Moreover, we strictly adhered to these indications; all 10 patients were women who present the advantage of a wider pelvic outlet.

The minimally invasive operative approach for rectal surgery has progressed substantially in the past decades. Reducing the trocar size and the number of ports is a logical solution for a less invasive and scarless surgery[14]. However, their applicability and overall value in clinical practice is questionable. Decreased wound size is associated with less wound-related complications, less pain, and enhanced cosmesis[15,16]. Specimen extraction is the final step of every laparoscopic or robotic surgery. The incision can be performed by enlarging a trocar site incision or creating a new one. An additional incision augments pain, risk of wound infection, and hernia formation[17]. The transvaginal approach has been used for several years for specimen removal in minimally invasive gynecologic procedures[18,19] and RC[20] to avoid abdominal wall incisions. Reduced trauma of the abdominal wall, shortened length of the skin incision, low or no wound-related complications, such as evisceration, infection, and incisional hernia, and less pain represent a faster recovery period and less intra-abdominal adhesion could be achieved with NOSE[21-23]. No any wound infection, mortality, or any other complications were observed after surgery in our series. In addition to its use for specimen extraction, the vagina allows retraction, manipulating, clipping, stapling, and sutures during surgery by insertion of a trocar at the beginning of surgery[6].

No patient required conversion to conventional laparoscopic or open surgery in this series; therefore, careful patient selection is needed. In addition, there were no intraoperative or postoperative complications or mortality occurred in the short term in this series. The complications of TVSE could be dyspareunia, infection, infertility, bleeding, rectovaginal fistula, trauma to pelvic structures, and the risk of pelvic adhesion[14]. In our study, we did not encounter such complications. The number of retrieved lymph nodes in the specimens was acceptable and comparable to other studies[7,8].

Although our study has a definite limitation due to retrospective nature and the small number of cases and short duration of follow-up, all patients were satisfied about their wounds and postoperative recovery. Obviously, comparative and prospective randomized trials with higher patient numbers are needed to figure out the role of using transvaginal way for specimen extraction in robotic-assisted rectal surgery.

CONCLUSIONS

Robotic-assisted LAR for RC and TVSE can be performed successfully with satisfying short-term outcomes in selected patients. Further comparative studies are required to verify the clinical advantages of our technique. Due to the unique advantages of the Da Vinci system, robotic-assisted LAR and TVSE for patients with RC can be performed safely and may be an effective approach in contrast to open or laparoscopic surgery. Besides, TVSE could provide an excellent cosmetic body image, which may be important

for women and could make patients feel less traumatized by presenting a scarless abdomen after the surgery. Besides presenting better cosmesis, this could reduce the complications associated with additional skin incisions and could upgrade the quality of life.

AUTHORS' CONTRIBUTIONS

TÇ: Conceptualization, Data curation, Formal Analysis, Writing – original draft. **AA:** Conceptualization, Writing – original draft, Writing – review & editing.

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