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Original research

Robotic rectal resection for cancer: A prospective cohort study to analyze surgical, clinical and oncological outcomes

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HIGHLIGHTS

- Robotic System is more available in last years.
- Patients with rectal cancer could benefit from this approach.
- The dissection phase results improved.

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ABSTRACT

Aim: Robotic systems are getting widely spread in recent years given the different technical advantages over traditional laparoscopy. Rectal surgery seems to benefit from this approach, for its ability to easily work in a confined space such as the pelvic cavity. The objective is to present results obtained by the robotic approach in patients with rectal cancer and to give technical considerations. **Method**: Data were prospectively collected in order to evaluate surgical and oncological outcomes. Subjects underwent robotic rectal resection in the period between June 2011 and June 2014 at the Department of Digestive Surgery, "S. Maria" Hospital – Terni (Italy). **Main outcome measures**: Patient characteristics and tumor, overall operative time, conversion to open surgery, site of mini-laparotomy for specimen extraction, intraoperative blood loss, intraoperative complications, time to first bowel movement, time-to-liquid and solid intake, postoperative complications, mortality, hospital stay, thirty-day complications, histopathological examination. **Results**: 40 consecutive patients underwent robotic resection of the rectum. Median operative time was 340 min (235–460 min), no procedure was converted. Median hospital stay was 5 days (3–18 days). Mesorectum resection was complete in all patients. Median number of harvested lymph nodes was 19 (6–35), median distal resection margin was 4 cm (2–8 cm). **Conclusion**: Robotic rectal surgery is safe and feasible in particular by facilitating the surgeon during the delicate phases of tissue dissection.

1. Introduction

Minimally invasive techniques have gradually changed the surgical approach to the disease of the colon and rectum [1,2].

The results from different studies and randomized trials have demonstrated the safety and reliability of laparoscopy and oncological advantages over open surgery in terms of operative parameters and a quicker resumption of daily activities [3].

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However, total mesorectal excision in rectal cancer is one of the most technically demanding times for operators due to narrowness and depth of surgical field of action, and in which laparoscopy has several limitations such as reduced tool movement associated with the amplification of physiological tremor, a two-dimensional vision closely tied to the coordination and harmony between the first operator and the assistant, an unstable traction, and last but not the least, the need to form a dedicated team and a long learning curve.

The use of robotic surgical systems in digestive surgery has spread in recent years, both competing with, and coming to represent an evolution of laparoscopy [4].

This new approach has attracted a lot of attention in rectal surgery to the obvious potential of robotic system in overcoming the problems of conventional laparoscopy and the possibility of obtaining an improvement in oncological and functional outcomes [5,6].

The purpose of this study is to present the results obtained by the robotic approach in patients with rectal cancer treated at our institute and to bring the robotic technique utilized.

2. Methods

We evaluated patients who underwent robotic resection of the rectum for cancer at the Department of Digestive Surgery of "S. Maria" Hospital in Terni (Italy) between June 2011 and June 2014.

Data were prospectively collected in a database and analyzed retrospectively.

The criteria for inclusion of patients in the study were older than 18 years old, malignant tumor of the rectum, acceptance of informed consent.

Exclusion criteria included tumors that cause invasion of adjacent organs, perforation or intestinal obstruction, tumors greater than 8 cm in diameter, patients whose American Society of Anesthesiologists score was higher than III.

The practice parameters of the American Society of Colon and Rectal Surgeons (ASCRS) were followed for the management of rectal cancer [7].

After being diagnosed by endoscopic biopsy of the lesions, patients underwent tumor staging using endorectal ultrasound (ERUS) and MRI for evaluating the local extension of the disease and the presence of pathological lymph nodes; computed tomography was used to assess the presence of distant metastases.

Patients whose tumors have been identified as extraperitoneal, staged at cT3-T4 and any cN1, underwent a 5-week neoadjuvant chemoradiotherapy (NCRT) and subsequent restaging with ERUS for 30 days after the end of therapy. In these cases, surgery is scheduled for 6–8 weeks after the end of the NCRT.

The patients were subjected to one of the following: low anterior resection with or without ileostomy and abdominoperineal resection.

Total mesorectal excision (TME) was performed for those localized tumors up to 8 cm from the puborectal ring while for higher lesions a partial mesorectal excision (PME) was carried out.

The robotic system "Da Vinci Si-HD" was used.

All procedures were performed by a senior surgeon (AP) with extensive experience in laparoscopic surgery and from the beginning of the learning curve of using the robotic system.

The analyzed outcomes include:

- Patient characteristics and tumor
- Overall operative time: from the start of pneumoperitoneum until suture of all surgical incisions, including robot-docking.
- Conversion to open surgery
- Site of mini-laparotomy for specimen extraction
- Intraoperative blood loss
- Intraoperative complications
- Time to first bowel movement
- Time-to-liquid and solid intake
- Postoperative complications (from end of surgery until discharge)
- Mortality
- Hospital stay: starting from the day of the operation till discharge
- Thirty-day complications (after discharge)
- Specimen dimension
- Number of harvested lymph nodes

The removal of the naso-gastric tube and early oral intake of liquids and solids was determined according to the conditions of each patient, considering gastric retention and restarting of bowel movement.

All patients were scheduled to follow surgical and medical oncology outpatient follow-up after discharge from the hospital.

Staging according to the American Joint Committee on Cancer was used to record the pathologic stage of the tumor. The specimen was sliced at approximately 3- to 5-mm intervals after the mesorectal surface had been inked. The lymph nodes were submitted for microscopic examination. Histopathological examination of the mesorectal fascia was evaluated according to a standardized procedure described by Quirke [8].

2.1. Surgical procedure

After induction of general anesthesia, the patient receives a nasogastric tube and urinary catheter and is placed in a modified lithotomy with legs 30–45° apart, in Trendelemburg with a slight rotation to the right.

The pneumoperitoneum is induced by Veress needle and the insufflator is set to a pressure of 12 mm Hg.

A 12 mm camera port, three 8-mm robotic working ports and two extra-5 mm and 12 mm ports are placed (Fig. 1).

In particular, the trocar used by the robotic arms are inserted along a supraumbilical line with downwards concavity.

The first part of the intervention is carried out laparoscopically through an approach that is medial to lateral, including vessel ligation and colon mobilization.

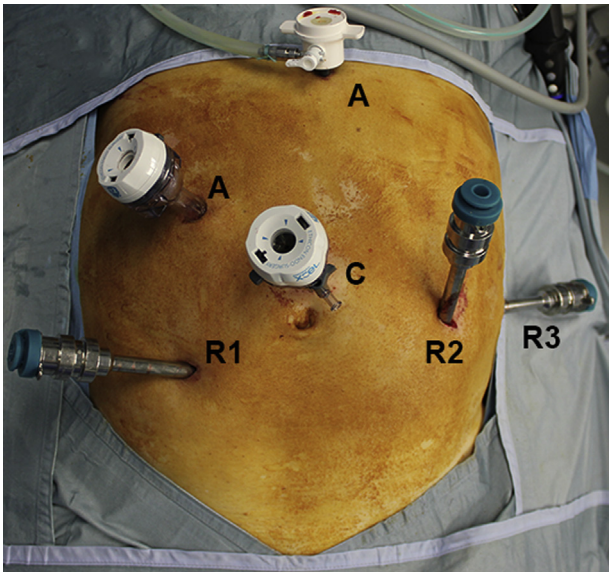

Fig. 1. Port position: R1, R2, R3 robotic arms; AS assistant; C camera.