Chapter

The Robotic Approach in Rectal Cancer

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Abstract

Since a robotic surgical system was developed in the early 1990s and the first robotic-assisted radical prostatectomy was reported in 2001, robotic surgery has spread in many surgical specialties, changing surgical management. Currently, compared to other colorectal procedures, robotic surgery appears to offer great benefits for total mesorectal excision for rectal cancer. Abdominal cavity other procedures such as right hemicolectomy and high anterior resection are relatively uncomplicated and can be performed easily by laparoscopic surgery. First reports have focused on the clinical benefits of robotic rectal cancer surgery compared with laparoscopic surgery. The indications for robotic and laparoscopic rectal cancer surgery are not different. The recently published results of the ROLARR trial, comparing robot-assisted TME to laparoscopic TME, show no advantages of robot assistance in terms of intraoperative complications, postoperative complications, plane of surgery, 30-day mortality, bladder dysfunction, and sexual dysfunction. A drawback of the study is the variability in experience of the participating surgeons in robotic surgery. After correction of this confounder, an advantage for robotic assistance was suggested in terms of risk of conversion to open surgery. For robotic rectal cancer surgery to become the preferred minimally invasive option, it must demonstrate that it does not have the technical difficulties and steep learning curve of laparoscopic surgery. Robotic surgery has several technical advantages over open and laparoscopic surgery. The system provides a stable operating platform, three-dimensional imaging, articulating instruments and a stable surgeon controlled camera which is mainly beneficial in areas where space and maneuverability is limited such as the pelvis.

Keywords: robotic treatment, rectal cancer, total mesorectal excision (TME), robotic surgery, laparoscopy

1. Introduction

Oncological surgery as it is known does not mean organ surgery, but it means the correct lymphadenectomy so that the oncological long-terms results are as expected. Rectal cancer surgery is a touchstone for any surgeon. The surgical technique has continuously progressed over the years and has been standardized with proven oncological results. After Richard Heald's contribution to the need to perform a complete excision of the mesorectum to have excellent control of locoregional spread of disease, surgeons quickly adopted the technique resulting in a significant improvement in local recurrence [1]. Then followed the revolution represented by the appearance of laparoscopy. Robotic surgery has brought a new lease of life to minimally invasive surgery due to its proven advantages. A shorter learning curve than laparoscopy, a lower conversion rate that has allowed an increasing number of patients to benefit from minimally invasive surgery [2, 3].

2. The minimally invasive approach to rectal cancer

Laparoscopy was a real revolution in surgery in the early 1990s. There are few examples in the history of surgery in which an innovative method has such a rapid and widespread spread throughout the world [4]. Of course, colorectal surgery has also faced the first attempts at laparoscopic surgery since the early 1990s, when the first published series of cases appeared [5–9].

The minimally invasive approach for colorectal neoplastic pathology had ups and downs. If initially laparoscopy began to be used especially for benign pathology, in the late 1990s it began to be approached more and more and neoplastic pathology. There have also been controversies related to this approach related to the quality of the specimens and the lymphadenectomy performed. There were also fears related to tumor dissemination at the level of the incision to extract the resection piece and the "chimney effect" with the possibility of metastases at the level of insertion of the trocars [10]. In the late 1990s, the first prospective studies appeared that showed the benefits of the laproscopic approach compared to the open approach, without repercussions related to the percentage of R0 resections or the increase in the number of parietal metastases [11–13].

Only in 2004 with the appearance of the COST study [14] and in 2005 of the CLASICC study [15] it was demonstrated that there are no differences between the laparoscopic and open approach in terms of 3-year recurrence rate, overall survival, number of excised lymph nodes and R0 resection percentage. But if we look to these studies carefully we can comment that most of the cases were related to the middle and upper locations and very few cases were related to low or ultra-low locations.

After that two other multicentric trials, aimed to specifically compare laparoscopic and open surgery in patients with rectal cancer, were the COLOR II trial [16] and the COREAN trial [17], enrolling respectively 1103 and 340 patients. In the COLOR II trial a complete or nearly complete TME was obtained in 92% of laparoscopic and 94% of open procedures; CRM positivity was 10% in both groups; distal margins were negative in 100% of both procedures. In the COREAN trial TME was complete/nearly complete in 92% (laparoscopic) and 88% (open) of patients; CRM was positive in 3% of laparoscopic and in 4% of open procedures; distal margins were negative in all patients in both procedures. In both COLOR and COREAN trials no significant differences were found regarding oncological outcomes, confirming the safety and feasibility of the laparoscopic approach for rectal cancer.

Even so, the global spread of the laparoscopic approach has been extremely slow. With a few exceptions, such as in the United Kingdom, South Korea, etc., the adoption rate has seen an upward but slow trend. In most countries, in centers with a high volume of colorectal interventions, the laparoscopic approach reaching in the period 2008–2015 a percentage that varied between 20 and 50%. If, however, we are talking about medium or low volume centers, the adoption rate was much lower. Another important element of increasing the number of cases was determined by the introduction in more and more centers of the ERAS program in colorectal surgery [18].

A study published on trends in the implementation of the minimally invasive approach in Canada and in the world in general showed that, except for South Korea and the United Kingdom where the percentage of minimally invasive approach in colorectal surgery exceeded 60%, otherwise the percentage varies between 20 and 40%. Finally, a series of strategies are issued to increase the use of the minimally invasive approach in colorectal surgery: increasing exposure to minimally invasive advanced surgery procedures, increasing the number of fellowship programs in minimally invasive surgery, intensive hands-on courses for young surgeons and programs of subsequent mentorship [19].

Despite the many benefits of the laparoscopic approach, there have been elements of slowing the spread on a large scale: the need for staff with expertise in both open surgery and laparoscopic surgery, relatively long learning curve, prolonged operation time, difficult positions for the surgeon maintained for a long time, the difficulty of performing an adequate dissection in case of a narrow pelvis, the need to change the operating device depending on the quadrant in which the operation is performed, etc.

The emergence of the AlaCaRT [20] and ACOSOGZ6051 [21] studies was a step backwards in terms of the ability of the laparoscopic approach to obtain oncological results at least comparable to the open approach. Even some of the lead authors of these studies have pointed out that the robotic approach may be an asset for minimally invasive rectal cancer surgery.

3. The robotic approach

Robotic surgery comes to replace the disadvantages of open surgery and many of those found in laparoscopy. It must be said from the beginning that we are not talking about a robotization of the surgical act, but about the fact that between the surgeon and the patient there is a high performance computer, which allows on the one hand a much finer surgery, with additional attention to detail. The disappearance of the tremor, with instruments that have 7 degrees of freedom, which make possible the access in the narrow spaces, and on the other hand allows the integration of an augmented reality by combining CT, MRI images, on the work screen. And we are talking about 3D images in which there is the possibility of using immunofluorescence with indocyanine green, so as to further visualize the vascularity or lymph node tissue that must be highlighted for a high quality oncological surgery. Fine tissues such as hypogastric nerve plexuses with a special role in maintaining potency are much better preserved when using robotic surgery in rectal cancer, and even more so in the case of large tumors or obese people with narrow pelvis.

This translates into a lower conversion rate, a reduced hospitalization, an easier learning curve and the ability to operate in confined spaces. Achieving a learning curve, which is half of that required for laparoscopy, requires the surgeon to master three unique concepts of robotic surgery, as outlined by Bokhari et al.: replacement of visual cues on tension and tissue manipulation instead of tactile feedback; aligning the robotic arms and trolley while operating remotely on the console, thus minimizing external collisions [22].

A recent retrospective study of 732 patients analyzing long-term oncologic outcomes using tilt score matching showed comparable survival between robotic and laparoscopic TME. In multivariate analysis, robotic surgery was a significant better prognostic factor for overall survival and cancer-specific survival [23]. The most recent and largest randomized clinical trial of laparoscopic or robotic approach for patients with rectal adenocarcinoma (ROLARR) demonstrated comparable oncological results [24].

With all the advantages that the robotic system has, there are also a number of disadvantages [25–27]. Of these, the absence of tactile sense is an important disadvantage. This is an important step in the learning curve so that you can get used to manipulating the tissues without over-pulling them and coordinating the pressure exerted by the instruments on the tissues only through the eye [28].

Another disadvantage was considered too long docking time, but this was shortened by the new generation of Da Vinci Xi robotic systems. After a learning curve of about 20 interventions, the docking time stabilized at a maximum of 15 minutes.

Another negative element that was attributed to the robotic system was also the fact that in the case of an intraoperative bleeding that would require conversion to the open approach, the time required to undo the robot may be too long. Today, however, with the improvements made to the robot, the undocking is done in a maximum of one minute [29].

Another difficulty in using robotic surgery rectal addressed is the possibility of collision between the robot arms.

The cost is a major disadvantage of the robotic approach in terms of rectal surgery. There are studies that show that robotic surgery is significantly more expensive than laparoscopic surgery. Baek et al. reported that hospital charges are 1.5 times higher for the robotic group compared to a laparoscopic group (USD 13,644 vs. USD 9,065, $P < 0.001$) [30]. On the other hand, Quijano et al. publishes a study on the cost-effectiveness comparison between the robotic and laparoscopic approach in rectal surgery. Even if the cost of hospitalization is really higher for the robotic approach, if we talk about quality adjusted life years then it seems that the robotic approach is superior to the laparoscopic one [31].

Disadvantages of robotic surgery include: increased operative time, lack of haptic feedback, remote location of the surgeon away from the operating table, inability to perform abdominal surgery in several quadrants and the cost of technology [25–27].

4. Indications of the robotic approach in rectal cancer

Patient selection is essential for surgeons at the beginning of the learning curve. The ideal candidate is the patient with a tumor located in the middle or upper rectum, in stage I or II, patient without previous abdominal interventions and with a normal BMI. With the gain of experience, the robotic approach proves its advantages exactly in cases where laparoscopy would have had relative contraindications. This includes obese, male patients with a narrow pelvis with tumors located in the lower rectum. In these cases the dissection can be performed successfully in small spaces, with articulated instruments, the quality of the total excision of the mesorectum to be superior even to the open approach. The three-dimensional view increased visibility allows a more precise visualization of the hypogastric nerve plexuses and their preservation as an extremely important objective in maintaining urinary and sexual functions.

5. Preoperative preparation

Preoperative preparation for colorectal robotic surgery is no different from laparoscopic surgery except in one significant way. Unlike laparoscopy, the surgeon is seated at the console, away from the operating table. That is why the role of a well-trained team is extremely important. The team ensures the correct handling of the robot's arms, in order to avoid the collision between the robot's arms during the intervention. The assistant surgeon will always be the one who will ensure the retraction of the structures to be dissected, will change the robot's instruments when necessary. There are also times during the operation when he will insert a stapler through which he will section the intestine, sometimes vascular sealing instruments or clips. Perhaps the most important role of the team is to be able, in case of need, to undock the robot in a very short time. That is why the permanent training of the team is very important.

Minimally invasive colorectal cancer surgery has also led to the widespread introduction of Enahenced Recovery After Surgery (ERAS) protocols. Within these protocols, an important role is represented by the preoperative preparation of the patients who are to have a colorectal intervention. The benefits are obvious in terms of reducing hospitalization, costs, postoperative infections, postoperative pain, facilitating faster resumption of intestinal transit and avoiding nausea or postoperative vomiting [18, 32].

As a preoperative preparation, an essential stage is represented by the patient's counseling, the discussion regarding the intervention, the postoperative evolution and the discharge criteria and the establishment of its compliance for the achievement of the criteria included in the protocol. The discussion is also important for the preparation of a possible stoma, either temporary protective or permanent, followed by marking the place of the future stoma. Avoiding a long period of fasting is important, the recommendation being to maintain a light fluid regime up to 2 hours before general anesthesia. The carbohydrate diet is encouraged in nondiabetic patients in an effort to reduce the increase in insulin resistance by starvation to which will be added the operating stress [33]. There is still controversy about intestinal preparation. The recommendation is for both mechanical and oral antibiotic preparation, which is associated with a decrease in the morbidity rate, including a decrease in the rate of infection in the incisions associated with the intervention [34]. Prophylaxis of deep vein thrombosis is achieved by preoperative administration of low molecular weight heparins. An important element is the multimodal analgesia that begins preoperatively by administering oral analgesics, along with antiemetics so that together with the measures taken intraoperatively to make an easy transition to the postoperative period and thus return the patient to normal much faster [35]. All will contribute to a reduced hospitalization with all the advantages that derive from it, including from the oncological point of view the faster initiation of the adjuvant treatments.

6. Operating setup

The first very important step is related to the positioning of the patient on the operating table. Given that the intervention can last a longer time in which the patient will sit in extreme positions. A Trendelenburg position sometimes accentuated at over 15 degrees for a long time requires effective cooperation with the anesthetic team, in terms of monitoring vital functions, cerebral edema, and last but not least the

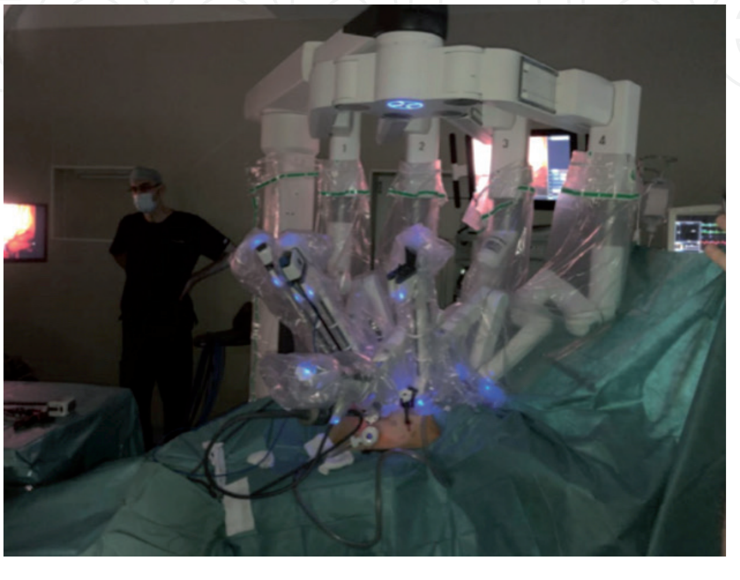

Figure 1.
Patient positioning.

existence of devices to prevent the patient from slipping by mounting shoulders, legs and arms, with protection of all pressure areas. The future positions of the robot's arms and the permanent possibility of the anesthetic team to have easy access to the airways must also be provided. The position of the table must be established from the beginning, because once the robot is fixed, the table cannot be changed (**Figure 1**). Recently the new table motion technology allowed robot and table movement in synchrony without having to undock the robot or reposition instruments.

The fourth generation of surgical robots, respectively da Vinci Xi, unlike the previous variants da Vinci S or Si, once fixed the position does not require its modification depending on the operating quadrant. After docking, the whole intervention can be done without the need for redocking, even if, for example, we perform splenic flexure mobilization first and after we go deep in the pelvis. The patient is placed in a modified lithotomy position, at least 15–20-degree Trendelenburg with the left side raised (**Figure 2**). The robot cart will be placed to the patient's

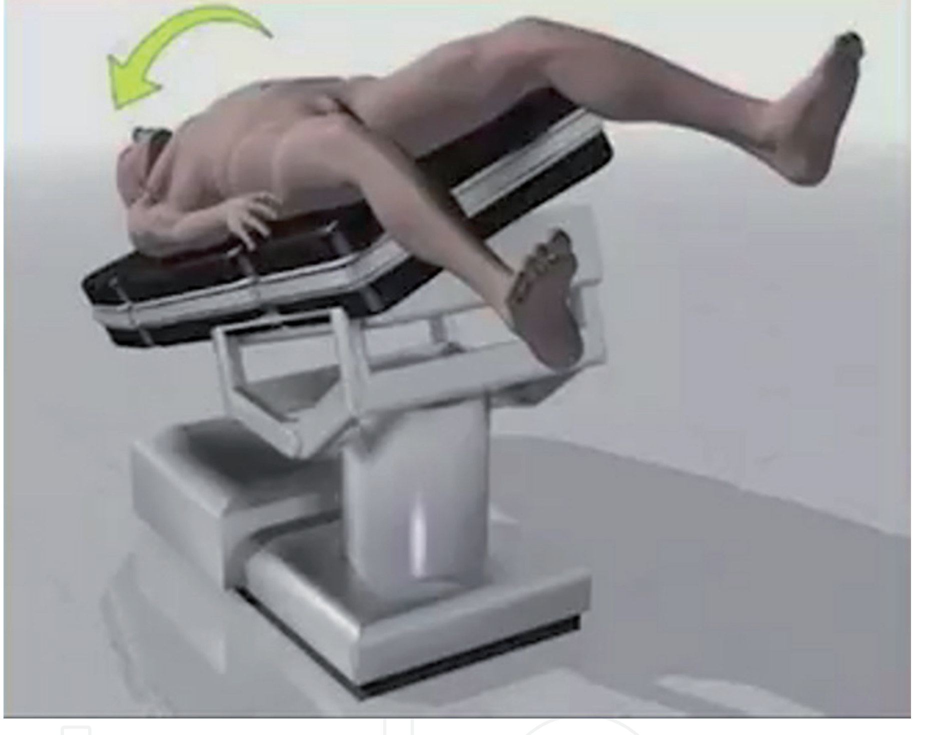

Figure 2.
Patient positioning 2015 Intuitive Surgical, Inc. with permission.

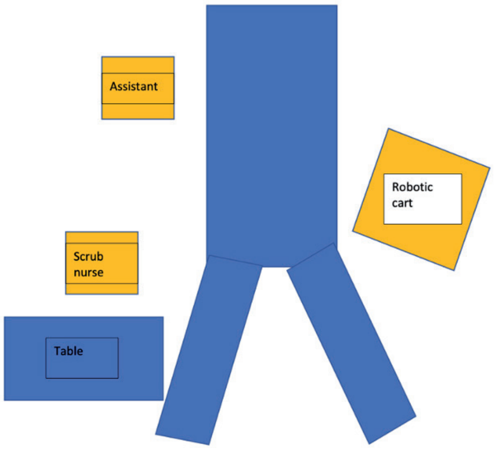

Figure 3.
Operative setup for robotic rectal surgery.

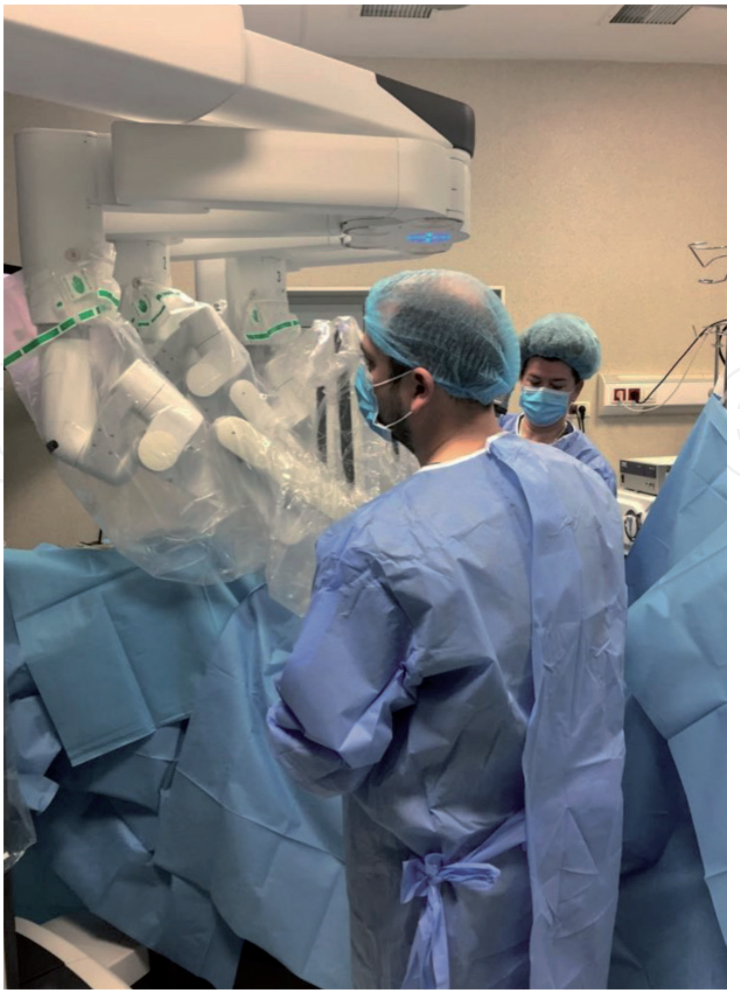

Figure 4.
Operative setup.

left. The assistant surgeon will be positioned to the patient's right. The scrub nurse will be set together with surgical instrument table at the patient's feet on the right (**Figures 3** and **4**).

7. Robotic low anterior resection of rectal cancer

After creating the pneumoperitoneum with the help of the Veres needle, the place of insertion of the future trocars for the 4 arms of the robot is marked. Unlike previous models for the Xi model, the 4 trocars of 8 mm must be placed in line. The distance between two trocars should be 6 to 8 cm. It starts with the trocar intended for the endoscope, which will be placed above the umbilical scar at about 3–4 cm on the right side (**Figure 5**). The insertion line of the following trocars should be slightly oblique between the right flank and the left hypochondrium. Thus, all stages of the intervention can be carried out without difficulty. In order for the possibility of losing pneumoperitoneum during the intervention and also for the immediate removal of the smoke resulting from electrocoagulation, the use of the AirSeal System Insufflation system is welcome. For this, the corresponding 12 mm trocar will be inserted in the right iliac fossa. Through this trocar, the assistant surgeon will introduce various tools: traction forceps, clip applicator, vessel sealing tools, linear staplers, etc. Sometimes, especially in obese patients, in order to maintain the intestinal loops in the right half of the abdomen, it is necessary to insert an additional trocar of 5 mm in the right hypochondrium (**Figure 6**).

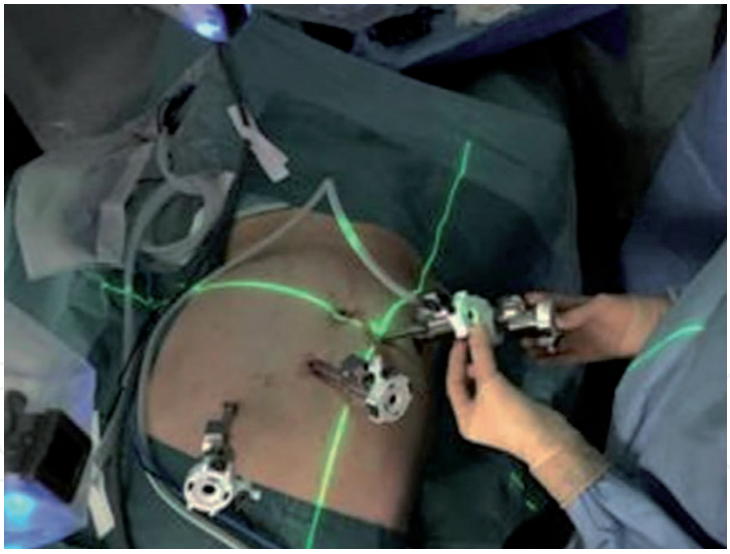

Figure 5.
Positioning of the cart.

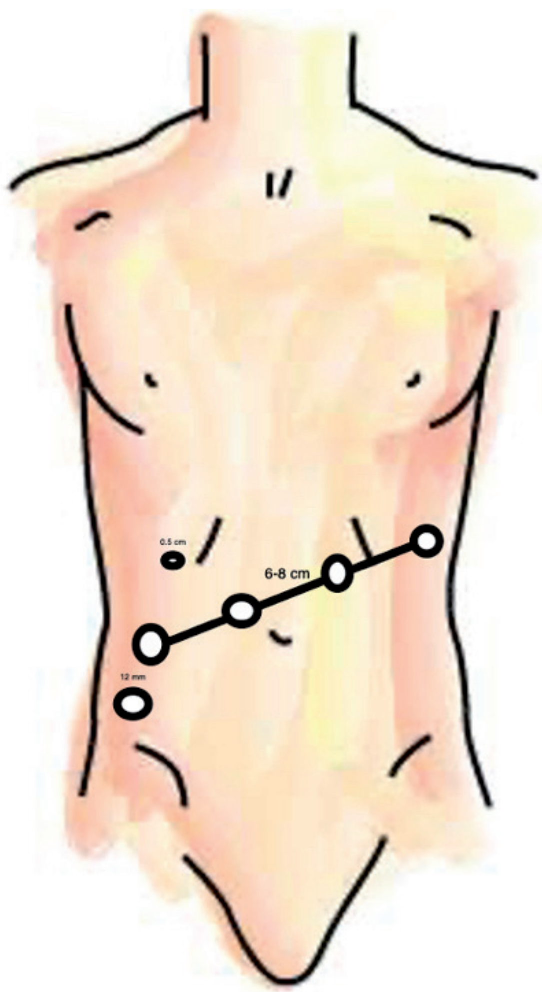

Figure 6.
Trocars positioning for robotic rectal surgery.

In the first stage of the operation, the large omentum is picked up and placed in the splenic fossa, after which the loops of small intestines are removed from the pelvis and kept in the right half of the abdomen, to have easy access from the duodenojejunal angle to the pelvis. In women, it is recommended that the uterus be raised to have enough working space in the pelvis. The uterus can be lifted either by using a uterine manipulator or by anchoring to the anterior abdominal wall with the help of a traction wire (**Figure 7**). The exploration of the peritoneal cavity begins by which the liver, colon and rectum are inspected with the identification of the area to be removed. At the same time, the anatomical landmarks are identified, and the length of the remaining colic partner is established, which will have to descend into the pelvis for the rectal anastomosis. In principle, there are two variants: a generous sigmoid loop sufficient for future anastomosis or a normal sigmoid loop and in this case, it will be necessary to perform a lowering of the splenic angle of the colon. In this situation it is good that the first stage of the intervention is this mobilization of the splenic flexion of the colon because it is a time-consuming step, which requires special attention to avoid damage to surrounding organs, spleen or tail of the pancreas. If done at the end of the procedure, when the surgeon is tired, the risks increase. The best approach of this part of procedure is to start the dissection from the medial to the lateral (**Figure 8**).

The vascular approach follows. The dissection must be performed in the vast majority of cases from the medial to the lateral. There are rare cases in which due

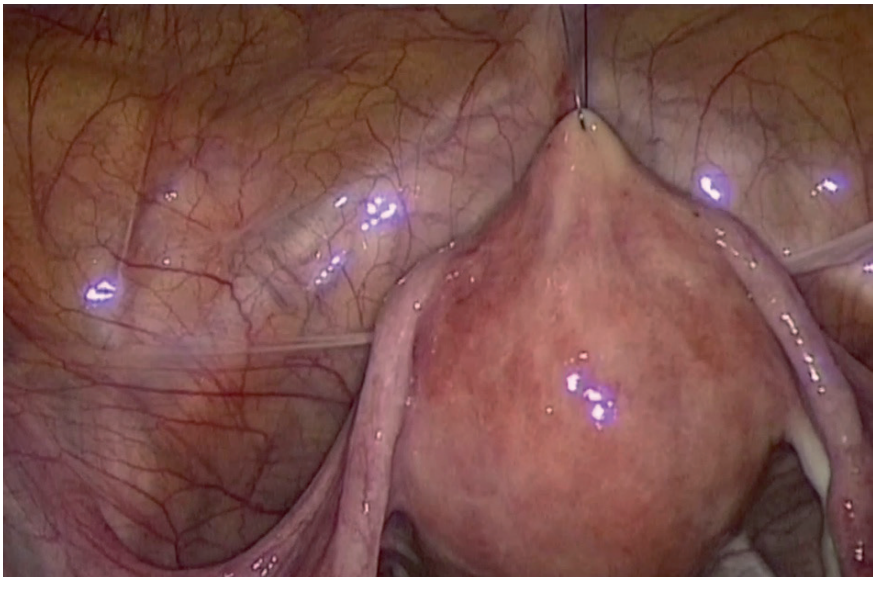

Figure 7.
Uterus mobilization.

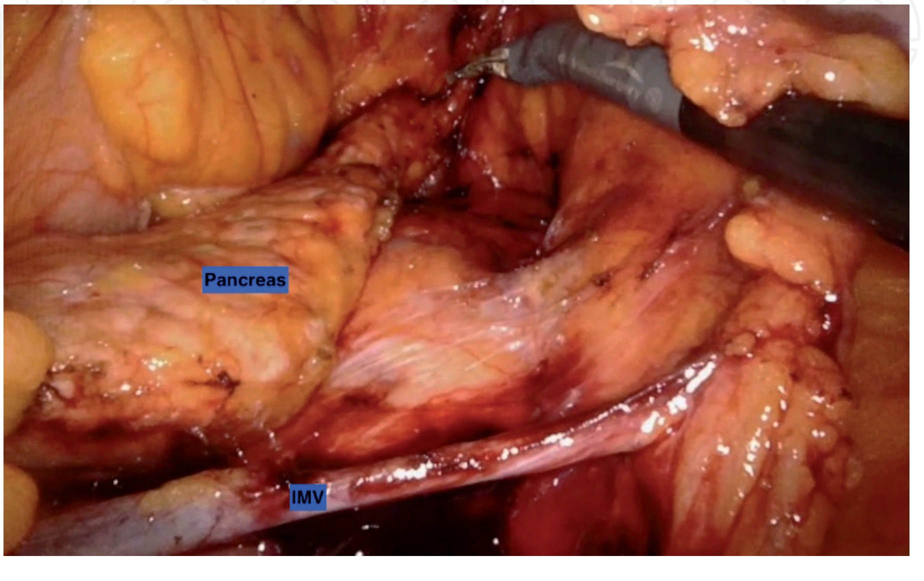

Figure 8.
Splenic flexure mobilization.

to local factors the dissection will take place starting from lateral. At this stage it is very important to correctly highlight the dissection space between the Toldt fascia and the Gerota fascia where we will identify the left ureteral and the genital vascular pedicle. The dissection at the level of the inferior mesenteric artery is performed meticulously for a correct and complete lymphadenectomy. For neoplastic pathology, high ligation of the inferior mesenteric artery is mandatory, followed by ligation of the inferior mesenteric vein (**Figure 9**).

After vascular time, the mesorectum can be completely dissected. Here the role of the robot becomes crucial for an accurate dissection, identification of hypogastric nerve plexuses and their preservation and maintenance in the avascular plane between the rectal fascia and the presacral fascia. At the level of the anterior wall, a complete dissection can also be performed at the level of the Denonvilliers fascia, with the highlighting of the seminal vesicles and the prostate lobes.

As a last stage, the lateral mobilization is performed, followed by the transection of the rectum with the help of linear staplers. They can be inserted through the AirSeal trocar or more recently through the staplers mounted on the robot's arms.

The specimen is currently extracted through a minimal Phanenstiel incision, protected by a system that covers the edges of the wound and thus avoids parietal dissemination. An alternative of extracting the specimen is the transanal extraction, in which the use of the robot proves once again its superiority over the laparoscopic approach [36]. The stapled rectal abutment is sectioned, and the colon is extracted transanal. After resection the specimen, the anvil is mounted either terminally or laterally and the colon is reintroduced into the peritoneal cavity. The stapler is inserted transanal and the rectal stump is circularly sutured around it, after which the anastomosis is created.

For a correct anastomosis, several principles must be observed: we need two healthy partners, well vascularized, with an adequate length and without tension in the future anastomosis. We must not forget that in most cases the tension does not exist at the level of the lateral portion, but at the level of the mesentery, which often appears as a rope at the level of the promontory.

The use of ICG in anastomosis perfusion testing has become a defining moment, especially since the robot is equipped as standard with the near-infrared firefly system (**Figure 10**) [37, 38].

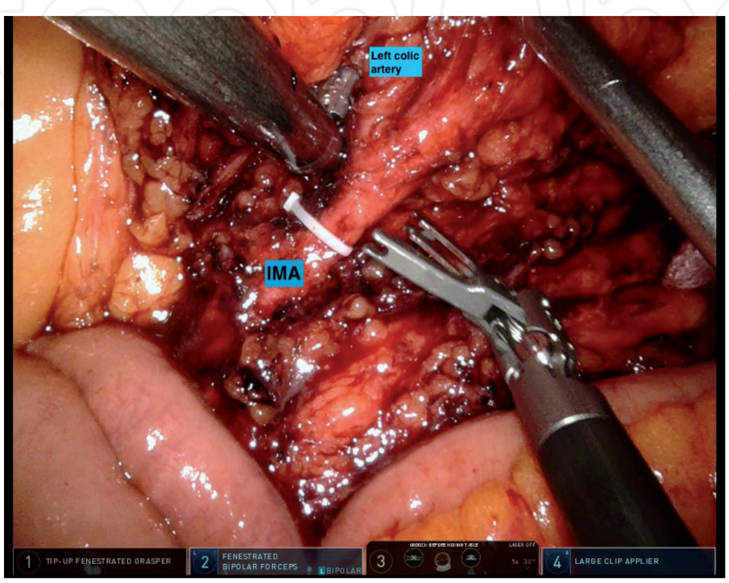

Figure 9.
Inferior mesenteric artery ligation.

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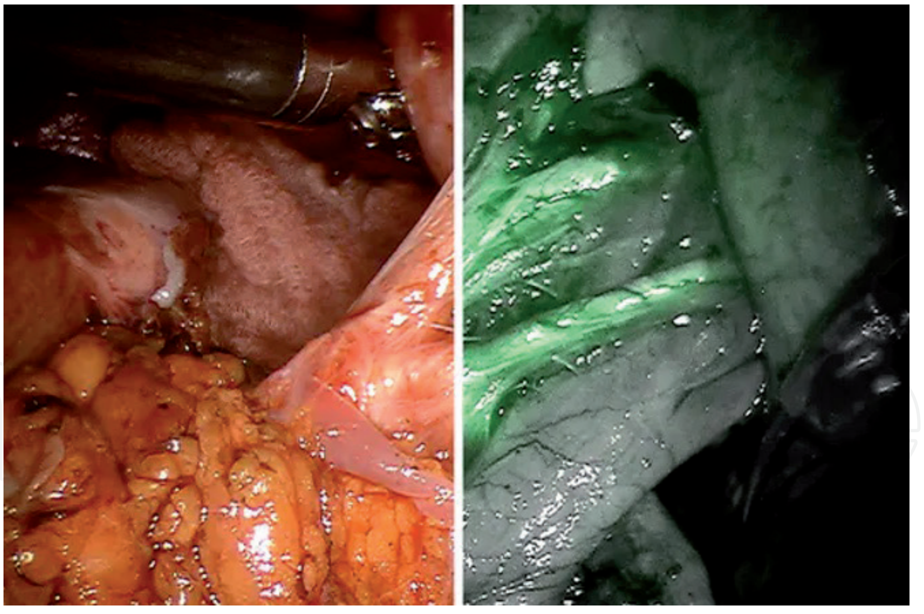

Figure 10.
Firefly fluorescence technology 2015 Intuitive Surgical, Inc. with permission.

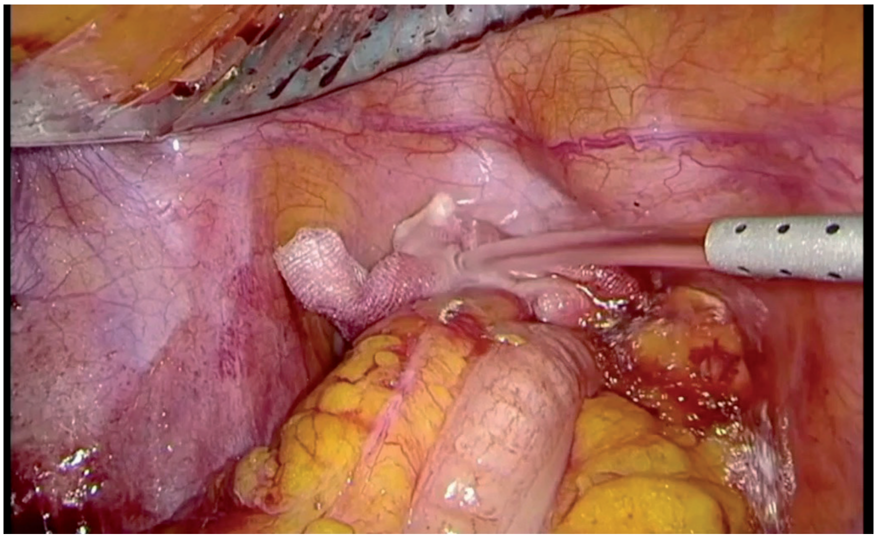

Figure 11.
Air test.

Figure 12.
Postoperative colonoscopy.

Finally, the colorectal anastomosis is checked by air test and colonoscopy. In this way we make sure that the anastomosis is sealed and there is no bleeding at the level of the stapling line (**Figures 11** and **12**).

8. Robotic abdominoperineal resection

The current indications for abdominoperineal resection are represented by:

- Rectal cancer that invades the levator ani muscle or the anal sphincter complex.
- Local recurrent rectal cancer.
- Rectal cancer in patients who cannot benefit of sphincter saving procedure due to poor functional status or comorbidities.
- Anal canal cancer: adenocarcinoma or squamous cell carcinoma.

There are no notable differences between the execution of the first steps. In general, the mobilization of the splenic flexure should not be performed, because the length of the sigmoid colon is sufficient to create a terminal colostomy. The differences occur in the dissection of the pelvic floor. For abdominoperineal resection, lateral dissection beyond the levator ani muscle is important for a lateral lymphadenectomy until the medial edge of the obturator fascia and down until the level of the ischiorectal fossa. If we compare the laparoscopic and the robotic approach, the superiority of the robot in performing the extra-levator resection is obvious. Robotic assisted sectioning of the levator ani muscle allows a precise dissection of the pelvic floor and shortens the perineal dissection time [39].

9. Robotic transanal total mesorectal excision (TaTME)

To improve the oncological and functional outcomes of the patients with rectal cancer new surgical techniques have been developed. It is known that the laparoscopic approach to rectal cancer with medium or lower location is a challenge due to the anatomy of a narrow pelvis and thus increases the risk of incomplete resection of the mesorectum with the possibility of an increased rate of local recurrences.

The introduction of single-port transanal surgery led to the development of the technique of complete excision of the transanal mesorectum [40, 41]. The first studies published by laparoscopic approach were published in 2010 [42]. The promoters of this approach claim that TaTME emphasize a number of benefits, namely a better quality of the specimen with a lower rate of circumferential resection involved, with a lower morbidity related to the extraction of the specimen and a much more sphincter saving procedures without compromising the oncological results.

The help of the robotic system is certain. Stable position, more ergonomic, the possibility of superior maneuverability in narrow spaces, with articulated instruments [43]. The first part of the intervention is performed normally with mesorectal dissection up to the level of the pelvic peritoneal fold. It then passes to the pelvic stage. Only three arms of the robot are used, and the use of AirSeal for smoke absorption is essential (**Figure 13**). It starts with a circular suture of the rectum about 1–2 cm below the tumor. The circular rectal wall is sectioned and after we reach the mesorectum plane, the complete dissection of the mesorectum

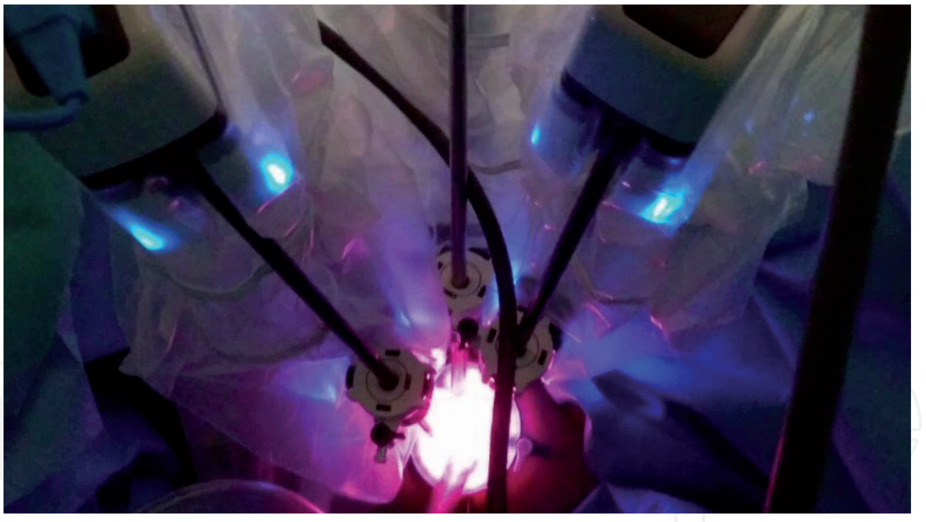

Figure 13.
Operative set-up for TaTME.

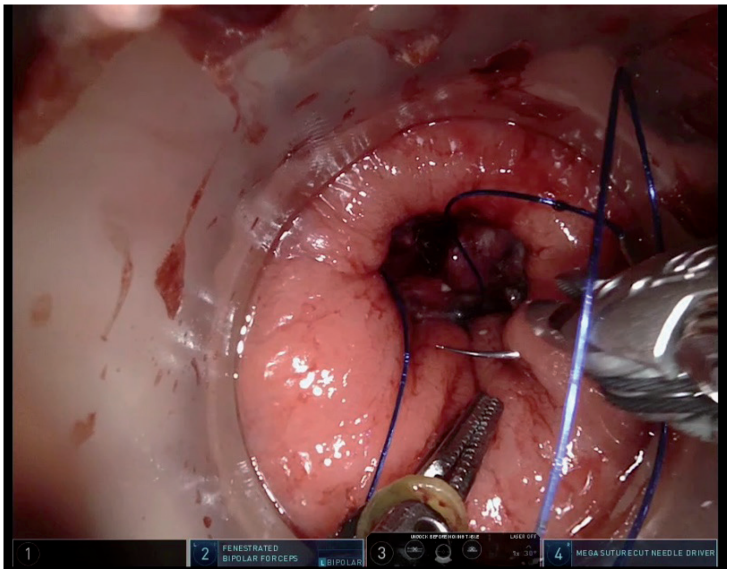

Figure 14.
Step 1 – transanal circular suture.

begins. The upper part will reach the peritoneal cavity, where the previously dissected mesorectal area will meet. The whole piece is extracted transanal and after the colorectal resection, the anvil of the stapler is mounted in the remaining colon, after which it is reintroduced in the peritoneal cavity. A circular bursa is performed at the level of the remaining anal canal and the stapler is inserted, performing a low or very low colorectal anastomosis (**Figure 14**).

10. Discussions

Colorectal laparoscopic surgery after the 1990s when viewed with considerable skepticism had a period of growth between 2000 and 2015 all over the world. According to studies published at that time, laparoscopy has a number of certain advantages over the open approach [11, 13]. However, it is obvious that it becomes extremely difficult to perform when there is relatively low visibility in a narrow pelvis or in different quadrants [14]. The learning curve for colorectal surgery is not small, on average a minimum of 90 interventions are required to overcome this learning curve. Miskovic et al. published in 2012 a meta-analysis related to the learning curve in laparoscopic surgery and shows that if we refer to the time of operation or blood loss more than 90 interventions are needed, but if we refer to the complication rate or conversion rate more than 150 procedures are needed [44].

After the publication of the ALaCaRT and ACOSOGZ6051 studies, the controversies resurfaced [20, 21]. There has been some delimitation between colon surgery and rectal surgery. For colon surgery, the laparoscopic approach is very good, with a clear distinction in terms of difficulty between right hemicolectomy and left colectomy. For rectal surgery, however, there have been controversies about the honesty of the laparoscopic approach compared to the open approach. Here rectal robotic surgery comes to replace all the disadvantages of laparoscopic surgery. The advantages of robotic surgery are obvious in terms of standard three-dimensional visibility, the ability to perform fine dissections in small spaces, difficult to access with tools with 7 degrees of freedom [45–48].

Although the first robotic operation for rectal cancer was performed in 2002 [49], published studies have been quite poor in comparing this approach to the laparoscopic or classical approach. Y. Cui et al. publishes in 2017 a meta-analysis which compares the robotic approach compared to the laparoscopic approach and which discusses only 9 studies that meet the eligibility conditions [50]. The following conclusions can be drawn from this meta-analysis. The robotic approach is superior to the laparoscopic approach in terms of intraoperative blood loss, length of hospital stays and postoperative morbidity rate. Only the time of the intervention was in favor of the laparoscopic approach. Another published meta-analysis which takes into account 5 eligible studies comparing 334 robotic interventions with 337 laparoscopic ones and which demonstrates the superiority of the robotic approach only in the lower conversion rate, but with a higher intervention time [51].

The findings of another study related to the robotic approach in rectal cancer published by Z. Azman highlight the benefits of this approach compared to the laparoscopic or open approach. Superior visualization, shorter learning curve, ergonomic position of the surgeon, lower conversion rate, lower blood loss, shorter hospitalization, lower morbidity rate and better preservation of sexual and urinary function are these robotic advantages [52].

The first randomized clinical trial (ROLARR Study) does not show statistically significant differences between the robotic and laparoscopic approach in any of the 8 end points studied [24]. Subsequent studies have shown a number of advantages of the robotic approach. Fleming et al. performs a meta-analysis comparing the robotic approach with the laparoscopic approach in terms of preserving urogenital function in men and concluding that urinary and erectile function is better in men undergoing the robot compared to conventional laparoscopic surgery for rectal cancer. The results in women did not identify a consistently more favorable result in any of the groups [53]. Another advantage of the robotic approach is found in obese patients, in whom hospitalization is lower and a re-admission to 30 days is rarer, with a faster recovery and a lower rate of postoperative complications, but with a longer duration of operation than the laparoscopic approach [54].

With the advent of novelties in robot instruments, vascular sealing instruments or robotic staplers bring obvious advantages in the easier and more precise development of interventions. In the future, with the advent of other robotic platforms with reusable tools, they will reduce costs and then this disadvantage of robotic surgery will disappear [55].

11. Conclusions

During the last two decades, advances in the surgical treatment of rectal cancer have drastically evolved into a more minimally invasive approach. The patients' need for a good or at least acceptable quality of life is one of the leading appearances of current rectal cancer surgery. Modern technologies, new surgical procedures, together with a deep knowledge of pelvic anatomy and oncological principles, may help the contemporary colorectal surgeon pursue the proper cancer treatment. The key could be tailored surgery, where the best technique is chosen on a case-by-case basis and the experience of the surgeon.

The field of minimally invasive medicine is going to evolve beyond our imagination. The abundance of techniques and technology should not defer the primary goal – patient's safety.

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