Is There Any Reason Not to Perform Standard Laparoscopic Total Mesorectal Excision?

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Abstract

The curative treatment of locally advanced rectal cancer is currently based on chemoradiotherapy and total mesorectal excision (TME). Laparoscopy has developed considerably because of obvious clinical benefits such as reduced pain and shorter hospital stay. Recently, several prospective randomized clinical trials with long-term follow-up have showed that laparoscopy is noninferior to laparotomy with the same oncologic outcomes in terms of survival and local control rate. However, laparoscopic TME remains a challenging procedure requiring a high level of expertise and a long learning curve to ensure an adequate and safe resection. The only relative contraindication of laparoscopic rectal surgery is T4 rectal cancer extended beyond the plane of TME. In this situation, it is reasonable to consider an open resection to avoid an uncomplete resection. In obese and elderly patients, laparoscopic TME also provides the same benefits as in nonobese and younger patients but may be more difficult to achieve. This review summarizes current knowledge on the place of laparoscopic TME in the treatment of rectal cancer.

Keywords

- rectal cancer
- TME surgery
- laparoscopy

First described in 1982 by Heald et al, total mesorectal excision (TME) has become the gold standard treatment for rectal cancer.¹ TME implementation led to a lower rate of local recurrence and also less definitive colostomy.² The combination of TME and neoadjuvant therapies has also improved local recurrence free survival.^{3–5} Although it has been shown since many years that open and laparoscopic resections for colon cancers offer similar oncological outcomes,⁶ laparoscopic approach for rectal cancer is a much more challenging procedure with particular specificities: a dissection after chemoradiation, a surgery in a confined area, the problem of sphincter preservation, and a higher anastomotic rate. Furthermore, preserving the pelvic nerves while following the “holy plane” requires a high level of expertise even for simple cases of laparoscopic TME. Finally, in some complex cases (i.e., obese patients, T4 tumors), it remains debated whether laparoscopic TME should be still considered as the standard curative operation.

What Is “Standard Laparoscopic Total Mesorectal Excision”?

Standard laparoscopic TME is now a well-described surgical procedure which we and others have previously described.^{7–9}

Neoadjuvant Treatments and Assessment of Tumor Response

Indications of chemoradiotherapy (CRT) are based on endorectal ultrasound and systematic magnetic resonance imaging (MRI) preoperative assessment. Furthermore, all patients undergo computed tomography (CT) for distant metastases assessment. Patients with low or mid-rectal tumor and advanced local disease (T3–T4 and/or an N+ tumor) receive preoperative radiotherapy (50 Gy in 5 weeks) with concomitant chemotherapy. All the patients undergoing CRT are restaged at least 6 weeks after the completion of CRT. Besides clinical examination, a new CT scan and a new MRI are obtained

in all cases. This restaging is performed because it helps the surgeon performing laparoscopic TME by carefully assessing the circumferential mesorectal margin just before laparoscopic TME to reduce the risk of R1 resection.¹⁰

Surgical Procedures

Since the randomized multicenter study that showed decreased infectious morbidity in patients who had preoperative mechanical bowel preparation for rectal cancer surgery,¹¹ all our patients receive mechanical bowel preparation before surgery. Surgery is usually performed 8 to 10 weeks after RCT. The operative procedure is performed by a 5-trocar entirely laparoscopic technique (one in each quadrant of the abdomen, and the last through the umbilicus for the camera). A 5-cm incision in the right iliac fossa for both specimen extraction (in case of stapled colorectal anastomosis) and the formation of a temporary diverting ileostomy is used. We routinely use a 0-degree camera and ultrasonic device (Harmonic Ace, Ethicon Endo Surgery, Cincinnati, OH) for dissection. If a manual coloanal anastomosis is performed, most of the times, transanal extraction of the specimen is chosen, and in this case, the right iliac fossa incision is smaller, only for the temporary ileostomy. The operative procedure routinely involves high ligation of the inferior mesenteric vessels and completes mobilization of the splenic flexure. Rectal dissection is performed to the pelvic floor with TME and nerve preservation. The rectum is transected with an endoscopic linear stapler (Echelon Flex Endopath; Ethicon Endo Surgery) after checking by rectal digital examination that the level of rectal division is correct (at least 2 cm below the level of the tumor to be sure than a 1-cm safe margin is obtained). The specimen is extracted through the right iliac fossa incision at the site of the former 12-mm trocar, with a wound protector. The anvil of a 29-mm circular stapler (CDH 29 Proximate ILS Curved Intraluminal Stapler; Ethicon Endo Surgery) is inserted laterally to perform an end-to-side stapled low colorectal anastomosis. If rectal tumor is located on the lower rectum, up to 2 or 3 cm above the dentate line, we prefer to start the operation by a perineal approach. In this situation, as we previously described,¹² we make a dissection in the intersphincteric plane up to 5 cm approximately above the anal sphincter, we close the rectum, and then we move to the abdomen to do the laparoscopic procedure with TME performed up to the rendezvous with the perineal dissection. In these cases, the specimen is extracted through the anus and a coloanal manual side-to-end anastomosis is fashioned with interrupted sutures (Vicryl 4/0; Ethicon, Cincinnati, OH). Intersphincteric resection is performed with either partial (coloanal anastomosis on the dentate line) or subtotal or total (coloanal anastomosis below the dentate line) resection of the internal anal sphincter. In all cases, a systematic temporary ileostomy is fashioned on the right iliac fossa. Abdominoperineal resection (APR) remains indicated in some patients with very low rectal cancer with involvement of the external anal sphincter or levator ani muscle and for some aged patients older than 75 years for whom functional results of a very low anastomosis is supposed to be very bad (especially in case of a poor preoperative anal function). However, since the introduction of intersphincteric

resection in our department, APR is performed in only 12% of our low rectal cancer patients and 7% of all our patients with rectal cancer.⁸

When a stapled anastomosis is performed, the doughnuts are always inspected for completeness and sent for pathologic examination. Since the results of the GRECCAR 5 study have been communicated,¹³ we do not place systematically a pelvic drain behind the anastomosis but only in case of pelvic bleeding. Ileostomy closure is performed at 6 to 8 weeks after the initial procedure if a CT scan with contrast enema control does not show any evidence of anastomotic leakage. Pathologic final assessments of the rectal specimen is performed according to a standardized protocol¹⁴ and staged according to the TNM classification.

Patients are treated with postoperative cares according to the concept of fast-track surgery such as avoidance of nasogastric intubation, short urinary drainage, multimodal postoperative analgesia, early oral intake, and mobilization.

Alternatives for "Standard" Laparoscopic Total Mesorectal Excision

As an alternative to up to down laparoscopic TME, transanal TME has been proposed as an interesting approach for low rectal cancer.¹⁵ The robotic rectal surgery is another big topic of current debate, but this technology has failed to prove so far a clinical benefit.¹⁶

The place of a systematic defunctioning ileostomy in rectal surgery is also a recurrent controversy.¹⁷ Although ileostomy decreases the risk of morbidity related to anastomotic leak, it increases some other risks and raises the question of whether it should or not be fashioned exclusively in patients with identified risk factors such as low anastomosis or preoperative CRT.

A delayed coloanal anastomosis may be in some difficult resections a helpful technique when an immediate anastomosis appears unsafe or when a diverting stoma was not planned.¹⁸

Finally, even if we prefer to proceed to the specimen extraction through the abdomen, it is also possible to choose a suprapubic incision as the Pfannenstiel incision, which is associated with lower rates of wound complications.¹⁹

Laparoscopic Total Mesorectal Excision Is the Gold Standard

Since the early 2000s, laparoscopic resection of colon cancer has shown its benefits compared with laparotomy. The main advantages of laparoscopy are nowadays well known: smaller surgical scars, reduced intraoperative blood loss, less pain following surgery, shorter hospital stay, faster return to normal activity, and reduced risk of infection without increase of perioperative mortality.^{20–22} Long-term oncological safety of colon cancer laparoscopic surgery has also been demonstrated in meta-analyses.²³ Besides, we showed in a French national survey that laparoscopic surgery was an independent factor for significantly lower postoperative 30-day mortality after colorectal cancer surgery.²⁴

Regarding rectal cancer, the path was longer to demonstrate the safety of laparoscopic TME. Indeed, laparoscopic

TME is a highly demanding procedure. However, laparoscopic approach can provide obvious theoretical advantages with a magnified view allowing a precise dissection in a narrow pelvic space leading to a better autonomic nerve-sparing surgery. However, because of the high morbidity rate, the possible consequences of sexual function disorders and the risk of local recurrence in case of incomplete resection may explain that laparoscopic TME is still considered by many surgeons to be a very difficult procedure, which must be performed only by highly skilled surgeons. In France, only ~30% of colorectal procedures are performed by laparoscopy.²⁴ This rate is almost the same as in the United States.²⁵

In the last few years, the short- and long-term results of several randomized clinical trials have been published and demonstrated the validity of laparoscopic TME approach. The COREAN trial included 340 patients randomized between open and laparoscopic rectal surgeries with only a 1.2% rate of conversion. Short-term benefits were found in the laparoscopic group with recently reported similar oncological outcomes.^{26,27} The low rate of conversion in this study may explain the differences of short-term outcomes compared with the CLASICC trial published in 2005 in which the conversion rate reached 34%.²⁸ Recently, the COLOR II trial has been published and confirmed the benefits of laparoscopic TME over open resection. This large international randomized phase 3 trial included 1,103 patients in 30 centers assigned to either laparoscopic (739 patients) or open surgery (364 patients).⁹ In the laparoscopic group, the oncologic quality of resection was not different from the open group with an improvement of postoperative recovery as it was observed in the COREAN trial. Long-term results of COLOR II were published recently and confirm that local recurrence, disease, and overall survival are not different between laparoscopic and open groups.²⁹ However, neither the health-related quality of life nor the genitourinary dysfunction was improved by the laparoscopic approach^{30,31} suggesting that the clinical benefits of laparoscopy persist only in the short postoperative period.

Recently, a meta-analysis of 27 studies and 10,861 patients found no difference in terms of rate of complete resection, mesorectal excision quality, and local recurrence between laparoscopic TME and laparotomy.³²

However, two recent randomized trials have reported controversial results showing that laparoscopy offers poorer outcome than open surgery.^{33,34} The ACOSOG Z6051 and the ALaCaRT are very similar noninferiority trials and both conclude to the inferiority of laparoscopy. However, these results are questionable since the primary end point was a composite histologic criterion (radial margin, distal margin, and completeness of TME) with an unclear significance. No local recurrence and overall survival results were provided. Moreover, in the ACOSOG study, the rate of 23% of APR is rather high since the mean of tumor distance from anal verge at 6 cm and the patients were operated by credentialed surgeons. Therefore, we consider that these two trials cannot challenge today the place of laparoscopy in rectal surgery.

In summary, it has to be considered that laparoscopic TME has become the best surgical approach to perform a rectal cancer resection and therefore a gold standard. However,

some specific clinical conditions may still represent a limitation to this procedure.

T4 Rectal Cancer

In the 7th edition of UICC TNM classification, T4 rectal cancer is defined as a tumor perforating the visceral peritoneum (T4a) or directly invading other organs or structures (T4b). T4 rectal cancer is usually excluded from randomized clinical trials evaluating the safety of laparoscopic TME. Thus, in the COREAN trial, only cT3 tumors after CRT were included.²⁷ In the COLOR II trial, patients diagnosed with T4 tumors or T3 tumors within 2 mm of the endopelvic fascia before neoadjuvant treatment were not included.²⁹ Therefore, without prospective controlled studies, it is not possible to assess the safety of laparoscopy in these indications.

However, in our department, T4 colorectal cancer is not an absolute contraindication of laparoscopic approach and we reported our experience of 39 T4 colorectal cancer operated through laparoscopy with good oncologic outcomes.³⁵ In this study, 12 rectal cancer were included. Complete R0 resection was successfully achieved in 87% of the patients and 75% with a rectal cancer. In this study, we consider that laparoscopic approach is not contraindicated in all patients with T4 rectal cancer. Obviously, laparoscopic TME should not be considered if vagina, urinary bladder, or prostate is clearly involved by the tumor on preoperative MRI. In this situation, an en bloc pelvicotomy has to be planned whether by laparoscopy or not depending on the skill of the surgical team. However, in case of localized external sphincter involvement, or in case of seminal vesicles involvement, we routinely performed the operation through laparoscopy, including APR.

Recently, we published a study in 233 patients with mid- or low rectal cancer who have undergone laparoscopic TME after neoadjuvant CRT.³⁶ Conversion rate into laparotomy was only 4%. In this study, we aimed to identify risk factors of incomplete circumferential microscopic R1c resection. T4 tumors on post-CRT MRI and operative time beyond 240 minutes were found as risk factors of R1c resection. Interestingly, it was possible to perform a laparoscopic TME with complete resection R0 in 10 patients among 15 with a T4 tumor post-CRT.

Impact of Obesity in Rectal Cancer Surgery

Obesity is steadily increasing worldwide and has become a public health problem. In laparoscopic surgery, obesity increases the surgical difficulties especially in male patients with predominance of visceral fat and could compromise surgical outcomes. The pelvic dissection is even more difficult in obese patients with difficult exposure due to visceral adiposity and a bulky mesorectal fat. Moreover, ileostomy creation can be hurdled by a thickened abdominal wall.³⁷

In several studies, it has been proven that obesity (body mass index [BMI] ≥ 30 kg/m²) leads to a higher rate of conversion and a longer operative time. In a large retrospective study of 490 patients,³⁸ Denost et al reported a rate of conversion of 5, 14, 23, and 32% with a BMI of < 20 , 20 to 25, 25 to 30, and ≥ 30 kg/m², respectively. Neither postoperative morbidity nor oncologic

outcomes were affected by obesity. Obesity was only the risk factor of conversion justifying that obese patients should also undergo laparoscopic TME. Bège et al also published a study of 210 patients who have undergone laparoscopic TME and also found a significant increase of operative time (513 vs. 421 minutes) and rate of conversion (46 vs. 12%) in obese patients versus nonobese patients, respectively.³⁹ Interestingly, in case of conversion from laparoscopy onto laparotomy, morbidity was unchanged. This may justify that laparoscopy should be proposed as the first-line approach for planned TME even in obese patients. It is our department policy to always start with laparoscopy since open rectal cancer in obese patients remains a difficult challenge. In this setting, we reported our experience of laparoscopy in obese patients with rectal cancer and showed that laparoscopic approach is safe and feasible and do not increase postoperative morbidity rate.⁴⁰

Whether the rate of anastomotic leakage does not differ in obese patients still remains unclear. A recent meta-analysis of 10 nonrandomized studies including more than 14,000 patients concluded that obesity increases the conversion rate and postoperative morbidity with significantly more anastomotic leakage, wound infection, and pulmonary events.⁴¹ Oncological outcomes were not affected by severity of BMI. However, among the 10 studies considered for the meta-analysis, only 4 studies involved patients operated laparoscopically.^{38,39,42,43} None of this study found an increase of anastomotic leakage. Therefore, it is not possible to draw a final conclusion on the link between obesity and anastomotic leakage.

Finally, although laparoscopic TME is a challenging procedure, obese patients still benefit from laparoscopy especially in the postoperative period with less pulmonary troubles than if they have been operated by laparotomy.⁴⁴

Laparoscopic Rectal Cancer Surgery in Elderly Patients

Life expectancy is increasing steadily and results in an aging population with an increasing number of cancer cases. We previously questioned in a study if laparoscopy could also provide any benefit in the elderly patients undergoing colorectal surgery.⁴⁵ In fact, there was some interrogations because of possible adverse events due to pneumoperitoneum on the cardiopulmonary function. Laparoscopy also exposes to extreme positions and at the beginning of the learning curve to a longer operative time. However, we showed in this case-matched study comparing 75 elderly patients with 103 younger that overall morbidity was not significantly different between the two groups and no mortality was observed. Although older patients had more cardiopulmonary comorbidities, only 5% required a conversion into laparotomy because of anesthesia problems. These results were confirmed in another study published by Frasson et al.⁴⁶ In this study of 535 patients who have undergone a colorectal resection, laparoscopy significantly reduced the morbidity rate (20.2 vs. 37.5%) in the elderly group. This group also had a shorter hospital stay (9.5 vs. 13 days) than the elderly patients in the open group.

Recently, three studies specifically reported the results of laparoscopic rectal surgery in elderly patients. In the first

one, Zeng et al showed a clinical benefit of laparoscopy for septuagenarians.⁴⁷ More precisely, even if operative time was 20 minutes longer in the laparoscopic group, the elderly patients had less operative blood loss, a shorter hospital stay, lower overall complication rate, wound complications, less need of blood transfusion, and surgical intensive care unit after surgery. The second study was also a retrospective study ~408 patients who were operated by laparoscopy or laparotomy.⁴⁸ The authors separated the patients between octogenarians and nonoctogenarians. The octogenarian population had more medical complications and grade C anastomotic leakage in the laparoscopic group compared with the open group. However, the result of this study is quite surprising because the mortality rate reached 11.5 and 9.4% in the laparoscopic group and the open group, respectively, which is a high rate in elective surgery indicating that a better selection of patients fit to surgery should be done.

Finally, we recently reviewed our experience on laparoscopic rectal cancer surgery in elderly patients (article submitted). In this series of 446 consecutive patients, 61 patients were older than 75 years. While elderly patients presented significantly higher American Society of Anesthesiologists (ASA) score, higher Charlson comorbidity index, and more frequent cardiovascular, pulmonary, and neurological comorbidities, we showed in multivariate analysis that age was not an independent factor for postoperative morbidity, unlike ASA score ≥ 3 , neoadjuvant radiotherapy/CRT, and operative time ≥ 240 minutes.

In summary, we think that elderly patients also benefit from laparoscopy and laparoscopy should be proposed as often as possible especially in high-risk patients since laparoscopy has shown decreased morbidity and mortality in this group.⁴⁹

Conclusion

The benefits and the safety of laparoscopic TME have been proved in several studies, justifying to consider it now as a standard treatment in most cases. We strongly believe that a laparoscopic approach should be offered whenever possible. Obesity may appear as an extra difficulty factor but should not be a reason to directly begin with a laparotomy, which also will be very difficult. Except a poor medical condition making laparoscopy dangerous for the patient, an old age is not a total contraindication of laparoscopy. Finally, we think that laparoscopic TME may not be indicated in case of resection requiring a complex en bloc pelvectomy or an associated sacrectomy. In all other cases, laparoscopic TME represents the best surgical approach provided that the surgeon masters the technique. Combination of laparoscopy with transanal TME and/or single port abdominal access may be the future of rectal cancer surgery.

Conflict of Interest
None.

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