Can less be more? Organ preservation strategies in the management of rectal cancer

F. Rouleau-Fournier MD* and C.J. Brown MD MSc*

ABSTRACT

Background Total mesorectal excision (TME) is the current standard of care for the treatment of rectal cancer. However, that surgery is associated with significant morbidity and mortality. Clinicians and patients are seeking alternatives to radical resection. Currently, prevalent organ-sparing strategies under investigation include local excision and nonoperative management (NOM).

Methods We reviewed the current evidence in the literature to create an overview of the use of transanal endoscopic surgery and watch-and-wait strategies in the modern management of rectal cancer.

Results Compared with radical resection, transanal endoscopic surgery in patients with early rectal cancer (cT1) having favourable histopathologic features is associated with an increased risk of local recurrence, but no difference in 5-year survival. In patients with T2 or early T3 cancer, strategies that use neoadjuvant or adjuvant therapy as adjuncts to local excision are under evaluation. Nonoperative management is a new option for patients who experience a complete clinical response after neoadjuvant chemoradiotherapy (nCRT). The selection criteria that will appropriately identify patients for whom NOM will succeed are not established.

Conclusions Local excision is appropriate for early rectal cancer with favourable histopathologic features. Although organ-preserving strategies are promising, the quality of the evidence to date is insufficient to replace the current standard care in most patients. Patients should be offered NOM in the safe setting of a clinical trial or registry. Rigorous follow-up, including endoscopy and imaging at frequent intervals is recommended when radical resection is forgone.

Key Words Rectal cancer, organ sparing, transanal endoscopic surgery, transanal endoscopic microsurgery, nonoperative management, watch and wait, NOM, WW

Curr Oncol. 2019 November;26(S1):S16-S23 www.current-oncology.com

INTRODUCTION

Since the end of the 1990s, the management of rectal cancer has become complicated. Although radical surgery remains the cornerstone of treatment for rectal cancer, recent developments in neoadjuvant therapy and multidisciplinary team management have raised questions about using a more tailored approach.

Historically, rectal cancer surgery has been associated with high morbidity and poor oncologic outcomes. Sharp dissection with total mesorectal excision (TME), first described by Heald et al. in 1982, was shown to lower the rate of local recurrence and is the current standard of care for surgical management of rectal cancer. Still, despite proper surgical technique, locally advanced tumours led to unfavourable oncologic outcomes. Data from a rectal cancer trial in the Netherlands and from the German Rectal Cancer Study Group in the early 2000s showed that neoadjuvant chemoradiotherapy (nCRT) combined with proper surgical technique leads to improved local disease control. Currently, nCRT followed by TME is the standard of care for stages II and III rectal cancer.

Although nCRT combined with TME has been critical in improving rates of local recurrence and survival, many patients experience profound morbidity and a significant effect on long-term quality of life, including bowel, sexual, and bladder dysfunction. Thus, patients and clinicians have pushed for strategies to reduce those complications,
including selective use of neoadjuvant therapy, minimally invasive surgery, organ-sparing surgery, and even non-operative management (nom).

The goal of the present review was to provide an overview of organ-preserving strategies in the modern management of rectal cancer.

**REVIEW**

**Organ-Sparing Surgery**

**Background**

Transanal excision (TAE) of rectal tumours was first popularized by Sir Alan Parks in the late 1960s. The procedure uses an endoluminal approach with the goal of completely removing the rectal lesion with negative margins. The advantages of the procedure are considerable: organ sparing, avoidance of a stoma, and avoidance of the morbidity associated with abdominal surgery. However, technical limitations constrained conventional TAE to lesions 3 cm or smaller, within 8 cm of the anal verge and occupying less than 40% of the lumen’s circumference.

At first, the application of that technique to early (T1) rectal cancer was based on the observation that approximately 5%–10% of those cancers demonstrate nodal involvement after radical resection. Thus, recurrence rates in that range were expected, and the expected rates of recurrence would be similar to the rates seen after radical resection for rectal cancer, while sparing the patient the morbidity of a low anterior resection or abdominal perineal resection. However, in the early 2000s, a number of high-volume rectal cancer centres reported higher-than-expected local recurrence rates of 10%–18%. That discovery spurred further consideration of the appropriate application of local excision techniques. Upon review, two important factors were identified. First, conventional TAE techniques were inadequate to visualize and properly treat the lesions. Second, not all T1 cancers have the same risk of recurrence; patient selection based on predictive pathologic features was found to be critical in ensuring acceptable local recurrence rates.

**Transanal Endoscopic Surgery**

Transanal endoscopic surgery (TES) was developed in the 1980s, but has been more widely adopted since about 2009, with advances in instrumentation and surgical training. Transanal endoscopic microsurgery (TEM) and transanal minimally invasive surgery are the two main TES surgery platforms. Both procedures are performed under general anesthesia using a dedicated proctoscope in which pneumorectum is achieved. As in laparoscopic procedures, cameras, graspers, cautery, and sutures can be used with the objective of achieving full-thickness en bloc excision of the rectal lesion with minimal morbidity. The procedure is typically performed in the outpatient setting.

Transanal endoscopic surgery can be technically challenging and is usually performed by trained colorectal surgeons. A recent review investigated the learning curve for transanal minimally invasive surgery among surgeons in a high-volume tertiary care institution. The authors found that, at a minimum, 14–24 cases were required to achieve an acceptable R1 resection rate of less than 10%.

Clancy *et al.* published the first meta-analysis comparing the TES technique with traditional TAE, showing the superiority of TES with regard to specimen fragmentation, R0 resection, and local recurrence. A meta-analysis published in 2015 by Kidane *et al.* reviewed one randomized controlled trial and twelve observational studies comparing local excision with radical surgery for patients with T1N0M0 rectal cancer. The 5-year overall survival (OS) was lower with TAE than with radical resection, but the same difference was not observed in the TEM excision subgroup. Local recurrence was higher in the combined traditional TAE and TEM group (risk ratio: 2.36; 95% confidence interval (CI): 1.64 to 3.39; *p* < 0.00001). Postoperative complications, mortality, and need for a permanent ostomy were significantly lower in the local excision group.

**Patient Selection Favourable for TES:** Local excision by TES is technically superior to the historical TAE approach, but the advantage is not adequate to apply the approach to all patients with early rectal cancer. Preoperative patient selection includes appropriate staging (endorectal ultrasonography or magnetic resonance imaging (MRI), or both; computed tomography of chest, abdomen, pelvis) to ensure that there is no evidence of advanced cancer, including nodal involvement. Making that selection remains a dilemma because current imaging modalities cannot reliably exclude the possibility of lymph node involvement. However, TES excision of the primary tumour for pathology assessment has led to the identification of predictors of lymph node involvement based on tumour biology. Those predictors have borne out as predictors of local recurrence.

**Depth of Invasion:** T1 tumours (invading the submucosa) are associated with a risk of lymph node metastasis of approximately 12%; T2 tumours (invading the muscularis propria) have a 23% chance of nodal involvement. Accordingly, TES is usually reserved for T1 rectal cancer. However, it is important to note that not every T1 tumour conveys the same risk of nodal metastasis. Kikuchi *et al.* described the importance of depth of submucosal invasion for lymph node metastasis in T1 cancer. After local excision, the authors subcategorized patients based on the depth of tumour invasion into upper, middle, and lower third of the submucosa, respectively assigning an SM1, SM2, and SM3 invasion designation. They followed 182 patients for 5 years or until death, finding that the rate of locoregional recurrence was 0%, 10%, and 25% for SM1, SM2, and SM3 tumours.

Although the SM categorization is informative, questions about the reproducibility of the assessment remain. To overcome variability, many pathologists recommend direct measurement of the depth of tumour invasion. A meta-analysis published by Beaton *et al.* found that a depth of submucosal invasion greater than 1000 μm was associated with a significantly higher risk of lymph node metastasis (odds ratio: 3.87; 95% CI: 1.5 to 10; *p* = 0.005). Given the association of depth of invasion with lymph node metastasis and local recurrence, most authors recommend radical surgery for patients with T1 rectal cancer with deep submucosal invasion (SM3 or >1 mm).
**Lymphovascular Invasion:** The presence of lymphovascular invasion (lvi) portends lymphatic spread of rectal cancer. It is characterized by the extension of tumour cells into lymphatic or blood vessels on histopathology assessment. In the meta-analysis published by Beaton et al., lvi was a strong predictor of lymph node metastasis in early colorectal cancer, with an odds ratio of 4.81 (95% CI: 3.14 to 7.37; p < 0.00001)\(^1\). In a retrospective study of 276 patients with lvi and cT1 rectal cancer, the rate of lymph node metastasis was reported to be 14.3%\(^1\). Radical surgery is recommended if lvi is present on tumour biology.

**Tumour Differentiation:** A colorectal cancer tumour can be graded as well, moderately, or poorly differentiated. That grading corresponds to the way cancer cells are organized in the tumour tissue and is associated with the degree of aggressiveness of the tumour’s biology. Compared with well-differentiated tumours, poorly differentiated tumours carry a greater risk of lymph node positivity (odds ratio: 5.6; 95% CI: 2.90 to 10.82; p < 0.00001)\(^1\).

**Tumour Budding:** Significant tumour budding is defined as small nests of 5 or more tumour cells along the invasive front the carcinoma. This histologic trait has been reported to be a predictor of lymph node metastasis with an odds ratio of 5.1–5.8\(^1\). However, the reproducibility and effect of tumour budding are still controversial; more study is needed.

**Local Recurrence After TES for Favourable Compared with Unfavourable T1 Cancer**

Bach et al.\(^2\) published a study investigating predictive models for local recurrence after TES. Within a multicentre registry, 253 patients with T1 rectal cancer had been treated by TES. Overall, 49 patients experienced isolated local recurrence, 11 experienced combined local and distant recurrence, and 6 experienced isolated distant recurrence. Median time to recurrence was 13 months. Kaplan–Meier estimates of local recurrence for pT1 tumours at 2, 3, and 5 years were 9.5%, 12.9%, and 18.6%. Local recurrence was found to be associated with 3 histopathologic factors: depth of invasion, tumour maximum diameter, and lvi. On multivariable analysis, pT1 SM2–3 tumours were associated with a hazard ratio of 2.74 for local recurrence (p = 0.026). The authors created a Cox regression model for local recurrence in well and moderately differentiated tumours. For favourable tumours (no lvi, SM1), local recurrence rates ranged from 3% to 8.1% depending on tumour size; rates were 17.8%–41.8% for unfavourable tumours (lvi-positive, SM2–3).

In 2016, Junginger et al.\(^2\) published long-term oncologic outcomes for 133 patients who had undergone TES for T1 rectal cancer. Their patients were divided into 3 different subgroups. The first group was low-risk tumours (R0 resection, >1 mm margin), the second group was low-risk with mention of clear margins only, and the third group was high-risk or incompletely resected tumours. Median follow-up was 8.6 years. The 5- and 10-year local recurrence rates in the first group were 6.6% and 11.6%; patients with high-risk tumours had 5- and 10-year local recurrence rates of 32% and 35% (p = 0.006). The 5- and 10-year cancer-specific survival rates for low-risk patients were 98% and 91%; for high-risk patients, they were 84.3% and 74.3% (p = 0.05).

Those findings suggest that, to minimize the risk of local recurrence, it is advisable to limit TES to patients with T1 rectal cancer with favourable histology (no lvi, graded as well or moderately differentiated, 1 mm margins).

**Local Excision for T2 and T3 Rectal Cancer**

Expanding the indications for TES excision of early rectal cancer to include patients with T2 and early T3 disease has attracted strong interest. However, local excision alone in such patients leads to local recurrence rates of 10%–66%\(^2\). Generally, that approach is acceptable only in patients with severe comorbidity and prohibitive operative risk or in patients who refuse radical resection. Nevertheless, there is evidence from Surveillance, Epidemiology and End Results program data that, in the United States, more than 20% of patients with T2 cancer are being treated by local excision\(^2\). In an effort to improve outcomes and expand eligibility for organ-sparing surgery, a number of observational studies and clinical trials have evaluated TES combined with neoadjuvant or adjuvant treatment.

**Local Excision Followed by Adjuvant Treatment:** The updated Cancer and Leukemia Group B 8984 trial investigated outcomes of T1 rectal cancer treated with local excision alone and T2 rectal cancer treated with local excision followed by adjuvant chemoradiotherapy (crt)\(^2\). Despite adjuvant therapy, the T2 group experienced worse 10-year OS and disease-free survival (dfs) and were at higher risk of local recurrence (18% vs. 8%).

Borstlap et al.\(^2\) published a meta-analysis of oncologic outcomes for patients with pT1–2 rectal cancer undergoing local excision followed by either adjuvant crt or completion surgery. They included fourteen studies that treated 405 patients with adjuvant crt and seven studies that treated 130 patients with completion surgery (heterogeneity concerns prevented a direct comparison of the two strategies). For pT2 tumours, the average rates of local recurrence were 15% (range: 11%–21%) with crt and 10% (range: 4%–22%) with completion surgery.

A recent systematic review by Cutting et al.\(^2\) combined data from twenty-two studies involving 804 patients with T1–3 cancer treated with local excision followed by either crt or radiation therapy alone. The authors demonstrated pooled local recurrence rates of 5.8% for pT1, 13.8% for pT2, and 33.7% for pT3 tumours.

Findings from the foregoing studies suggest that adjuvant therapy after local excision for T2 or greater rectal cancers is inferior to radical surgery, but better than TES alone.

**Neoadjuvant CRT Followed by Local Excision:** In locally advanced rectal cancer, nCRT before radical surgery is the current standard of care—an approach that was associated with improvement in local recurrence and tumour downsizing in large randomized controlled trials\(^2\). About 10%–30% of patients will experience a complete pathologic response after nCRT\(^2\). The development of better endoluminal surgery techniques and improvements in multidisciplinary management prompted investigation into
downsizing tumours to allow for organ-sparing surgery with local excision.

The American College of Surgeons Oncology Group Z6041 study was a phase II trial with a single arm of 84 patients having cT2 rectal cancer that was treated with nCRT followed by local excision.27 Downstaging to ypT0–1 was seen in 64% of patients, and 44% experienced a complete pathologic response. With an average of 4.2 years of follow-up in 72 patients, local recurrence was observed in 2 patients and distant metastasis in 5 patients. The 3-year DFS and OS were 87% and 96% respectively.

Two randomized controlled trials investigated nCRT combined with either local excision or radical resection. In 2012, Lezoche et al.28 compared TES with laparoscopic TME in patients with cT2N0M0 low rectal cancer. Each group consisted of 50 patients, randomly allocated, who received nCRT. All patients had an R0 resection. At a median of 9.6 years’ follow-up, local recurrence rates were similar in the TES and TME groups (8% vs. 6% respectively). The cancer-related survival rate was 89% for local excision and 94% for TME (p = 0.609). In 2017, the GRECCAR 2 multicentre phase II randomized controlled trial investigated patients with cT2–3 rectal cancer (maximum size: 4 cm) treated with nCRT and then randomized to either local excision or radical surgery29. By protocol, a good clinical response after neoadjuvant treatment was required (residual size: ≤2 cm) to enter the local excision arm of the study; the protocol otherwise mandated reversion to radical resection.

The primary outcome was a composite primary endpoint of mortality, recurrence, morbidity, and side effects at 2 years after surgery. Between 2007 and 2012, 145 patients were randomized. Outcomes between the groups were similar, with 1 or more events from the composite primary outcome occurring in 41 patients (56%) in the TES group and 33 patients (48%) in the TME group (odds ratio: 1.33; 95% CI: 0.62 to 2.86; p = 0.43). Notably, 36% of patients in the local excision arm were treated with TME, thus increasing the morbidity in the intention-to-treat analysis. No statistically significant differences in oncologic outcomes between the groups were evident; 3-year local recurrence rates were similar for TES and TME (6% vs. 3%, p = 0.63). The corresponding 3-year DFS rates were 75% and 82% (p = 0.84), and OS rates were 89% and 95% respectively (p = 0.40). Only 8% of patients treated by completion radical surgery had nodal involvement, suggesting that radical surgery was unnecessary for most of them.

The recently published cartS study investigated oncologic and functional outcomes of nCRT followed by TES in cT1–3N0M0 rectal cancer30. The 55 patients recruited were followed for a median of 53 months. Of those 55 patients, 47 (85%) were treated with TME after nCRT, among whom 35 (74%) qualified on pathology evaluation for local excision alone. Based on preoperative response or operative pathology, 16 patients were subsequently treated with radical resection. Overall, the 5-year local recurrence rate was 7.7%, with 5-year DFS and OS rates of 81.6% and 82.8% respectively. Health-related quality of life was equal to that at baseline, with improved emotional well-being for patients treated with TME (mean score at baseline: 72; 95% CI: 67.1 to 80.1; mean score at follow-up: 86.9; 95% CI: 79.2 to 94.7; p = 0.001).

**Neoadjuvant Chemotherapy Followed by TES:** Interest in neoadjuvant chemotherapy as an alternative to nCRT in rectal cancer care is growing. A number of randomized controlled trials investigating this strategy in patients with locally advanced rectal cancer have completed recruitment and will be reporting outcomes soon (see NCT01515787 at https://ClinicalTrials.gov/). Schrag et al. demonstrated significant downstaging in tumours treated with chemotherapy, achieving a pathologic complete response (pCR) rate of 25%.31 The approach is appealing in patients considered for neoadjuvant treatment and local excision, because nCRT has been shown to increase perioperative morbidity in patients treated with TES.32

Currently, a phase II multicentre single-arm trial recruiting in North America is investigating neoadjuvant chemotherapy followed by local excision for early-stage rectal cancer (see NCT03259035 at https://ClinicalTrials.gov/). Patients with cT1–3aN0 rectal cancer are being treated with 12 weeks of Folfox (fluorouracil–leucovorin–oxaliplatin) or CAPOX (capcitabine–oxaliplatin) and are then being reassessed for tumour response. Non-responders and patients with disease progression are treated with TME, and responders are treated with TES. Trial completion is expected in 2020.

**Nonoperative Management**

**Background**

The concept of eliminating surgical intervention after neoadjuvant therapy in patients in whom a clinical complete response (cCR) is achieved is variably described as NOM or watch-and-wait. Since the introduction of nCRT, pCR has been noted after radical resection in 13%–20% of patients whose surgery is conducted 6–8 weeks after nCRT. Analogue to the approach to anal cancer introduced by Nigro et al. in the 1970s,34 the possibility of avoiding the morbidity and mortality of radical resection in these patients intrigued clinicians.

In 2004, Habr-Gama et al.35 first published outcomes for NOM in 71 patients who achieved a cCR after nCRT. Initially, the patients demonstrated impressive outcomes: only 2 patients (2.8%) experienced local recurrence at 56 and 64 months after treatment. However, patients were included in the observation group only after reaching 12 months of uneventful follow-up after nCRT, raising concerns about selection bias. More recent updates from the group revealed a local recurrence rate of 30%.35

In 2016, the Maasstricht group from the Netherlands published outcomes for patients enrolled in an organ-preservation strategy after nCRT.36 The 100 patients enrolled between 2004 and 2014 had a median follow-up of 41.1 months that included endoscopy and MRI every 3 months for the first year and twice annually thereafter. At the initial assessment, 61 of the patients experienced a cCR, and 39 experienced a near cCR, with 24 of those 39 achieving a cCR at the 2nd assessment. The remaining 15 patients with a near cCR were treated using local excision by TME. After 25 months’ follow-up, 15 patients developed local regrowth, and all underwent successful salvage surgery. Unfortunately, 5 patients developed distant metastases. The 3-year OS was 96.6%; distant metastasis-free survival,
96.8%; local regrowth-free survival, 84.6%; and rrs, 80.6%. The authors concluded that, with strict selection criteria and follow-up, this organ-sparing strategy appears safe and warrants discussion with the patient as a possible alternative to radical surgery.

A recent meta-analysis from Chadi et al.\textsuperscript{37} obtained individual participant data from eleven studies involving 602 patients undergoing nom after ncrt from 1990 to 2017. Median follow-up was 37.6 months. The 2-year cumulative incidence of local recurrence was 21.4% (95% cr: 15.3% to 27.6%), and 5-year local regrowth reached 31.6%. High heterogeneity was noted between studies. The analysis showed a correlation between higher cT stage and increased risk of local recurrence. Analysis of the subgroup of 459 patients managed after 2008 (when mri became standardized) showed a 2-year cumulative incidence of local regrowth of 19% for cT1 and cT2 tumours, 31% for cT3 tumours, and 37% for cT4 tumours.

**Assessment of cCR**

The accurate assessment of ccr remains the principal limiting factor for a safe approach to nom. The challenge is that a significant proportion of patients with an apparent ccr have undetected residual disease. In a retrospective study of patients assessed for ccr preoperatively and treated with tme, 27% with preoperative ccr were found to have residual cancer on final pathology.\textsuperscript{38} No current consensus about the definition of ccr has been developed, but all published protocols recommend a combination of endoluminal and mri criteria.

**Endoluminal Assessment:** The 2017 European Society for Medical Oncology guidelines define ccr as the absence of any irregularities or a palpable tumour on digital rectal examination and no visible lesion on endoscopy with the exception of a flat scar, telangiectasia, or whitening of the mucosa.\textsuperscript{39} The use of biopsy to exclude the persistence of microscopic disease remains controversial. Figure 1 shows pre- and posttreatment colonoscopy findings for a cT3 rectal cancer in which a ccr was achieved.

**MRI:** High-resolution mri is the de facto standard adjunct to clinical assessment in determining ccr. Treatment response and fibrosis are characterized by low signal intensity on T2 weighted imaging. The U.K. mercury study group proposed a magnetic resonance tumour regression grade (mtrg) using pre- and posttreatment mri\textsuperscript{40}. The mtrg relies on the ratio of fibrosis to residual tumour and is graded from 1 to 5, with grade 1 corresponding to a radiologic complete response and grade 5 indicating no response. Compared with mtrgs 4–5, mtrgs 1–3 correlate with better survival outcomes. Those findings are now being widely used in experienced centres to assess tumour downstaging and to guide treatment for multidisciplinary teams. Functional imaging factors such as diffusion-weighted imaging and dynamic contrast-enhanced mri are currently being studied and are showing great potential for improving the detection of tumour response\textsuperscript{41}. Figure 2 presents pre- and posttreatment (at 6 weeks) MRI images in a patient with a ccr.

**Timing of Assessment:** The most appropriate interval for assessment of ccr after neoadjuvant treatment remains unknown, but recent trends suggest that a prolonged interval after the end of ncrt leads to the highest rates of ccr. The Lyon R80-01 trial randomized patients to an interval of 6–8 weeks or less than 2 weeks after radiation therapy and found a higher rate of pcr in the longer-interval group (26% vs. 10.3%, \(p = 0.005\)).\textsuperscript{42} Although it is generally accepted that a longer interval after radiation therapy leads to a better chance of pcr, it is unclear whether the later responders share the same favourable prognosis. A recent meta-analysis demonstrated that surgery delayed for a longer interval after ncrt (>6–8 weeks) was associated with a better rate of pcr (19.5% vs. 13.7%; risk ratio: 1.42; 95% cr: 1.19 to 1.68; \(p < 0.0001\)), without significant differences in os and rrs, r0 resection rates, sphincter preservation, and complications.\textsuperscript{33} Nonetheless, most centres assess patients at an interval of 8–16 weeks after treatment for consideration of nom.

![Colonoscopy images of a cT3 rectal cancer](image1.png)

**FIGURE 1** Colonoscopy images of a cT3 rectal cancer. (A) Before and (B) 6 weeks after chemoradiation therapy.
Ongoing Trials

Based on the prognostic significance of \( \text{mrTRG} \), the multicentre randomized controlled phase III \( \text{TRIGGER} \) trial is currently underway in the United Kingdom\(^4\). The trial is comparing outcomes in patients with locally advanced rectal cancer managed based on the baseline pretreatment MRI or on the \( \text{mrTRG} \). Patients in the control arm undergo surgery after \( \text{NCRT} \). In the intervention arm, patients are stratified into one of two groups according to the \( \text{mrTRG} \). Good responders (\( \text{mrTRG} 1–2 \)) are referred for \( \text{NM} \) with 24 weeks of adjuvant chemotherapy; poor responders (\( \text{mrTRG} 3–5 \)) receive 12 weeks of consolidation chemotherapy before undergoing subsequent MRI reassessment. Conversion to the \( \text{NM} \) group is possible if consolidation therapy downstages the tumour to \( \text{mrTRG} 1–2 \).

The international multicentre randomized STAR-TREC trial is aiming to compare standard radical surgery with organ-preserving strategies including \( \text{NM} \) and local excision\(^4\). This 3-arm phase II study is recruiting patients with rectal cancer at stage T3bN0M0 or lower to be randomized to either the control group of \( \text{TME} \) surgery, organ-saving treatment with long-course chemoradiation, or short-course radiation therapy. For patients treated with an organ-saving approach, the clinical response guides the next treatment step. Active surveillance is conducted for patients showing a cCR; local excision using \( \text{TRE} \) will be used in cases of incomplete clinical regression.

Follow-Up in Patients Treated with Organ Preservation

Although no standardized follow-up strategy has been widely accepted in the literature, it is clear that conventional follow-up recommendations for patients treated with radical resection are inadequate. The relatively high risk of luminal and nodal recurrence mandate a strategy that purposefully evaluates those zones, particularly during the first 3 years, when recurrence rates are highest. A survey of protocols developed to investigate \( \text{TRE} \) or \( \text{NM} \) in appropriate candidates with rectal cancer reveals that clinical, endoscopic, MRI, and computed tomography evaluation at 3- to 6-month intervals for at least 3 years is typical.

In 2018, the International Watch and Wait Database presented outcomes of 880 patients with cCR in a multicentre registry who were managed by \( \text{NM} \) after \( \text{NCRT} \)\(^4\). The local regrowth rate at 2 years was 25.2%, the 3-year distant metastasis rate was 8%, and the 5-year OS was 84.7%. Of patients with local recurrence, 88% (101 of 115) underwent successful salvage surgery with R0 resection. Those findings suggest that an aggressive follow-up approach should be undertaken to detect both locoregional and distant recurrence, especially in the first 2 years.

Most authors adopt a 1- to 3-month clinical assessment schedule during the first 2 years, incorporating digital rectal examination, endoscopy with or without biopsy, and measurement of carcinoembryonic antigen\(^4\)–\(^8\). They also suggest twice-annual or annual MRI and computed tomography, with the intensity of follow-up tending to decrease in frequency after 2 years. In any case, clinicians should be aware of any available clinical trials at their centre and adhere to a strict and safe follow-up strategy.

Multidisciplinary Rectal Cancer Care

There is increasing evidence that the use of multidisciplinary team management is associated with improved decision-making and outcomes in many types of neoplasia, including rectal cancer. Several European countries have adopted pathways that use multidisciplinary conferences to improve the quality of care in rectal cancer. A similar initiative was developed in North America in 2011 as the OSTRiCh Consortium\(^9\). The group made recommendations based on 5 principles for better rectal cancer care:

- Total mesorectal excision
- Measurement of the quality of the surgery by specific techniques of pathology assessment
- Specialist imaging techniques to identify patients at high risk of local recurrence

\( \text{FIGURE 2} \) Magnetic resonance imaging findings for a cT3a rectal cancer. (A) Before treatment (the white arrow indicates rectal wall involvement by the tumour) and (B) after chemoradiation therapy (the white arrow indicates dense low-signal intensity of the fibrotic scar).
Use of newer, more effective neoadjuvant and adjuvant therapies

A multidisciplinary team approach that identifies, coordinates, delivers, and monitors the ideal treatment on a patient-by-patient basis

In Canada, most high-volume centres are now using the multidisciplinary team approach for rectal cancer management.

SUMMARY

Although organ-sparing approaches show promising results in small single-centre studies, appropriate selection criteria remain uncertain. Local excision alone can be offered to patients with early rectal cancer (pT1) in the absence of adverse histopathologic features such as poor differentiation, tlv1, depth of invasion, or close margins. Patients with appropriate early T2 or T3 cancer should be considered for local excision only in the context of palliative intent or enrollment in a clinical trial. Nonoperative management for rectal cancer patients with a ccr should be offered in the context of a registry or clinical trial. All patients managed with organ preservation must be supported with diligent posttreatment multimodality surveillance. A multidisciplinary team approach is recommended for improving treatment selection and outcomes for patients with rectal cancer.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood Current Oncology's policy on disclosing conflicts of interest, and we declare that we have none.

AUTHOR AFFILIATIONS

*Department of Surgery, St. Paul’s Hospital, Providence Health Care, Vancouver, BC.

REFERENCES

1. Heald RJ, Husband EM, Ryall RDH. The mesorectum in rectal cancer surgery—the clue to pelvic recurrence? Br J Surg 1982;69:613–16.

2. Kapiteijn E, Marijnen CA, Nagtegaal ID, et al. on behalf of the Dutch Colorectal Cancer Group. Preoperative radiotherapy combined with total mesorectal excision for resectable rectal cancer. N Engl J Med 2001;345:638–46.

3. Sauer R, Becker H, Hohenberger W, et al. on behalf of the German Rectal Cancer Study Group. Preoperative versus postoperative chemoradiotherapy for rectal cancer. N Engl J Med 2004;351:1731–40.

4. Parks AG. A technique for excising extensive villous papillomatous change in the lower rectum. Proc R Soc Med 1968;61:441–2.

5. Garcia-Aguilar J, Mellgren A, Sirivongs P, Buie D, Madoff RD, Rothenberger DA. Local excision of rectal cancer without adjuvant therapy: a word of caution. Ann Surg 2000;231:435–51.

6. Nascimento R, Nivatvongs S, Larson DR, Burgart LJ. Long-term survival after local excision for T1 carcinoma of the rectum. Dis Colon Rectum 2004;47:1773–9.

7. Endreseth BH, Myrvold HE, Romundstad P, Hestvik UE, Bjerketet T, Wiré A on behalf of the Norwegian Rectal Cancer Group. Transanal excision vs. major surgery for T1 rectal cancer. Dis Colon Rectum 2005;48:1380–8.

8. Bentrem DJ, Okabe S, Wong WD, et al. T1 adenocarcinoma of the rectum: transanal excision or radical surgery? Ann Surg 2005;242:472–7.

9. Lee L, Kelly J, Nassif GJ, et al. Establishing the learning curve of transanal minimally invasive surgery for local excision of rectal neoplasms. Surg Endosc 2018;32:1368–76.

10. Clancy C, Burke JP, Albert MR, O’Connell PR, Winter DJ. Transanal endoscopic microsurgery versus standard transanal excision for the removal of rectal neoplasms: a systematic review and meta-analysis. Dis Colon Rectum 2015;58:254–61.

11. Moore JS, Cataldo PA, Osler T, Hyman NH. Transanal endoscopic microsurgery is more effective than traditional transanal excision for resection of rectal masses. Dis Colon Rectum 2008;51:1026–30.

12. de Graaf EJ, Burger JW, van IJsselveldt AL, Tetteroo GW, Dawson I, Hop WC. Transanal endoscopic microsurgery is superior to transanal excision of rectal adenomas. Colorectal Dis 2011;13:762–7.

13. Kidane B, Chadi SA, Kanters S, Colquhoun PH, Ott MC. Local resection compared with radical resection in the treatment of T1N0M0 rectal adenocarcinoma: a systematic review and meta-analysis. Dis Colon Rectum 2015;58:122–40.

14. Chang HC, Huang SC, Chen JS, et al. Risk factors for lymph node metastasis in pT1 and pT2 rectal cancer: a single-institute experience in 943 patients and literature review. Ann Surg Oncol 2012;19:2477–84.

15. Kikuchi R, Takano M, Takagi K, et al. Management of early invasive colorectal cancer. Risk of recurrence and clinical guidelines. Dis Colon Rectum 1995;38:1286–95.

16. Beaton C, Twine CP, Williams GL, Radcliffe GF. Systematic review and meta-analysis of histopathological factors influencing the risk of lymph node metastasis in early colorectal cancer. Colorectal Dis 2013;15:788–96.

17. Tateishi Y, Nakanishi Y, Taniguchi H, Shimoda T, Umemura S. Pathological prognostic factors predicting lymph node metastasis in submucosal invasive (T1) colorectal carcinoma. Mod Pathol 2010;23:1068–72.

18. Bosch SL, Teerenstra S, Wild JM, Cunningah C, Nagtegaal ID. Predicting lymph node metastasis in pT1 colorectal cancer: a systematic review of risk factors providing rationale for therapy decisions. Endoscopy 2013;45:827–34.

19. Glasgow SC, Bleier JI, Burgart LJV, Finne CO, Lowry AC. Meta-analysis of histopathological features of primary colorectal cancers that predict lymph node metastases. J Gastrointest Surg 2012;16:1019–28.

20. Bach SP, Hill JM, Monson JR, et al. on behalf of the Association of Coloproctology of Great Britain and Ireland Transanal Endoscopic Microsurgery Collaboration. A predictive model for local recurrence after transanal endoscopic microsurgery for rectal cancer. Br J Surg 2009;96:280–90.

21. Junginger T, Goenner U, Hitzler M, et al. Long-term oncologic outcome after transanal endoscopic microsurgery for rectal carcinoma. Dis Colon Rectum 2016;58:98–15.

22. Sittenberg KB, Sanoff HK, Penn DC, Meyers MO, Tepper JE. Practice patterns and long-term survival for early-stage rectal cancer. J Clin Oncol 2013;31:4276–82.

23. Greenberg JA, Shibata D, Herndon JE 2nd, Steele GD Jr, Mayer R, Bleday R. Local excision of distal rectal cancer: an update of Cancer and Leukemia Group B 8984. Dis Colon Rectum 2008;51:1185–91.

24. Borstlap WA, Coeymans TJ, Tanis PJ, et al. Meta-analysis of oncological outcomes after local excision of pT1–2 rectal cancer requiring adjuvant (chemo)radiotherapy or completion surgery: oncological outcomes after local excision of rectal cancer. Br J Surg 2016;103:1015–16.

25. Cutting JE, Hallam SE, Thomas MG, Messenger DE. A systematic review of local excision followed by adjuvant therapy in early rectal cancer: are pT1 tumours the limit? Colorectal Dis 2018;20:854–63.
26. Habr-Gama A, Perez RO, Nadalin W, et al. Operative versus nonoperative treatment for stage 0 distal rectal cancer following chemoradiation therapy. Ann Surg 2004;240:711–17.
27. Garcia-Aguilar I, Benfrø LA, Chow OS, et al. Organ preservation for clinical T2N0 distal rectal cancer using neoadjuvant chemoradiotherapy and local excision (acosog Z6041): results of an open-label, single-arm, multi-institutional, phase 2 trial. Lancet Oncol 2015;16:1537–46.
28. Lezoche E, Baldarelli M, Lezoche G, Paganini AM, Gesuita R, Guerrieri M. Randomized clinical trial of endoluminal locoregional resection versus laparoscopic total mesorectal excision for T2 rectal cancer after neoadjuvant therapy. Br J Surg 2012;99:1211–18.
29. Roulier E, Rouanet P, Tuech JJ, et al. Organ preservation for rectal cancer (greccar 2): a prospective, randomised, open-label, multicentre, phase 3 trial. Lancet 2017;380:469–79.
30. Stijns RCH, de Graaf EJR, Punt CJA, et al. Long-term oncological and functional outcomes of chemoradiotherapy followed by organ-sparing transanal endoscopic microsurgery for distal rectal cancer: the cartesi study. JAMA Surg 2019;154:47–54.
31. Schrag D, Weiser MR, Goodman KA, et al. Neoadjuvant chemotherapy without routine use of radiation therapy for patients with locally advanced rectal cancer: a pilot trial. J Clin Oncol 2014;32:513–18.
32. Perez RO, Habr-Gama A, Sào Julião GP, Procurshim I, Scarnavini Neto A, Gama-Rodrigues J. Transanal endoscopic microsurgery for residual rectal cancer after neoadjuvant chemoradiation therapy is associated with significant immediate pain and hospital readmission rates. Dis Colon Rectum 2011;54:545–51.
33. Petrelli F, Sgroi G, Sarti E, Barni S. Increasing the interval between neoadjuvant chemoradiation therapy and surgery in rectal cancer: a meta-analysis of published studies. Ann Surg 2016;263:458–64.
34. Nigro ND, Vaitkevicius VK, Considine B Jr. Combined therapy for cancer of the anal canal: a preliminary report. Dis Colon Rectum 1974;17:354–6.
35. Habr-Gama A, Gama-Rodrigues J, Sào Julião GP, et al. Local recurrence after complete clinical response and wait and wait in rectal cancer after neoadjuvant chemoradiation: impact of salvage therapy on local disease control. Int J Radiat Oncol Biol Phys 2014;88:822–8.
36. Martens MH, Maas M, Heijnen LA, et al. Long-term outcome of an organ preservation protocol after neoadjuvant treatment for rectal cancer. J Natl Cancer Inst 2016;108:pdtjw171.
37. Chadli SA, Malcomson L, Ensor J, et al. Factors affecting local regrowth after watch and wait for patients with a clinical complete response following chemoradiation therapy in rectal cancer (InterCoRe consortium): an individual participant data meta-analysis. Lancet Gastroenterol Hepatol 2018;3:825–36.
38. Smith FM, Wiland H, Mace A, Pai RK, Kalady MF. Clinical criteria underestimate complete pathological response in rectal cancer treated with neoadjuvant chemoradiotherapy. Dis Colon Rectum 2014;57:311–15.
39. Glynne-Jones R, Wyrwicz L, Tirtel E, et al. on behalf of the esmo Guidelines Committee. Rectal cancer: esmo clinical practice guidelines for diagnosis, treatment and follow-up. Ann Oncol 2017;28(suppl 4):iv22–40. [Erratum in: Ann Oncol 2018;29(suppl 4):iv263]
40. Patel UB, Taylor F, Blomqvist L, et al. Magnetic resonance imaging–detected tumor response for locally advanced rectal cancer predicts survival outcomes: mertainty experience. J Clin Oncol 2011;29:3753–60.
41. Pham TT, Liney GP, Wong K, Barton MB. Functional mı for quantitative treatment response prediction in locally advanced rectal cancer. Br J Radiol 2017;90:20151078.
42. Francois Y, Nemoz CJ, Baulieux J, et al. Influence of the interval between preoperative radiation therapy and surgery on downstaging and on the rate of sphincter-sparing surgery for rectal cancer: the Lyon R90-01 randomized trial. J Clin Oncol 1999;17:2396.
43. Battersby NJ, Dattani M, Rao S, et al. A rectal cancer feasibility study with an embedded phase III trial design assessing magnetic resonance tumour regression grade (mrtbg) as a novel biomarker to stratify management by good and poor response to chemoradiotherapy (trigger): study protocol for a randomised controlled trial. Trials 2017;18:394.
44. Rombouts AJM, Al-Najami I, Abbott NL, et al. on behalf of the star-trec Collaborative Group. Can we save the rectum by watchful waiting or transanal microsurgery following (chemo) radiotherapy versus total mesorectal excision for early rectal cancer (star-trec study)?: protocol for a multicentre, randomised feasibility study. BMJ Open 2017;7:e019474.
45. Li J, Liu H, Yin J, et al. Wait-and-see or radical surgery for rectal cancer patients with a clinical complete response after neoadjuvant chemoradiotherapy: a cohort study. Oncotarget 2015;6:42354–61.
46. Smith RK, Fry RD, Mahmoud NN, Paulson EC. Surveillance after neoadjuvant therapy in advanced rectal cancer with complete clinical response can have comparable outcomes to total mesorectal excision. Int J Colorectal Dis 2015;30:769–74.
47. Araujo RO, Valadão M, Borges D, et al. Nonoperative management of rectal cancer after chemoradiation opposed to resection after complete clinical response. A comparative study. Eur J Surg Oncol 2015;41:1456–63.
48. Lai CL, Lai MJ, Wu CC, Jao SW, Hsiao CW. Rectal cancer with complete clinical response after neoadjuvant chemoradiotherapy, surgery, or “watch and wait.” Int J Colorectal Dis 2016;31:413–19.
49. Dietz DW on behalf of the Consortium for Optimizing Surgical Treatment of Rectal Cancer. Multidisciplinary management of rectal cancer: the ostrich. J Gastrointest Surg 2013;17:1863–8.