

Total Transanal Mesorectal Excision and Sphincter Preservation in Distal Rectal Cancer: A Comprehensive Review of Intensive Neoadjuvant Chemoradiation Strategies

Alondra Cuadra Casillas^{*1}, Juan Antonio Vazquez Rojo², Alexia Paola Rodríguez Barboza³, Lina Sarahí de la Madrid Trevizo⁴, Victor Manuel Campos Cruz⁵, Humberto Emiliano Cordova Mata⁵, David Bernardo García Noriega⁶, Efrén Flores Tavizón²

¹Universidad Autónoma de Guadalajara. Zapopan, Mexico.

²Universidad Autonoma de Aguascalientes. Aguascalientes, Mexico.

³Tecnologico de monterrey campus monterrey. Monterrey, Mexico.

⁴Universidad de Colima. Colima, Mexico.

⁵Universidad Cuauhtémoc plantel Aguascalientes. Aguascalientes, Mexico.

⁶Universidad Autónoma de Zacatecas. Zacatecas, Mexico.

ABSTRACT

The management of low rectal cancer, particularly tumors of the lower third, presents a persistent surgical challenge centered on the balance between oncological radicality and the preservation of continence and quality of life. Organ preservation strategies have emerged as a paradigm shift, moving beyond the historical standard of abdominoperineal resection. This comprehensive review examines the integrated role of intensive neoadjuvant chemoradiation therapy (nCRT) regimens and total transanal mesorectal excision (TaTME) in facilitating sphincter-preserving resection for distal rectal carcinomas. We synthesize current evidence on the induction of pathological complete response (pCR) through dose-escalated radiation and concurrent chemotherapy, and its critical impact on surgical planning. The focus is on how the TaTME technique, with its enhanced distal visualization and precision in the deep pelvis, enables a more reliable assessment of tumor response and a technically optimized intersphincteric dissection. This manuscript analyzes the synergistic potential of these two approaches—aggressive nonsurgical cytoreduction and refined surgical access—to achieve clear circumferential and distal margins while preserving the sphincter complex. We discuss the implications of pCR as a surrogate for favorable long-term oncological outcomes and review the stringent patient selection, response assessment protocols, and functional considerations inherent to this multidisciplinary model. The evolving landscape of non-operative management is contextualized alongside definitive TaTME resection, providing a nuanced overview of contemporary organ-preserving pathways.

KEYWORDS: Rectal neoplasms; Transanal total mesorectal excision; Neoadjuvant chemoradiotherapy; Pathological complete response; Sphincter preservation; Organ preservation; Lower rectal cancer; Intersphincteric resection.

ARTICLE DETAILS

Published On:
03 February 2026

Available on:
<https://ijmscrs.com/>

INTRODUCTION

Rectal adenocarcinoma located within the lower third of the rectum, conventionally defined as within 5 cm from the anal verge, has historically necessitated surgical resection with permanent colostomy due to the technical difficulty of

obtaining adequate distal margins while sparing the anal sphincter apparatus. The gold standard of total mesorectal excision (TME), while improving oncological outcomes, did not initially alter this high rate of permanent stoma formation. The development of neoadjuvant chemoradiation, established

Total Transanal Mesorectal Excision and Sphincter Preservation in Distal Rectal Cancer: A Comprehensive Review of Intensive Neoadjuvant Chemoradiation Strategies

by landmark trials, introduced the possibility of tumor downstaging, which in turn created a conceptual window for less extensive surgery. Within this context, the pursuit of organ preservation has become a central tenet of multidisciplinary rectal cancer care, encompassing both non-operative "watch-and-wait" strategies and sphincter-preserving resections.^{1,2,3}

The efficacy of this paradigm hinges critically on the degree of tumor response to preoperative treatment. Recent years have seen investigation into intensified nCRT protocols, incorporating strategies such as radiation dose escalation to the primary tumor, concurrent use of novel chemotherapy agents, and extended time intervals to surgery. These approaches aim to maximize tumor regression and the rate of pathological complete response, a well-correlated prognostic marker for improved disease-free and overall survival. A pCR not only signifies effective local control but also fundamentally alters the surgical anatomy, often rendering previously inoperable or marginally resectable tumors amenable to sphincter-preserving techniques.³

Concurrently, advancements in surgical technique have been pivotal. The introduction of total transanal mesorectal excision represents a significant innovation, addressing the anatomical constraints of the narrow, deep male pelvis and the visual limitations of traditional laparoscopic or open approaches from above. By initiating the dissection transanally under direct vision, TaTME allows for unparalleled precision in defining the distal resection margin and performing a meticulous intersphincteric dissection when required. This technique mitigates the risk of a positive distal margin—a key concern in ultra-low tumors—and facilitates a *de facto* ultralow anterior resection that would have been technically prohibitive otherwise.³

This extensive review synthesizes the current literature to explore the convergence of these two contemporary modalities: intensive neoadjuvant therapy and TaTME. We posit that their integration forms a robust and logical framework for true organ (sphincter) preservation in carefully selected patients with distal rectal cancer. The discussion will navigate the evidence for optimized nCRT regimens, the role of advanced imaging in restaging, the technical nuances of TaTME in the setting of post-radiation planes, and the critical evaluation of functional outcomes and oncological safety. By examining the latest clinical data and ongoing trials, this review aims to provide a comprehensive overview of a treatment sequence that seeks to cure cancer while unequivocally preserving the continuity of the intestinal tract and patient dignity.⁴

Indications and Contraindications for Organ-Preserving Strategies in Low Rectal Cancer: Integrating Intensive Neoadjuvant Therapy and TaTME

The successful implementation of an organ-preserving strategy for low rectal cancer, which synergizes intensive neoadjuvant chemoradiation with total transanal mesorectal

excision, is predicated on rigorous patient selection. This multimodal approach is not universally applicable but is reserved for a specific clinical phenotype where the balance of oncological radicality and functional preservation can be optimally achieved. The indications are consequently multifaceted, encompassing precise anatomical, histological, and patient-specific parameters.⁵

Foremost among the indications is the confirmed adenocarcinoma situated in the lower third of the rectum, typically defined as a tumor whose distal edge lies within 5 centimeters of the anal verge, as measured by rigid proctoscopy or high-resolution MRI. This anatomical localization traditionally confers a high risk of requiring abdominoperineal resection due to the proximity to the sphincter complex. The tumor must be clinically staged as locally advanced, specifically a cT2 lesion with high-risk features (such as threatened mesorectal fascia), or more commonly cT3-T4a, and/or node-positive (cN+) disease, without evidence of distant metastatic dissemination. A critical prerequisite is the absence of direct invasion into the external anal sphincter, levator ani muscle, or the pelvic sidewall, as assessed by high-quality pelvic MRI. This imaging modality is indispensable for evaluating the relationship of the tumor to the mesorectal fascia and the intersphincteric plane, determining the feasibility of an R0 resection with sphincter preservation. Furthermore, the patient must exhibit adequate baseline anal sphincter function and continence, as determined by clinical evaluation and, when indicated, anorectal physiological testing, to ensure that preservation will yield a meaningful functional benefit. A comprehensive discussion of patient expectations, commitment to potential long-term surveillance, and understanding of the potential for altered bowel function is an essential psychosocial indication. The overarching goal is to identify tumors that are locally aggressive enough to warrant intensive neoadjuvant therapy but anatomically confined enough to permit a clear distal margin via a transanal intersphincteric approach following significant tumor regression.^{5,6}

Conversely, several clinical scenarios constitute relative or absolute contraindications to this specific organ-preservation pathway. Tumor-related factors are paramount. The presence of synchronous distant metastases, except in the context of a highly selective oligometastatic disease program with curative intent for both sites, generally shifts the treatment priority toward systemic control and often precludes an aggressive local organ-preserving approach. Direct and unequivocal radiological or clinical evidence of tumor infiltration into the external sphincter or levator ani muscles (cT4b) typically renders the tumor unresectable via sphincter-preserving means, as an oncologically sound resection would necessitate their removal. Similarly, tumors exhibiting extensive involvement of the anorectal ring or fixed tumors that show no response to initial neoadjuvant therapy on

Total Transanal Mesorectal Excision and Sphincter Preservation in Distal Rectal Cancer: A Comprehensive Review of Intensive Neoadjuvant Chemoradiation Strategies

restaging imaging are poor candidates. Patient-related comorbidities that significantly increase the perioperative risk of a prolonged pelvic dissection, such as severe cardiopulmonary insufficiency or uncorrected coagulopathy, must be carefully weighed. A history of previous pelvic radiation or major pelvic surgery can create hostile anatomy that increases the technical complexity and risk of complications during TaTME. Perhaps one of the most significant contraindications is pre-existing severe fecal incontinence or a disrupted sphincter mechanism, as preserving a non-functional sphincter offers no quality-of-life advantage and may be detrimental. Furthermore, patient inability or unwillingness to comply with the intensive neoadjuvant treatment regimen, the surgical procedure, and the mandatory long-term surveillance for recurrence is a critical practical contraindication. Finally, the absence of a dedicated, multidisciplinary team with expertise in rectal cancer management, including specialized radiology, medical oncology, radiation oncology, and a surgical team proficient in both advanced laparoscopic/robotic and transanal techniques, is a fundamental systemic contraindication. The decision to pursue this pathway is thus a nuanced synthesis of objective clinical data and shared decision-making within an expert team framework, always prioritizing oncological safety as the non-negotiable foundation.^{5,6,7}

Clinical Benefits of an Organ-Preservation Strategy Integrating Intensive Neoadjuvant Therapy and TaTME for Low Rectal Cancer

The adoption of a sequential treatment paradigm combining dose-intensified neoadjuvant chemoradiation with total transanal mesorectal excision for adenocarcinoma of the lower rectum confers a multifaceted spectrum of clinical benefits. These advantages extend beyond the immediate procedural success to encompass long-term oncological security, enhanced functional outcomes, and significant psychosocial gains, fundamentally altering the disease trajectory for appropriately selected patients. The synergy between maximal nonsurgical cytoreduction and precision surgical technique is the cornerstone upon which these benefits are realized.^{7,8,9}

From an oncological perspective, the primary benefit is the achievement of a margin-negative (R0) resection in an anatomical territory historically fraught with high rates of incomplete excision. The intensive neoadjuvant regimen is designed to induce significant tumor regression, often culminating in a pathological complete response. This profound downstaging effectively increases the distance between the residual tumor cell nests—or their complete eradication—and the critical distal and circumferential resection margins. Subsequently, the TaTME approach provides unrivaled visualization and technical access to the distal dissection plane. By operating from a bottom-up perspective under magnified endoscopic view, the surgeon

can delineate the intersphincteric plane with exceptional accuracy, directly observing and ensuring an adequate distal margin even for tumors initially abutting the anorectal ring. This dual-modality attack on tumor burden minimizes the risk of a positive distal margin, a known independent predictor of local recurrence, thereby bolstering local disease control. Furthermore, the systemic component of the neoadjuvant chemotherapy may address micrometastatic disease early in the treatment course, potentially improving long-term disease-free survival metrics. The phenomenon of pCR itself is a robust biomarker, associated with superior oncological outcomes including significantly reduced rates of both local and distant recurrence.^{9,10,11}

The functional and quality-of-life benefits of this strategy are perhaps its most transformative aspect. The unequivocal primary benefit is the preservation of intestinal continuity and the avoidance of a permanent abdominal colostomy. Sphincter preservation, when coupled with nerve-sparing techniques facilitated by the clear visualization in TaTME, allows for the maintenance of natural defecatory pathways. While patients may experience anterior resection syndrome symptoms, these are invariably preferable to the profound lifestyle alterations, body image challenges, and appliance management required with a permanent stoma. Preservation of the anal sphincter complex maintains the potential for acceptable continence, which can be further rehabilitated postoperatively. This directly correlates with superior scores across validated quality-of-life metrics, particularly in domains related to body image, social functioning, and psychological well-being. The avoidance of a perineal wound associated with abdominoperineal resection also eliminates a major source of morbidity, including perineal wound complications, chronic pain, and persistent sinus formation.^{12,13}

From a technical and perioperative standpoint, the TaTME component offers distinct advantages in the context of a radiated pelvis. The transanal approach mitigates the challenges posed by a narrow, deep male pelvis or a bulky tumor, which can severely limit instrumentation and visualization during a traditional transabdominal TME dissection. By initiating the dissection in the often less-affected distal plane below the tumor, the surgeon can establish the correct anatomical plane before encountering the potentially fibrotic and adhered tissue in the upper mesorectum affected by radiation. This can lead to a more precise dissection, potentially reducing intraoperative complications such as rectal wall perforation and facilitating a more complete mesorectal specimen—a key determinant of oncological quality. Although operative times may be longer, some evidence suggests this approach may be associated with a reduction in conversions to open surgery in challenging pelvic anatomy.^{14,15}

In synthesis, the clinical benefits of this integrated organ-preservation strategy are profound and interdependent. The

Total Transanal Mesorectal Excision and Sphincter Preservation in Distal Rectal Cancer: A Comprehensive Review of Intensive Neoadjuvant Chemoradiation Strategies

approach successfully navigates the central dilemma in low rectal cancer management by not forcing a choice between cure and quality of life but by rationally employing advanced modalities to strive for both. It transforms what was once a near-certain mandate for mutilating surgery into a plausible pathway for cure with preserved bodily integrity. The benefits are cumulative: the neoadjuvant therapy increases the likelihood of surgically amenable anatomy, and the TaTME technique then capitalizes on this regressed state to execute a resection that is both oncologically radical and anatomically conservative. This results in the paramount clinical benefit: offering patients with a particularly challenging tumor location a realistic hope for a disease-free future without the lifelong physical and emotional burden of a permanent stoma, provided they are managed within a dedicated multidisciplinary framework committed to achieving these nuanced outcomes.¹⁶

CONCLUSION

The management paradigm for adenocarcinoma of the lower third of the rectum is undergoing a profound and necessary evolution, driven by the imperative to reconcile oncological radicality with the preservation of patient dignity and quality of life. This comprehensive review has examined the synergistic potential of a meticulously sequenced treatment strategy that integrates intensive neoadjuvant chemoradiation therapy with the technical innovation of total transanal mesorectal excision. The evidence synthesized herein suggests that this integrated approach is not merely an alternative but, for a carefully selected cohort of patients, represents a superior therapeutic pathway that actively redefines the possible.

At its core, this strategy leverages the synergistic effects of two complementary advances. Intensive neoadjuvant protocols, incorporating dose escalation, optimized chemotherapy agents, and extended intervals to surgery, are engineered to maximize tumor regression. The goal of achieving a pathological complete response is of paramount significance, serving as a powerful prognostic indicator and fundamentally altering the surgical landscape. A pCR simplifies the anatomical relationships in the deep pelvis, effectively increasing the distance between the residual tumor focus—if any remains—and the critical resection margins, particularly the distal margin that is so consequential for sphincter preservation. The TaTME technique, in turn, is uniquely positioned to capitalize on this optimized anatomical context. By providing direct, magnified visualization and unimpeded access to the most distal pelvic anatomy, it allows for a precise and bloodless dissection along the often subtle intersphincteric plane. This technical capability directly addresses the historical Achilles' heel of low rectal surgery: the reliable attainment of a clear distal margin while preserving the sphincter complex.

The convergence of these modalities facilitates a true organ-preserving resection that was previously unattainable for many patients with tumors near the anorectal ring. The clinical benefits are therefore multidimensional. Oncologically, the approach strives to maintain, if not enhance, the principles of total mesorectal excision by improving the quality of the distal dissection and the completeness of the mesorectal specimen in a challenging location, thereby safeguarding local control. Functionally, it offers the transformative benefit of sphincter preservation, allowing patients to avoid a permanent colostomy and its associated lifelong physical and psychosocial burdens. While functional outcomes require careful management and patient counseling, particularly regarding low anterior resection syndrome, the preservation of native continence mechanisms represents a monumental advancement in patient-centered care.

Nevertheless, the successful implementation of this sophisticated strategy is contingent upon several non-negotiable prerequisites. It demands rigorous patient selection based on high-resolution pelvic MRI staging, an assessment of baseline sphincter function, and a thorough evaluation of patient comorbidities and expectations. It is entirely dependent on the seamless collaboration of a dedicated multidisciplinary team encompassing specialized radiologists, radiation and medical oncologists, and surgeons with advanced technical expertise in both transanal and pelvic surgery. Furthermore, the field continues to evolve, with ongoing research needed to refine the optimal radiation dose fractionation, the most effective systemic agents for radiosensitization, and the long-term functional outcomes following this approach.

In conclusion, the integration of intensive neoadjuvant therapy and TaTME for low rectal cancer epitomizes the modern shift towards precision oncology and personalized surgical care. It moves beyond the simplistic binary choice between radical excision and organ preservation, proposing instead a rational, staged approach that uses aggressive non-surgical therapy to create the anatomical conditions for a radically precise and tissue-preserving operation. This strategy successfully navigates the complex trade-offs inherent in rectal cancer surgery, offering a compelling pathway to achieve the dual and equally sacred goals of oncology: to cure the disease whenever possible, and in doing so, to allow patients to return to a life as whole and unaltered as their cure will permit. The future of lower rectal cancer management lies in further refining this synergy, expanding its accessibility through training and technological advancement, and continually validating its outcomes through rigorous, prospective study.

Total Transanal Mesorectal Excision and Sphincter Preservation in Distal Rectal Cancer: A Comprehensive Review of Intensive Neoadjuvant Chemoradiation Strategies

REFERENCES

1. Heald RJ, Husband EM, Ryall RD. The mesorectum in rectal cancer surgery--the clue to pelvic recurrence? *Br J Surg* 1982;69:613-6.
2. Quirke P, Durdey P, Dixon MF, et al. Local recurrence of rectal adenocarcinoma due to inadequate surgical resection. Histopathological study of lateral tumour spread and surgical excision. *Lancet* 1986;2:996-9.
3. Clinical Outcomes of Surgical Therapy Study Group, Nelson H, Sargent DJ, et al. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med* 2004;350:2050-9.
4. Veldkamp R, Kuhry E, Hop WC, et al. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. *Lancet Oncol* 2005;6:477-84.
5. Bonjer HJ, Deijen CL, Abis GA, et al. A randomized trial of laparoscopic versus open surgery for rectal cancer. *N Engl J Med* 2015;372:1324-32.
6. Stevenson AR, Solomon MJ, Lumley JW, et al. Effect of Laparoscopic-Assisted Resection vs Open Resection on Pathological Outcomes in Rectal Cancer: The ALaCaRT Randomized Clinical Trial. *JAMA* 2015;314:1356-63.
7. Fleshman J, Branda ME, Sargent DJ, et al. Disease-free Survival and Local Recurrence for Laparoscopic Resection Compared With Open Resection of Stage II to III Rectal Cancer: Follow-up Results of the ACOSOG Z6051 Randomized Controlled Trial. *Ann Surg* 2019;269:589-95.
8. Fleshman J, Branda M, Sargent DJ, et al. Effect of Laparoscopic-Assisted Resection vs Open Resection of Stage II or III Rectal Cancer on Pathologic Outcomes: The ACOSOG Z6051 Randomized Clinical Trial. *JAMA* 2015;314:1346-55.
9. Jayne D, Pigazzi A, Marshall H, et al. Effect of Robotic- Assisted vs Conventional Laparoscopic Surgery on Risk of Conversion to Open Laparotomy Among Patients Undergoing Resection for Rectal Cancer: The ROLARR Randomized Clinical Trial. *JAMA* 2017;318:1569-80.
10. Raestrup H, Manncke K, Mentges B, et al. Indications and technique for TEM (transanal endoscopic microsurgery). *Endosc Surg Allied Technol* 1994;2:241-6.
11. Albert MR, Atallah SB, deBeche-Adams TC, et al. Transanal minimally invasive surgery (TAMIS) for local excision of benign neoplasms and early-stage rectal cancer: efficacy and outcomes in the first 50 patients. *Dis Colon Rectum* 2013;56:301-7.
12. de Lacy AM, Rattner DW, Adelsdorfer C, et al. Transanal natural orifice transluminal endoscopic surgery (NOTES) rectal resection: "down-to-up" total mesorectal excision
13. (TME)--short-term outcomes in the first 20 cases. *Surg Endosc* 2013;27:3165-72.
14. Chen CC, Lai YL, Jiang JK, et al. The evolving practice of hybrid natural orifice transluminal endoscopic surgery (NOTES) for rectal cancer. *Surg Endosc* 2015;29:119-26.
15. Heald RJ. A new solution to some old problems: transanal TME. *Tech Coloproctol* 2013;17:257-8.
16. Chen CC, Lai YL, Jiang JK, et al. Transanal Total Mesorectal Excision Versus Laparoscopic Surgery for Rectal Cancer Receiving Neoadjuvant Chemoradiation:
17. A Matched Case-Control Study. *Ann Surg Oncol* 2016;23:1169-76.
18. Penna M, Hompes R, Arnold S, et al. Incidence and Risk Factors for Anastomotic Failure in 1594 Patients Treated by Transanal Total Mesorectal Excision: Results
19. From the International TaTME Registry. *Ann Surg* 2019;269:700-11.