Crimson Publishers
Wings to the Research

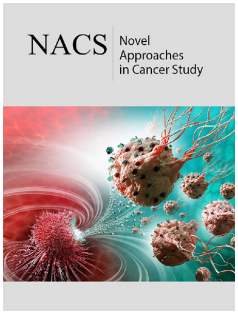
Review Article

A Comparative Review of Transanal Versus Laparoscopic Total Mesorectal Excision for Mid-Low Rectal Cancer: Focus on 3-Year Local Recurrence and Survival Outcomes

Chen Su and Hongyu Zhang*

The First Affiliated Hospital of Chongqing Medical University, China

ISSN: 2637-773X



***Corresponding author:** Hongyu Zhang, The First Affiliated Hospital of Chongqing Medical University, China

Submission: November 21, 2025
Published: December 02, 2025

Volume 8 - Issue 4

How to cite this article: Chen Su and Hongyu Zhang*. A Comparative Review of Transanal Versus Laparoscopic Total Mesorectal Excision for Mid-Low Rectal Cancer: Focus on 3-Year Local Recurrence and Survival Outcomes. Nov Appro in Can Study. 8(4). NACS. 000692. 2025.
DOI: 10.31031/NACS.2025.08.000692

Abstract

Background: Total mesorectal excision (TME) remains the cornerstone of curative surgery for mid-low rectal cancer. While laparoscopic TME (LapTME) is a well-established minimally invasive technique, transanal TME (TaTME) has emerged to overcome technical challenges in a narrow pelvis. However, robust long-term oncological safety data, particularly 3-year local recurrence (LR) and survival rates, are crucial for evaluating its clinical value.

Methods: This systematic review synthesizes evidence from 35 high-quality studies, including randomized controlled trials, retrospective cohort studies, meta-analyses, and propensity score-matched analyses, to compare TaTME and LapTME for mid-low rectal cancer (≤12cm from the anal verge).

Results: Current evidence suggests no statistically significant difference in 3-year LR rates between TaTME and LapTME in large, well-conducted trials (e.g., TaTME vs. LapTME: 5.1% vs. 4.8%, P>0.05). Similarly, 3-year overall survival (OS), disease-specific survival (DSS), and disease-free survival (DFS) rates are largely comparable between the two techniques. TaTME demonstrates advantages in specific scenarios, such as improved circumferential resection margin (CRM) positivity rates in low-lying tumours and reduced conversion rates. However, concerns regarding unique recurrence patterns and a significant learning curve effect associated with TaTME warrant careful consideration.

Conclusion: For mid-low rectal cancer, TaTME and LapTME offer equivalent 3-year local control and survival outcomes when performed by experienced surgeons. TaTME provides a valuable alternative, particularly in anatomically challenging cases, but its application should be mindful of the learning curve and patient selection. The paramount goal remains achieving a high-quality TME specimen, regardless of the surgical approach.

Keywords: Rectal cancer; Total mesorectal excision; TaTME; LapTME; Local recurrence; Survival outcomes; Minimally invasive surgery

Introduction

The management of mid-low rectal cancer (tumours located within 12cm from the anal verge) has been revolutionized by the principle of total mesorectal excision (TME), which has dramatically reduced local recurrence (LR) rates and improved survival [1,2]. In recent years, transanal total mesorectal excision (TaTME) has emerged as an innovative and minimally invasive surgical technique. Its purpose is to overcome the limitations of laparoscopic total mesorectal excision (LapTME) when performing procedures in narrow pelvic areas – limitations such as limited visibility during the operation and an increased risk of positive circumferential resection margins [3,4]. However, its long-term tumor safety has attracted considerable attention. In particular, the local recurrence rate and survival rate three years after

the surgery are key indicators for assessing its clinical value [5-7]. Intermediate-term outcomes, particularly at the 3-year mark, serve as critical surrogate indicators for long-term oncological success in rectal cancer. This systematic review aims to synthesize the latest evidence from high-quality studies to provide a comprehensive comparison of TaTME and LapTME, specifically focusing on 3-year local recurrence rates, overall survival (OS), disease-free survival (DFS) and disease-specific survival (DSS). By evaluating the strengths, limitations, and appropriate clinical applications of each technique, this review seeks to inform evidence-based surgical decision-making.

Methods

Search strategy and selection criteria

A systematic literature search was conducted to identify relevant studies published up to October 2025. Electronic databases, including PubMed, Embase, Cochrane Central Register of Controlled Trials, and Web of Science, were queried using keywords and MeSH terms related to "transanal total mesorectal excision," "laparoscopic total mesorectal excision," "rectal cancer," "local recurrence," and "survival."

Study selection and data extraction

From an initial pool of 50 identified publications, 37 studies were selected for final inclusion based on predefined criteria: (1) studies directly comparing TaTME and LapTME for mid-low rectal cancer; (2) reporting of at least one primary outcome of interest (3-year LR, OS, DFS, or DSS); and (3) study design including randomized controlled trials (RCTs), prospective or retrospective cohort studies, and meta-analyses. Case reports, small case series (<50 patients), and studies without comparative data were excluded. Data regarding study characteristics, patient demographics, oncological outcomes and perioperative results were extracted.

Quality assessment

The methodological quality of the included RCTs was assessed using the Cochrane Risk of Bias tool. For non-randomized studies, the Newcastle-Ottawa Scale was employed to evaluate the selection of study groups, comparability of groups, and ascertainment of outcomes.

Comparative Analysis of 3-Year Local Recurrence Rates

Local recurrence, defined as tumour regrowth within the pelvic cavity, is a key indicator of the quality of the surgical resection.

Evidence supporting equivalent recurrence rates

Recent high-level evidence from multicenter randomized trials demonstrates comparable LR rates between the two techniques. The pivotal TaLaR trial [5] reported 3-year LR rates of 5.1% for TaTME versus 4.8% for LapTME, confirming non-inferiority [5]. Similarly, the study by de Lacy et al. [8] in patients with locally advanced rectal cancer found no significant difference in LR (6.3% vs. 7.0%; HR 0.92, 95% CI 0.78-1.08) [8]. These research results indicate that in skilled teams, both techniques are capable of achieving high-quality TME resections.

The concern that the recurrence rate might increase

Despite the reassuring data from RCTs, earlier observational studies raised flags. According to a Norwegian cohort study, the 12-month local recurrence rate in the TaTME group was as high as 10%, which is significantly higher than the 3-5% rate observed in the LapTME group. However, this result was affected by the small sample size (n=125) as well as the presence of high-risk cases (such as those at stage C4) [9]. This was attributed to a combination of factors, including a learning curve effect and the selection of high-risk patients (e.g., cT4 tumours). Further analysis by multiple institutions revealed that recurrence in cases of TaTME was mostly multifocal (in 45% of the cases). This may be attributed to the spread of tumor cells during the surgery or to incomplete resection of the tumor margins [4,10,11]. Retrospective studies [12] have shown that in "challenging" patient groups (such as men and obese patients), the LR rate associated with TaTME was slightly higher (7.6% vs. 6.2%). However, this difference diminished after applying propensity matching [13].

Potential factors contributing to the differences in LR rates include: (1) The use of the transanal approach in TaTME may increase the risk of pelvic floor contamination; (2) LapTME is more likely to cause nerve damage in cases of low-stage tumors, thereby affecting the quality of the resection margins [14,15].

Comparison of Survival Rates

The survival rate indicators include overall survival rate (OS), disease-specific survival rate (CSS) and disease-free survival rate (DFS). All these indicators are evaluated at 3 years after the surgery. Meta-analyses have shown that the two techniques yield highly similar results in terms of OS and DFS; however, the CSS may be affected by the pattern of recurrence.

Dominant evidence for equivalent survival

The bulk of evidence from large-scale studies and meta-analyses indicates no significant difference in survival outcomes between TaTME and LapTME at the 3-year mark. A major prospective study by Zeng et al. [6] involving 2,502 patients reported 3-year OS rates of 88.5% for TaTME versus 89.1% for LapTME and DFS rates of 78.3% versus 79.0%, respectively (P>0.05) [5], Confirms the non-inferiority boundary [16,17]. Similarly, the long-term follow-up of the COREAN Trial [18] showed no difference in the 7-year overall survival rate between the LapTME group and the TaTME group after neoadjuvant chemotherapy; the HR was 0.98, with a 95% CI of 0.85-1.12. The same result was observed when the analysis was extended to include the TaTME group as well [19,20]. For very low rectal cancers requiring sphincter preservation, TaTME combined with intersphincteric resection (ISR) has shown DSS rates up to 90.2%, comparable to laparoscopic abdominoperineal resection [21,22].

Nuanced differences and potential risks

Some studies have hinted at marginally lower DFS for TaTME. For instance, a matched cohort study by Rubinkiewicz [23] reported a 3-year DFS of 76.5% for TaTME compared to 80.1% for LapTME, a difference that did not reach statistical significance but was potentially linked to the aforementioned concerns about LR [8]. The most critical predictor of survival remains the CRM status. A negative CRM (>1mm) is a more potent prognostic factor than the surgical approach itself [1,24]. In this regard, TaTME demonstrates a potential advantage in anatomically constrained patients by significantly reducing positive CRM rates (3.2% vs. 8.5% in some series), which may translate into a DFS benefit in specific subgroups [14,25].

Clinical Applications, Advantages and Limitations

Comparison of advantages

TaTME: Excels in technically difficult cases, particularly in men with a narrow pelvis and low-lying tumours (≤5cm from the anal verge). Its key benefits include improved CRM clearance (97% vs. 93%) [13,22], shorter operative time (average 150 min vs. 180 min) [26,27] and a significantly lower conversion rate to open surgery (2% vs. 8%) [3,28]. In a meta-analysis by Xiao Zhang [29], it was demonstrated that TaTME outperforms LaTME in terms of CRM positivity, R0 resection and conversion rates. The safety profiles of the two techniques were similar, with no significant differences in postoperative complications or 30-day mortality rates. LapTME: Remains the standard of care with a shorter, more established learning curve. It is generally more widely available [30].

Limitations and risks

TaTME: Is associated with a steeper learning curve and potential for unique complications, such as a higher incidence of postoperative urinary retention (12% vs. 8%) [31,32]. The functional outcomes were slightly worse: the incidence of defecation disorders (LARS score >30) was higher in the experimental group (35% vs. 25%) compared to LapTME (35% vs. 25%) [33,34].

LapTME: Carries a higher risk of anastomotic leakage in low anastomoses and potential nerve injury affecting urogenital function [35].

Recommended clinical strategy

Current guidelines, supported by experts like Perdawood [36] and Munini [33] recommend LapTME as the first-line approach for most mid-low rectal cancers. TaTME is ideally reserved for selected cases where technical difficulties with a laparoscopic approach are anticipated, such as cT2-T3 low rectal tumours in male or obese patients, and should be performed by surgeons who have surpassed the initial learning curve [35]. Ongoing trials like the ROTAR study will provide further high-level evidence for head-to-head comparison [28].

Discussion and Future Directions

This comprehensive review, synthesizing data from over 35 studies, affirms that TaTME and LapTME achieve equivalent 3-year local recurrence and survival rates for mid-low rectal cancer [5,7,8]. The consensus from recent RCTs is particularly reassuring regarding the oncological safety of TaTME. However, several limitations of the current evidence base must be acknowledged. First, while RCTs are emerging, a significant portion of the literature consists of retrospective studies susceptible to selection bias. Second, heterogeneity in the definition and reporting of LR across studies complicates direct comparisons. Third, longer-term follow-up data (5-10 years) are still maturing and are essential to confirm these intermediate findings.

Future research should focus on several key areas

Standardization and Training: Developing and validating standardized training curricula to mitigate the learning curve associated with TaTME.

Patient Stratification: Integrating radiological biomarkers (e.g., MRI-based pelvimetry) and molecular subtypes to better identify which patients will derive the greatest benefit from a TaTME approach.

Technological Integration: Exploring the role of robotic-assisted TaTME and other technological advancements to further enhance precision and outcomes.

Patient-Reported Outcomes: Placing greater emphasis on functional results and quality of life in comparative studies.

Conclusion

For patients with mid-low rectal cancer, both transanal (TaTME) and laparoscopic (LapTME) total mesorectal excision are valid surgical strategies, providing equivalent oncological outcomes at the critical 3-year benchmark. The choice of technique should be individualized based on patient anatomy (e.g., tumour height, pelvic dimensions), surgeon expertise, and institutional resources. TaTME offers distinct advantages in achieving clear margins in complex cases but demands rigorous training and careful patient selection to minimize risks. The overarching principle remains the unwavering commitment to obtaining a high-quality TME specimen, as this is the primary determinant of optimal cancer control, irrespective of the operative approach.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Bülow S, Christensen IJ, Harling H, Kronborg O, Fenger C, et al. (2003) Recurrence and survival after mesorectal excision for rectal Cancer. British Journal of Surgery 90(8): 974-980.

2. Köckerling F, Reymond MA, Altendorf-Hofmann A, Dworak O, Hohenberger W, et al. (1998) Influence of surgery on metachronous distant metastases and survival in rectal cancer. Journal of Clinical Oncology 16(1): 324-329.

3. Dittrich L, Biebl M, Schmuck R, Gul S, Weiss S, et al. (2020) Initial experience with the safe implementation of transanal total mesorectal excision (TaTME) as a standardized procedure for low rectal cancer. Journal of Clinical Medicine 10(1): 72.

4. Roodbeen SX, Spinelli A, Bemelman WA, Di Candido F, Cardepont M, et al. (2020) Local recurrence after transanal total mesorectal excision for rectal cancer: A Multicenter Cohort Study. Annals of Surgery 274(2): 359-366.

5. Kang L, Zeng Z, Liu H, Chinese Transanal Endoscopic Surgery Collaborative (CTESC) Group (2024) Three-year disease-free survival after transanal vs. laparoscopic total mesorectal excision for rectal cancer (TaLaR): A randomized clinical Trial. Journal of Clinical Oncology 42(16_suppl): 3516-3516.

6. Zeng Z, Liu Z, Luo S, Liang Z, Huang L, et al. (2022) Three-year outcomes of transanal total mesorectal excision versus standard laparoscopic total mesorectal excision for mid and low rectal Cancer. Surgical Endoscopy 36(6): 3902-3910.

7. Zeng Z, Luo S, Zhang H, Wu M, Ma D, et al. (2025) Chinese transanal endoscopic surgery collaborative(CTESC) group. Transanal vs Laparoscopic total mesorectal excision and 3-year disease-free survival in rectal cancer: The TaLaR randomized clinical trial. JAMA 333(9): 774-783.

8. De Lacy FB, Roodbeen SX, Ríos J, van Laarhoven J, Otero-Piñeiro A, et al. (2020) Three-year outcome after transanal versus laparoscopic total mesorectal excision in locally advanced rectal cancer: A multicenter comparative analysis. BMC Cancer 20(1): 677.

9. Gioia P, Gloor S, Troller R, Adamina M (2021) Rate of local recurrence in a cohort of 125 patients treated by transanal total mesorectal excision due to rectal cancer. British Journal of Surgery 108(Supplement_4).

10. González-Abós C, De Lacy FB, Guzmán Y, Nogueira ST, Otero Pineiro A. et al. (2021) Transanal total mesorectal excision for stage II or III rectal cancer: Pattern of local recurrence in a tertiary referral center. Surgical Endoscopy 35(12): 7191-7199.

11. Veltcamp Helbach M, Koedam TWA, Knol JJ, Diederik A, Spaargaren G J, et al. (2018) Residual mesorectum on postoperative magnetic resonance imaging following transanal total mesorectal excision (TaTME) and laparoscopic total mesorectal excision (LapTME) in rectal cancer. Surgical Endoscopy 33(1): 94-102.

12. Ye J, Tian Y, Li F, Van Oostendorp S, Chai Y, et al. (2021) Comparison of transanal total mesorectal excision (TaTME) versus laparoscopic TME for rectal cancer: A case matched study. European Journal of Surgical Oncology 47(5): 1019-1025.

13. Li Z, Xiao J, Hou Y, Zhang X, Jie H, Liu H, et al. (2022) Transanal versus laparoscopic total mesorectal excision in male patients with low tumor location after neoadjuvant therapy: A propensity score-matched cohort study. Gastroenterology Research and Practice 2022: 2387464.

14. Chen YT, Kiu KT, Yen MH, Chang TC (2019) Comparison of the Short-term outcomes in lower rectal cancer using three different surgical techniques: Transanal total mesorectal excision (TME), laparoscopic TME, and open TME. Asian Journal of Surgery 42(6): 674-680.

15. Roodbeen SX, Penna M, Mackenzie H, Kusters M, Slater A, et al. (2018) Transanal total mesorectal excision (TaTME) versus laparoscopic TME for MRI-defined low rectal cancer: A propensity score-matched analysis of oncological outcomes. Surgical Endoscopy 33(8): 2459-2467.

16. Li Z, Liu H, Luo S, Hou Y, Zhou Y, et al. (2023) Long-term oncological outcomes of transanal versus laparoscopic total mesorectal excision for mid-low rectal cancer: A retrospective analysis of 2502 patients. International Journal of Surgery 110(3): 1611-1619.

17. Kang L, Zeng Z, Luo S, Zhang H, Wang Q, et al. (2020) Transanal vs laparoscopic total mesorectal excision for rectal cancer: A multicenter randomized phase III clinical trial (TaLaR trial) protocol. Gastroenterology Report 9(1): 71-76.

18. Park JW, Jeong SY, Kang SB, Joo J, Song MK, et al. (2017) Comparison of long-term survival outcomes between laparoscopic and open surgery for mid or low rectal cancer treated with preoperative chemoradiotherapy: 7-year follow-up of COREAN Trial. Journal of Clinical Oncology 35(15_suppl): 3518.

19. Chi P, Su X, Xu J, Qiu H, Wang Z, et al. (2024) Effect of Laparoscopy-assisted vs open surgery on 3-year disease-free survival in patients with low rectal cancer: The LASRE randomized clinical Trial. Journal of Clinical Oncology 42(3_suppl): 8.

20. Serra Aracil X, Zarate A, Bargalló J, Gonzalez A, Serracant A, et al. (2022) Transanal versus laparoscopic total mesorectal excision for mid and low rectal cancer (Ta-LaTME study): Multicentre, randomized, open-label trial. British Journal of Surgery 110(2): 150-158.

21. Liu ZH, Zeng ZW, Jie HQ, Huang L, Luo SL, et al. (2022) Transanal total mesorectal excision combined with intersphincteric resection has similar Long-term oncological outcomes to laparoscopic abdominoperineal resection in low rectal cancer: A propensity score-matched cohort Study. Gastroenterology Report 10: goac026.

22. Rubinkiewicz M, Zarzycki P, Witowski J, Pisarska M, Gajewska N, et al. (2019) Functional outcomes after resections for low rectal tumors: Comparison of transanal with laparoscopic total mesorectal excision. BMC Surgery 19(1): 79.

23. Rubinkiewicz M, Nowakowski M, Wierdak M, Mizera M, Dembinski M, et al. (2018) Transanal total mesorectal excision for low rectal cancer: A case-matched study comparing TaTME versus standard laparoscopic TME. Cancer Management and Research 10: 5239-5245.

24. Marks JH, Montenegro GA, Salem JF, Shields MV, Marks GJ, et al. (2016) Transanal TATA/TME: A case-matched study of taTME versus laparoscopic TME surgery for rectal cancer. Techniques in Coloproctology 20(7): 467-473.

25. Detering R, Roodbeen SX, Van Oostendorp SE, Dekker JWT, Sietses C, et al. (2019) Three-Year nationwide experience with transanal total mesorectal excision for rectal cancer in the Netherlands: A propensity score-matched comparison with conventional laparoscopic total mesorectal excision. Journal of the American College of Surgeons 228(3): 235-244e1.

26. Ren J, Liu S, Luo H, Wang B, Wu F (2021) Comparison of Short-term efficacy of transanal total mesorectal excision and laparoscopic total mesorectal excision in low rectal cancer. Asian Journal of Surgery 44(1): 181-185.

27. Perdawood SK, Thinggaard BS, Bjoern MX (2017) Effect of transanal total mesorectal excision for rectal cancer: Comparison of short-term outcomes with laparoscopic and open surgeries. Surgical Endoscopy 32(5): 2312-2321.

28. Jootun R, Cuk P, Ellebæk M, Andersen PA, Salomon S, et al. (2022) Robotic vs. TaTME rectal surgery (ROTA STUDY) matched cohort trial for mid to low rectal cancer surgery evaluation trial in the hands of an experienced surgeon. International Journal of Surgery Protocols 26(1): 7-13.

29. Xiao Zhang, Jiang Chen, Feng He, Wenchun Du, Xianhe Li, et al. (2025) Comparing efficacy and safety of transanal vs. laparoscopic total mesorectal excision for middle and low rectal cancer: Updated meta-analysis. European Journal of Surgical Oncology 51(3): 109559.

30. Flynn J, Larach JT, Kong JCH, Waters PS, Warrier SK, et al. (2021) The learning curve in robotic colorectal surgery compared with laparoscopic colorectal surgery: A systematic review. Colorectal Disease 23(11): 2806-2820.

31. Minmin C (2019) Comparison of transanal total mesorectal excision and laparoscopic total mesorectal excision for rectal cancer.

32. Aubert M, Mege D, Panis Y (2019) Total mesorectal excision for low and middle rectal cancer: Laparoscopic versus transanal approach-a meta-Analysis. Surgical Endoscopy 34(9): 3908-3919.

33. Munini M, Popeskou SG, Galetti K, Roesel R, Mongelli F, et al. (2021) Transanal (TaTME) vs. laparoscopic total mesorectal excision for mid and low rectal cancer: A propensity score-matched analysis of early and

long-term outcomes. International Journal of Colorectal Disease 36(10): 2271-2279.

34. Ong G KB, Tsai B, Patron RL, Johansen O, Lane F, et al. (2021) Transanal total mesorectal excision achieves equivalent oncologic resection compared to laparoscopic approach, but with functional consequences. The American Journal of Surgery 221(3): 566-569.

35. Lin YC, Kuo YT, You JF, Chern YJ, Hsu YJ, et al. (2022) Transanal total mesorectal excision (TaTME) versus laparoscopic total mesorectal excision for lower rectal cancer: A propensity score-matched analysis. Cancers 14(17): 4098.

36. Perdawood SK, Kroeigaard J, Eriksen M, Mortensen P (2020) Transanal total mesorectal excision: The slagelse experience 2013-2019. Surgical Endoscopy 35(2): 826-836.