E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/15.02.213

Research Article

Critical Analysis of Post-Operative Morbidity and Mortality in Patients of Carcinoma Rectum Following Neoadjuvant Concurrent Chemoradiation Therapy

Lt Col (Dr) A Karthik[1], Col (Dr) Puneet Takkar[2], Col (Dr) Sree Hari Pothina[3], Dr. Manyala V L S Praveena[4]

[1]Assistant Professor, Department of Surgery, Command Hospital Southern Command Pune affiliated to Armed Forces Medical College, Pune

[2]Professor, Department of Surgery, Command Hospital (WC) Chandimandir

[3]Associate Professor, Department of Surgery Oncology, Command Hospital (EC), Kolkata

[4]Assistant Professor, Department of Physiology, Maharshi Markandeswar Medical College (Deemed to be University) Mullana, Haryana.

Corresponding Author: Lt Col (Dr) A Karthik

Received: 30.06.25, Revised: 25.07.25, Accepted: 27.08.25

ABSTRACT

Background: Carcinoma rectum is a prevalent malignancy that often presents at a locally advanced stage. Neoadjuvant Concurrent Chemoradiation Therapy (NACCRT) has become the cornerstone of management in locally advanced rectal cancers, potentially downstaging tumors and improving resectability. Despite these benefits, the impact of NACCRT on short-term postoperative outcomes—morbidity and mortality—warrants thorough investigation.

Methods: This prospective, observational study was conducted at a tertiary care center over two years. Patients with T3/4 or N+ rectal cancer received NACCRT, followed by definitive surgery (Abdomino-Perineal Resection, Low Anterior Resection, or Total Pelvic Exenteration). Perioperative data, including operative time, blood loss, postoperative complications, and 30-day mortality, were collected. Statistical analyses were performed using SPSS, and comparisons were made between open versus laparoscopic surgical approaches.

Results: A total of 67 patients with carcinoma rectum were included. The mean patient age was 50.87±16.63 years, and 65.7% were male. Most tumors (55.2%) were located in the lower rectum. After NACCRT, 47.8% of patients underwent Abdomino-Perineal Resection and 47.8% Low Anterior Resection. Laparoscopic surgery accounted for 52.2% of cases, with significantly lower intraoperative blood loss (p=0.019) and fall in hemoglobin (p=0.001) compared to open surgery. Overall short-term morbidity was comparable between laparoscopic and open groups regarding ICU stay, postoperative pain scores, and complication rates (e.g., anastomotic leak in 1 patient, re-exploration in 3). There was no 30-day mortality.

Conclusion: NACCRT followed by curative resection in locally advanced rectal cancer is feasible with acceptable short-term morbidity with no observed 30-day mortality. Laparoscopic surgery appears to confer certain intraoperative advantages, notably lower blood loss, without increasing complication rates. Further multicenter studies with larger cohorts are warranted to confirm these findings and refine perioperative management protocols.

Keywords: Carcinoma rectum, Neoadjuvant chemoradiation, Morbidity, Mortality, Laparoscopic surgery, Rectal cancer

INTRODUCTION

Carcinoma rectum is among the most common gastrointestinal malignancies worldwide, contributing significantly to cancer-related morbidity and mortality [1]. In recent decades, neoadjuvant therapy—particularly concurrent chemoradiation—has become integral in the multidisciplinary management of rectal cancer [2]. Neoadjuvant chemoradiotherapy (NACCRT) can reduce tumor bulk, enhance operability, facilitate sphincter preservation for low-lying lesions and improve local control [3]. Despite these notable benefits, careful consideration must be given to potential complications and the impact on both short-term and long-term outcomes.

The rectum's anatomy confined within the pelvis inherently complicate surgical resection, increasing the risk of complications such as anastomotic leaks, urinary dysfunction, and intraoperative injuries to adjacent structures [4]. In addition, patients who have undergone

NACCRT may exhibit tissue changes such as fibrosis and inflammation, which can alter surgical planes and increase technical complexity [5]. Previous studies have reported varying morbidity rate ranging from anastomotic leaks and infectious complications to prolonged ileus particularly in patients with locally advanced disease [6]. Hence, understanding the interplay between NACCRT and postoperative outcomes is crucial.

Surgical options for rectal carcinoma include Abdomino-Perineal Resection (APR), Low Anterior Resection (LAR), and, in selected patients with extensive organ involvement, Total Pelvic Exenteration (TPE) [7]. Minimally invasive approaches, such as laparoscopic or robotic-assisted resections, are increasingly employed. These techniques have been associated with reduced operative blood loss, shorter hospital stays, and earlier recovery in some reports [8]. However, the choice between a laparoscopic or open surgical approach often depends on tumor location, surgeon expertise, and patient-specific factors (e.g., comorbidities, body habitus).

The present study aims to evaluate the short-term post-operative morbidity and mortality in patients with carcinoma rectum treated with NACCRT, followed by definitive surgery. By focusing on 30-day outcomes, we attempt to determine whether the introduction of NACCRT influences perioperative complications. In doing so, we hope to generate evidence-based data that can guide treatment decisions, risk stratification, and surgical planning in these challenging rectal cancer cases [9].

With the rising burden of colorectal cancers and the critical role of NACCRT in managing locally advanced rectal tumors, an in-depth understanding of its impact on operative parameters and postoperative outcomes is imperative. This investigation provides a focused analysis of short-term morbidity and mortality and highlights any differences between laparoscopic and open surgical techniques, aiming to support future interventions and optimize patient care.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study was conducted at the Department of Surgery, Command Hospital (Western Command), Chandimandir, from September 2020 to August 2022.

Study Population

All consecutive patients diagnosed with carcinoma rectum who were planned for surgical resection after receiving Neoadjuvant Concurrent Chemoradiotherapy (NACCRT) were considered eligible.

Inclusion Criteria

1. Patients with biopsy-proven carcinoma rectum.
2. Tumors staged as T3/4 or N+ (based on imaging) who underwent NACCRT.
3. Patients receiving definitive surgery within 5 to 12 weeks post-NACCRT.
4. Patients who provided written informed consent.

Exclusion Criteria

1. Unresectable cases of carcinoma rectum after NACCRT.
2. Metastatic disease.
3. Patients who had upfront surgery without NACCRT.
4. Patients unwilling to participate.

Sample Size and Rationale

Based on previous data suggesting a 10% incidence of short-term postoperative morbidity and mortality in rectal carcinoma, and with a 3% margin of error at a 95% confidence level, the initially calculated sample size was 385. Owing to time constraints, all consecutive eligible patients during the study period were enrolled, with a minimum target of 50 patients.

Ethical Considerations

Ethical approval was obtained from the institutional review board. Informed written consent was obtained from each participant after explaining the study's purpose, potential benefits, and risks.

Methodology

All patients underwent comprehensive clinical evaluation, laboratory investigations, colonoscopy, and histopathological confirmation of rectal carcinoma. Imaging modalities, including contrast-enhanced CT of the abdomen, MRI pelvis, and/or whole-body PET-CT, were employed to stage the disease according to AJCC guidelines (8th edition).

Patients with T3/4 or N+ disease received NACCRT according to institutional protocols (a radiation dose typically ranging from 4500cGy to 5040cGy with concurrent chemotherapy). After an interval of 4 weeks from completion of NACCRT, restaging was performed. Definitive surgery (Abdomino-Perineal Resection, Low Anterior Resection, or Total Pelvic Exenteration) was undertaken 5–12

weeks after NACCRT, depending on clinical judgment and tumor response.

Intraoperative details—operating time, blood loss, technique of anastomosis, covering stoma use, and any organ injury—were recorded. Postoperative complications were monitored for 30 days and included: anastomotic leaks, surgical site infection (SSI), respiratory or cardiac events, thromboembolic events, urinary complications, and re-exploration. Mortality within 30 days of surgery was noted. Further long-term complications were excluded from the present analysis.

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS version 21.0. Continuous variables are presented as mean ± standard deviation, while categorical variables are shown as frequencies and percentages. Chi-square tests were used to explore associations in categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

Patient Characteristics and Preoperative Findings

A total of 69 patients initially enrolled; however, 2 patients were excluded due to peritoneal deposits. Hence, 67 patients formed the final study cohort. The mean age was 50.87±16.63 years, ranging from 23 to 85 years, and 65.7% were male.

Regarding tumor location, 55.2% had lower rectal tumors (within 6 cm of the anal verge), 28.4% had mid-rectal tumors (7–11 cm), and 16.4% upper rectal tumors (12–15 cm). The majority (53.8%) had moderately differentiated adenocarcinoma, followed by well-differentiated (17.9%), poorly differentiated (14.9%), and mucinous (13.4%).

Pre-NACCRT staging revealed that 59.7% were in cT3N+M0, and 17.9% in cT4N+M0. Based on clinical staging, 61.2% were stage IIIB and 17.9% stage IIIC. Adjacent organ involvement was noted in some patients, most commonly the prostate (8.9%) and uterus or vagina (6%).

Neoadjuvant Treatment

Most patients (85.1%) received a radiotherapy dose of 5040cGy. The commonest chemotherapy regimen was Capecitabine alone (70.1%), with others receiving combinations such as Capecitabine + Oxaloplatin, Folfox, 5-FU + Leucovorin, or 5-FU + Mitomycin.

Surgical Procedure

Of 67 patients, 47.8% underwent Abdomino-Perineal Resection, 47.8% Low Anterior Resection (LAR/ULAR), and 4.4% required Total Pelvic Exenteration. Laparoscopic surgery was performed in 52.2% of cases, while the remaining 47.8% were open procedures.

Table 1. Surgical Procedure Distribution

Procedure	Frequency (n=67)	Percentage (%)
Abdomino-Perineal Resection (APR)	32	47.8
Low Anterior Resection (LAR/ULAR)	32	47.8
Total Pelvic Exenteration	3	4.4

Intraoperative Factors

- **Operating Time**: Mean operating time was 259±68 minutes (261±66 in open vs. 257±72 in laparoscopic; p=0.815).
- **Blood Loss**: Mean blood loss was significantly lower in the laparoscopic group (154.29±47.23 ml) compared to open surgery (185.63±58.79 ml) (p=0.019).
- **Fall in Hemoglobin**: Patients who underwent laparoscopic surgery had a significantly lower decrease in hemoglobin (1.0±0.78 g/dl) compared to open surgery (1.93±0.98 g/dl) (p=0.001).

Table 2. Intraoperative Parameters

Parameter	Open (n=32)	Lap (n=35)	p-value
Operating time (min)	261 ± 66	257 ± 72	0.815
Blood loss (ml)	185.63 ± 58.79	154.29 ± 47.23	0.019
Fall in Hb (g/dl)	1.93 ± 0.98	1.0 ± 0.78	0.001

Peritoneal soiling was minor in 2 patients (3.0%), both in the open surgery group. Among the 32 patients with a colorectal anastomosis (LAR/ULAR group), stapled anastomosis was used in 93.7%.

Postoperative Outcomes

- **ICU Stay**: The average ICU stay was comparable (1.93±1.04 days in open vs. 2.06±0.78 days in lap; p=0.683).
- **Drain Duration**: Patients in the open group had drains for a longer period (6.16±3.05 days) versus the laparoscopic group (4.34±1.41 days, p=0.004).
- **Analgesia & Pain Score**: Most patients (71.6%) received epidural + IV analgesia. The average VAS pain score was 4.85±0.77 for open and 4.81±0.68 for laparoscopic (p=0.954).
- **Post-op Ileus**: Mean duration of postoperative ileus was 3.03±1.33 days (open) vs. 2.69±0.87 days (lap) (p=0.209).

Table 3. Key Postoperative Morbidity Parameters

Parameter	Open (n=32)	Lap (n=35)	p-value
ICU stay (days)	1.93 ± 1.04	2.06 ± 0.78	0.683
Drain duration (days)	6.16 ± 3.05	4.34 ± 1.41	0.004
VAS score (0–10)	4.85 ± 0.77	4.81 ± 0.68	0.954
Post-op ileus (days)	3.03 ± 1.33	2.69 ± 0.87	0.209

Complications

No cardiac, respiratory, or thromboembolic events were observed. Anastomotic leak occurred in 1 patient (lap group). Three patients required re-exploration: 2 in the open group (burst abdomen, stoma complication) and 1 in the lap group (anastomotic leak). Urinary retention was observed in 5 male patients overall. Surgical site infection (SSI) occurred in 13 cases (19.4%); the distribution was not statistically different between open (7/32) and lap (6/35) groups.

No 30-day mortalities were reported in the study cohort.

Table 4. Major Complications

Complication	Open (n=32)	Lap (n=35)	p-value
Anastomotic leak	0	1	0.892
Re-exploration	2	1	0.602
Urinary retention	3	2	0.664
Stoma complications	1	0	0.478
Surgical site infection (SSI)	7	6	0.274
Post-op sepsis	1	1	1.000
30-day mortality	0	0	-

DISCUSSION

Neoadjuvant Concurrent Chemoradiation Therapy (NACCRT) has emerged as a critical component in the treatment of locally advanced rectal cancer, primarily for downstaging the tumor, improving resectability, and potentially enhancing sphincter preservation [1,2]. The central questions surrounding NACCRT focus on how it influences perioperative risks and whether its introduction impacts short-term morbidity and mortality. Our study indicates that, in a cohort of 67 patients, NACCRT did not significantly elevate the risk of major postoperative complications, nor was there any mortality within 30 days.

Previous studies have demonstrated that NACCRT can induce histopathological response, thereby allowing more precise surgical margins and stable anastomoses [3,4]. However, concerns persist regarding tissue friability and increased vulnerability to complications such as anastomotic leaks [5]. In our cohort, only one patient suffered an anastomotic leak, consistent with other contemporary reports suggesting similar or marginally higher leak rates in patients receiving NACCRT compared to those undergoing upfront surgery [6,7]. These findings underscore that while NACCRT might pose theoretical risks, appropriate surgical technique and patient selection may mitigate these concerns.

One of the noteworthy observations in our study was the difference in intraoperative parameters between open and laparoscopic approaches. Laparoscopic surgery was associated with lower blood loss and a lesser decline in hemoglobin levels, which aligns with earlier findings that laparoscopic resections for rectal cancer can yield superior short-term outcomes in appropriately selected patients [8]. Although overall complications such as surgical site infection and urinary retention did not

significantly differ between the two approaches, the reduced drain duration in the laparoscopic group may highlight improved wound healing or decreased surgical trauma.

Moreover, none of our patients experienced cardiopulmonary or thromboembolic complications, possibly reflecting a carefully optimized patient population and vigilant perioperative measures. Long-term outcomes, including disease-free survival and local recurrence rates, remain beyond the scope of this analysis, but are critical to fully appraise the benefit of NACCRT [9]. Nonetheless, immediate postoperative data indicate that NACCRT does not add a disproportionate burden of morbidity when standardized protocols and multidisciplinary coordination guide patient care.

Our findings are limited by a relatively small sample size and a single-institution experience, which may limit generalizability. Larger, multicenter trials are needed to corroborate these observations and evaluate diverse patient subgroups, such as those with significant comorbidities or borderline unresectable disease. Nonetheless, this study highlights that NACCRT can be safely implemented, and in combination with laparoscopic surgery, may provide distinct intraoperative advantages. Future research endeavors could also investigate patient-reported outcomes, cost-effectiveness, and novel biomolecular markers predicting NACCRT response.

In conclusion, the short-term postoperative morbidity and mortality in rectal cancer patients undergoing NACCRT, followed by definitive resection, remains acceptable. Laparoscopic surgery emerges as a favorable approach regarding certain intraoperative parameters without an evident rise in complication rates.

CONCLUSION

In our analysis of rectal cancer patients undergoing NACCRT followed by definitive surgery, we observed favorable short-term postoperative outcomes, including a low incidence of major complications and no 30-day mortality. Laparoscopic surgery demonstrated advantages in terms of reduced blood loss and shorter drain duration compared to open surgery. These findings suggest that NACCRT, combined with an appropriate surgical approach, is both feasible and safe. Further large-scale, multicenter studies are necessary to confirm these findings and to explore long-term oncologic outcomes, ultimately guiding optimized treatment pathways for patients with locally advanced carcinoma rectum.

REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. *Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries.* CA Cancer J Clin. 2018;68(6):394–424.
2. National Comprehensive Cancer Network (NCCN) Guidelines. *Rectal Cancer (Version 2.2021).* NCCN; 2021.
3. Sauer R, Liersch T, Merkel S, et al. *Preoperative versus postoperative chemoradiotherapy for rectal cancer: results of the German CAO/ARO/AIO-94 randomized phase III trial after a median follow-up of 11 years.* J Clin Oncol. 2012;30(16):1926–1933.
4. Heald RJ, Husband EM, Ryall RDH. *The mesorectum in rectal cancer surgery—The clue to pelvic recurrence?* Br J Surg. 1982;69(10):613–616.
5. Pucciarelli S, Toppan P, Friso ML, et al. *Preoperative chemoradiotherapy for middle and lower rectal cancer: risk factors for postoperative complications and tumour response.* Eur J Surg Oncol. 2002;28(7):689–695.
6. Sebag-Montefiore D, Stephens RJ, Steele R, et al. *Preoperative radiotherapy versus selective postoperative radiotherapy in patients with rectal cancer (MRC CR07 and NCIC-CTG C016): a multicentre, randomised trial.* Lancet. 2009;373(9666):811–820.
7. 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(14):1324–1332.
8. Den Dulk M, Marijnen CA, Putter H, et al. *Risk factors for adverse outcome in patients undergoing surgery for rectal cancer in the context of a multimodal treatment strategy: results of a prospective multicenter study.* Ann Surg. 2009;249(6):998–1004.
9. van Gijn W, Marijnen CA, Nagtegaal ID, et al. *Preoperative radiotherapy combined with total mesorectal excision for resectable rectal cancer: 12-year follow-up of the multicenter,*

randomized controlled TME trial. Lancet Oncol. 2011;12(6):575–582.