

Treatment Patterns and Long-Term Survival Outcomes in Muscle-Invasive Bladder Cancer: A Decade-Long Single-Institution Retrospective Cohort Study

Fajar Rafi Ranjha^{1,*}, Asma Rashid², Abdullah Adnan³, Muhammad Kashif³, Ikrama Tanveer³, Tabinda Sadaf², Zile-Huma Hashmi³, Amna Munawar⁴

¹Department of Clinical and Radiation Oncology, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan

²Consultant Clinical Oncologist, Department of Clinical and Radiation Oncology, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan

³Resident, Clinical and Radiation Oncology, Department of Clinical and Radiation Oncology, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan

⁴Jinnah Post Graduate Medical Center, Karachi

Abstract

Introduction

Muscle-invasive bladder cancer (MIBC) is an aggressive malignancy with heterogeneous treatment approaches and outcomes. Long-term survival data from real-world settings remain limited. We evaluated treatment patterns and 10-year survival outcomes in a large single-institution cohort of patients with MIBC.

Materials and Methods

This retrospective cohort study included 349 patients with MIBC who were treated at Shaukat Khanum Cancer Hospital and Research Centre, Pakistan between 2010 and 2020. Treatment strategies comprised neoadjuvant chemotherapy followed by radical cystectomy or definitive chemoradiotherapy or radiotherapy, upfront cystectomy, definitive bladder-preserving chemoradiotherapy, radiotherapy alone, and palliative treatment. Overall survival was estimated using the Kaplan-Meier method and compared using the log-rank test. Univariate and multivariate Cox proportional hazards regression analyses were performed to identify independent prognostic factors.

Results

The median age was 57 years, with male predominance of 82.2%. High-grade disease was present in 88.5% of patients. At last follow-up, 67.9% of patients were alive. Overall survival differed significantly across treatment strategies (log-rank $p < 0.001$). Median overall survival was not reached in curative-intent treatment groups, whereas patients treated with palliative intent had an inferior median overall survival of 30 months. In multivariate analysis, Stage IV disease (adjusted HR 2.41, 95% CI 1.33 to 4.37) and palliative treatment (adjusted HR 3.30, 95% CI 1.49 to 7.31) were independently associated with worse survival. After adjustment, no statistically significant differences in overall survival were observed between definitive surgical and bladder preserving approaches, noting the limitations of non-randomized treatment allocation.

Conclusion

Definitive treatment was associated with durable long-term survival in appropriately selected patients. Disease stage and treatment intent remained the dominant determinants of outcome. Bladder-preserving chemoradiotherapy was an effective definitive option in selected patients in this real-world cohort.

Keywords

Muscle-invasive bladder cancer • radical cystectomy • chemoradiotherapy • neoadjuvant chemotherapy • overall survival • low- and middle-income countries

1. Introduction

Muscle-invasive bladder cancer (MIBC) is an aggressive malignancy accounting for approximately 25 to 30% of newly diagnosed bladder cancer cases worldwide and is associated with significant morbidity and mortality. Long-term outcomes are largely determined by disease stage at presentation and the ability to deliver definitive multimodality treatment. Radical cystectomy with pelvic lymph node dissection, with or without neoadjuvant chemotherapy, has traditionally been the standard treatment for operable disease, while definitive bladder-preserving chemoradiotherapy has emerged as an established alternative in appropriately selected patients.

Randomized trials from high-income countries have demonstrated a modest but consistent survival benefit with platinum-based neoadjuvant chemotherapy, leading to its adoption in international guidelines. In parallel, long-term data from bladder preservation studies have shown that trimodality therapy can achieve oncologic outcomes comparable to surgery in selected patients while maintaining bladder function. However, the applicability of these data to low- and middle-income countries remains uncertain due to differences in disease burden, patient characteristics, and access to specialized oncologic care.

*Corresponding author: Fajar Rafi Ranjha

E-mail: Fajarrafi@skm.org.pk

In low- and middle-income settings, patients with MIBC frequently present with advanced and high-grade disease, and treatment selection is often constrained by comorbidities, renal dysfunction, and limited surgical and systemic therapy resources. Consequently, real-world management frequently diverges from guideline-based recommendations, with greater reliance on bladder-preserving approaches, radiotherapy alone, or palliative treatment. Despite this, long-term survival data reflecting these real-world practices from low- and middle-income institutions remain limited.

To address this gap, we performed a decade-long retrospective analysis of patients with muscle-invasive bladder cancer treated at a tertiary cancer center. The primary objective was to evaluate treatment patterns and long-term overall survival across contemporary management strategies in a real-world low- and middle-income setting, with secondary objectives including stage-stratified survival and identification of independent prognostic factors using Cox regression analysis.

2. Materials and Methods

2.1. Study Design and Setting

This was a retrospective observational cohort study conducted at a tertiary comprehensive cancer center in Pakistan. Consecutive adult patients diagnosed with muscle-invasive bladder cancer (MIBC) and treated between January 2010 and December 2020 were included. The study was approved by the Institutional Review Board of Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan (IRB number EX-14-01-26-01). The requirement for informed consent was waived due to the retrospective nature of the study.

2.2. Patient Selection

Adult patients aged 18 years or older with histologically confirmed muscle-invasive bladder cancer (T2 or higher) were eligible. Both urothelial carcinoma and variant histologies were included. Patients with incomplete survival data or missing essential treatment details were excluded. Patients presenting with distant metastatic disease at diagnosis were included and analyzed separately. Stage IV disease comprised both metastatic and locally advanced unresectable tumors, with treatment intent determined on an individual basis through multidisciplinary assessment.

2.3. Data Collection and Baseline Variables

Clinical data were extracted from institutional electronic medical records. Baseline variables included age, sex, histological subtype, tumor grade, clinical T stage, nodal status, metastatic status, and AJCC stage at presentation. Clinical staging was based on available radiological and pathological findings at the time of diagnosis.

2.4. Treatment Classification

Patients were categorized by their initial treatment strategy into the following groups: neoadjuvant chemotherapy followed by radical cystectomy; neoadjuvant chemotherapy followed by definitive chemoradiotherapy; upfront radical cystectomy; definitive chemoradiotherapy; definitive radiotherapy alone; and palliative radiotherapy.

Neoadjuvant chemotherapy consisted predominantly of platinum-based regimens and was administered according to institutional protocols and patient fitness. Definitive radiotherapy and chemoradiotherapy were delivered with curative intent, while palliative radiotherapy was administered using hypofractionated schedules for symptom control. Due to inconsistent documentation, detailed treatment response, pathological downstaging, and chemotherapy-related toxicity data were not included in outcome analyses.

Definitive radiotherapy was delivered to the bladder with or without elective pelvic lymph nodes based on disease extent. Radical dose radiotherapy typically ranged from 60 to 66 Gy, delivered using conventional fractionation or biologically equivalent hypofractionated schedules, with three-dimensional conformal or intensity-modulated techniques. Concurrent chemotherapy, most commonly cisplatin administered on weekly or three-weekly schedules, was given to patients with adequate performance status and renal function.

2.5. Outcome Measures and Follow-up

Patients were followed from the date of diagnosis until death or last documented follow-up. The primary outcome measure was overall survival, defined as the interval from diagnosis to death from any cause or last follow-up. Patients alive at last follow-up were censored.

2.6. Statistical Analysis

Descriptive statistics were used to summarize baseline characteristics. Continuous variables were reported as medians with interquartile range or range, while categorical variables were expressed as frequencies and percentages. Overall survival was estimated using the Kaplan-Meier method, and comparisons across treatment groups were performed using the log-rank test. Survival analyses were conducted for the overall cohort and, where appropriate, stratified by treatment group and disease stage. A two-sided p-value less than 0.05 was considered statistically significant. All analyses were performed using IBM SPSS Statistics for Windows.

3. Results

3.1. Patient Characteristics

A total of 349 patients with muscle-invasive bladder cancer were included. The median age at diagnosis was 57 years (IQR

47-65; range 22-89), with a marked male predominance (287 patients, 82.2%). Urothelial carcinoma accounted for 337 cases (96.6%), while variant histology was identified in 12 patients (3.4%), including squamous, adenocarcinoma, and micropapillary subtypes. High-grade disease was present in 309 patients (88.5%).

Locally advanced disease was common at presentation. Clinical T stage distribution included cT2 in 80 patients (22.9%), cT3 in 232 (66.4%), and cT4 in 37 (10.6%). Regional nodal involvement was observed in 109 patients (31.2%), while distant metastases at diagnosis were present in 42 patients (12.0%). According to AJCC staging, Stage III disease predominated (212 patients, 60.7%), followed by Stage II (79 patients, 22.6%) and Stage IV (58 patients, 16.6%). At last follow-up, 237 patients (67.9%) were alive, and 112 (32.1%) had died. Baseline characteristics are summarized in Table 1.

3.2. Treatment Characteristics

Patients were managed using a range of treatment strategies based on disease stage, renal function, performance status, comorbidities, and multidisciplinary assessment. The majority received curative intent treatment, while a substantial proportion required palliative therapy. Treatment distribution is summarized in Table 2.

Table 1. Baseline Patient and Tumor Characteristics (N = 349).

Characteristic	Category	n	%
Age (years)	Median (IQR)	57	47-65
	Range	22-89	—
Gender	Male	287	82.2
	Female	62	17.8
Histology	Urothelial (TCC)	337	96.6
	Variant histology*	12	3.4
Tumor Grade	High grade (G3)	309	88.5
	Intermediate/Low (G2)	40	11.5
Clinical T stage	cT2	80	22.9
	cT3	232	66.4
	cT4	37	10.6
Clinical N stage	cN0	240	68.8
	cN+ (N1-N3)	109	31.2
Metastatic status	cM0	307	88.0
	cM1	42	12.0
AJCC Stage	Stage II	79	22.6
	Stage III	212	60.7
	Stage IV	58	16.6

*Variant histology includes squamous, adenocarcinoma, and micropapillary variants.

Table 2. Treatment Distribution.

Treatment Strategy	n (%)
NAC → cystectomy	47 (13.5%)
NAC → CRT/RT	64 (18.3%)
Upfront cystectomy	50 (14.3%)
Definitive CRT	87 (24.9%)
Definitive RT	34 (9.7%)
Palliative treatment	67 (19.2%)

3.3. Neoadjuvant Chemotherapy

Neoadjuvant chemotherapy was administered to patients planned for either radical cystectomy or definitive bladder-preserving treatment. Platinum-based regimens were used, including cisplatin–gemcitabine, carboplatin–gemcitabine, and dose-dense MVAC (methotrexate, vinblastine, doxorubicin, and cisplatin). Regimen selection was individualized according to renal function and performance status. Cisplatin-based therapy was used in eligible patients, while carboplatin-based regimens were used in cisplatin-ineligible patients. Dose-dense MVAC was administered in selected fit patients. The number of cycles ranged from three to five. Survival analyses were based on treatment intent and final treatment pathway rather than response to neoadjuvant chemotherapy.

3.4. Definitive Chemoradiotherapy and Radiotherapy

Definitive chemoradiotherapy was delivered to 87 patients (24.9%) with radical intent. Radiotherapy was administered to the bladder with or without pelvic lymph nodes based on disease extent, with concurrent chemotherapy, predominantly cisplatin, in patients with adequate performance status and renal function. An additional 34 patients (9.7%) received definitive radiotherapy alone, primarily due to comorbidities or renal dysfunction precluding concurrent chemotherapy. Patients receiving radical-dose radiotherapy (≥ 60 Gy EQD2 [equivalent dose in 2 Gy fractions]) were analyzed within definitive treatment groups, while those treated with hypofractionated palliative schedules were categorized separately.

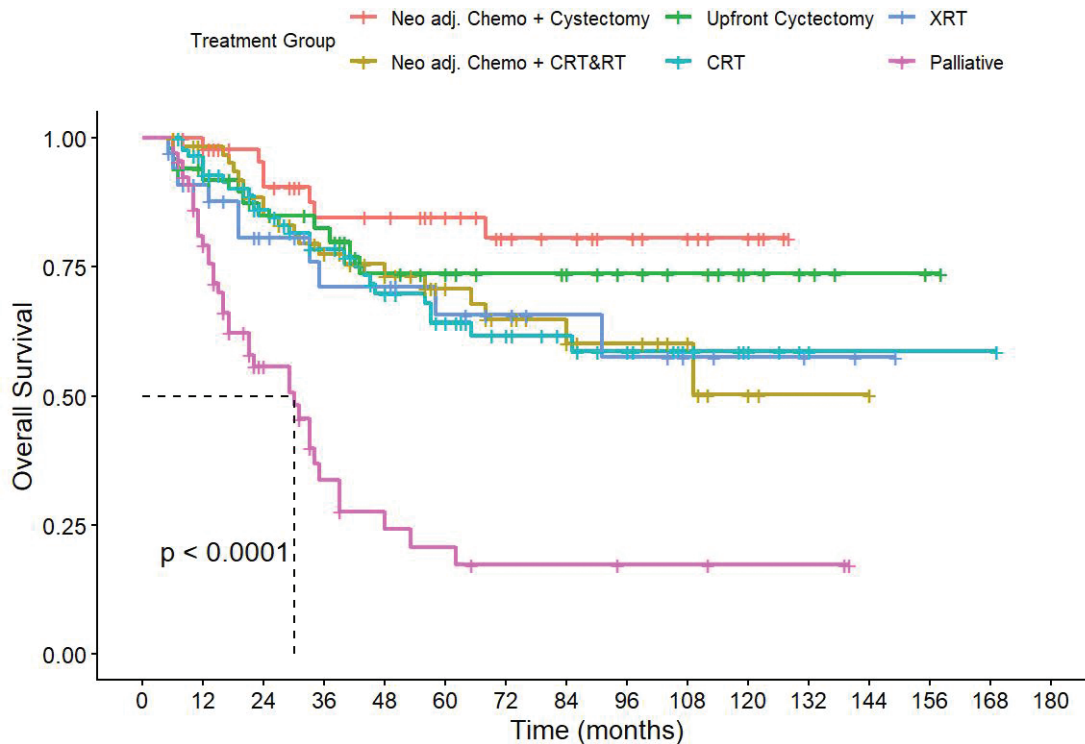
3.5. Patterns of Disease Relapse

During follow-up, 130 patients (37.2%) experienced disease relapse, while 219 (62.8%) remained relapse-free. Distant metastasis was the most common pattern of failure (61%), followed by locoregional relapse (25%) and isolated local recurrence (14%). Relapse outcomes were reported descriptively due to inconsistent documentation of relapse timing.

3.6. Overall Survival

Kaplan-Meier analysis demonstrated significant differences in overall survival across treatment groups (log-rank $p < 0.001$) (Figure 1). Median overall survival was not reached in any

Figure 1. Overall survival by treatment modality Kaplan-Meier overall survival curves stratified by treatment modality, showing significant differences across groups (log-rank $p < 0.0001$).



curative intent treatment group. Patients treated with palliative intent had inferior outcomes, with a median overall survival of 30 months. Mean overall survival exceeded 100 months across all definitive treatment strategies and is summarized in Table 3.

3.7. Stage Stratified Survival

Overall survival declined progressively with advancing stage. Patients with Stage II disease demonstrated excellent long-term survival with definitive treatment, while Stage III disease remained potentially curable with aggressive multimodality therapy. Stage IV disease, including metastatic and locally advanced unresectable presentations, was associated with significantly inferior survival compared with Stage II and III disease (Figure 2). Stage-wise survival outcomes are summarized in Table 4.

3.8. Univariate Analysis

On univariate Cox regression analysis, Stage IV disease was associated with significantly inferior overall survival compared with Stage II (HR 4.64, 95% CI 2.62-8.22; $p < 0.001$). Palliative treatment was also associated with an increased hazard of death compared with upfront cystectomy (HR 5.33, 95% CI 2.70-10.50; $p < 0.001$). Age and sex were

Table 3. Overall Survival by Treatment Group (median OS not reached in curative-intent groups).

Treatment Group	Deaths / N	Mean OS (months)	95% CI
NAC → cystectomy	7 / 47	109.9	97.7-122.1
NAC → CRT/RT	20 / 64	99.5	84.0-114.9
Upfront cystectomy	11 / 50	122.9	104.8-141.0
Definitive CRT	26 / 87	114.6	97.9-131.2
Definitive RT	10 / 34	101.9	78.5-125.3
Palliative	38 / 67	45.1	30.7-59.5

not significantly associated with overall survival, and no statistically significant differences were observed among definitive local treatment strategies. Univariate analysis is summarized in Table 5.

3.9. Multivariate Analysis

On multivariate Cox regression analysis adjusting for age, sex, stage, and treatment group, Stage IV disease remained independently associated with inferior overall survival (adjusted HR 2.41, 95% CI 1.33-4.37; $p = 0.0039$), as did palliative treatment (adjusted HR 3.30, 95% CI 1.49-7.31; $p = 0.0034$). Stage III disease was not independently associated with survival

Figure 2. Overall survival by stage at diagnosis Kaplan-Meier overall survival curves stratified by clinical stage, demonstrating progressively worse survival with advancing stage (log-rank $p < 0.0001$).

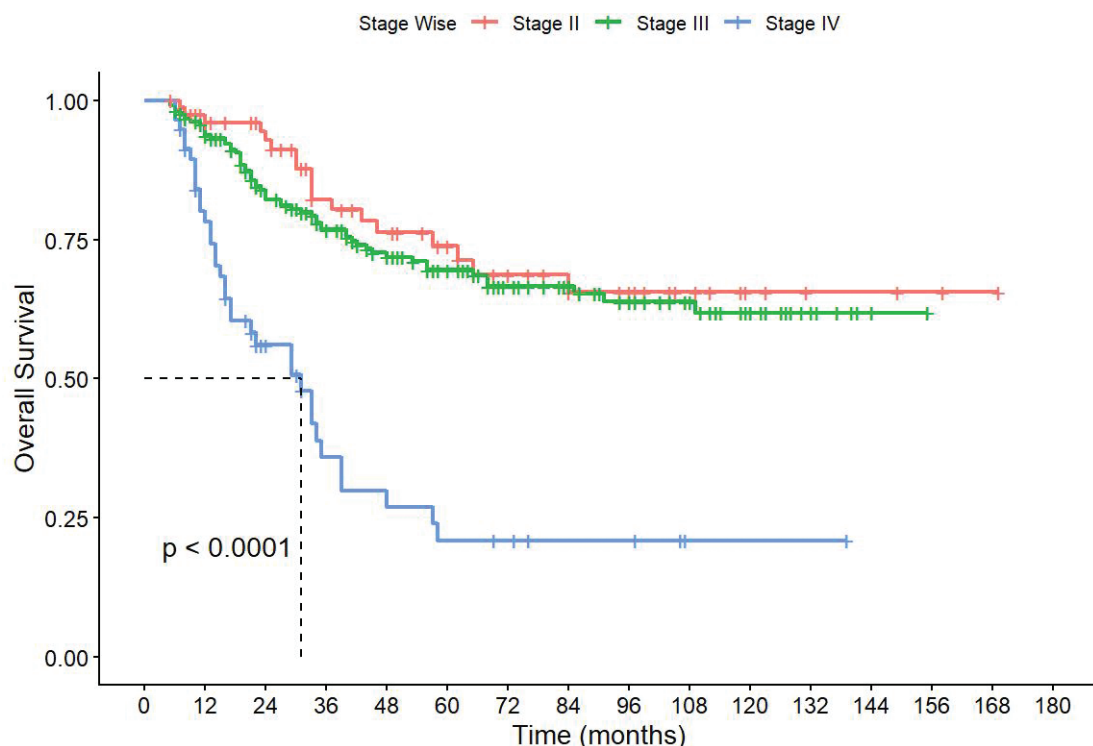


Table 4. Stage-wise Overall Survival in Muscle-Invasive Bladder Cancer.

Stage	Patients (N)	Deaths (Events)	Mean OS (months)	95% Confidence Interval
Stage II	79	18	124.96	107.99 - 141.94
Stage III	212	59	110.40	101.05 - 119.74
Stage IV	58	35	48.39	33.30 - 63.47
Overall	349	112	110.52	101.98 - 119.07

Table 5. Univariate Cox Regression Analysis for Overall Survival.

Variable	HR	95% CI	p-value
Age (per year)	1.00	0.99-1.02	0.656
Female sex	1.11	0.70-1.76	0.655
Stage III vs II	1.23	0.73-2.08	0.443
Stage IV vs II	4.64	2.62-8.22	<0.001
Palliative vs upfront cystectomy	5.33	2.70-10.50	<0.001

compared with Stage II. No statistically significant differences in overall survival were observed between definitive surgical and bladder preserving treatment modalities after adjustment. Multivariate analysis is summarized in Table 6.

Table 6. Multivariate Cox Regression Analysis for Overall Survival.

Variable	HR	95% CI	p-value
Age (per year)	1.00	0.98-1.01	0.830
Female sex	1.08	0.69-1.68	0.740
Stage III vs II	1.23	0.68-2.11	0.459
Stage IV vs II	2.41	1.33-4.37	0.0039
Palliative vs upfront cystectomy	3.30	1.49-7.31	0.0034

4. Discussion

This large single-institution retrospective cohort provides one of the most comprehensive long-term outcome analyses of muscle-invasive bladder cancer from a low- and middle-income country to date. The key findings of this study are that curative-intent treatment is associated with durable long-term survival even in a population enriched for high-risk disease; disease stage at presentation remains the strongest independent prognostic factor; and bladder-preserving chemoradiotherapy achieves survival outcomes comparable to radical cystectomy in appropriately selected patients.

The disease profile of this cohort reflects the real-world biology of muscle-invasive bladder cancer in resource-constrained settings, with a high prevalence of advanced and high-grade disease. Nearly ninety percent of patients had Grade III tumors and the majority presented with Stage III or IV disease. This contrasts with many series from high-income countries where earlier stage presentation is more common, underscoring the importance of generating outcome data from low- and middle-income settings rather than extrapolating from Western populations (1–3).

Despite adverse baseline characteristics, patients treated with definitive intent demonstrated durable survival, with median overall survival not reached across curative treatment modalities. These outcomes compare favorably with contemporary population-based data from high-income countries, where five-year overall survival following definitive treatment typically ranges from 45% to 65% (4–6). These findings suggest that when delivered within specialized, high-volume centers, effective multimodality management of muscle-invasive bladder cancer is achievable in low- and middle-income settings.

Neoadjuvant chemotherapy was integrated into both surgical and bladder-preserving pathways using contemporary platinum-based regimens. While favorable long-term outcomes were observed in patients receiving neoadjuvant therapy followed by definitive local treatment, treatment modality did not retain independent prognostic significance on multivariable analysis. This likely reflects the retrospective design, non-randomized treatment allocation, and the absence of uniform pathological response data, limiting precise estimation of chemotherapy-specific benefit. Nevertheless, the observed outcomes are consistent with randomized trial evidence demonstrating modest but clinically meaningful survival benefits with platinum-based neoadjuvant chemotherapy (7–9).

A central observation of this study is the absence of a statistically significant difference in overall survival between radical cystectomy and definitive bladder-preserving chemoradiotherapy after adjustment for disease stage and treatment intent. This finding should not be interpreted as therapeutic equivalence. Rather, it reflects comparable long-term outcomes achieved in carefully selected patients within a multidisciplinary clinical framework. Treatment selection was influenced by performance status, renal function, comorbidities, and patient preference, factors that inherently introduce selection bias in retrospective analyses (10–13).

Disease stage emerged as the dominant determinant of outcome. Patients with Stage IV disease experienced significantly inferior survival on both univariate and multivariable analyses. This group represented a biologically heterogeneous population, including patients with distant metastatic disease and those with locally advanced unresectable tumors. Selected

patients within this group received definitive-intent treatment, contributing to variability in survival outcomes and highlighting the need for cautious interpretation of stage-based survival estimates in real-world cohorts (14–16).

From a health systems perspective, these findings have important implications for low- and middle-income countries. The demonstrated effectiveness of bladder-preserving strategies provides a viable definitive treatment option in settings where surgical resources, perioperative care, or patient fitness may limit cystectomy. The comparable outcomes achieved across definitive modalities emphasize the importance of multidisciplinary decision-making and individualized treatment selection rather than rigid adherence to a single treatment paradigm.

This study has limitations inherent to its retrospective design. Treatment allocation was non-randomized and influenced by clinical factors including performance status, renal function, and comorbidities. Detailed toxicity, quality-of-life, and functional outcome data were inconsistently documented and could not be reliably analyzed. Pathological response following neoadjuvant chemotherapy was not uniformly available. Relapse outcomes were reported descriptively due to incomplete documentation of relapse timing. Despite these limitations, the large cohort size, extended follow-up duration, and consistent institutional treatment practices provide robust real-world evidence on long-term outcomes of management of muscle-invasive bladder cancer in a resource-constrained setting.

In conclusion, this decade-long single-institution experience demonstrates that long-term survival in muscle-invasive bladder cancer is achievable in low- and middle-income settings when definitive treatment is delivered within a multidisciplinary framework. Disease stage and treatment intent remain the primary determinants of outcome, while bladder-preserving chemoradiotherapy represents a valid definitive treatment option in appropriately selected patients. These findings support individualized, resource-adapted management strategies for muscle-invasive bladder cancer. Earlier diagnosis, timely referral, improved access to multimodal care, and prospective studies that incorporate toxicity, quality of life, and functional outcomes are needed.

Authors Contributions

Conceived and designed the analysis: FRR, AR, ATA.

Collected the data: IT, AA, TS, ZHH, AM.

Contributed data or analysis tools: AR, MK, ATA.

Performed the analysis: FRR, MK.

Wrote the paper: FRR, AR, ATA, IT, AA, TS, ZHH, MK, AM.

Data Availability

Data will be made available on request.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

This research received no external funding.

References

- Witjes JA, Bruins HM, Cathomas R. European Association of Urology Guidelines on Muscle-Invasive and Metastatic Bladder Cancer: Summary of the 2021 Guidelines. *European Urology*. 2021;79(1):82–104.
- Galsky MD, Stensland KD, Sfakianos JP. Comparative effectiveness of treatment strategies for muscle invasive bladder cancer. *Lancet*. 2020;395(10221):554–64.
- Flaig TW, Spiess PE, Agarwal N. NCCN Guidelines Insights: Bladder Cancer, Version 2.2020. *Journal of the National Comprehensive Cancer Network*. 2020;18(3):329–54. doi:10.6004/jnccn.2020.0017
- Grossman HB, Natale RB, Tangen CM, Speights V, Vogelzang NJ, Trump DL, et al. Neoadjuvant chemotherapy plus cystectomy compared with cystectomy alone for locally advanced bladder cancer. *New England Journal of Medicine*. 2003;349(9):859–66.
- Seisen T, Sun M, Lipsitz SR, Abdollah F, Leow JJ, Menon M, et al. Comparative effectiveness of trimodal therapy versus radical cystectomy for localized muscle-invasive urothelial carcinoma of the bladder. *European urology*. 2017;72(4):483–7.
- Yin M, Joshi M, Meijer RP, Glantz M, Holder S, Harvey HA, et al. Neoadjuvant chemotherapy for muscle-invasive bladder cancer: a systematic review and two-step meta-analysis. *The oncologist*. 2016;21(6):708–15.
- Zargar-Shoshtari K, Zargar H, Lotan Y, Shah JB, van Rhijn BW, Daneshmand S, et al. A multi-institutional analysis of outcomes of patients with muscle-invasive bladder cancer treated with neoadjuvant chemotherapy followed by cystectomy. *Journal of Clinical Oncology*. 2016;34(17):1934–40.
- Dash A, Pettus IV JA, Herr HW, Bochner BH, Dalbagni G, Donat SM, et al. A role for neoadjuvant gemcitabine plus cisplatin in muscle-invasive urothelial carcinoma of the bladder: a retrospective experience. *Cancer*. 2008;113(9):2471–7.
- James ND, Hussain SA, Hall E, Jenkins P, Tremlett J, Rawlings C, et al. Radiotherapy with or without chemotherapy in muscle-invasive bladder cancer. *New England Journal of Medicine*. 2012;366(16):1477–88.
- James ND, Hussain SA, Hall E, Jenkins P, Tremlett J, Rawlings C, et al. Long-term outcomes of radiotherapy with or without chemotherapy for muscle invasive bladder cancer: ten-year follow-up of the BC2001 trial. *Journal of Clinical Oncology*. 2022;40(4):384–94. doi:10.1200/JCO.21.01506
- Mak RH, Hunt D, Shipley WU, Efsthathiou JA, Tester WJ, Hagan MP, et al. Long-term outcomes in patients with muscle-invasive bladder cancer after selective bladder-preserving combined-modality therapy: a pooled analysis of Radiation Therapy Oncology Group protocols 8802, 8903, 9506, 9706, 9906, and 0233. *Journal of Clinical Oncology*. 2014;32(34):3801–9.
- Giaccalone NJ, Shipley WU, Clayman RH, Niemierko A, Drumm M, Heney NM, et al. Long-term outcomes after bladder-preserving tri-modality therapy for patients with muscle-invasive bladder cancer: an updated analysis of the Massachusetts General Hospital experience. *European urology*. 2017;71(6):952–60.
- Hamad J, McCloskey H, Milowsky MI, Royce T, Smith A. Bladder preservation in muscle-invasive bladder cancer: a comprehensive review. *International braz j urol*. 2020;46(2):169–84.
- Gupta S, Hensley PJ, Li R, Choudhury A, Daneshmand S, Faltas BM, et al. Bladder preservation strategies in muscle-invasive bladder cancer: recommendations from the International Bladder Cancer Group. *European urology*. 2025.
- Moschini M, Shariat SF, Rouprêt M, et al. Impact of surgical delay on outcomes in patients with muscle invasive bladder cancer. *European Urology Focus*. 2021;7(1):89–97.
- Vetterlein MW, Gild P, Kluth LA, Soave A, Dahlem R, Fisch M, et al. Conditional survival of patients with muscle invasive bladder cancer. *European Urology*. 2020;77(4):553–61. doi:10.1016/j.eururo.2019.11.019